



STANLEY PARK RESTORATION

December 2007



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This progress report is a summary of work completed on the restoration of Stanley Park during the first year after the major windstorm of December 15, 2006. The work is guided by the Stanley Park Restoration Plan, which was approved by the Vancouver Park Board on April 16, 2007. While many restoration activities have been completed in 2007, several important initiatives will occur in 2008. A follow-up report will be prepared in late 2008.

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STANLEY PARK RESTORATION





VANCOUVER
BOARD OF
PARKS AND
RECREATION

December 1st, 2007

Greetings from the Vancouver Board of Parks and Recreation

On behalf of the Vancouver Board of Parks and Recreation (Park Board), I am pleased to present you with the Stanley Park Restoration Progress Report.

It has been one year since the devastating storm that left our beloved park bruised and broken. Since then, intense work has been undertaken to assess, restore and renew the park. Through the generous financial support of individuals, corporations and all three levels of government, we have made much-needed improvements to the forest and the seawall, ensuring that this park remains vibrant for many, many generations to come.

This report provides a detailed summary of the work that has been done to protect the park and its visitors, restore the worst-hit areas and rebuild the seawall. We have also included a summary of expenditures and plans for completion of the restoration work over the next year.

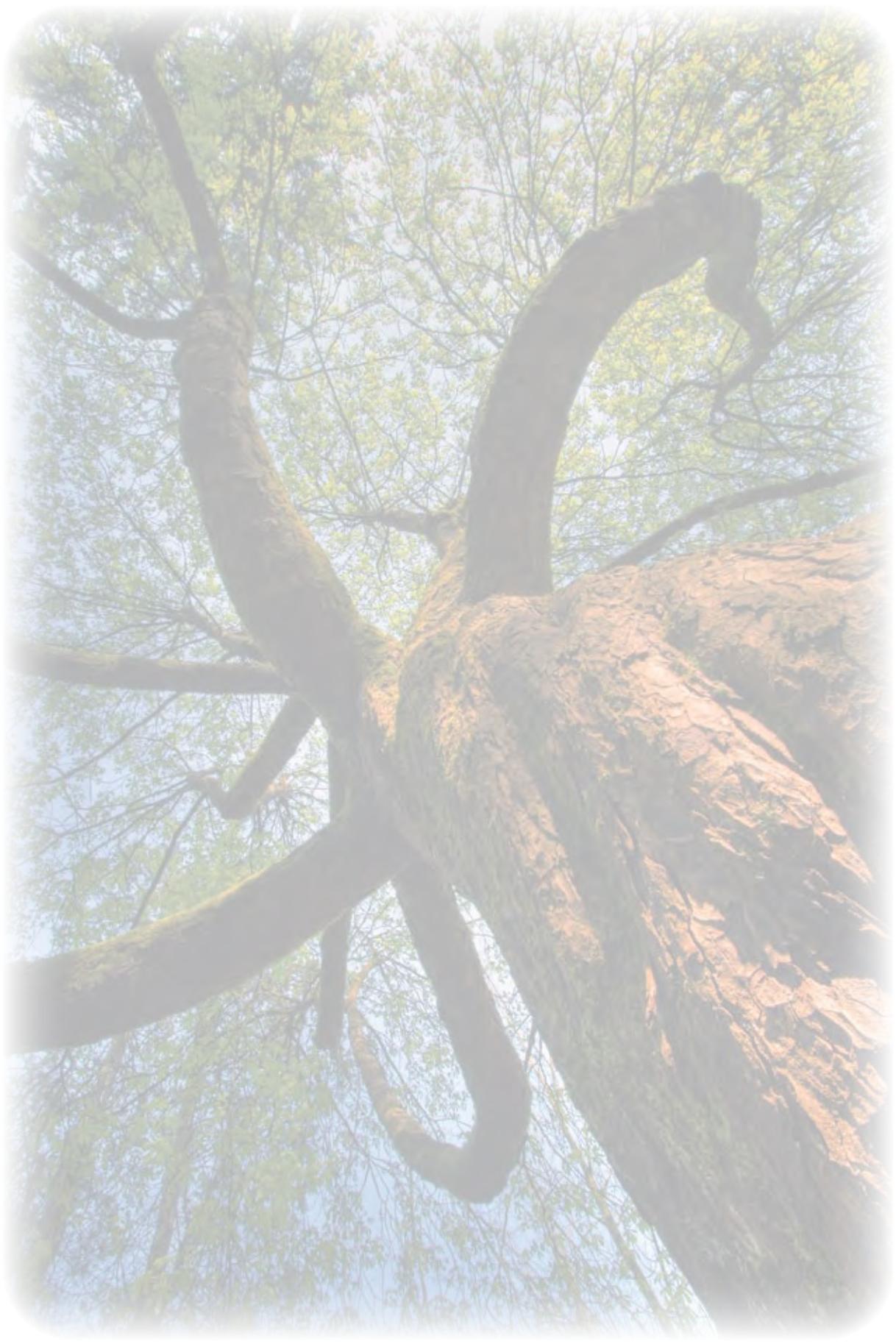
The Park Board is committed to the stewardship of our city's parks and recreation facilities. This major undertaking to restore Vancouver's largest, oldest and best loved park is a testament to that commitment.

I hope that you find the following report on our restoration efforts both reassuring and informative.

Yours truly,

Commissioner Ian Robertson

Chair



Stanley Park and the 2006-2007 Windstorms



Stanley Park

- established in 1888
- 391 hectares (969 acres)
- 9 km waterfront seawall
- 8 million visitors annually

Forest

- 250 hectares (620 acres)
- 150,000 mature trees
- tallest tree: about 75 m
- 24 km of trails

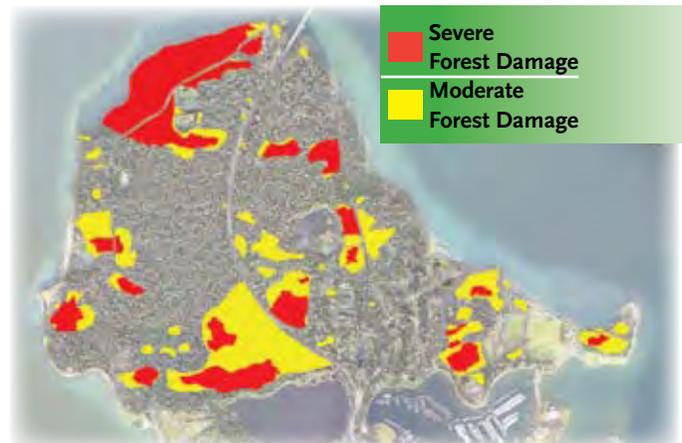
Stanley Park is Vancouver's oldest, largest and most popular park and a National Historic Site. Stanley Park's forest is one of its central features.

On December 15, 2006, the biggest windstorm in more than forty years roared through Vancouver, causing significant destruction and damage to Stanley Park. This was followed by two major windstorms on January 5 and January 9, 2007.

- approximately 10,000 trees fell (between 5% and 10% of all trees in the park);
- there was severe damage to about 40 hectares (100 acres) of the forest (about 15% of the forest) – these areas are referred to as the “blowdown areas”;

- there was light to moderate damage to another 40 hectares (100 acres) of the forest (about 15% of the forest);
- there was significant damage to portions of the seawall between Prospect Point and Third Beach;
- there was significant damage to Siwash Rock Trail and Merilees Trail between Prospect Point and Third Beach; and
- the escarpment above the seawall between Prospect Point and Third Beach was weakened, causing several landslides.

Windstorms



Windstorms



On December 15, 2006, the biggest windstorm in more than forty years roared through Vancouver, causing significant destruction and damage to Stanley Park



Immediately after each windstorm, the Park Board closed most or the whole of Stanley Park for safety reasons: for four days after the first windstorm, for one day after the second windstorm and for three days after the third windstorm. After each storm, Park Board crews cleared fallen trees and removed or modified hazard trees from park roads, pathways, forest trails and public gathering places.

Over 7,000 individuals and corporations rallied to restore the park, donating \$3.5 million. All three levels of government – the City of Vancouver, the Provincial government and the Federal government – have contributed \$2 million each toward the restoration project. A total of \$9.5 million has been earmarked for the restoration of Stanley Park.



Stanley Park Restoration Plan

Restoration activities were guided by the Stanley Park Restoration Plan, which was approved by the Park Board on April 16, 2007. It was prepared by a team of Park Board staff, consultants and volunteers with a wide range of knowledge and experience. A community consultation process was undertaken during February and March 2007 to assist with the preparation of the Restoration Plan. The Restoration Plan identifies the following vision:

That Stanley Park's forest be a resilient coastal forest with a diversity of native tree and other species and habitats, that allows park visitors to experience nature in the city.



Three goals were established for the restoration of the park:

- 1 Establish and maintain conditions in the blowdown areas that will foster a resilient coastal forest with a diversity of native tree and other species and habitats, using methods and equipment that protect the environment, park visitors, workers and volunteers;
- 2 Repair the park's infrastructure so that the park activities can resume as quickly as possible; and
- 3 Create legacies that will support the whole of Stanley Park's forest in the long term.

Protection

Protection

A fundamental principle of the Stanley Park Restoration Plan was to ensure that all work be done in a manner that protects Stanley Park's natural and cultural environments, as well as park visitors, workers and volunteers.

The first step was to create a comprehensive inventory of these various features, which involved experts in forest ecology, arboriculture, biology, and archaeology. Much of this work required hiking through the blowdown areas, flagging features that needed to be protected or retained, and recording their location with a 'global positioning system' (GPS) unit. In the case of the habitat of species at risk, multiple visits were required to determine the presence of these species. All this information was mapped on a computerized aerial photograph of the park using a 'geographic information system' (GIS).

The second step was to create a set of detailed work guidelines for each blowdown area, taking into consideration environmental and human features needing protection. These 'prescriptions', as they are called, guided forest crews as to where fallen trees were to be removed and where fallen trees were to be left on the forest

floor in each blowdown area. They identified the precise location on a map of environmentally sensitive areas and archaeological resources. In some cases, they identified specific time periods during which forest crews could not work (e.g. nesting season for birds).

The third step was to monitor and assist forest crews as they were working in the blowdown areas. In some cases, it meant that the site supervisor ensured that all workers were aware of features that were flagged (e.g. a snag or an archaeological resource) near their work zone. In other cases, experts (e.g. arborists, biologists) were brought in to work side-by-side with the work crews.



Although forest restoration work was planned and carried out in an environmentally-friendly way, there were situations where protecting workers, volunteers and/or park visitors was the Park Board's first obligation, for example the removal of a dangerous tree next to a forest trail.

Following is a list of specific initiatives that were taken with regard to environmental, cultural and human protection objectives.

Protecting the forest floor and understory plant communities

A series of measures were instituted to achieve this objective, including:

- designating certain areas that have intact forest floor, understory plant communities and trees as protected zones;
- using machines which are specially adapted to minimize soil disturbance; two 'log loaders' (machines used to lift and transport fallen trees) were selected because of their reach, mobility and light footprint;
- laying down temporary access routes made with broken branches so that the 'log loaders' would not travel directly on the forest floor; about 20 of these temporary access routes were created and, once the work was done, removed;
- ensuring that the 'log loaders' lifted fallen trees clear off of the ground before moving them rather than dragging them across the forest floor.

Protecting environmentally sensitive areas and the habitat of species at risk

Biologists from the Stanley Park Ecology Society, Parks Canada and the BC Ministry of Environment assisted in defining environmentally sensitive areas and the habitat of species at risk in and near the blowdown areas. Biologists surveyed the blowdown areas for the five 'endangered' or 'threatened' species at risk that may be present in Stanley Park: Streaked Horned Lark,

Western Painted Turtle, Marbled Murrelet, Pacific Water Shrew, and Peregrine Falcon (anatum).

Two seasonal streams along Merilees Trail were identified as environmentally sensitive areas and designated as protected zones. In addition, the bog-like terrain in the blowdown areas north of Lost Lagoon and east of Beaver Lake was identified as potential habitat for the Pacific Water Shrew. Because these two areas are too large to designate as protected zones, special measures were drafted by biologists to allow work crews to enter into these areas in a way that would minimize disturbance.

The vast majority of work in the blowdown areas also avoided the spring nesting season for birds.

Protection



Retaining as many trees and snags as possible



Protection

Several thousand trees and snags survived the windstorms in the blowdown areas, although many were damaged. About 75% of these trees and snags were retained, although this figure varies from blowdown to blowdown. Many trees that were retained were modified to improve their chance of survival or to reduce the risk they posed to workers and/or the public.

Retaining an appropriate amount of fallen trees on the forest floor to meet current and future ecological needs

The target set in the Restoration Plan was to retain between 80 and 120 tonnes of fallen trees and stumps per hectare on the forest floor



– a quantity that is typical of a West Coast forest. The target has been achieved in all blowdown areas.

Protecting the forest next to the blowdown areas from future windstorms

Newly exposed trees at the edge of the blowdown areas are typically unstable but can be stabilized by a process called “windfirming” (selectively thinning branches on a tree and occasionally removing the crown of a tree). Trees were assessed by experts and the work was performed by specialized forestry workers who climb the trees and remove branches using chain-saws. More than 2,000 trees at the edge of the blowdown areas have been ‘windfirmed’.



Protecting archaeological resources

The key archaeological resources to protect in the blowdown areas were ‘culturally modified trees’ (CMT).

A CMT is a tree modified by First Nations prior to European contact – for example, the stripping of a piece of bark or the sampling of a tree to establish its suitability

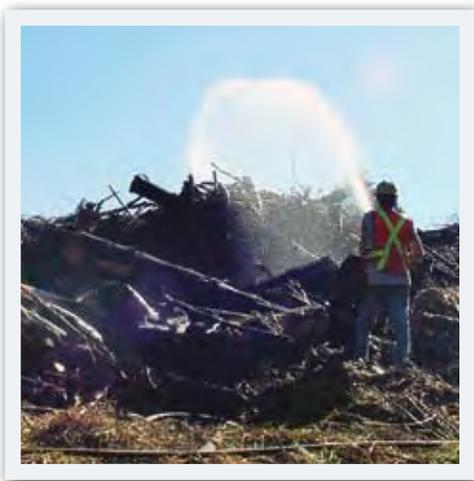


for canoe making. An archaeologist flagged CMTs in the field. All CMTs were protected from disturbance, except one which was cut because it was a hazard to workers and the public.

Reducing the risk of having a major forest fire



There is a high fire risk in the summer following a major blowdown because there is a larger quantity of fallen trees, branches and needles on the forest floor. A series of measures were taken to reduce the risk of having a major forest fire:



- A comprehensive forest fire protection strategy was developed and implemented, including fire prevention measures and fire suppression measures.

- Work crews collected small woody debris (often the ignition source of a forest fire) found within five meters of both sides of trails and roadways and within the blowdown areas, and shipped it to a central location in the park, where it was ground into chips and shipped away (more than 12,000 cubic meters).

- Work crews installed temporary water lines to the two largest blowdown areas and watered high risk areas during hot summer days.

There were a total of five fires during the 2007 fire season which required a fire department response. All of them were spotted early and extinguished before they caused significant damage.

Reducing the risk of having an insect infestation

There is a higher risk of insect infestation during the first summer after a major windstorm because the large quantity of fallen trees on the forest floor provides good conditions for attracting insects and their breeding. A series of insect traps were installed in various locations

in the forest. The traps were monitored by UBC entomologists every three weeks during the summer months. Fortunately, an infestation did not occur.



Protecting park visitors, workers and volunteers

Protection

Every effort was made to protect park visitors from falling trees/branches, unstable trail conditions and landslides by closing off high risk areas along the seawall and forest trails.

After the windstorms, the seawall between Prospect Point and Third Beach was closed and remained so until mid-November 2007. Barriers with signs were installed near Prospect Point and Third Beach. Detour routes were offered to park visitors.



Another key component was to provide a safe work environment for staff, consultants, contractors and volunteers. This effort involved staff from WorkSafe BC, the provincial agency responsible for safe working conditions. The desire to retain as many trees and snags as possible in the blowdown areas and the steep slope above the seawall between Prospect Point and Third Beach meant additional measures were needed to create a safe environment for work crews. Only one work-related injury has been reported: the injury was not considered serious and the forestry worker returned within one month.



All forest trails were also closed. By April 2007, about 75% of the trails were re-opened. The remaining 25% of the forest trails remained closed throughout the summer and fall. Barriers with

signs were installed at trail heads. Only two forest trails will remain closed until 2008: Siwash Rock Trail and Cathedral Trail. Forest trails were also closed on a temporary basis while forest crews worked in the nearby blowdown areas.



Restoration

The central goal of the Restoration Plan is to establish and maintain conditions in the blowdown areas that will foster a resilient coastal forest with a diversity of native tree and other species and habitats. It is hoped that the forest will not only heal after being damaged by the windstorms, but become stronger and healthier so that future disturbances do not have devastating effects.

The Restoration Plan identified a series of steps to follow in the blowdown areas:

- Remove dangerous trees;
- Remove an appropriate amount of fallen trees from the forest floor;
- Distribute the fallen trees that will be removed based on a hierarchy of needs;
- Plant a diversity of native trees and shrubs;
- Brush back the understory surrounding newly planted trees for the next ten years;
- Reduce risk of invasive plant infestation.

Remove dangerous trees

Several thousand trees and snags survived the windstorms in the blowdown areas. About 25% of these trees and snags were removed because of the high risk they posed to workers and/or the public.

Status: *about 80% completed.*



Restoration

Remove an appropriate amount of fallen trees from the forest floor

About 75% of fallen trees are being removed from the forest floor. This will permit tree planting efforts since large portions of the blowdown areas are currently covered with fallen trees. It will also reduce the risk of having a major forest fire by reducing the quantity of wood left on the forest floor.

Fallen trees to be removed are first of all limbed and then cut by work crews into lengths suitable for transportation. The logs are then loaded onto trucks. About 5,500 logs have been removed from the blowdown areas since July 2007.





Distribute the fallen trees that will be removed based on a hierarchy of needs

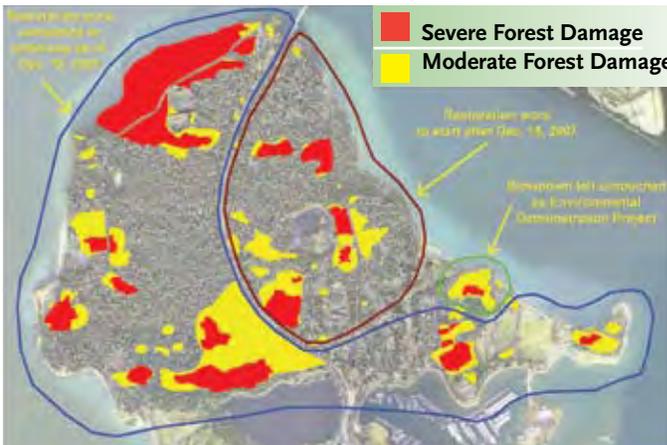
The 5,500 logs that have been removed from Stanley Park have been brought to a storage site in an industrial area in Vancouver. The Restoration Plan recommended distributing the fallen trees based on a hierarchy of needs.

Restoration

The log removal process is tricky because of complicating circumstances such as trees that fell atop each other, steep slopes, and bog-like terrain. Moreover, the work is time consuming because of the desire to protect Stanley Park's natural and cultural environments, as well as workers, volunteers and park visitors.

The removal of fallen trees has been completed or is underway in 10 of the 16 blowdown areas, including the large blowdown located between Prospect Point and Third Beach, as shown on the map below. Five blowdown areas, all located near Beaver Lake, remain to be done. One blowdown (northeast of the Aquarium) has been set aside as an environmental demonstration project and will be left untouched to regenerate on its own.

Status: *about 80% completed.*



- First Nations needs: about 40 to 50 cedar logs will be given to the Musqueam, Squamish and Tsleil-Waututh Nations.
- Institutional / government needs: two projects are being considered (the new Trout Lake Ice Rink and a longhouse to be built for the 2010 Winter Olympics and Paralympics).
- Private needs: hemlock and lower grade timber is actively being marketed and sold. The net revenue from the sale of the wood is being placed in the Stanley Park Forest Restoration Fund.

Status: *ongoing.*

Plant a diversity of native trees and shrubs

The Restoration Plan recommended planting a diversity of native trees, including Douglas-fir, western red cedar, Sitka spruce, grand fir, big leaf maple and red alder. About 20,000 trees will be planted during the 2007-2008 winter season.

About 3,000 trees and 500 ferns have been planted to date in the blowdown area near Prospect Point.



Status: *about 15% completed.*

Reduce risk of invasive plant infestation

Invasive plants (e.g. English ivy, Himalayan blackberry) could flourish in the blowdown areas and hinder the re-establishment of newly planted trees. Park Board staff and the Stanley Park Ecology Society (SPES) have begun and will continue to monitor the possible spread of invasive plants in the blowdown areas and take appropriate action if necessary. SPES has recently hired a coordinator who will focus on expanding the existing volunteer program to remove invasive plants from the park.



Status: *ongoing for the foreseeable future.*

Brush back the understory surrounding newly planted trees for the next ten years

The Restoration Plan recommended this ongoing activity to ensure the survival of newly planted conifers, which could otherwise be out-competed for sunlight by hemlocks, invasive plants and deciduous brush.



Status: *start in 2008.*

Restoration

Enhancement

Enhancement

Not only did the windstorms devastate large portions of Stanley Park's forest, they also damaged the seawall and the steep slope from Prospect Point to Third Beach, including Siwash Rock Trail. As these and other elements are rebuilt, they offer the Park Board the opportunity to construct them in a way that will enhance Stanley Park in the long term. The key features where important enhancements have or will occur are described below.

Prepare and implement a slope stabilization plan for the area between Prospect Point and Third Beach.

The windstorms caused a series of small to medium scaled landslides along the steep slope that runs from Prospect Point to Third Beach. The debris and the trees that tumbled down the slope blocked the seawall, which was immediately shut down for public safety reasons.

This area has a history of landslides. Over the last 20 years, the Park Board has responded by inspecting the slope and removing rocks and debris every year.

With the seawall closed for an extended period, there was an opportunity to perform additional slope stabilization work in 2007. Trees, soil and rock that were considered likely to fall down over the next 10-20 years were removed. Plants and shrubs that grow well on steep terrain and provide good soil stability were planted. Drainage improvements were made where soils typically become overly saturated during winter months.

In total, about 40% of the 2 km segment between Prospect Point and Third Beach was modified and made more stable. It is anticipated that the number of landslides will decrease for the

foreseeable future, thereby increasing the safety level for seawall users and decreasing the number of times the seawall has to be closed. The Park Board will nevertheless continue to inspect the slope on an annual basis and perform the necessary work to maintain slope stability.



Status: about 90% completed;

the remaining 10% will be done in 2008

Repair and/or reconstruct damaged portions of the seawall.

The seawall between Prospect Point and Third Beach was damaged by trees falling from the slopes above and the powerful waves off of English Bay during the December 15, 2006 windstorm. It was immediately closed for safety reasons. The seawall reopened in mid-November 2007 after work on slope stabilization, debris removal and basic repairs to the asphalt surface were completed.

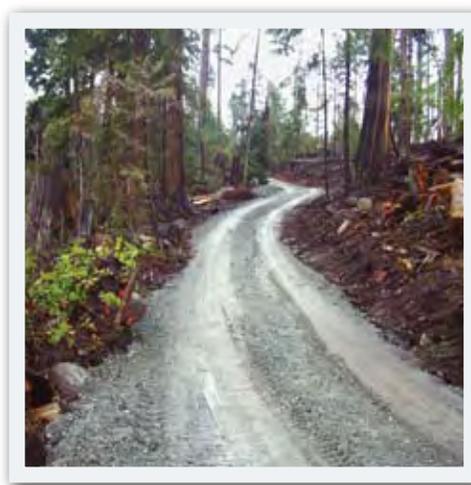
It is clear that portions of the seawall are not as structurally sound as they should be. Powerful waves have washed out material under the seawall walkway and created voids, which can weaken the walking/riding surface and even the strength of the stone wall itself. A second phase of work is planned for this portion of the seawall in 2008, namely the strengthening of the exterior wall in places where reinforcement is deemed necessary.



Status: scheduled for 2008.

Repair and/or reconstruct damaged forest trails.

The forest trail that was most damaged during the windstorm was Siwash Rock Trail, a one kilometer trail connecting Prospect Point to Third Beach, at the top of the bluff overlooking the seawall. Several segments of the trail were lost due to landslides. Other segments are on terrain that is not considered stable in the long term.



About 60% of the trail has been relocated upland on more stable soil and built with a better drainage system. The trail will have fewer hills and be able to accommodate Park Board maintenance and emergency services vehicles, thereby improving safety for park visitors. Work started in the fall of 2007 and will be completed in 2008.

Status: work on Siwash Rock Trail

is about 60% completed.

Relocate Park Drive and parking lot away from Prospect Point to improve drainage, visitor safety and aesthetics.

Park Drive and a parking lot are built very close to the viewpoint at Prospect Point. An opportunity exists to relocate the road and parking lot away from Prospect Point because a portion of the forest about 100 meters away from Prospect Point was blown down during the December 15, 2006 windstorm. The blowdown is wide enough for the road and parking. The existing portion of Park Drive and the parking lot would be naturalized.



Enhancement



Preliminary plans (one option is shown here) have been prepared and include additional walking paths and landscaping, an enhanced viewing area at the point and a larger plaza in front of the Prospect Point Café. A preferred option will be selected by the Park Board in December 2007. Detailed construction plans will then be prepared and construction will be carried out in 2008.

Status: *about 10% completed.*

Upcoming Work

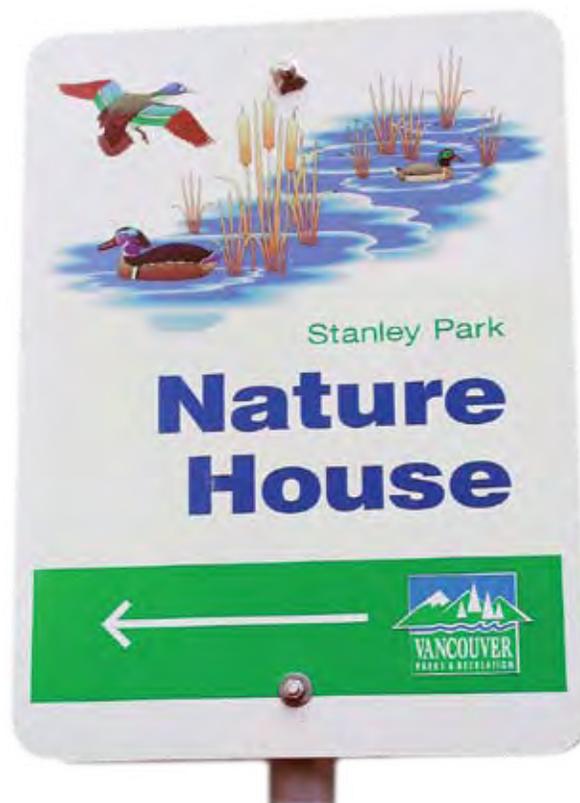
A significant amount of work has been accomplished in the first year after the windstorm, though many items remain to be done in 2008.

A number of tasks which began in 2007 will continue into next year:

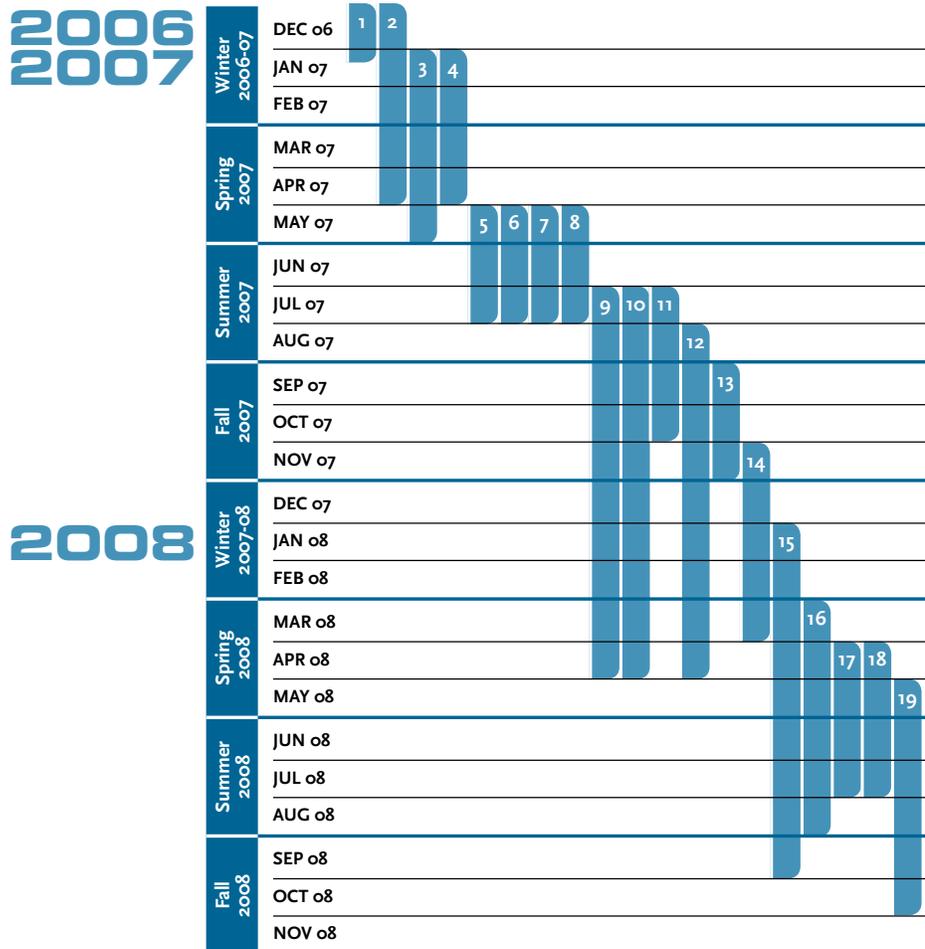
- Removing fallen trees in the five blowdown areas located near Beaver Lake;
- Finishing the distribution of fallen trees that will be removed from Stanley Park;
- Planting about 17,000 trees in the blowdown areas;
- Controlling the spread of invasive plants;
- Completing stabilization work on the slope between Prospect Point and Third Beach;
- Performing structural repairs to the seawall between Prospect Point and Third Beach; and
- Completing the reconstruction of Siwash Rock Trail.

Next year will also mark the start up of the following activities:

- Relocating Park Drive and parking lot away from Prospect Point;
- Building a boardwalk along portions of Cathedral Trail;
- Adding educational and interpretative resources in Stanley Park, including the possibility of building a permanent interpretative centre; and
- Updating Stanley Park's 1990 forest management plan.



Time Line



- | | | |
|---|--|---|
| <p>1 Windstorms on Dec. 15, 2006, Jan. 5 and Jan. 9, 2007</p> <p>2 Clearing of fallen trees from roads, pathways and trails</p> <p>3 Removing or modifying dangerous trees along both sides of roads, pathways and trails</p> <p>4 Preparation and approval of Restoration Plan</p> <p>5 Identification of environmental & cultural features to protect</p> <p>6 Preparation of forest fire protection strategy</p> | <p>7 Protection of newly created forest edge with 'windfirming' of trees</p> <p>8 Removal of fine woody debris from sides of roads and trails</p> <p>9 Restoration work in blowdown areas (removal or modification of dangerous trees, removal of fallen trees, removal of fine woody debris, monitoring by biologists)</p> <p>10 Distribution of fallen trees</p> <p>11 Stabilization of slope between Prospect Point and Third Beach</p> <p>12 Reconstruction of Siwash Rock Trail</p> | <p>13 Clearing and basic repairs to seawall between Prospect Point and Third Beach</p> <p>14 Planting of new trees and shrubs</p> <p>15 Preparation of a forest education/interpretative strategy</p> <p>16 Relocation of Park Drive and parking lot at Prospect Point</p> <p>17 Structural upgrade to seawall between Prospect Point and Third Beach</p> <p>18 Construction of boardwalk along Cathedral Trail</p> <p>19 Updating Stanley Park's Forest Management Plan</p> |
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Budget and Expenditures

The Stanley Park Restoration project has a budget of \$9.5 million:

- \$3.5 million in donations;
- \$2.0 million from the City of Vancouver;
- \$2.0 million from the Provincial government; and
- \$2.0 million from the Federal government.

Expenditures for 2007 and those planned for 2008 are estimated to cost about \$8.2 million. About \$1.3 million is reserved as a contingency for unforeseen costs and future forest restoration work. Monies remaining at the end of the project in December 2008 will be transferred to the Stanley Park Forest Restoration Fund, to be spent on forest restoration work required in the years ahead (e.g. brushing, infill tree planting, etc.) as identified in the Restoration Plan.

Year	Major Restoration Activities	Expenditures
2007	<ul style="list-style-type: none"> • Initial clean-up • Removing/modifying dangerous trees • Preparing Restoration Plan • Environmental protection strategy • Forest fire protection strategy • Protecting newly created forest edge • Removing fine woody debris • Restoration work in blowdown areas • Slope stabilization work • Rebuilding Siwash Rock Trail • Seawall clearing and basic repairs 	\$3.0 million (32%)
2008	<ul style="list-style-type: none"> • Restoration work in blowdown areas • Planting of trees and shrubs • Structural upgrade of seawall • Boardwalk along Cathedral Trail • Prospect Point road relocation • Education/interpretative strategy • Updating forest management plan • Repairing damaged roads and trails 	\$5.2 million (55%)
Contingency and future forest work		\$1.3 million (13%)
TOTAL		\$9.5 million (100%)

