

STANLEY PARK RESTORATION

RECOMMENDED PLAN



*Report printed on April 9, 2007
Report to be considered by Park Board on April 16, 2007
(Note: Section 2(b) was reprinted on April 12, 2007 with
corrections by Parks Canada.)*



Vancouver Park Board – 2099 Beach Avenue, Vancouver, B.C., V6G 1Z4
www.vancouverparks.ca

Table of Contents

Executive Summary	3
Report Outline.....	7
Stanley Park’s Forest.....	8
The Windstorms and the Damage.....	10
The Park Board Response.....	12
The Community’s Response	13
Preparing the Plan.....	14
Forest Management Strategy	15
Vision for Stanley Park’s Forest	16
Goals of the Restoration Plan	17
Guiding Principles of the Restoration Plan.....	18
1. Restoration Activities to Foster a Resilient Coastal Forest.....	19
2. Restoration Activities to Protect the Natural and Cultural Environments	26
3. Restoration Activities to Protect Park Visitors, Workers and Volunteers.....	32
4. Restoration Activities to Repair Park Infrastructure.....	35
5. Restoration Activities to Create Supporting Legacies	38
Community Consultation	42
Schedule of Major Restoration Activities	45
Provisional Budget.....	46
Recommendations for Implementation.....	47
Glossary	48
Park Board Staff, Consultants and Volunteers	51
Map of Stanley Park.....	53

Executive Summary

Stanley Park is Vancouver's oldest, largest, and most popular park. Its forest is one of the park's central features, with an estimated 150,000 mature trees. During the winter of 2006-2007, three major windstorms struck Stanley Park, causing significant destruction, including the blowing down of more than 10,000 trees and substantial damage to the seawall between Prospect Point and Third Beach.

On January 15, 2007, the Park Board approved the preparation of a Restoration Plan with a multi-disciplinary team and broad community consultation.

The Stanley Park Restoration Plan identifies a vision for the whole of Stanley Park's forest, goals for the restoration of the park, and principles to guide the implementation of the Restoration Plan.

Vision for Stanley Park's Forest:

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.



Goals 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.

Guiding Principles:

1) Foster a resilient coastal forest

- a) Adapt the Restoration Plan to respond to the specific conditions of the various blowdown areas.
- b) Retain as much as possible of remaining forest structure in the blowdown and perimeter areas.
- c) Reduce the amount of coarse woody debris in the blowdown areas to an acceptable level.
- d) Plant a diversity of native trees and shrubs within the blowdown areas.
- e) Protect the newly forested areas from being damaged or destroyed by natural occurrences or human activity.

2) Protect the natural and cultural environments

- a) Protect environmentally sensitive areas within and near the blowdown areas.
- b) Protect the habitat of species at risk found within and near the blowdown areas.
- c) Minimize the impacts of roads and trails.
- d) Protect archaeological resources.

3) Protect park visitors, workers and volunteers

- a) Modify or remove hazard trees.
- b) Stabilize the slopes above the seawall between Prospect Point and Third Beach.
- c) Reduce risk of forest fires.

4) Repair park infrastructure

- a) Re-open transportation corridors without compromising public safety.
- b) Repair or reconstruct damaged transportation corridors and utilities.

5) Create supporting legacies

- a) Allow nature to take its course without human intervention in one of the blowdown areas as an environmental demonstration project.
- b) Create opportunities for historical, cultural and forest education and interpretation.
- c) Create an ongoing forest maintenance fund.
- d) Update the park's forest management plan.

Recommendations for Implementation:

Specific restoration activities have been listed for each of the principles. The bulk of the restoration activities will be completed within one year. The cost of implementing the Restoration Plan is estimated to be about \$9 million. Major restoration activities that are recommended are listed below:

1. Modify or remove danger trees within or near the blowdown areas, and hazard trees elsewhere in the park.
2. Protect the forest floor and understory plant communities and retain as many trees and snags as possible in the blowdown areas.
3. Modify the newly created forest edge so that the risk of the blowdown areas spreading to remaining trees is minimized.
4. Remove an appropriate amount of fallen trees from the forest floor, balancing the need to manage fire and insect infestation risks while meeting the current and future ecological needs of the forest.
5. Reduce risk of forest fires by removing fine woody debris within five meters of all trails, roads and parking lots, and from areas of human activity within the forest, and by removing most fallen trees from the blowdown areas.
6. Prepare and implement a slope stabilization plan for the area between Prospect Point and Third Beach.
7. Repair or reconstruct damaged portions of the seawall.
8. Repair or reconstruct damaged roads, trails, drainage, and utilities.
9. Relocate Park Drive and parking lot away from Prospect Point to improve drainage, visitor safety and aesthetics.
10. Work with First Nations and agencies like Stanley Park Ecology Society, Nature Vancouver, Vancouver Historical Society and Vancouver Heritage Commission to enhance and augment educational and interpretative resources for Stanley Park.
11. Allocate the fallen trees that will be removed based on a hierarchy of needs.
12. Plant Douglas-fir, western red cedar, Sitka spruce, grand fir, big leaf maple, red alder and a variety of shrubs.
13. Brush back the understory surrounding newly planted trees for the next ten years.
14. Reduce risk of invasive plant infestation within and near the blowdown areas.

The Future of Stanley Park's Forest

Work on the forest does not stop after restoration activities are completed. An ongoing program to maintain and care for the forest is necessary, as well as the preparation of an updated forest management plan for the whole of Stanley Park's forest.

With carefully planned restoration and management, Stanley Park's forest will recover in the fullness of time. It is hoped that the forest will not only heal after being damaged by the windstorms, but become stronger and healthier such that future disturbances do not have catastrophic effects.

As it has for generations, Stanley Park's forest will continue to inspire residents of and visitors to Vancouver and allow all to richly experience nature in the city.

Report Outline

The Stanley Park Restoration Plan begins with a short introduction about Stanley Park and its forest. This is followed by a description of the damage caused by the windstorms during the winter of 2006-2007. The Park Board's response to the windstorms is detailed, as well as the community's reaction and response.

The report then discusses how the Restoration Plan was prepared. The management strategy and a long-term vision for the whole of Stanley Park's forest are presented. It is within this context that the report states the goals and guiding principles of the Restoration Plan, which focus mostly but not exclusively on restoring the blowdown areas.

The report then proceeds to identify and discuss the recommended restoration activities. Specific sections have been included on community consultation, the schedule of major restoration activities, the budget, and recommendations for implementation.

A glossary and a list of Park Board staff, consultants and volunteers who participated in the preparation of the Restoration Plan are included at the end of the report.



Stanley Park's Forest



Stanley Park is Vancouver's oldest (established in 1888), largest (391 hectares or 967 acres), and most popular (about 8 million visitors annually) park.

Stanley Park's forest (about 250 hectares or 620 acres) is one of its central features. It is estimated that there are about 150,000 mature trees in Stanley Park's forest. The forest performs a number of key functions, including:

- it is one of Vancouver's central symbols, here at home, across Canada and abroad;
- it is valuable ecological habitat in an urban environment;
- it is an important environmental education resource for Vancouverites and tourists; and
- it offers recreational and leisure opportunities for Vancouverites and tourists to enjoy walks, jogs, bike rides and drives through the forest.



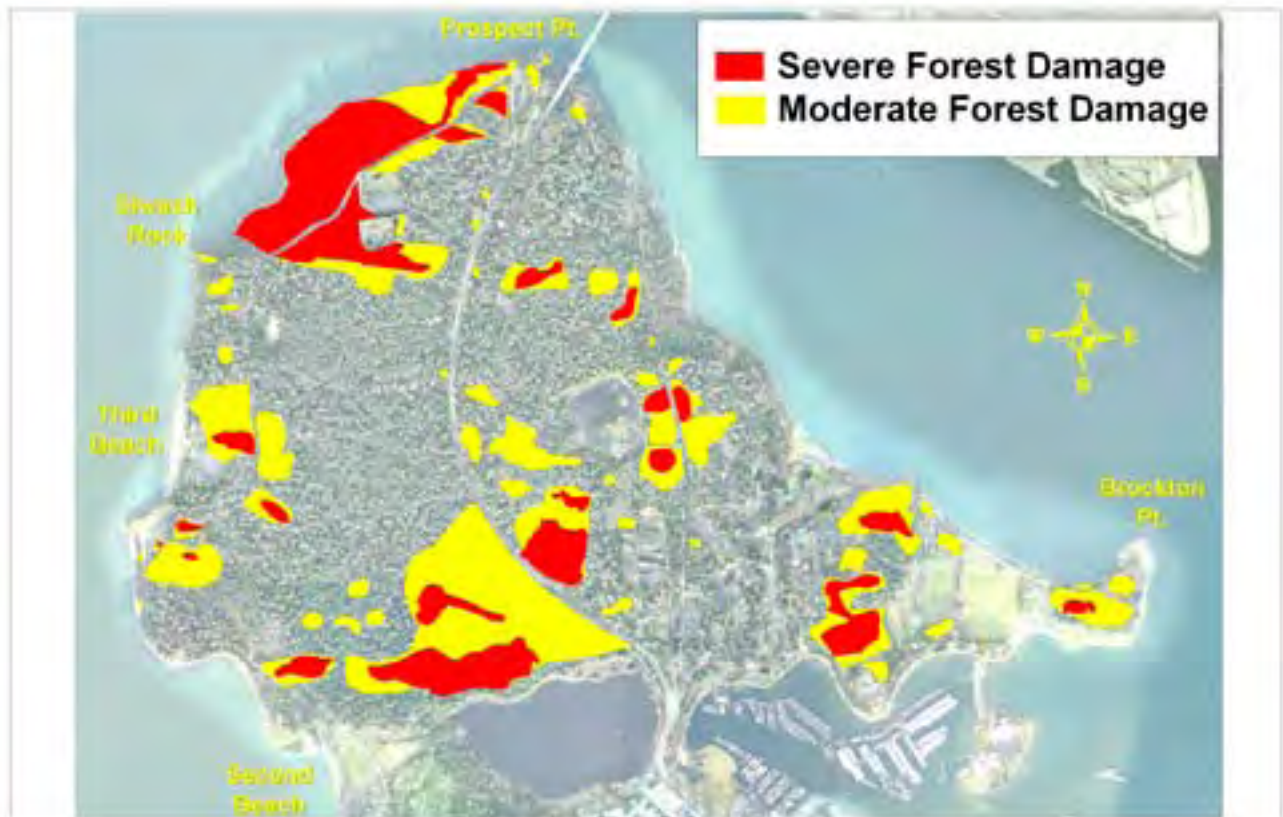
Key historical events about Stanley Park’s forest include:

<p>Pre 1850</p>	<p>First Nations peoples inhabit Stanley Park. Forest trees are used as sources of fuel, cedar bark, slabs, housing and canoe logs.</p>	
<p>ca. 1850</p>	<p>First Europeans occupy areas around Stanley Park.</p>	
<p>1860 to 1886</p>	<p>Portions of the forest in what is now Stanley Park are logged during this period.</p>	
<p>ca. 1885</p>	<p>Fire burns a large area from Lost Lagoon to Beaver Lake.</p>	
<p>1888</p>	<p>Stanley Park is established.</p>	
<p>1890 to 1930</p>	<p>Approximately 100 hectares (250 acres) of forest in Stanley Park is converted to recreational uses.</p>	
<p>1935</p>	<p>A windstorm severely damages Stanley Park’s forest.</p>	
<p>1940’s</p>	<p>First long term forestry program begins in the park.</p>	
<p>1962</p>	<p>A windstorm (“Frieda”) severely damages Stanley Park’s forest – about 20% of the forest is blown down.</p>	
<p>1980</p>	<p>Report entitled “Forest Maintenance Program for Stanley Park” is prepared.</p>	
<p>1989</p>	<p>Report entitled “Stanley Park Forest Management Plan” is prepared.</p>	

The Windstorms and the Damage

During the winter of 2006-2007, three major windstorms struck Stanley Park (December 15, 2006, January 5 and January 9, 2007), causing significant destruction and damage to the park, including:

- more than 10,000 trees fell (between 5% and 10% of all trees) – there is tree damage and loss throughout the park;
- there was severe damage to about 30 hectares (75 acres) of the forest (more than 10% of the forest) – these areas are referred to as the “blowdown areas”;
- there was light to moderate damage to another 50 hectares (125 acres) of the forest (about 20% 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 destabilized, causing several landslides.





Fallen trees on Park Drive



Seawall damage

The Park Board Response

Immediately after each windstorm, the Park Board closed most or the whole of Stanley Park for safety reasons: for 4 days after the first windstorm, for 1 day after the second windstorm and for 3 days after the third windstorm.

After each storm, the first priority was to clear fallen trees and branches from major roads in the park, including the Causeway, Park Drive and Pipeline Road. The second priority was to identify and remove or modify all hazard trees that could potentially fall on roadways.

Once safe road access was provided, crews addressed in a systematic fashion the removal of fallen trees and the removal or modification of hazard trees from public gathering places and forest trails. By April 1st, most forest trails in the park were re-opened for public use.

The seawall, Merilees Trail and Siwash Rock Trail between Prospect Point and Third Beach are closed for safety reasons and will remain so until at least August 2007.

The next major task is to deal with the areas that were damaged by the windstorms. A Restoration Plan is needed to guide Park Board activities in an orderly and well thought out manner over the next year.



The Community's Response

Many people were shocked after seeing images of the damage to the forest on the television and/or viewing the damage from Park Drive. People are deeply attached to Stanley Park and want to see the forest restored.

Many have offered support, advice and/or money to help the Park Board cope with the situation. About \$3 million has been collected in donations from individuals and corporations since the first windstorm on December 15, 2006.

All three levels of government – the City of Vancouver, the Provincial government and the Federal government – have participated financially and each has committed \$2 million toward the restoration project.

Individuals, corporations and governments have contributed a total of about \$9 million toward the restoration of Stanley Park.

Preparing the Plan

On January 15, 2007, the Park Board approved the preparation of a restoration plan for Stanley Park.

The Stanley Park Restoration Plan was prepared by an inter-disciplinary team of Park Board staff and consultants between January and April 2007.

A Steering Committee, comprised of volunteer experts in the fields of ecology, forestry and geotechnical engineering, advised the Park Board on the preparation and implementation of the Restoration Plan.

A Partners and Stakeholders Committee, comprised of representatives from First Nations and individuals from a variety of non-profit organizations, was established to gather input as the Restoration Plan was being prepared.

Park Board staff, consultants and volunteers involved in the preparation of the Restoration Plan are listed at the end of the report.

A community consultation process was undertaken during February and March 2007 to assist with the preparation of the Restoration Plan – see section on Community Consultation for details.

Forest Management Strategy

The current management strategy for Stanley Park's forest is one that envisions carefully selected human interventions to adjust the forest's evolution. The rationale for this strategy is:

- Stanley Park's forest is part of a larger park visited by millions every year. The Vancouver Park Board has the duty to care for this resource in such a way that risks to people and property are reasonably managed.
- There are certain events that would occur naturally, such as forest fire, disease outbreak or major blowdown, that would have an unacceptable catastrophic impact on the park. Intervention becomes prudent should the risk of these types of events become unreasonably high.
- Stanley Park's forest today is not as diverse as it was when Europeans arrived 150 years ago. At that time, the forest had roughly equal quantities of cedar, Douglas-fir and hemlock, as well as a well established population of Sitka spruce, grand fir, and western white pine. Today the forest is dominated by hemlock, a tree which is less resilient to storms and diseases than cedar and Douglas-fir.
- Stanley Park's forest is under constant threat from invasive exotic plants, insects, and diseases. These threaten to disrupt its ecological functions. They are monitored and managed on an ongoing basis.

The following are examples of forest management activities that have been conducted on an ongoing basis over the previous twenty years:

- Hazard tree program: Trees within striking distance of human activity were inspected on a regular basis. Hazard trees were either modified or removed.
- Storm cleanup: Storms of lesser intensity than the December 15, 2006 storm occur frequently. Downed trees and debris were cleared as required.
- Forest regeneration: Over 20,000 trees were planted since adoption of the Forest Management Plan. Ongoing brush management continues.
- Tending of tree stands established in the wake of the Frieda windstorm: Stands have been thinned to allow better growth of the remaining trees. As a fire management initiative, lower branches were pruned to provide fuel break between the forest floor and the upper branches.
- Emergency preparedness: A system of fire hydrants is maintained in portions of the forest trail network. Staff have been trained in fast fire response. Information is exchanged with City and Provincial fire control personnel, and simulations were run to ensure emergency preparedness.

Vision for Stanley Park's Forest

The Vancouver Park Board, as steward of Stanley Park since 1888, has managed the forest over the years based on the values of successive generations. The last vision statement was formulated a generation ago, shortly after Stanley Park celebrated its 100th birthday. In 1989, the Stanley Park Forest Management Plan included the following statement: “that Stanley Park continues to provide an example of mature coniferous coastal forest, while maintaining or enhancing wildlife, interpretative and scenic values”.

As part of the current work on the restoration of Stanley Park, the following vision has been formulated for Stanley Park's forest:

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.

In contrasting the two statements, the new vision emphasizes the desire that the forest be more resilient since, as the recent windstorms have demonstrated, the present hemlock-dominated forest is a fragile entity. The new vision also integrates more closely the notions of forest and ecology (species and habitats), and defines more clearly the role the forest plays for park visitors.



Goals of the Restoration Plan

Having stated the management strategy and the vision for Stanley Park's forest, three goals have been 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.

These goals will be realized through the application of the guiding principles listed in the next section.

Guiding Principles of the Restoration Plan

A series of guiding principles have been established for the restoration of Stanley Park:

1) Foster a resilient coastal forest

- a) Adapt the Restoration Plan to respond to the specific conditions of the various blowdown areas.
- b) Retain as much as possible of remaining forest structure in the blowdown and perimeter areas.
- c) Reduce the amount of coarse woody debris in the blowdown areas to an acceptable level.
- d) Plant a diversity of native trees and shrubs within the blowdown areas.
- e) Protect the newly forested areas from being damaged or destroyed by natural occurrences or human activity.

2) Protect the natural and cultural environments

- a) Protect environmentally sensitive areas within and near the blowdown areas.
- b) Protect the habitat of species at risk found within and near the blowdown areas.
- c) Minimize the impacts of roads and trails.
- d) Protect archaeological resources.

3) Protect park visitors, workers and volunteers

- a) Modify or remove hazard trees.
- b) Stabilize the slopes above the seawall between Prospect Point and Third Beach.
- c) Reduce risk of forest fires.

4) Repair park infrastructure

- a) Re-open transportation corridors without compromising public safety.
- b) Repair or reconstruct damaged transportation corridors and utilities.

5) Create supporting legacies

- a) Allow nature to take its course without human intervention in one of the blowdown areas as an environmental demonstration project.
- b) Create opportunities for historical, cultural and forest education and interpretation.
- c) Create an ongoing forest maintenance fund.
- d) Update the park's forest management plan.

1. Restoration Activities to Foster a Resilient Coastal Forest

GUIDING PRINCIPLE 1(a):

Adapt the Restoration Plan to respond to the specific conditions of the various blowdown areas.

RESTORATION ACTIVITIES:

- *Prepare detailed restoration prescriptions that are specific to each blowdown area.*

There are 15 blowdown areas of various sizes in Stanley Park (the smallest being about 0.2 hectares, the largest being about 15 hectares). Some of the blowdown areas are on flat terrain, others on steeper terrain. Some are in areas where the soil is typically drier, others where the soil is typically wetter. The physical and biological conditions vary from blowdown area to blowdown area. As a result, a set of prescriptions specific to each blowdown area will be prepared and implemented.

GUIDING PRINCIPLE 1(b):

Retain as much as possible of remaining forest structure in the blowdown and perimeter areas.

RESTORATION ACTIVITIES:

- *Protect the forest floor and understory plant communities in the blowdown areas.*

Major portions of the forest floor and understory plant communities were damaged during the windstorms. However, smaller parts were left largely intact and will be protected.

Planned restoration activities in the blowdown areas, which will involve machinery, will be organized to minimize damage to the forest floor and understory plant communities. A series of guidelines have been established to achieve this:

- designate certain areas that have intact forest floor, understory plant communities and trees as ‘machine-free zones’;
 - utilize equipment which is specially adapted to minimize disturbance;
 - restrict work when the soil moisture levels are excessive;
 - plan major forest access routes in advance so that machine travel and turning is minimized;
 - utilize on-site woody debris for laying down temporary forest access routes to displace the weight of the machine;
 - stockpile organic soil when building forest access routes so that the soil can be put back when the routes are deactivated;
 - lift fallen trees clear off the ground before moving them rather than dragging them across the forest floor;
 - minimize interference with natural drainage system; and
 - repair ruts and divots, and deactivate forest access routes.
- ***Retain an appropriate amount of coarse woody debris (fallen trees, stumps) on the forest floor, meeting the current and future ecological needs of the forest while balancing the need to replant and manage fire and insect infestation risks.***

All forests have a certain amount of coarse woody debris (fallen trees, stumps) on the forest floor, although the quantity goes up and down as the forest develops through its different stages. Coarse woody debris provides important habitat for flora and fauna, such as invertebrates, amphibians, birds and small mammals, and stores moisture during summer months.

Stanley Park’s forest has approximately 80 tonnes of coarse woody debris per hectare. Forests similar to Stanley Park typically have about 80 to 120 tonnes of per hectare. As a result of the windstorms, it is estimated that the quantity of coarse woody debris has increased to between 400 and 600 tonnes per hectare in most blowdown areas.

The recommendation is to retain an amount of coarse woody debris that is moderately greater than the pre-blowdown amounts (80 tonnes per hectare), as a measure of prudence to ensure a sufficient amount as the forest ages. At the same, the amount of coarse woody debris should not be above a level that results in a high fire risk (120 tonnes per hectare).

Therefore the amount of coarse woody debris to be retained on the forest floor will generally be between 80 and 120 tonnes per hectare in the blowdown areas. The exact amount of coarse woody debris to be retained will be determined on a site-by-site basis. Less than 80 tonnes per hectare may be retained in areas of high fire hazard concern.

Excessive amounts of coarse woody debris on the forest floor are likely to become a breeding haven for forest insect pests such as bark beetles. Should their population increase dramatically, they would pose a health threat to the adjacent forest. The excessive debris would also become a strong attractant to exotic insects. See Section 1(e) for details.

The removal of fallen trees is discussed in Section 1(c).

- ***Retain as many trees and snags as possible in the blowdown areas.***

Trees and snags (standing trees that are dead) provide important habitat for birds and insects. In most of the blowdown areas, between 50% and 80% of the original trees were destroyed and, as a result, a significant amount of the habitat has been lost. Retaining as many of the remaining trees and snags will provide habitat and support biodiversity until the forest regenerates.

It will be impossible to save all trees and snags in the blowdown areas as many of these trees are “danger trees” and will be removed to protect park visitors, workers and volunteers – see section 3(a) for details. “Hazard trees” that have important habitat or heritage value will be retained if the trees can be safely stabilized. Some of the hazard trees that are cut down will be re-erected after recovery operations are completed.

- ***Modify the newly created forest edge so that the risk of the blowdown areas spreading to remaining trees is minimized.***

Newly exposed trees at the edge of the blowdown areas are typically unstable. The roots of these edge trees are often partially damaged by the windstorm. Undamaged new edge trees are more susceptible to being blown over because their inherent stabilization processes have not had time to react fully to the increased wind forces. It takes several years for them to become independently wind resistant. There is therefore a tendency for unmanaged blowdown areas to continue to grow until limited by improving stand conditions, soil or hydrological dynamics, or lessened wind exposure.

The likelihood of blowdown is reduced when newly created forest edges are stabilized by a process called “windfirming”. Research has shown that this method is effective at reducing post catastrophic event blowdown spread because the wind force is dissipated gradually as it enters the new edge. Windfirming involves the “feathering” of stand edges by a combination of “spiral thinning”, “stubbing”, and the selective removal of damaged trees.

In the long term, the exposed trees will gradually adapt to the new growing conditions. The exposed tree will sway during windy weather and this will stimulate the tree to develop thicker supporting roots. Eventually the tree will develop stem and rooting features that are proportional to the wind forces.

GUIDING PRINCIPLE 1(c):

Reduce the amount of coarse woody debris in the blowdown areas to an acceptable level.

RESTORATION ACTIVITIES:

- ***Remove an appropriate amount of fallen trees from the forest floor, balancing the need to replant and manage fire and insect infestation risks while meeting the current and future ecological needs of the forest.***

As discussed in Section 1(b), the amount of coarse woody debris on the forest floor after the windstorms is estimated to be between 400 and 600 tonnes per hectare in blowdown areas, significantly higher than the amount before the windstorms (about 80 tonnes per hectare) and the level that results in a high fire risk (above 120 tonnes per hectare). The amount of coarse woody debris to be retained on the forest floor will generally be between 80 and 120 tonnes per hectare in the blowdown areas.

In addition to reducing the fire risk, removing a significant quantity of the fallen trees from the blowdown areas will also:

- permit tree planting efforts since large portions of the blowdown areas are currently covered with fallen trees;
- reduce the risk of insect pests taking hold in the blowdown areas (see Section 1(e) for details); and
- enhance ability to deal with invasive exotic plants taking hold in the blowdown areas (see Section 1(e) for details).

GUIDING PRINCIPLE 1(d):

Plant a diversity of native trees and shrubs within the blowdown areas.

RESTORATION ACTIVITIES:

- ***Plant Douglas-fir, western red cedar, Sitka spruce, grand fir, big leaf maple, red alder and a variety of shrubs.***

A diversity of trees native to the coastal forest will be planted in the blowdown areas in order to allow the forest to regenerate as a resilient forest with diverse habitats. It is estimated that about 20,000 trees will be planted in the blowdown areas.

Conifers to be planted include Douglas-fir, western red cedar, Sitka spruce and grand fir. Hemlock will not be planted – it will continue to be a significant component of the forest since it abundantly reproduces on its own. Deciduous trees to be planted include big leaf maple and red alder.

Conifers and deciduous trees that will be planted will be 1 year old or about 30 centimeters high. Trees will be planted in clusters in order to generate trees with a higher degree of wind firmness. The new trees will be fertilized at time of planting using a spot application of pelletized fertilizer, and in some cases brush control mats will be placed around the base of the planted trees. These initiatives will improve the growth of the planted trees and increase their ability to survive in their first year.

As part of the community consultation process, a specific question was asked about the types of trees to be planted in the blowdown areas – refer to Question 6 in the section on Community Consultation for details.

Slope stabilizing shrubs will be planted where soil erosion is a concern. These include huckleberry, salmonberry, salal, Oregon grape and vine maple.

The large blowdown located west and southwest of Prospect Point deserves more discussion as it pertains to tree planting. Prior to the windstorms, this portion of Park Drive was enclosed by tall trees on both sides of the road. The windstorms blew down the majority of the trees between Park Drive and the seawall below. What was a drive through the forest is now a drive with views of English Bay and Cypress Mountain.

Three choices regarding tree planting were identified for this area:

- Replant what will eventually become a forest with tall trees;
- Replant trees and retain some of the views; or
- Replant and manage in a way to retain all of the views.

As part of the community consultation process, a specific question was asked about these choices – see Question 3 in the section on Community Consultation for details.

The option to replant trees and retain some of the views will be pursued. Additional information will be collected to identify the best locations for possible viewpoints along this portion of Park Drive. The B.C. Society of Landscape Architects has agreed to assist with this assignment.

GUIDING PRINCIPLE 1(e):

Protect the newly forested areas from being damaged or destroyed by natural occurrences or human activity.

RESTORATION ACTIVITIES:

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

A series of planned interventions is necessary to ensure the survival of newly planted conifers, otherwise they will be out-competed for sunlight by hemlocks, invasive plants and deciduous brush in the medium to long term. For the first ten years, this competing vegetation will need to be mechanically brushed back each year. The brushing regime can be adapted each year to suit the changing competitive behaviour of the various species that are competing with the newly planted trees.

- ***Reduce risk of forest fires by removing fine woody debris within five meters of all trails, roads and parking lots, and from areas of human activity within the forest, and by removing most fallen trees from the blowdown areas.***

There is always the risk of a forest fire in Stanley Park during summer months because fine woody debris (needles, leaves, twigs) on the forest floor dries up and may catch fire, if ignited. The fire risk is higher in the summer after a major blowdown because there a larger quantity of fuel on the forest floor (both fine woody debris and coarse woody debris).

The most important initiative to reduce the risk of a fire igniting is to reduce the quantity of fine woody debris on the forest floor. Having said this, it is undesirable to remove all the fine woody debris from the blowdown areas because fine woody debris decomposes and leaves behind a large quantity of nutrients in the soil.

The proposed strategy is to remove the fine woody debris from areas in close proximity to human activity in the park, since many forest fires are caused by deliberate or inadvertent actions. The proposal is to remove all fine woody debris within 5 meters of all trails, roads and parking lots, and from areas of human activity within the forest.

The removal of many of the fallen trees (see Section 1(c) for details) will also help by reducing the quantity of fuel left on the forest floor.

The issue of forest fire is also discussed in Section 3(c).

- ***Reduce risk of invasive plant infestation within and near the blowdown areas.***

Invasive plants are typically introduced species that propagate quickly and are adapted to out-compete native vegetation. Left unchecked, they can fully occupy a forest and render it unsuitable for any native vegetation.

There are a number of invasive plants already in existence in Stanley Park's forest, including English ivy and Himalayan blackberry. It is estimated that English Ivy is present in more than 10% of the forest today. These invasive plants have already had an impact on forest health, in spite of efforts by the Park Board and the Stanley Park Ecology Society to control their spread.

If not managed, Himalayan blackberry and other invasive plants will flourish in the blowdown areas. If this occurs, it will hinder the re-establishment of newly planted trees. Interventions to control invasive plants include mechanical cutting and uprooting of these species.

- ***Reduce risk of insect infestation within and near the blowdown areas.***

Excessive amounts of coarse woody debris on the forest floor are likely to become a breeding haven for forest insect pests such as bark beetles. Should their population increase dramatically, they would pose a health threat to the adjacent forest. The removal of many of the fallen trees (see section 1(c) for details) will reduce the risk of this occurring.

Stanley Park is also vulnerable to the introduction of exotic insects from other continents due to its proximity to shipping lanes leading to the Port of Vancouver. Wood boring insects would likely be attracted to the blowdown areas and, because they would have few native predators, would be very aggressive in attacking the native forest. An infestation could have serious consequences to the remainder of the forest in Stanley Park and to surrounding lands.

There is also an elevated risk of quarantined insects becoming established in the blowdowns, which would prompt the removal of adjacent non-infected forest in a federally mandated sanitation program.

The first step is to set up a sampling and monitoring program in order to detect the presence and abundance of exotic insects in Stanley Park. The second step would be to develop a response plan, which would guide the response measures if exotic insects are discovered in Stanley Park.

2. Restoration Activities to Protect the Natural and Cultural Environments

GUIDING PRINCIPLE 2(a):

Protect environmentally sensitive areas within and near the blowdown areas.

RESTORATION ACTIVITIES:

- *Meet or exceed applicable Senior Government requirements.*

There are portions of Stanley Park’s forest that could be considered “environmentally sensitive areas”. Their identification is based on whether a site:

- is a unique or rare habitat;
- is productive wildlife habitat;
- includes an essential corridor for wildlife movement; or
- is critical habitat for species at risk.

The following types of environmentally sensitive areas have been noted for consideration for Stanley Park:

- streams (e.g. Beaver Creek) and water bodies (e.g. Beaver Lake);
- land adjacent to streams and lakes (called “riparian zones”);
- wetlands (e.g. bog surrounding Beaver Lake);
- intertidal zones (area between low tide and high tide);
- nesting habitats (e.g. bald eagle, birds that are at risk – see Section 2(b) for details); and
- rare habitats (e.g. old growth forest, cliffs).

Restoration activities in and near the blowdown areas need to be planned and implemented in a way that protects these environmentally sensitive areas. This will be achieved by following applicable Federal and Provincial legislation. Mapping the environmentally sensitive areas and overlaying them with the blowdown areas will identify the areas of possible concern.

Guidelines for restoration work will be formulated to protect the environmentally sensitive areas. A monitoring program will be instituted to ensure that guidelines are followed. The protection of environmentally sensitive areas will be done in consultation with the Stanley Park Ecology Society and Federal and Provincial officials.

GUIDING PRINCIPLE 2(b):

Protect the habitat of species at risk found within and near the blowdown areas.

RESTORATION ACTIVITIES:

- ***Meet or exceed applicable Senior Government requirements.***

The Federal Ministry of Environment, in conjunction with the Canadian Wildlife Service, the Department of Fisheries and Oceans and Parks Canada, has developed and updates a registry of species at risk or potentially at risk. The registry is referred to as the COSEWIC list (Committee on the Status of Endangered Wildlife in Canada).

There are a total of five “endangered” or “threatened” species that could be present in one or more of the blowdown areas in Stanley Park: Streaked Horned Lark, Western Painted Turtle, Marbled Murrelet, Pacific Water Shrew, and Peregrine Falcon (anatum).

The registry identifies species that are of “special concern”. A total of 6 “special concern” species (largely birds) may be present in the blowdown areas. These include the Great Blue Heron, Western Screech Owl, and Red-legged Frog. One other species (Keen’s Myotis) is listed as Data Deficient.

A registered professional biologist has been retained and will confirm the possible presence of any of these 12 species in or near the blowdown areas. Work procedures in the blowdown areas will be adjusted accordingly, in a manner that meets or exceeds senior government requirements.

The Stanley Park Ecology Society and volunteers have also compiled sightings of 28 other species on the B.C. Conservation Data Centre list of species at risk. These species and any other species at risk identified as potentially being present (e.g., rare plants) will also be considered by the biologist.

(Note: Section 2(b) was reprinted on April 12, 2007 with corrections by Parks Canada.)

GUIDING PRINCIPLE 2(c):
Minimize the impacts of roads and trails.

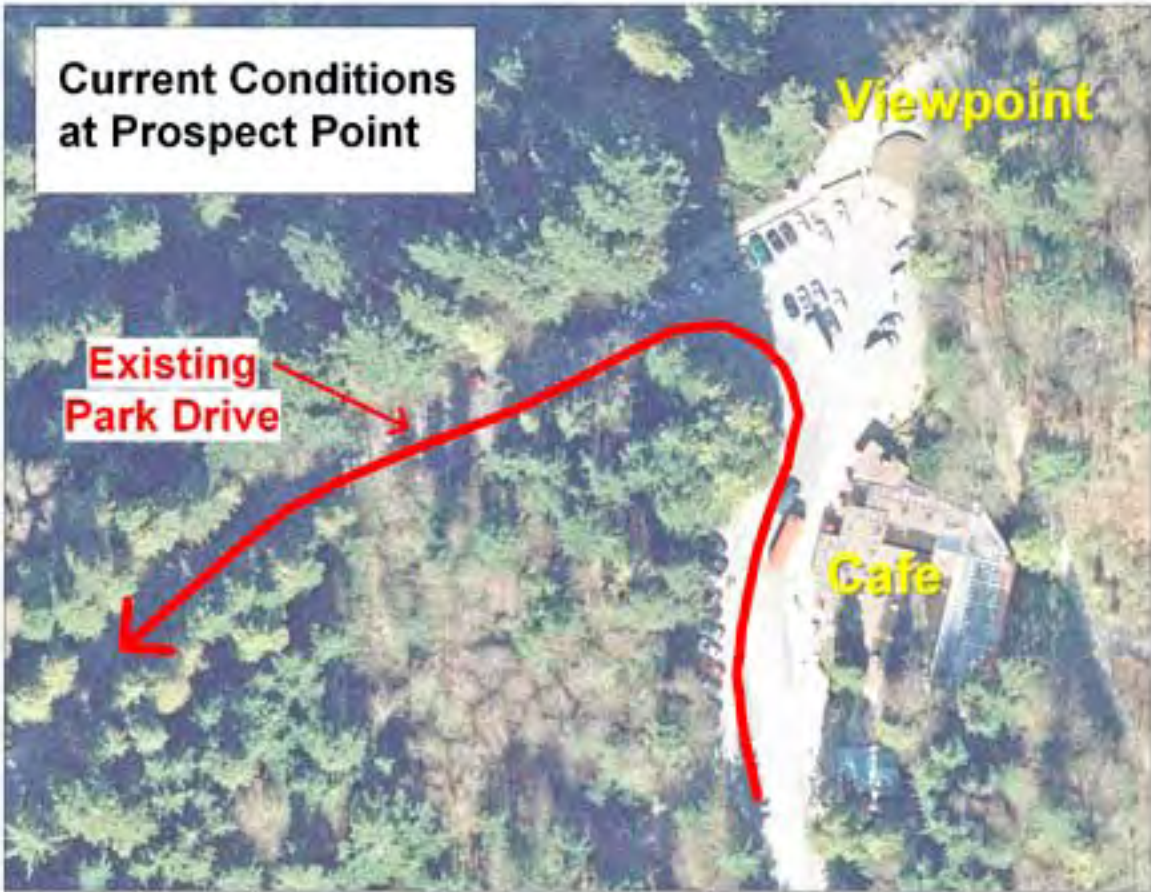
RESTORATION ACTIVITIES:

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

Park Drive and a parking lot (60 spaces) 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 to accommodate the road and parking. If the new road and parking lot are built, the existing portion of Park Drive and the parking would be converted to areas for planting and pathways made of crushed granite.

The benefits of this proposal are:

- less hard surface near Prospect Point and the ability to drain rainwater away from the escarpment (thereby improving slope stability during heavy rainfall periods);
- improved pedestrian safety because all the parking would be on the Prospect Point side of Park Drive (i.e. pedestrians would no longer have to cross Park Drive to get to Prospect Point); and
- the removal of asphalted areas (road and parking lot) from an important visitor destination in Stanley Park (thereby improving the aesthetics of the area).



- ***Do not increase the extent of permanent forest trails in the park.***

There is a total of about 24 km of trails that crisscross Stanley Park's forest today. It is possible to add new trails in some of the larger blowdown areas by converting access routes for mechanical equipment during the recovery process to permanent forest trails after the recovery process. Decisions about creating new forest trails will be made based on a variety of factors including:

- the amount of benefit the trail can bring to park visitors;
- the cost of building and maintaining the trail; and
- the impact of the trail on environmentally sensitive areas.

As part of the community consultation process, a specific question was asked about whether the forest should be made more or less accessible – refer to Question 1 in the section on Community Consultation for details.

If new trails are proposed to be established, it is recommended that existing trails of equal or greater length be decommissioned. The objective is to keep the environmental impact of the overall trail system and its usage by park visitors equal to the current conditions. If a trail or a portion of a trail is proposed to be decommissioned, a number of factors will be examined, including whether the trail:

- has heritage or historic value;
- connects to important destinations;
- parallels other nearby trails;
- accommodates specific transportation needs (e.g. wheelchairs, bicycles, emergency vehicles); and
- accommodates other needs (e.g. above or below ground utilities).

Decisions regarding the creation and/or decommissioning of specific permanent forest trails will be made by the Park Board after a community consultation process.

- ***Road and trail drainage systems should be modified where necessary to reduce runoff concentrations that affect slope stability or the natural soil moisture regime.***

The natural drainage system in Stanley Park has been altered by the building of roads and forest trails. Rainwater is frequently channeled in culverts and drainage pipes. In some instances, the channeling of rainwater has increase the moisture level of soil in specific zones. This may affect the stability of nearby slopes (e.g. the escarpment between Prospect Point and Third Beach) and/or the health of specific trees in the forest (particularly trees whose health is negatively affected by saturated soils or the ponding of water).

It is proposed that necessary alterations be undertaken wherever it is determined that road or trail drainage systems negatively affect slope stability or forest health. Road related work may involve methods to collect, transport and disperse rain water and ground water away from the slope. Trail related work may involve the installation of additional culverts or other appropriate interventions.

GUIDING PRINCIPLE 2(d):
Protect archaeological resources.

RESTORATION ACTIVITIES:

- ***Follow applicable Federal heritage legislation, policies and guidelines with respect to previously recorded or newly discovered archaeological resources in the blowdown areas.***

Oral histories and written sources indicate the Musqueam, Squamish and Tsleil-Waututh First Nations utilized and inhabited Stanley Park for millennia.

A number of archaeological sites have been recorded and mapped in Stanley Park, and it is conceivable that expanded sites may be encountered while restoration work is underway in the blowdown areas. An archaeologist will conduct research using secondary sources to identify possible areas of interest that may be located in or near a blowdown area.

If archaeological remains, including “culturally modified trees”, are encountered in blowdown areas, the Park Board will adhere to applicable Federal heritage legislation, policies and guidelines. A qualified archaeologist has been retained and will visit known or newly discovered sites in the blowdown areas with First Nations representatives. New sites, or known sites that have sustained damage will be recorded and mapped, and appropriate steps will be taken to protect the remaining archaeological resources from further disturbances or damage.

3. Restoration Activities to Protect Park Visitors, Workers and Volunteers

GUIDING PRINCIPLE 3(a):

Modify or remove hazard trees.

RESTORATION ACTIVITIES:

- *Modify or remove danger trees within or near the blowdown areas.*

In most of the blowdown areas, between 20% and 50% of the original trees are still standing. Some of these trees present can be dangerous to workers because:

- trees may fall down due to ground failure or root breakage; or
- trunks and/or branches may fall due to cracking, disease or rot.

Protecting workers is a very high priority. The following steps are being taken to provide as safe a work environment that is compliant with WorkSafe B.C. regulations:

- conduct a risk assessment of all standing trees within or near blowdown areas;
- modify or remove trees classed as dangerous before allowing work to begin within a specified distance; and
- create “work exclusion zones” or seek variances from the Workers Compensation Board to protect hazard trees that have a high habitat or heritage value and that cannot be modified to meet safety standards.

- *Modify or remove hazard trees elsewhere in the park.*

Elsewhere in Stanley Park (i.e. outside the blowdown areas), there were hundreds of trees that were still standing that could have been dangerous to park visitors and workers because the whole tree or one or several of its branches could have fallen down. Protecting park visitors and workers is a very high priority.

The following steps are being taken to provide as safe environment for park visitors and workers outside the blowdown areas:

- conduct a risk assessment of all standing trees:
 - within impact distance of road, pathway or forest trail in Stanley Park; and
 - within close proximity to public gathering places in Stanley Park.
- modify or remove trees when the sum of risk factors assessed equals or exceeds a predetermined threshold of risk.

GUIDING PRINCIPLE 3(b):

Stabilize the slopes above the seawall between Prospect Point and Third Beach.

RESTORATION ACTIVITIES:

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

The slopes above the seawall between Prospect Point and Third Beach are the steepest sections found in Stanley Park. The slopes climb from the seawall to Park Drive (40 to 70 meters above sea level). The conditions vary considerably within this zone: the steepness of the slope (escarpment, benches, and steep slope), the current level of soil stability, and the water drainage flows. Slope stability has been an issue for at least 20 years, with an average of one or two small landslides per year.

Major blowdown areas are located along these slopes. Some trees fell over the escarpment down onto the seawall. Others are hanging over the edge or leaning on the remaining trees. There were also several small landslides, bringing soil and debris onto the seawall. The seawall between Prospect Point and Third Beach is impassable and unsafe, and has been closed since December 15, 2006.

The loss of several thousand trees along these slopes has weakened the structural integrity of the slope. Disturbed rootball areas can now allow rain water and ground water to flow much faster along the slopes and could create significant landslides. The condition is dangerous for those who will be working on the slope and for those working along the seawall. Because the consequence of a landslide is potentially very significant (injury or death), the risk is considered extremely high.

An initial geotechnical assessment of the slopes has been completed. There are two objectives for slope stability. The first is to ensure slope stability in the short term in order to reduce the risk to workers who will be performing tasks on the slopes. This can be achieved by allowing the soils to sufficiently dry up and by sectioning off portions of the slopes designated as high risk.

The second objective is to ensure slope stability in the longer term in order to reduce the risk to workers and park visitors, particularly those along the seawall below. The following steps will be taken:

- prepare a more detailed geotechnical / drainage study of the slopes and forest trails;
- develop and evaluate prescriptions for specific zones along the overall area; and
- implement preferred prescriptions.

A wide range of factors will be included in the review of prescriptions, including:

- the effectiveness at minimizing landslides onto the seawall;
- the impacts on forest regeneration and ecosystem function;
- the impacts on the aesthetics of the park, as viewed from Park Drive, forest trails, the seawall and English Bay;
- the construction/implementation cost; and
- the annual maintenance cost.

Decisions regarding the prescriptions to stabilize the slopes will be made after the geotechnical / drainage study is completed.

GUIDING PRINCIPLE 3(c):

Reduce risk of forest fires.

RESTORATION ACTIVITIES:

- ***Reduce risk of forest fires by removing fine woody debris within five meters of all trails, roads and parking lots, and from areas of human activity within the forest, and by removing most fallen trees from the blowdown areas.***

As discussed in Section 1(e), there is a heightened risk of a forest fire in Stanley Park during summer months because the winter windstorms have led to a higher than normal quantity of fine woody debris and coarse woody debris remaining on the forest floor. If a forest fire were to occur in the park, there is a risk to park visitors and workers, especially given the fact that Park Drive is a one-way roadway, which limits the park's exiting capacity during an emergency.

The proposed strategy is to remove the fine woody debris from areas in close proximity to human activity in the park, since many forest fires are caused by deliberate or inadvertent actions. The proposal is to remove all fine woody debris within 5 meters of all trails, roads and parking lots, and from areas of human activity within the forest.

The removal of many of the fallen trees (see section 1(c) for details) will also help by reducing the quantity of fuel left on the forest floor.

4. Restoration Activities to Repair Park Infrastructure

GUIDING PRINCIPLE 4(a):

Re-open transportation corridors without compromising public safety.

RESTORATION ACTIVITIES:

- *Clear fallen trees from and adjacent to roads, pathways, forest trails and the seawall on a priority basis.*

Stanley Park has a wide range of transportation corridors, including:

- about 16 km of roadways (including the Stanley Park Causeway);
- about 9 km of seawall;
- about 24 km of forest trails; and
- about 10 km of pathways outside the forest.

Hundreds of trees fell on these transportation corridors on December 15, 2006. Dozens of additional trees fell on these transportation corridors on January 5 and January 9, 2007. The clearing of fallen trees has been organized based on the following priorities:

- clearing the Stanley Park Causeway;
- clearing major park roads, including Park Drive and Pipeline Road;
- clearing minor park roads;
- clearing the seawall, except the section between Prospect Point and Third Beach;
- clearing pathways outside the forest;
- clearing forest trails east of the Causeway;
- clearing forest trails west of the Causeway; and
- clearing the seawall and Merilees and Siwash Rock Trails between Prospect Point and Third Beach.

All roadways were cleared by mid-January. The seawall, except the section between Prospect Point and Third Beach, and pathways outside the forest were cleared by the end of January. Most forest trails east of the Causeway were cleared in February. Most forest trails west of the Causeway were cleared in March. The seawall and Merilees and Siwash Rock Trails between Prospect Point and Third Beach will be cleared in the summer, although public access is dependent upon the extent of the repairs required along these three routes.

The seawall is British Columbia’s most popular recreational corridor, with about 2 millions users per year. The seawall between Prospect Point and Third Beach will continue to be closed until at least August. Detour routes have been identified and signed for pedestrians, joggers, in-line skaters and cyclists. Three alternate routes are offered to pedestrians, joggers and cyclist from the north foot of Pipeline Road:

- one detour route will be parallel the seawall along Park Drive up to Prospect Point and then down to Third Beach (pedestrians and joggers along trails and the sidewalk, cyclists along the roadway);
- one detour route will cut across the park along forest trails (via Beaver Lake and the pedestrian bridge over the Causeway); and
- one detour route will follow the seawall back to the park’s entrance near Georgia Street (this portion of the seawall will accommodate two-way recreational traffic until the closed portion of the seawall is re-opened).

The only detour route suitable for in-line skaters is the detour route that follows the seawall back to the park’s entrance near Georgia Street. The two other detour routes are either too steep or do not have asphalt surface.

Extra signage directs cyclists wanting to go from Second Beach to Third Beach to travel along Rawlings Trail (and not to travel counter-flow along this portion of the seawall, which has sharp corners and narrow segments).



GUIDING PRINCIPLE 4(b):

Repair or reconstruct damaged transportation corridors and utilities.

RESTORATION ACTIVITIES:

- ***Repair or reconstruct damaged portions of the seawall.***

The windstorms caused a variety of damage to Stanley Park's transportation corridors, including the seawall between Prospect Point and Third Beach. Several portions were significantly damaged by trees falling down from the slopes above and the powerful waves off of English Bay.

In some places, the waves have washed out the mortar and caused 'undermining' (the removal of sufficient material behind the stone wall). This has resulted in the creation of voids under the seawall walkway, which can compromise the bearing capacity of the walking/riding surface and even the strength of the stone wall itself. In these sections, the material immediately behind the stone wall may have to be removed and filled with concrete.

Significant portions of the asphalt are also damaged and will required resurfacing.

- ***Repair or reconstruct damaged roads, trails, drainage, and utilities.***

The windstorms caused a variety of damage to Stanley Park's other transportation corridors and utilities, including

- Merilees and Siwash Rock Trails between Prospect Point and Third Beach: some portions of both trails were wiped out by uprooted trees and landslides. Portions of Siwash Rock Trail may need to be rebuilt further away from the edge of the cliff. Improved drainage systems along both trails will be required.
- Forest trails, pathways and roadways: damage was caused at various locations due to the uprooting of a nearby tree. In most cases, minor repairs are needed.
- Drainage: the drainage pipes in the Prospect Point area were for the most part disrupted or destroyed during the storms. They will be repaired or replaced.
- Utilities: electrical service was damaged and disrupted in several areas of the park. The damaged segments will be permanently repaired or replaced.

The removal of the fallen trees (see section 1(c) for details) will require machinery and trucks and it is anticipated that there will be some additional damage to forest trails and park roads during this process. Repair work will be initiated once the recovery process is completed.

5. Restoration Activities to Create Supporting Legacies

GUIDING PRINCIPLE 5(a):

Allow nature to take its course without human intervention in one of the blowdown areas as an environmental demonstration project.

RESTORATION ACTIVITIES:

- *Designate the blowdown area northeast of the Aquarium as an environmental demonstration project.*

There is an opportunity to use one of the blowdown areas as an environmental demonstration project, showcasing over time the results of natural regeneration without human intervention. It will become a base for comparison to other blowdown areas, exploring how quickly forest regeneration occurs, what type of species is more successful, etc. The results of the environmental demonstration project can ultimately be measured against the goals set out in the Restoration Plan.



As part of the community consultation process, a specific question was asked about this concept – see question 2 in the section on Community Consultation for details.

An analysis of the 15 blowdown areas led to the conclusion that the blowdown area northeast of the Aquarium as being the most suitable location for the environmental demonstration project because it is surrounded by roadways on all four sides. This level of isolation is desirable because it reduces the risk that potential problems in this blowdown area can spread to other forested areas, for example:

- Forest fire: if a forest fire were to occur in this blowdown area, its relative isolation will make it easier to fight the fire and therefore more difficult for the fire to spread to nearby forested areas; and
- Invasive plants: if invasive plants take hold in this blowdown area, its relative isolation will make it more difficult for the invasives to spread to nearby forested areas.

A review of successes and failures of this blowdown area will be conducted in the short, medium and long terms. If the problems associated with this environmental demonstration project are significant and may pose risks for nearby forested areas, the demonstration project will be modified.

GUIDING PRINCIPLE 5(b):

Create opportunities for historical, cultural and forest education and interpretation.

RESTORATION ACTIVITIES:

- ***Work with First Nations and agencies like Stanley Park Ecology Society, Nature Vancouver, Vancouver Historical Society and Vancouver Heritage Commission to enhance and augment educational and interpretative resources in Stanley Park.***

The windstorms and the damage to Stanley Park's forest raised interest and awareness amongst the public. Many enjoy the forest without understanding much about its ecology. Over the years, the Park Board and non-profit organizations like the Stanley Park Ecology Society and Nature Vancouver have provided education and interpretation to park visitors. Yet, there is a sense that the efforts to date stop short of offering sufficient information and support to park visitors.

Ideas that have been discussed to date to enhance or augment educational and interpretative resources include:

- a detailed cataloging of the 2006-2007 windstorms, their damage to the forest and subsequent restoration activities, including photographs, video recordings and maps;
- guided tours and verbal presentations in conjunction with programs offered by the Stanley Park Ecology Society;
- interpretative signage regarding the windstorms and its damage, forest ecology and cultural history; and
- a permanent interpretive centre combining history, culture and ecology, in a location that is in close proximity to the forest.

GUIDING PRINCIPLE 5(c):

Create an ongoing forest maintenance fund.

RESTORATION ACTIVITIES:

- ***Allocate the fallen trees that will be removed based on a hierarchy of needs.***

The fallen trees that will be removed from the blowdown areas (see section 1(c) for details) are proposed to be allocated based on the following hierarchy of needs:

- Stanley Park needs: the Park Board could use timber to replace existing wooden structures (e.g. Lumbermen’s Arch) and/or possibly build new public facilities in Stanley Park.
- Other public needs: the Park Board could give timber to:
 - First Nations wishing to build a First Nations structure or building in Stanley Park, or to create smaller cultural artifacts;
 - environmental groups to assist with stream enhancement or restoration projects;
 - institutional or government agencies currently involved in planning, designing or building significant public buildings or structures (e.g. Olympic venues); and/or
 - artisans wishing to create artistic features to commemorate the event using some of the smaller-sized and unique-shaped logs or stumps.
- Private needs: the Park Board will sell the remaining of the fallen trees through competitive bids and use the revenue to create a restoration fund for Stanley Park’s forest.

As part of the community consultation process, two specific questions were asked about using fallen trees for new buildings or structure in Stanley Park and about selling the remaining of the fallen trees to create a restoration fund for the forest – see questions 4 and 5 in the section on Community Consultation for details.

- ***Establish a Stanley Park Forest Restoration Fund that will pay for ongoing forest maintenance activities in the future.***

The management of Stanley Park's forest will continue well beyond the restoration activities for the blowdown areas included in this report. There is ongoing maintenance activity required to keep Stanley Park's forest as healthy as possible: the removal of dead or diseased trees, the planting of trees in small clearings, the brushing back of the understory in selected areas, the removal of invasive plants, etc.

These forest maintenance activities will increase in scope for at least the next ten years because of additional work required in the blowdown areas. Stable funding is required. In the past, the Park Board's Capital Plans have included allocations for Stanley Park's forest, but these allocations have been gradually diminishing since their peak in the 1990s.

The mechanism that is recommended is the establishment of a permanent Stanley Park Forest Restoration Fund. The initial step would be to transfer the revenues generated from the sale of timber to this restoration fund. Other financial sources will also be considered. The restoration fund would yield an annual dividend, which would be used for annual forest management activities.

GUIDING PRINCIPLE 5(d):

Update the park's forest management plan.

RESTORATION ACTIVITIES:

- ***Prepare an update to the Stanley Park Forest Management Plan, in consultation with partners, stakeholders, community groups and interested citizens.***

The Stanley Park Forest Management Plan was prepared for the Park Board by William Beese, a forest ecologist, in 1989. An amended version of the plan was approved by the Park Board in 1990. The plan is now nearly 20 years old and needs updating to reflect new realities (the major blowdowns caused by the recent windstorms) and new knowledge in forest management. The updated plan can be broadened to include new topics (e.g. hydrology in Stanley Park, the possible impacts of climate change on Stanley Park's forest). The preparation of the updated plan will include broad community consultation before it is presented to the Park Board for approval.

Community Consultation

A broad ranging community consultation process was undertaken during February and March 2007. A variety of methods was used to communicate with the public:

Media

Newspaper, television and radio coverage of the windstorm damage and the restoration efforts has been substantial. Park Board staff attended two television and two radio public feedback sessions.

Emails and letters

In January, Park Board created a central email address for all public comments and inquiries: stanleyparkrestoration@vancouver.ca

A total of 240 emails and letters were received with comments and suggestions, focusing on:

- The use of fallen trees (54% of emails/letters focussed on this);
- Forest cleaning / clearing (21%);
- Reforestation / rebuilding (11%); and
- Other topics (14%).

Website

In mid-February, Park Board launched the ‘Stanley Park Restoration’ website at <http://vancouver.ca/parks/parks/stanley/restoration/index.htm>, which includes photographs, maps and information. Between mid-February and early April, the website contained a ‘feedback’ page with six key questions for the public. A total of 313 responses were received. See below for details.

Newspaper Insert

An insert about Stanley Park Restoration was included in many community newspapers in mid-March. The insert included six key questions for the public. A total of 95 responses were received (81 by mail, 12 by fax, and two by telephone). See below for details.

Park Board staff

In order to keep Park Board staff apprised of the project, an information sheet was distributed to all staff in March. The sheet included six key questions for staff. A total of 125 responses were received. See below for details.

Public Opinion Survey

A telephone survey of Greater Vancouver residents was conducted by Synovate in mid-March. The survey asked 500 residents six key questions. The margin of error is +/-4.4%, 19 times out of 20. See below for details.

Results to Six Key Questions

A total of 1,033 citizens participated in answering the following six key questions.

1. Should the forest areas, other than existing trails, be made more or less accessible to hikers?	Website, Newspaper & Staff	Public Opinion Survey
- More accessible to hikers	37%	48%
- Less accessible to hikers	60%	45%

2. Should a portion of the damaged areas be left to regenerate on its own as a demonstration project?	Website, Newspaper & Staff	Public Opinion Survey
- Leave as is	65%	76%
- Replant now	33%	20%

3. Should reforestation plans in the Prospect Point area include retaining all the new views, some of the new views or should the priority be the long term reforestation of this area?	Website, Newspaper & Staff	Public Opinion Survey
- Retain all of the views	13%	9%
- Retain some of the views	40%	44%
- Replant the West Coast forest	29%	45%

4. Use some of the fallen trees to build new buildings or attractions in the park?	Website, Newspaper & Staff	Public Opinion Survey
- Agree	50%	66%
- Disagree	48%	30%

5. Sell the fallen trees that are left over and use the funds to ensure the long term restoration and protection of the park's forest?	Website, Newspaper & Staff	Public Opinion Survey
- Agree	69%	85%
- Disagree	12%	12%

6. Should the restoration project attempt to re-establish the historical ratio of one-third each of hemlocks, cedars and Douglas-fir trees in the replanting program?	Website, Newspaper & Staff	Public Opinion Survey
- Agree	65%	78%
- Disagree	10%	17%

Note: percentages do not always add up to 100% because some individuals did not answer all questions.

Partners and Stakeholders Committee

A 'partners and stakeholders committee' was established in February and met four times with Park Board staff. The committee included representatives from the Squamish Nation, the Tsleil-Waututh Nation, Parks Canada, the Stanley Park Ecology Society, Nature Vancouver, the Sierra Club, Tourism Vancouver, the B.C. Society of Landscape Architects, the Vancouver Heritage Commission and the Vancouver Area Cycling Coalition. The Musqueam Nation was invited to participate.

Meetings with Other Agencies

Park Board staff met with the Vancouver Heritage Commission, the Archaeological Society of British Columbia, Save Our Parkland Society and Western Canadian Wilderness Committee. Park Board staff also participated in a session hosted by the Stanley Park Ecology Society, which was attended by experts in a variety of fields related to forest ecology.

Public Forum

On April 12th, a public forum will be held, co-sponsored by UBC (Faculty of Forestry), SFU (School of Resource and Environmental Management) and the Vancouver Park Board. The event is an opportunity to ask a panel of experts about the challenges and opportunities related to the restoration of Stanley Park.

Schedule of Major Restoration Activities

The following is a provisional schedule of major restoration activities over the next year (April 2007 to March 2008). The schedule may be altered because of external factors such as bad weather conditions.

	Spring April-June	Summer July-Sept.	Fall Oct.-Dec.	Winter Jan.-March
1. Foster a resilient coastal forest	Protect the forest floor		Plant trees & shrubs	
	Retain trees and snags			
	Remove fallen trees			
	Remove fine woody debris			
	Modify new forest edge			
Reduce risk of plant infestation				
2. Protect the natural and cultural environments	Inventory of environmentally sensitive areas	Monitor for insect pests		
	Inventory of species at risk			
3. Protect park visitors, workers and volunteers	Modify or remove danger trees and hazard trees			
	Remove fine woody debris			
	Stabilize slope near Prospect Point			
4. Repair park infrastructure		Repair seawall between Prospect Point and Third Beach	Repair roads, trails, drainage and utilities	
5. Create supporting legacies			Disposition of fallen trees	Prepare education & interpretation strategy

Major restoration activities after first year:

- brush back the understory surrounding newly planted trees (the next ten years);
- relocate Park Drive and parking lot away from Prospect Point (2008).

Provisional Budget

Preparing the Restoration Plan.....	\$ 500,000
<i>(community consultation, consultants, studies)</i>	
Clearing and repairing roads and trails	\$1,000,000
Prospect Point blowdown area.....	\$2,250,000
<i>(removal of fallen trees, drainage, slope stabilization, road realignment)</i>	
Other blowdown areas	\$1,250,000
<i>(removal of fallen trees, drainage)</i>	
Reforestation (new plantings).....	\$1,000,000
Seawall repairs and reconstruction	\$1,000,000
Supporting legacies.....	\$ 750,000
Contingency	\$1,250,000
TOTAL.....	\$9,000,000

More detailed costing of some portions of the budget must await the site clean-up, such as the slope stability program and the seawall repairs. Tree and debris clearing will be on a time or unit price basis to enhance team control over environmental concerns. Legacy funding will be the remaining funding left after clean-up, repair and restoration costs are accurately determined.

Recommendations for Implementation

The Stanley Park Restoration Plan is grounded in a long-term vision for the park's forest. Three goals and eighteen principles have been formulated to guide the complex decision-making required to restore the blowdown areas. Major restoration activities that are recommended are listed below:

- 1. Modify or remove danger trees within or near the blowdown areas, and hazard trees elsewhere in the park.**
- 2. Protect the forest floor and understory plant communities and retain as many trees and snags as possible in the blowdown areas.**
- 3. Modify the newly created forest edge so that the risk of the blowdown areas spreading to remaining trees is minimized.**
- 4. Remove an appropriate amount of fallen trees from the forest floor, balancing the need to manage fire and insect infestation risks while meeting the current and future ecological needs of the forest.**
- 5. Reduce risk of forest fires by removing fine woody debris within five meters of all trails, roads and parking lots, and from areas of human activity within the forest, and by removing most fallen trees from the blowdown areas.**
- 6. Prepare and implement a slope stabilization plan for the area between Prospect Point and Third Beach.**
- 7. Repair or reconstruct damaged portions of the seawall.**
- 8. Repair or reconstruct damaged roads, trails, drainage, and utilities.**
- 9. Relocate Park Drive and parking lot away from Prospect Point to improve drainage, visitor safety and aesthetics.**
- 10. Work with First Nations and agencies like Stanley Park Ecology Society, Nature Vancouver, Vancouver Historical Society and Vancouver Heritage Commission to enhance and augment educational and interpretative resources for Stanley Park.**
- 11. Allocate the fallen trees that will be removed based on a hierarchy of needs.**
- 12. Plant Douglas-fir, western red cedar, Sitka spruce, grand fir, big leaf maple, red alder and a variety of shrubs.**
- 13. Brush back the understory surrounding newly planted trees for the next ten years.**
- 14. Reduce risk of invasive plant infestation within and near the blowdown areas.**

With carefully planned restoration and management, Stanley Park's forest will recover in the fullness of time. It is hoped that the forest will not only heal after being damaged by the windstorms, but become stronger and healthier such that future disturbances do not have catastrophic effects.

Glossary

Biodiversity [biological diversity]: A term to describe the breadth of species representation within an ecosystem. A higher level of biodiversity is thought to bestow resilience to plant and animal communities, and is therefore desirable.

Blowdown Area: Areas of forest where a significantly sized group of trees were blown over by a windstorm. It is the result of either extremely strong frontal winds, or of localized blasts with cyclonic or turbulence effect qualities. It is often a chain reaction effect where the loss of a few weak trees allows strong winds to penetrate the forest canopy and topple over large numbers of healthy trees that are structurally unprepared for the new force.

The large blowdown south and west of Prospect Point was probably caused by topographically induced turbulence. This area is very prone to such occurrences. The locations of other blowdowns were probably influenced by the combined effects of wind exposure, soil/water relations, and tree canopy factors.

Coarse Woody Debris: The dead rootballs, trunks and larger branches left behind a forest disturbance event, either standing or on the ground. It is an essential element of a functioning forest as it plays a role in the decay and renewal process, through its provision of floral and fauna habitat, available water in time of drought, and slowly released nutrients.

Conifer: A cone bearing tree. Major conifers in a BC coastal forest are Douglas-fir, cedar, hemlock, grand fir and Sitka spruce.

Culturally Modified Tree: A culturally modified tree is a tree that has been altered by First Nations peoples as part of their traditional use of the forest. These are typically cedar trees that have had strips of bark removed, planks split off, or test holes bored into the trunks to determine their suitability for canoe carving. BC's Heritage Conservation Act protects culturally modified trees created before European contact, which is assigned as the year 1846.

Danger Tree: A tree that is described by a certified danger tree inspector as having a higher risk of failure due to the character and extent of structural flaws to its strength.

Deciduous Tree: A tree that loses its leaves during its dormant period. Typical wild deciduous trees in the park are bigleaf maple, cottonwood, alder, wild cherry and vine maple.

Environmentally Sensitive Area: Represents those areas that are particularly unique. They include a diverse mix of natural features and habitats that are essential to the biodiversity and ecosystem health of the park as a whole.

Exotic Insects and Plants: Insects or plants of an origin outside of coastal BC that have colonized, or have the potential to colonize the forest, roadsides or water courses

of Stanley Park. The term ‘invasive’ is used to describe an exotic organism that is so aggressive in its nature that it can significantly alter natural forest processes. Invasive insects, plants or pathogenic organisms are undesirable because they destabilize natural systems and generally bring about a decrease in biodiversity.

Feathering: The practice of dissipating horizontal wind forces against a newly exposed forest edge by a combination of spiral thinning, stubbing, and the careful selective removal of wind damaged trees.

Fine Woody Debris: Dead smaller branches on the forest floor. Fine woody debris and tree leaves and needles tend to be high in nitrogen and other critical nutrients that are made available by the process of decay for new growth over a short period of time. The positive benefits of fine woody debris need to be balanced with the elevated fire risk associated with it.

Forest Access Route: Routes providing access for equipment into blowdown areas during the restoration process. Existing trails will be used where they are sturdy enough and temporary access routes will be constructed with wood debris where trails are inadequate. Temporary access routes will be deactivated when work is complete, in such a manner that the forest will regrow and obliterate them.

Forest Fire Risk: A value determined by professional assessors that estimates the likelihood and extremity of a forest fire. It is calculated using parameters such as fuel mass, size, arrangement and moisture content. The likelihood of ignition, expected quickness of spread, and the probable consequences of a fire are also critical considerations in calculations of fire danger.

Forest Floor: The base of the forest. It is the layer of organic soil, rotting plant material, and associated flora and fauna that function to provide beneficial nutrient holding and cycling qualities, water holding and drainage properties, and wildlife habitat. It is the base of larger plant and animal communities.

Forest Structure: The combination of forest features that together can be used to classify forest stands as being either young, mature or old growth. Examples of such features are tree species and age, density, understory and forest floor makeup, and standing and fallen dead trees. Work in blowdowns is conducted mindfully in order to protect the older features so that the replacement forest will sooner take on the characteristics of an old growth forest.

Forest Succession: The gradual change in the makeup of a forest from one plant community to another. It is a process that begins with a severe site disturbance, then develops through a range of different species replacing one another until it reaches a climax stage which is more or less stable. The climax forest remains until another severe disturbance occurs.

Hazard tree: A tree that has been described as a danger tree that poses an unacceptable risk due to the human activities taking place within striking range.

Quarantined Pest: An organism that is listed as such by the Canadian Food Inspection Agency. Federal legislation gives broad powers to this agency to interdict or prevent the spread of these organisms.

Resilient Forest: Term used in this report to describe a forest that is not vulnerable to frequent catastrophic disturbance. Such disturbances are a threat to park users and prevent the development of an old growth ecosystem. As urban growth in the Vancouver region increasingly fractures and stresses its urban forests, the stewarding of long standing trees within an urban park is deemed to be desirable.

Slope Stabilization: The process of reducing the frequency and severity of future landslides. Mechanical slope stabilization techniques would include improving drainage, and removing loose overburden or fractured base material. Biological slope stabilization involves the planting of native plants in vulnerable areas where their roots will reduce soil subsidence. Ideal plants for this purpose have low growing profiles and aggressive roots.

Snag: A dead, standing tree. Larger snags can stand for as long as a century. They are valuable habitat for plants and animals.

Species at Risk: The Federal Ministry of Environment, in conjunction with the Canadian Wildlife Service, the Department of Fisheries and Oceans and Parks Canada, has developed and updates a registry of species at risk or potentially at risk. The registry is referred to as the COSEWIC list (Committee on the Status of Endangered Wildlife in Canada) and classifies listed species as being either extirpated, endangered, threatened or a special concern.

Spiral thinning: The practice of reducing the wind resistance of a tree by removing branches. If done correctly, the tree will gradually recover its lost foliage while also having a few years to adjust to the increased wind forces to which it is subject due to the adjacent loss of trees.

Stubbing: The practice of removing sections of tree stems in order to reduce its hazard potential to an acceptable level. It is used in conjunction spiral thinning in windfirming work, or might be employed to create a wildlife habitat tree from a hazard tree.

Understory Plant Communities: The sum of plants that grow beneath the upper canopy of a forest. Vine maple and elderberry are examples shrub layer species, while sword fern and foamflower would be considered ground cover. All of these plants act together as a complex community which has the net effect of enhancing forest dynamics.

Windfirming The practice of protecting standing trees from future wind damage. Newly created edges are often unstable – it can take several years for them to become wind resilient again. The tendency for unmanaged windthrow edges to expansively change is checked by applying the techniques of spiral thinning, stubbing, and the selective removal of damaged trees. Blowdown predictive factors such as tree characteristics, soil / water relations, and expected storm exposure are used to model high risk areas. Tree and site specific prescriptions are prepared and followed.

Park Board Staff, Consultants and Volunteers

The following individuals assisted with the preparation of the Restoration Plan.

Park Board Staff

General Manager: **Susan Mundick**, General Manager of Parks and Recreation

Project Director: **Jim Lowden**, Director of Special Projects

Project Manager: **Paul Lawson**, Registered Professional Forester, seconded from his regular position as Manager of UBC's Malcolm Knapp Research Forest

Other staff: **John Brossard**, Financial Analyst
Carol DeFina, Communications Coordinator
Michel Desrochers, Park Planner
Yuna Flewin, Research Analyst
Ofer Marom, GIS Technician
Eric Meagher, Supervisor of Stanley Park Maintenance
Brian Quinn, Foreman of Stanley Park Gardeners
Virgil Soh, Graphics Technician
Bill Stephen, Urban Forestry Technician

Consultants / Advisors:

Archaeology: **Andrew Mason**, Archaeologist, Golder Associates Ltd.

Biology: **Sally Leigh-Spencer**, Registered Professional Biologist, Ecologic Consulting

Communications: **Jacque Asante**, Senior Account Director, Optimum Public Relations

Danger Tree Assessment: **Trevor Cox**, Registered Planner and Certified Arborist, Diamond Head Consulting Ltd.

Entomology (insects): **John McLean**, Registered Professional Biologist, Department of Forest Sciences, UBC

Fire Risk Assessment: **Bruce Blackwell**, Registered Professional Forester, Registered Professional Biologist, B.A. Blackwell and Associates Ltd.

Geotechnical Engineering: **Mike Wise**, Geological Engineer, GeoWise Engineering

Soil Bioengineering: **David Polster**, Registered Professional Biologist, Polster Environmental Services Ltd.

Windfirming of Trees: **Steve Mitchell**, Associate Professor, Department of Forest Sciences, UBC

Steering Committee

A Steering Committee was set up to advise the Park Board on the preparation and implementation of the Stanley Park Restoration Plan, representing three fields of expertise. The committee met seven times and consists of the following individuals:

- Ecology: **Dr. Hamish Kimmins**, Professor of Forest Ecology,
Department of Forest Sciences, UBC
Dr. Ken Lertzman, Professor, School of Resource and
Environmental Management, SFU
- Forestry: **Bob Cavill**, Registered Professional Forester, Manager of
Watershed Division, GVRD
Rick Slaco, Registered Professional Forester, VP and Chief
Forester, International Forest Products Ltd.
Ron Van Oord, Superintendent of Watershed Operations,
GVRD
Dwight Yochim, Registered Professional Forester,
Association of BC Forest Professionals
- Geotechnical Engineering: **Mike Currie**, M.Eng., P.Eng., President, Kerr Wood Leidal
Associates Ltd.
David Smith, P.Eng., Principal, Thurber Engineering Ltd.

Partners and Stakeholders Committee

This committee was established to gather input from partners and stakeholders as the Restoration Plan was being prepared. The committee met four times. The following individuals participated:

- B.C. Society of Landscape Architects: **David Thompson, Ken McKillop**
Nature Vancouver: **David Cook, Al Grass, Daphne Solecki**
Parks Canada: **Philip Lee, Steve Oates**
Sierra Club: **Dermot Hikisch**
Squamish Nation: **Chief Ian Campbell**
Stanley Park Ecology Society: **Patricia Thomson**
Tourism Vancouver: **Stephen Regan**
Tsleil-Waututh Nation: **Carleen Thomas, Justin George**
Vancouver Area Cycling Coalition: **Jack Becker, Hans Groen**
Vancouver Heritage Commission: **Karen Jarvis**

Map of Stanley Park

