Invasive Plant Mapping in Stanley Park

Submitted to: Alan Duncan, Vancouver Park Board
Submitted by: Robyn Worcester and Greg Ferguson, Stanley Park Ecology Society
Date: 24 January 2012
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Invasive Plant Mapping in Stanley Park

Project Background

On May 6, 2010, the Vancouver Park Board (VPB) directed staff to form a working group with the Stanley Park Ecology Society (SPES) to prioritize previously identified short-term restoration and enhancement activities to benefit the ecological health and biodiversity of Stanley Park. On January 17, 2011, the VPB approved a series of recommended actions to improve the ecological integrity of Stanley Park with the SPES in the following five priority areas of concern: Beaver Lake’s rapid infilling; Lost Lagoon’s water quality; invasive plant species; fragmentation of habitat; and species of significance. In June 2011, the VPB and SPES finalized contracts to update its invasive plant species mapping and integrate this information into the VPB’s Geographic Information System (GIS). Funding specified the mapping of several invasive plant species along edges in Stanley Park, four of which were also mapped in the 2006 windstorm blow down areas (Appendix 1).

Invasive plant species are one of the leading threats to the conservation of biodiversity globally, in addition to posing significant economic costs to society. In Stanley Park, a total of seventy two invasive plant species have been identified (Zevit, 2011*). Species such as English ivy (Hedera helix) and Himalayan blackberry (Rubus armeniacus) have been in Stanley Park for many years, while other species are more recent introductions (e.g., knotweed species (Fallopia spp. and Polygonacea sp.), giant hogweed (Heracleum mantegazzianum)). A common theme among invasive plant species in Stanley Park is their continued spread and negative impact on native biodiversity.

SPES is the only Park Partner working in Stanley Park with the VPB and undertakes all the invasive plant species management. SPES wrote the Best Management Practices for invasive plant species, which are included in the Stanley Park Forest Management Plan (VBPR, 2009**). SPES has an agreement to address issues, such as liability, concerning the use of volunteers in park operations related to invasive plant species control and the restoration of habitat.

Project Summary

This report is for the second phase of the invasive plant species strategy between the VPB and SPES. This second phase updated the mapping of invasive plant species throughout Stanley Park, documented and tracked the success of restoration measures to date, and identified priority areas for further controls. This second phase also includes the development of operational systems in continuing collaboration with VPB staff. This will allow consistent updating of mapping by both SPES and VPB staff to ensure effective, ongoing management and monitoring of invasive plant species. It will also provide the basis to evaluate the success of restoration programs throughout Stanley Park.

Data collected from this mapping project will be integrated into SPES’s forthcoming invasive species management plan for Stanley Park and used by SPES and the VPB to track the occurrence, distribution and abundance of invasive plant species and employ future management strategies for their control and eradication.

Invasive Plant Mapping in Stanley Park

Project Goal

Undertake proactive measures to map invasive plant species in Stanley Park and to ensure that mapping remains up-to-date for ongoing management operations and to evaluate the success of restoration programs.

Project Objectives

1. Create and update invasive plant species maps to obtain the locations and extent of invasive plant species in Stanley Park for management purposes and prioritization of areas for removal by VPB staff, SPES and volunteers.
2. Map habitat restoration areas for use as visual indicators of VPB/SPES programs progress.
3. Leverage project funding from other sources for the betterment of Stanley Park.
4. Create a process and mechanism for providing convenient access to invasive plant species maps for VPB staff.

Project Work Plan

<table>
<thead>
<tr>
<th>Deliverable</th>
<th>Completion Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Up-to-date maps of invasive plant species listed in Appendix B</td>
<td>September 30, 2011</td>
</tr>
<tr>
<td>2. Maps indicating the extent of habitat restoration work to date</td>
<td>December 31, 2011</td>
</tr>
<tr>
<td>3. On-line accessibility for VPB staff and the public to map layers</td>
<td>December 31, 2011</td>
</tr>
</tbody>
</table>

Key Staff and Project Partners

SPES

Robyn Worcester, SPES Conservation Programs Manager. Robyn is a Registered Professional Biologist, a graduate of BCIT’s Resource Management Fish, Wildlife, and Recreation program, and received a B.Sc. in Biology from SFU. Having begun her work with SPES in 2004, Robyn is responsible for designing and delivering wildlife and habitat monitoring, GIS mapping and research programs, while also overseeing the urban wildlife and environmental stewardship programs of SPES in Stanley Park.
Invasive Plant Mapping in Stanley Park

Greg Ferguson, SPES Stewardship Coordinator. Greg has over seven years’ experience working in the fields of environmental conservation, education and research, with specialization in natural resource assessment and community environmental stewardship. A Registered Professional Biologist, he has an advanced certificate in Habitat Restoration from Douglas College and a B.Sc. from UBC in Natural Resources Conservation.

VPB

Alan Duncan, Environmental Planner (Project Supervisor)

Bill Stephen, (act) Supervisor Arboriculture (Project Advisor)

Methodology

Field Data Collection

SPES Stewardship Coordinator recruited volunteers with experience in natural sciences to assist with mapping in June of 2011. SPES staff and volunteers involved in the project were trained in field safety, invasive plant species identification, field mapping methodology and data entry processes.

Stanley Park was divided into six mapping zones and blow down area maps were printed to guide and track the progress of field mapping. Field crews consisted of two or more staff/volunteers who worked together to map the occurrence and abundance of invasive plant species along edges (e.g., trails, unnatural openings, fields) and in the 2006 windstorm blow down areas. A standard data form, map of Stanley Park and each blow down area, invasive species identification guide and Garmin Map 60CSx Global Positioning System (GPS) was used to map invasive plants detected.

Field crews recorded the following information for each invasive plant species detected: the species’ name; the area the species covered in meters squared; and the abundance of the species in the area it was detected (i.e., percent ground cover).

Points, lines and polygons were used to differentiate the various sizes and shapes of plant species’ coverage. Points were recorded for species that covered an area of less than 10m², with Universal Transverse Mercator (UTM) coordinates collected at the center of such areas. Lines were used to record a species’ coverage over a linear area (e.g., along a natural or non-natural edge), with UTM coordinates collected at the junctions and ends of where the species’ occurred and the lines width and direction recorded to map its area. Polygons were used to map species that covered and area greater than 10m², with surveyors walking the perimeter of the area covered by the species and collecting UTM coordinates at applicable junctions.
Invasive Plant Mapping in Stanley Park

Additional information recorded included the accuracy of the UTM coordinate collected and the number of stems and height of invasive trees and shrubs detected. If a plant was unidentifiable in the field, key features were recorded and photos and samples were taken for later identification. If plants were unidentifiable to species, they were grouped by family.

Restoration Site Data Collection

Since 2004, SPES has been undertaking invasive species removal programs in Stanley Park, in collaboration with the VPB. Between 2004 and 2006, removal sites were tracked and data was collected on the size of the restoration area. Unfortunately this data was lost. In 2007, SPES’s new Conservation Programs began and the invasive species management program expanded with the addition of a full-time program coordinator and better methodologies for habitat restoration. Since this time, GPS coordinates and areas of all invasive species removal sites have been documented as well as other details, such as the species removed, volunteer group size, etc. This information can be found in the maps’ associated table. Data used in the creation of the up-to-date SPES restoration site maps was collected during the events held between September 2007 and November 2011. Data are organized on separate layers by species. The English ivy layer is organized by year and there is a separate map showing the areas where tree ivy has been removed. There is also a separate layer for planting events. The data associated with these layers, such as species planted and area of planting, can be found in the map tables.

Data Entry and Geographic Information Systems Mapping

All field data collected were entered into Microsoft Excel and UTM coordinates were downloaded following each day of field work. All field data was amalgamated in Excel and sorted by species to create species specific layers in MapInfo 9.0, SPES’s Geographic Information Systems (GIS) software. All UTM data was projected in MapInfo using North American Datum 83 for zone 10. Points, lines and polygons were created using the easting and northing coordinates collected. Lines and polygons were manually drawn, with MapInfo’s buffering feature used to map applicable line widths. Each invasive species was saved as its own layer, with corresponding .tab file, and combined with existing SPES base layers (e.g., orthophoto, infrastructure) to make final species maps for edges and the blow downs. Restoration sites were mapped in a similar fashion.

For some of the updated map layers, additional data collected between 2007 and 2010 and map layers () were added to the 2011 survey data. For example, English holly in blowdown area S4 was mapped in 2007, not 2011; the English ivy layer is made up of data collected in 1996, 2009 and 2011. Additional points collected in previous years were added to species layers if the locations were missed in the more recent surveys. Dates and surveyor identity is recorded in the tables for all layers, but in cases where older data were used, certain details have been skipped (i.e. % cover).
Results

Map layers were created for all species listed in Appendix 1, except for purple loosestrife (*Lythrum salicaria*) and Reed Canary Grass (*Phalaris arundinacea*). The timing for the mapping project did not allow for accurate data to be collected for these species. Since there were several unidentified laurel species (*Prunus spp.*) found during field surveys, we combined the two species outlined in the contract into “Laurel spp.”.

All of the maps were made from GPS coordinates collected in the field, with the exception of a few points that were added during the GIS mapping process and for fragrant water lily (*Nymphaea odorata*), which was mapped entirely by digitizing vegetation from orthophotos.

The results of the invasive plant species mapping along edges (e.g., roads and trails) can be found in Appendix 2. The results of the invasive plant species mapping in blowdown areas can be found in Appendix 3. The results of restoration site mapping, including planting sites, invasive pull sites, and tree ivy areas, can be found in Appendix 4.

Integrating Invasive Plant Maps into VanMap

In December 2011, SPES began conversations with VPB staff and the GIS Manager for the City of Vancouver to determine the feasibility of integrating these updated invasive plant maps into VanMap ([http://vancouver.ca/vanmap/](http://vancouver.ca/vanmap/)).

Work is in progress to transfer all of the maps created during this project to the private section of the VanMap website so that they can be viewed and used by Park and City staff. The files must first be converted from .TAB files (used by SPES and the VPB MapInfo software) to .SHP files (used by City of Vancouver AutoDesk mapping software). The second step will be to determine the colour and style of the symbols for the invasive species map layers. This style will need to be compatible with other VanMap layers (i.e. different colours and symbols must be used for the new invasive plant layers, so that they stand out from existing layers).

Additional information that will need to be determined by Park Board staff and discussed with City of Vancouver GIS staff is:

1. How often will the data need be updated?
2. Will some or all of the map layers to be displayed on the public VanMap site?
3. Will some or all of the map layer data to be made publicly available on the City of Vancouver Open Data website ([http://data.vancouver.ca](http://data.vancouver.ca))?
### Appendix 1: Invasive Plants Mapped

<table>
<thead>
<tr>
<th>Species</th>
<th>Locations to be mapped</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gorse (<em>Ulex europaeus</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Butterfly Bush (<em>Buddleja davidii</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Bamboo spp.</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Morning Glory (<em>Convolvulus sepium</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>St John’s Wort (<em>Hypericum calycinum</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Lesser periwinkle (<em>Vinca minor</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Giant Hogweed (<em>Heracleum mantegazzianum</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>English Laurel (<em>Prunus laurocerasus</em>)</td>
<td>From all roads and trails ** combined into “Laurel spp.”</td>
</tr>
<tr>
<td>Portugal Laurel (<em>Prunus lusitanica</em>)</td>
<td>From all roads and trails ** combined into “Laurel spp.”</td>
</tr>
<tr>
<td>Spurge Laurel (<em>Daphne</em>) (<em>Daphne laureola</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Yellow Lamium (<em>Lamiastrum galeobdolon</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Climbing Nightshade (<em>Solanum dulcamara</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>Scotch Broom (<em>Cytisus scoparius</em>)</td>
<td>From all roads and trails</td>
</tr>
<tr>
<td>English Holly (<em>Ilex aquifolium</em>)</td>
<td>From all roads and trails and in blowdown areas</td>
</tr>
<tr>
<td>Himalayan Blackberry (<em>Rubus armeniacus</em>)</td>
<td>From all roads and trails and in blowdown areas</td>
</tr>
<tr>
<td>Japanese Knotweed (<em>Polygonum cuspidatum</em>)</td>
<td>From all roads and trails and in blowdown areas</td>
</tr>
<tr>
<td>English Ivy (<em>Hedera helix</em>)</td>
<td>From all roads and trails and in blowdown areas</td>
</tr>
<tr>
<td>Fragrant Water Lily (<em>Nymphaea odorata</em>)</td>
<td>in the parks major wetlands</td>
</tr>
<tr>
<td>Yellow Flag Iris (<em>Iris pseudacorus</em>)</td>
<td>in the parks major wetlands</td>
</tr>
<tr>
<td>European Ash Species (<em>Sorbus spp.</em>)</td>
<td>From all roads and trails ** added to the list</td>
</tr>
</tbody>
</table>
Lesser Periwinkle Occurrence Along Trail Edges in Stanley Park, 2011

Appendix 2: Invasive Plant Mapping by Species

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created: December 2011
Website: www.stanleyparkecology.ca

LEGEND
- Periwinkle
- Roads
- Trails

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Morning Glory Occurrence Along Trail Edges in Stanley Park, 2011

LEGEND
- Morning Glory
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10

Map Created December 2011

Website:
www.stanleyparkecology.ca

Copyright 2011, Stanley Park Ecology Society. For reference use only, not intended for navigational purposes.
English Ivy Occurrence Along Trail Edges in Stanley Park, 2011

Data Source:
June - November 2011
SPEES field surveys

Projection: NAD 83 Zone 10
Map Created: December 2011

Website: www.stanleyparkecology.ca

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European Ash Species Occurrence
Along Trail Edges in Stanley Park, 2011

Map: Stanley Park Ecological Society

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Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10

Map Created December 2011

Website: www.stanleyparkecology.ca
Giant Hogweed Occurrence Along Trail Edges in Stanley Park, 2011

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created December 2011

Website:
www.stanleyparkecology.ca

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St. John's Wort Occurrence Along Trail Edges
in Stanley Park, 2011

LEGEND
- St. John's Wort
- Roads
- Trails

Data Source:
June - November 2011
Spies field surveys

Projection: NAD 93 Zone 10
Map Created December 2011

Website:
www.stanleyparkecology.ca

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Invasive Plant Mapping in Stanley Park, 2011

Fragrant Water Lily Occurrence Along Trail Edges in Stanley Park, 2011

LEGEND
- Buckbean/Fragrant Water Lily
- Fragrant Water Lily
- Yellow Pond Lily/Fragrant Water Lily
- Road
- Trail

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10

Map Created: December 2011

Website:
www.stanleyparkecology.ca

Laurel Species Occurrence Along Trail Edges in Stanley Park, 2011

Legend:
- Red dot: Laurel Species
- Solid line: Roads
- Dashed line: Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created December 2011
Website:
www.stanleyparkecology.ca
Invasive Plant Mapping in Stanley Park

Gorse Occurrence Along Trail Edges in Stanley Park, 2011

LEGEND
- Gorse
- Roads
- Trails

Data Source: June - November 2011
SPES Field Survey
Map Created: December 2011
Website: www.stanleyparkecology.ca

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English Holly Occurance Along Trail Edges in Stanley Park, 2011

LEGEND
- English Holly
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created December 2011

Website:
www.stanleyparkecology.ca
Japanese Knotweed Occurrence Along Trail Edges in Stanley Park, 2011

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created December 2011

Website:
www.stanleyparkecology.ca
Scotch Broom Occurrence Along Trail Edges in Stanley Park, 2011

LEGEND
- Scotch Broom
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created December 2011
Website:
www.stanleyparkecology.ca

Yellow Flag Iris Occurrence Along Trail Edges in Stanley Park, 2011

LEGEND
- Yellow Flag Iris
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10

Map Created December 2011

Website:
www.stanleyparkecology.ca

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Daphne Laurel Occurance Along Trail Edges in Stanley Park, 2011

LEGEND
• Daphne

Roads

Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10

Map Created: December 2011

Website:
www.stanleyparkecology.ca

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Invasive Plant Mapping in Stanley Park
Bamboo Occurrence Along Trail Edges in Stanley Park, 2011

LEGEND
- Bamboo
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created: December 2011
Website:
www.stanleyparkecology.ca

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Climbing Nightshade Occurrence Along Trail Edges
in Stanley Park, 2011

LEGEND
- Climbing Nightshade
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created: December 2011

Website:
www.stanleyparkecology.ca

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Appendix 3: Restoration Site Maps

SPES Invasive Plant Removal Sites, 2007-2011

LEGEND

- **Species Removed:**
  - Single Scotch Broom
  - Single Yellow Flag Iris
  - Single Purple Loosestrife
  - Single Dephne Laurel
  - English Holly Area
  - English Ivy Area
  - Morning Glory Area
  - Himalayan Blackberry Area
  - Goose Area

Data Source:
SPES field surveys

Projection: NAD 83 Zone 10

Map Created December 2011

Website:
www.stanleyparkecology.org

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Invasive Plant Mapping in Stanley Park

SPES Invasive Plant Removal Sites, 2007-2011

LEGEND
- Single Scotch Broom
  - Scotch Broom Area
- Single Yellow Flag Iris
  - Yellow Flag Iris Area
- Single Purple Loosestrife
  - Purple Loosestrife Area
- Single Rhododendron
  - Rhododendron Area
- Morning Glory
  - Morning Glory Area
- Himalayan Blackberry
  - Himalayan Blackberry Area
- Gorse
  - Gorse Area

Data Source: SPES Field Surveys
Projection: WGS 84 Zone 10
Map Created: December 2011
Website: www.stanleyparkecology.ca


Lost Lagoon
Invasive Plant Mapping in Stanley Park

SPES Invasive Plant Removal Sites, 2007-2011

Legend:
- Single Scotch Broom
- Chokecherry Area
- Single Yellow Flag Iris
- Yellow Flag Iris Area
- Single Purple Loosestrife
- Purple Loosestrife Area
- Single Dogwood Laurel
- Dogwood Laurel Area
- English Holly
- English Holly Area
- English Ivy
- English Ivy Area
- Morning Glory
- Morning Glory Area
- Huckleberry
- Huckleberry Area
- Goats Anise

Data Source:
SPES Field Surveys
Projection: NAD 83 Zone 10
Map Created December 2011
Website:
www.stanleyparkecology.ca

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Second Beach

Third Beach
Invasive Plant Mapping in Stanley Park

SPES Invasive Plant Removal Sites, 2007-2011
Invasive Plant Removal

English Ivy

LEGEND
- 2011
- 2010
- 2009
- 2007 (single point)
- 2007
- 2006

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Appendix 4: Blowdown Area Maps

Himalayan Blackberry Occurrence in Blowdown Areas in Stanley Park, 2011
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Himalayan Blackberry Occurrence in
Blowdown Areas "N1" and "N2" in Stanley Park, 2011

LEGEND
- Single Blackberry
- Blackberry Area
- Blowdown Area Border
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created December 2011
Website:
www.stanleyparkecology.ca

Himalayan Blackberry Occurrence in
Blowdown Area "S4" in Stanley Park, 2011

LEGEND
- Single Blackberry
- Blackberry Area
- Blowdown Area Border
- Roads
- Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10
Map Created December 2011
Website:
www.stanleyparkecology.ca
English Holly Occurance in Blowdown Areas in Stanley Park, 2011

LEGEND
★ Single Holly Holly Area

Blowdown Area Border
Roads
Trails

Data Source:
June - November 2011
SPES field surveys

Projection: NAD 83 Zone 10

Map Created December 2011

Website:
www.stanleyparkecology.ca

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Invasive Plant Mapping in Stanley Park

English Holly Occurrence in
Blowdown Area "N1" in Stanley Park, 2011

English Holly Occurrence in
Blowdown Area "S4" in Stanley Park, 2011
Invasive Plant Mapping in Stanley Park

English Ivy Occurrence in
Blowdown Area "E2" in Stanley Park, 2011

English Ivy Occurrence in
Blowdown Area "N1" in Stanley Park, 2011

Data Source:
June - November 2011
SPPES field surveys
Projection: NAD 83 Zone 10
Map Created: December 2011
Website:
www.stanleypark ecology.ca