UBC Campus Vision 2050

Ecological Baseline

September 21, 2023

Submitted to:
Lia Gudaitis
Senior Planner
Campus + Community Planning - UBC
2210 West Mall | Vancouver British Columbia | V6T 1Z4 Canada

Submitted by:

DIAMOND HEAD
3559 Commercial Street
Vancouver, BC 604.733.4886

Contents

Figures

Tables

Executive Summary

UBC Vancouver consists of 994 acres (402 hectares) and is located on the western edge of the Point Grey peninsula, approximately 9 km from downtown Vancouver. It is surrounded by the 2160 acre (874 ha) Pacific Spirit Regional Park which provides rich terrestrial, marine, and estuarine habitats. The peninsula was logged in the mid-late 1800s, and a mature second-growth forest remains in areas that have not been developed. Much of these forests are protected within Pacific Spirit Regional Park and some remain within the UBC Campus.

This Ecological Baseline Study was developed as a key input to the Campus Vision 2050 planning process. This comprehensive planning process launched in 2022 to update key land use policy documents for UBC's Vancouver campus, including the Provincially adopted Land Use Plan and 10-Year Campus Plan. The latest draft of Campus Vision 2050: Shaping the Future of UBC Vancouver (the Vision) includes six big ideas, which articulate how the campus will grow and change over the next decades.

This study provides a baseline assessment of current ecological conditions on the Vancouver campus in support of Campus Vision 2050. It will guide the development of more specific targets, strategies, and guidelines through future planning processes, including the 10-Year Campus Plan and future Neighbourhood Plans, and enable monitoring and reporting on the progress of the Vision.

This study follows a workshop with Musqueam and UBC to explore and share understandings of broad patterns over the whole Point Grey Peninsula, including Musqueam IR2, UBC, the University Endowment Lands, Musqueam's University Golf Course and Pacific Spirit Regional Park. The workshop discussion was informed by high-level mapping of existing ecological systems and conditions across the peninsula, developed by Diamond Head Consulting and based on LiDAR data collected in 2021.

Methodology

This baseline study was developed in four phases:

1) Understanding Campus Vision 2050 ecological objectives to prioritize data sets;

2) Gathering, reviewing, and analyzing existing spatial data and identifying gaps;

3) Field visits to fill these gaps; and

4) Desktop analysis and reporting.

Findings

UBC Vancouver is located within a unique ecological area, surrounded by rich terrestrial, marine and estuarine habitats. The following are some of the key findings from this study:

- 56% or 226 hectares of UBC's Vancouver campus lands are soft landscapes, these are the focus of this baseline study (i.e. lawns, gardens, farms, and forests).
- Most of UBC Vancouver's campus lands have been modified. Natural areas that remain are second-growth forests.
- Many of the remaining natural areas on campus could be enhanced to provide higher levels of biodiversity.

- UBC Vancouver's tree canopy covers 36% of the total land area on campus. This is just under the top third of Metro Vancouver member municipalities. Metro Vancouver has adopted a target of 40% tree canopy cover within the region's Urban Containment Boundary, which includes UBC.
- The ecological condition of soft landscapes on campus varies; 55% of soft landscapes are in a low or very low ecological condition, 18% are in a moderate condition and 26% are in a high or very high condition.
- 60% of the soft landscape areas on campus are "herb and grass" or "shrub" due to the abundance of lawns and gardens. 28% are "Mature" and "old mature" forests and 10% are young forests. None of the original old-growth forests remain on the campus.
- 68% of the soft landscapes are "artificial." These include human-constructed environmental features with primarily ornamental plant species, with poor or limited habitat quality, and that require active maintenance. Only 4% are considered "natural." These include areas that are in a natural state, with low ground disturbance and low invasive species.
- During the 2021 heat dome, ground temperatures at 7:00 PM UBC ranged from 19.4 to 29.5 degrees Celsius – a difference of 10 degrees. The hottest spots on campus were artificial turf fields and sparsely treed areas dominated by concrete.
- 19 species at risk, including four BCCDC red-listed species were identified within 2 km of the UBC Vancouver campus, highlighting the unique and sensitive ecosystems in and around campus.
- 25 invasive plant species were identified on campus. The most abundant species were Himalayan Blackberry and English Ivy, affecting over 58,000 m^2 and 15,000 m^2 of area respectively.

Opportunities

Campus Vision 2050's Restorative and Resilient Landscapes Big Idea (Figure 2) illustrates several key strategies for enhancing ecological health and biodiversity on campus. Areas of opportunity highlighted by the analysis and reflected in the Vision include:

- The majority of "very high" and "high" value ecological areas are protected as green space.
- The focus of neighbourhood development for the next decade is Wesbrook Place South, which includes 1.3 ha (15%) very high and 2 ha (22%) high ecological areas. Campus Vision 2050 proposes to preserve and enhance most of these higher ecological areas in Wesbrook Place South, with details to be determined as part of a neighbourhood plan process (which would include a tree condition survey to help prioritize trees for retention, alongside other factors).
- For later phases of Campus Vision 2050 implementation, there is one area where a high value stand will be impacted. This is where the draft Stadium Neighbourhood Plan proposes the partial removal of a stand to accommodate the relocation of Thunderbird Stadium. The draft Stadium Neighbourhood Plan compensates for this loss through establishing a large ecological park.
- Many areas identified as "high", "moderate" and "low" ecological conditions are enhanced in the Vision (e.g. Main Mall, tree patches in Acadia, Rhododendron Wood, the Bosque), and expanded (e.g. the central connector, the diagonal connector).
- Most of the suggested connections in the potential biodiversity network are maintained, created, and/or expanded in the Vision.

The analysis also identified some goals to be explored as part of more detailed planning and implementation. Many of these will require further study, which will be pursued as part of the campus plan and future neighbourhood planning processes:

- Increase tree canopy cover across campus to align with Metro 2050 canopy cover goals.
- Consider the protection and replacement of trees during academic and neighbourhood planning and development.
- Improve native habitats and biodiversity across the campus.
- Provide naturalised connections within urbanized landscapes for wildlife to travel between surrounding habitat areas.

1.0 Introduction

The University of British Columbia Campus + Community Planning (UBC CCP) engaged Diamond Head Consulting (DHC) to help understand on-campus environmental assets and their place within UBC communities' values. This exercise was informed by UBC Campus Vision, a comprehensive public planning process to update key land use policy documents for UBC's Vancouver campus, including the Provincially adopted Land Use Plan. Campus Vision 2050 was launched in early 2022 and will inform implementation plans such as the 10-Year Campus Plan and future Neighbourhood Plans.

Throughout the Campus Vision 2050 planning process, biodiversity and ecology have been key themes. Biodiversity and ecology are featured in the latest draft of Campus Vision 2050: Shaping the Future of UBC Vancouver (the Vision), including the Vision's 7 guiding principles, and 6 big ideas (see Figure 2).

UBC's Vancouver campus is located approximately 9 km from downtown Vancouver, on the western edge of the Point Grey peninsula. It is surrounded by Pacific Spirit Regional Park, including rich terrestrial, marine, and estuarine habitats. The campus consists of 994 acres (402 hectares) of land, which is the subject of this study.

This report identifies a set of 'baseline' ecological conditions on campus in support of Campus Vision 2050. These have been mapped at a high level and considered along with other land use planning interests to inform the future Vision. The data is intended to guide the development of more specific targets, strategies, and guidelines through future planning processes, including the 10-Year Campus Plan and future Neighbourhood Plans, and enable monitoring and reporting on the progress of the Vision over time. It is meant to be used as part of a multidisciplinary iterative planning process.

This analysis builds on high-level mapping of ecological systems and conditions that was done for the whole Point Grey Peninsula, as part of a workshop held in 2022 with Musqueam and UBC (Figure 1). This study was completed in four phases:

1. Understanding Campus Vision 2050 ecological objectives to prioritize data sets;
2. Gathering, reviewing, and analyzing existing spatial data and identifying information gaps
3. Field visits to verify conditions on the ground; and
4. Desktop GIS analysis and reporting.

A portion of the assessment was completed remotely using existing datasets and LiDAR analysis, however, a significant portion of the data generated from this project was informed by fieldwork completed by DHC biologists. The fieldwork was intended to ground truth some existing data and to collect information which could not be inferred remotely, such as understory vegetation and condition.

Figure 1. This study builds on a workshop with Musqueam and UBC to explore and share understandings of broad patterns over the whole Point Grey Peninsula, including Musqueam IR2, UBC Vancouver, the University Endowment Lands, Musqueam's University Golf Course.

Photo 1. Most of the UBC campus has been modified, however, some second-growth natural areas remain. Photo taken in UBC Botanical Garden.

Big Idea: Restorative and Resilient Landscapes

UBC Vancouver in 2050... Guided by rich natural surroundings and Indigenous knowledge, the campus integrates natural systems and supports increased biodiversity. A network of connected green public spaces, courtyards, corridors, green roofs and places for respite and social connection work alongside academic and neighbourhood buildings. Indigenous plants and other features that embody Musqueam values create a sense of welcome to Musqueam territory. Biodiversity and ecological resilience are supported throughout the campus, including new tree canopy, rain gardens and green corridors for biking, walking and rolling.

Figure 2. Big Idea: Restorative and Resilient Landscapes from UBC Campus Vision 2050. This study provides a baseline assessment of current ecological conditions on the Vancouver campus in support of Campus Vision 2050.

2.0 Methodology

The ecological baselining exercise used four primary data sources: existing UBC data, recent LiDAR data collected for the entire peninsula, data collected as part of the fieldwork, and available datasets from outside of UBC. This data was analyzed using ESRI's ArcGIS Pro software when possible. Fieldwork was completed in April of 2023, by DHC biologists.

GIS Analysis

Diamond Head Consulting (DHC) utilized UBC's existing spatial data in combination with new LiDAR-derived data to identify a set of 'baseline' conditions across the campus. The data used for this ecological baseline analysis are listed below:

Baseline mapping	Data	Source
2021 Tree Canopy and Flow Accumulation Models	2021 LiDAR and High-Resolution Orthophoto	UBC existing database
2022 Tree Canopy	2022 LiDAR and High-Resolution Orthophoto	Diamond Head Consulting and the City of Vancouver
Land Surface Temperature	Satellite Imagery – Landsat 8, acquired June 30, 2021, at 7 PM.	USGS Earth Explorer: https://earthexplorer.usgs.gov/
Vegetation Type/Landscape Typology	UBC Landscape Soft	UBC existing database
Disturbance Ecological Condition Invasive plants Restoration Opportunities Stand Structure Terrestrial Habitat Type	Field data	Diamond Head Consulting

2.1.1 Methods

The following methods were employed to create new datasets for 1) Tree Canopy Analysis; 2) Water Flow Accumulation Model; and 3) Land Surface Temperature Analysis:

1. **Tree canopy**
   The 2021 Tree Canopy cover was initially completed using 2021 LiDAR and Imagery included on UBC's open data site. DHC used the existing 2021 Tree Canopy data to create a baseline mapping for fieldwork and draft maps. The campus-wide tree canopy was then updated to 2022 as a part of the *City of Vancouver 2022 Canopy Mapping Update* project done by DHC. DHC used 2022 leaf-on LiDAR data in combination with the leaf-on, 4-band 2022 orthophoto to create individual tree detection, segmentation, and classification (coniferous/deciduous/dead). An object-oriented classification generated the tree canopy layer. The resulting canopy was then segmented and classified using individual tree detection and classification algorithms.

2. **Flow Accumulation Model**
   2021 LiDAR data was used to create a Digital Elevation Model (DEM) and a Flow Accumulation Model. DHC ran a spatial model on the LiDAR data to interpolate elevation values and generate a high-resolution (0.5 x 0.5 m) bare earth surface. This bare earth surface represents the DEM.

The DEM was then used to derive a flow accumulation model, blue spots[1] model, and watercourses. The resulting flow accumulation model and blue spots mapping provide valuable information about the hydrological characteristics of the landscape, such as identifying potential drainage networks, stream networks, and areas of high-water accumulation.

3. **Land Surface Temperature**

   DHC used freely available USGS Landsat 8 data (acquired June 30, 2021, at 7 PM) and ArcGIS Pro Software to run spatial analysis and create a land surface temperature raster. The spatial analysis used the thermal infrared sensor bands 10 & 11 and ArcGIS band arithmetic to calculate the land surface temperature in degrees Celsius, at 30 m x 30 m spatial resolution.

   Note: This land surface temperature map only reflects the land surface temperature at one point in time and does not reflect the air temperature.

Ecological Mapping

A ground survey was conducted to identify ecological features that could not be identified remotely. Data collected for this field assessment was used to update an existing spatial layer of UBC which identified areas of 'soft' surfaces. This includes natural areas, gardens, lawns, boulevards, fields, farms, and other areas of campus with permeable surfacing where plants are growing. This spatial layer was then refined based on the assessment results to further delineate polygons.

The field inventory was carried out using ESRI's ArcGIS Collector app loaded onto iPads. Data was stored and backed up on DHC's online ArcGIS account. Data cleanup and analysis were done using ESRI's ArcGIS Pro.

Polygon features were recorded overlaying the 'soft surfaces' data layer (provided by UBC). To expedite field work progress, a single collected polygon could be applied to multiple soft surface polygons if they had similar characteristics. The characteristics assessed included ecological condition, vegetation type, ground vegetation, habitat type, disturbance history, among other data categories collected (See Appendix 1).

Invasive Plant Inventory

A detailed ground survey was conducted to provide a comprehensive map of the distribution and abundance of invasive plant species currently on campus. While the inventory targeted the UBC Campus, some edges of the surrounding Pacific Spirit Regional Park were also inventoried to gain an understanding of potential future sources of invasives to campus.

The timing of the inventory may contribute to an under-representation of specific species. Some herbaceous species (e.g., Himalayan balsam, hedge bindweed, etc.) are difficult or impossible to detect under winter seasonal conditions, when plants are dormant. The invasive inventory was completed during Spring 2023 to capture as many species as possible while operating within the timing constraints of the project.

[1] *Blue spots modelling was done for Lower West Mall Precinct only.*

The field inventory was carried out using ESRI's ArcGIS Collector app loaded onto iPads. Data was stored and backed up on DHC's online ArcGIS account. Data cleanup and analysis were done using ESRI's ArcGIS Pro.

Every species occurrence was denoted as a point feature. All infestation area measurements are visual estimations. The smallest measured unit is one square meter. Area estimations were made as contiguous measurements of impacted square meters (i.e., if there are 10 knotweed stems within two contiguous square meters, the impacted area is recorded as two square meters). When an occurrence impacted an area greater than 25 m^2 a polygon feature was used to record the extent. Polygon features recorded the percent cover for the species indicated. Percent cover was defined as the percent of ground affected by the species.

Vine Status

Three categories were used to define vine status for climbing invasive species (English ivy, clematis, hops):

1. Not climbing,
2. Previously treated (by removal from tree stem) or early-stage climb (<5 years),
3. Established climb (>5 years); requires treatment.

Inventoried Plant Species

There are 31 invasive plant species known to occur in the Lower Mainland (Table 1). These species are all known to pose ecological, economic, and/or human health risks in the Metro Vancouver region. Invasive plant species cause ecological impacts by displacing native species through aggressive growth, causing the loss of native food sources for wildlife, and altering habitat structure. Some species also pose economic risks such as Japanese Knotweed (*Reynoutria japonica*) which can damage building foundations and infrastructure. Other species also pose health risks such as Giant Hogweed (*Heracleum mantegazzianum*) which can cause severe skin burns. The survey also included provincial EDRR species and proposed prohibited noxious weeds, as well as new emergent non-native plant species with the potential to become invasive.

Table 1. Invasive species targeted during field inventory.

Common Name	Scientific Name
Bamboo species	Various
Butterfly bush	*Buddleia davidii*
Cherry-laurel (English laurel)	*Prunus laurocerasus* and related species
Clematis (old man's beard)	*Clematis vitalba*
Common comfrey	*Symphytum officinale*
Common hops	*Humulus lupulus*
Common tansy	*Tanacetum vulgare*
English holly	*Ilex aquifolium*
English ivy and Irish holly	*Hedera helix* and *Hedera hibernica*
Garlic mustard	*Alliaria petiolata*
Giant hogweed	*Heracleum mantegazzianum*
Gorse	*Ulex europaeus*
Goutweed (Bishop's weed)	*Aegopodium podgaria*
Hedge bindweed (morning glory)	*Calystegia sepium*
Himalayan balsam (policeman's helmet)	*Impatiens glandulifera*
Himalayan blackberry	*Rubus armeniacus*
Knotweed, bohemian/Japanese	*Reynoutria japonica* and *Fallopia x bohemica*
Knotweed, giant	*Fallopia sachalinensis*
Knotweed, Himalayan	*Polygonum polystachyum* and *Persicaria wallichii*
Lamiastrum (yellow archangel)	*Lamiastrum galeobdolon*
Orange hawkweed	*Hieracium aurantiacum*
Parrot's feather	*Myriophyllum aquaticum*
Periwinkle	*Vinca minor*
Pickerel weed	*Pontederia cordata*
Purple loosestrife	*Lythrum salicaria*
Reed canary grass	*Phalaris arundinacea*
Scotch broom	*Cytisus scoparius*
Small-flowered touch-me-not	*Impatiens parviflora*
Spurge laurel (daphne laurel)	*Daphne laureola*
Wild chervil	*Anthriscus sylvestris*
Yellow flag-iris	*Iris pseudacorus*

Species on Campus

A Species on Campus database was developed using downloaded data from eBird and iNaturalist. Spatial filters were applied to each dataset to include only areas west of Blanca Avenue. iNaturalist data was filtered to include research-grade results only. Only human observations were included, meaning data predicted by models was excluded.

Potential Historical Streams on Campus

LiDAR data and historical documents were analyzed to identify historic streams on Campus to identify opportunities to restore and daylight these features. A flow accumulation model was used to identify watercourses using the LiDAR-derived Digital Elevation Model (DEM) and hillshade layers. This flow model was used to identify existing watercourses, ditches and other potential areas of overland flow, and remnant creeks on the Point Grey Peninsula. Historical maps and digitized records were also used to explore where historic streams existed on Campus.

3.0 Findings

The UBC Vancouver Campus is situated on the Point Grey Peninsula. This area, along with much of the Lower Mainland has been altered from its original state due to resource harvesting, development, and land use changes over the past several hundred years. Despite these historical disturbances, the Vancouver Campus is surrounded by rich terrestrial, freshwater, marine, and estuarine habitats. Many of the terrestrial and freshwater ecosystems on the Peninsula are protected in Pacific Spirit Regional Park. Metro Vancouver's sensitive ecosystem inventory identifies "sensitive" and "modified" ecosystems in most areas of the Pacific Spirit Regional Park and in small areas within the UBC campus.

Soft Landscapes

Most of the landscaping on campus consists of modified landscapes such as lawns, gardens, and street trees. These highly altered areas are contrasted by several expanses of intact natural areas which have regenerated with few disturbances since the peninsula was initially logged at the turn of the last century. The assessments included in this report are based only on areas which are considered 'soft', meaning areas which provide substrate for vegetation growth such as lawns, gardens, farms, and forests. Buildings, roads, sidewalks, and parking lots were excluded. Some of these included planter boxes and green roofs which may not permeate into groundwater, however, these still provide a growing medium for plants. In total, these soft landscapes cover 226.4 ha or 56.3% of the campus's land base (Table 2).

Soft landscape cover was classified into ten categories, as identified in Table 2 and Figure 1. A total of 18.3% of the campus or 32.5% of the soft landscapes were mapped as forested (coniferous, deciduous, or mixed). Importantly, this is only reflective of the ground covered by these soft landscapes. Tree canopy coverage extends beyond these boundaries and was measured using the 2022 LiDAR dataset.

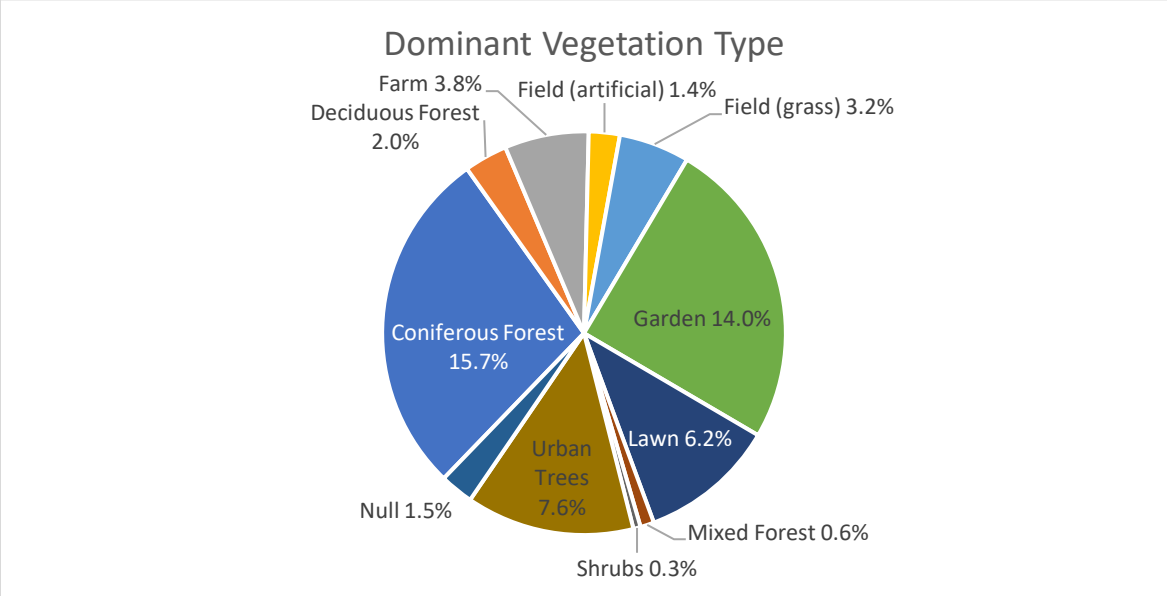

Figure 3. Dominant vegetation types identified on campus.

Table 2. Dominant vegetation types classified during the fieldwork.

Dominant Vegetation type	Definition	Total Area (ha)	Percent of Soft Landscapes	Percent of UBC Campus
Coniferous Forest	Natural plant community dominated by >66% conifer tree species	63.2	27.9%	15.7%
Deciduous Forest	Natural plant community dominated by >66% deciduous tree species	7.9	3.5%	2.0%
Mixed Forest	Natural plant community dominated by a mix of conifer and deciduous tree species	2.5	1.1%	0.6%
Urban Trees	Areas dominated by native or ornamental trees constrained within developed landscapes.	30.5	13.5%	7.6%
Farm	Area used primarily for agriculture, vegetables, or research	15.3	6.7%	3.8%
Field (artificial)	Artificial grass fields used for sports.	6.6	2.9%	1.6%
Field (grass)	Turf grass sports and playing fields.	11.8	5.2%	2.9%
Garden	Area used primarily for growing ornamental flowers or shrubs	56.4	24.9%	14.0%
Lawn	Open area dominated by grasses, used for passive recreation	24.8	10.9%	6.2%
Shrubs	Area dominated by native and non-native shrubs and herbs	1.3	0.6%	0.3%
Null	active construction sites, where land use could not be assessed	6.1	2.7%	1.5%
Total		**226.4**	**100%**	**56.3%**

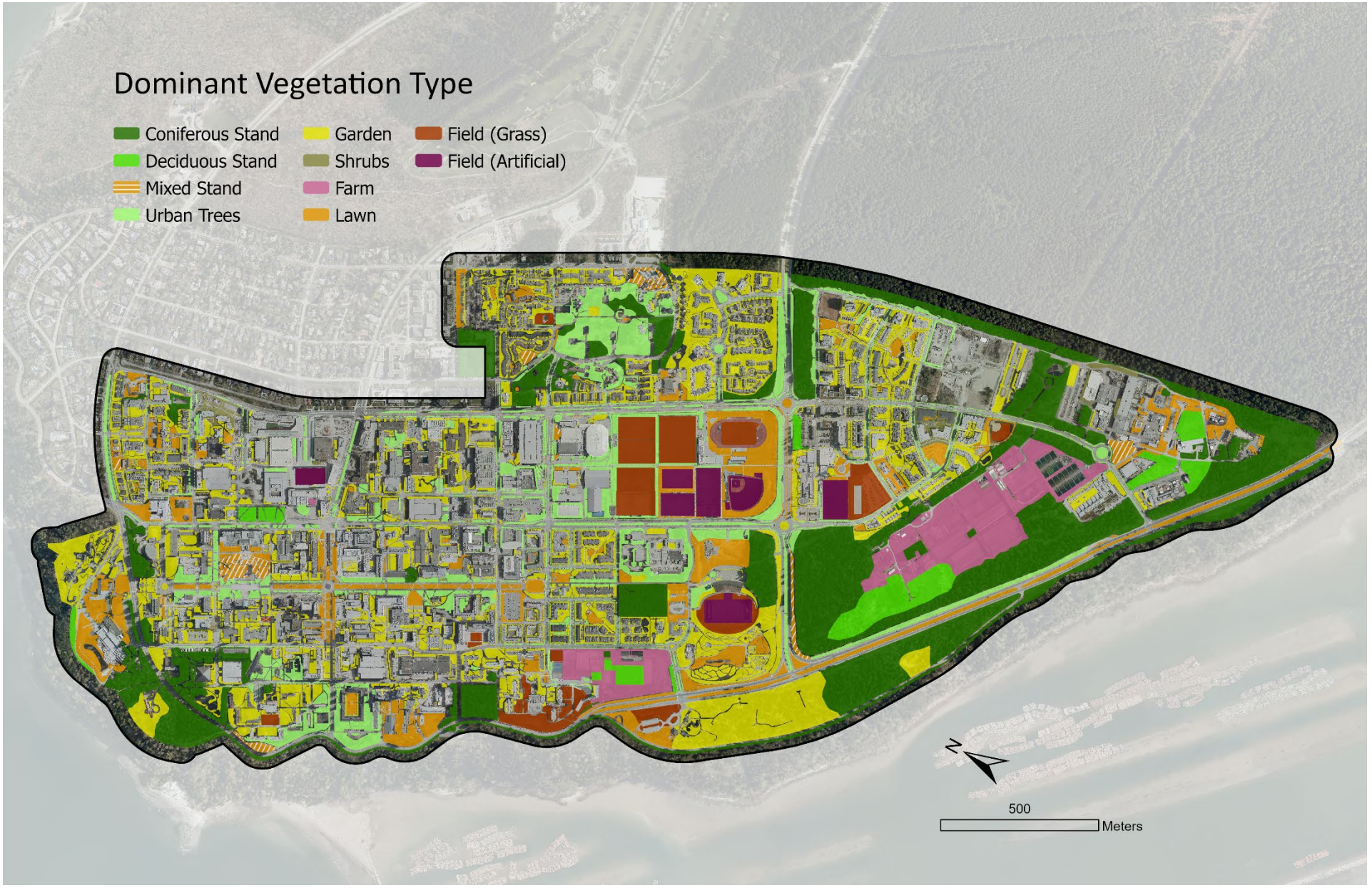

Figure 4. Soft landscapes divided by dominant vegetation types across campus.

3.1.1 Canopy Coverage

UBC's tree canopy covers 146.4 ha or 36% of the total land area of the campus. The distribution of this varies across campus depending on the land use, growing space, age, and species of trees. Forested areas provide areas with high canopy coverage, while recently developed neighbourhoods typically have numerous newly planted trees that have a low canopy coverage due to their age and size (Figures 2 & 3). In 2020, the tree canopy cover within the Urban Containment Boundaries of Metro Vancouver's member municipalities2 was an average of 27.9%. Metro Vancouver has adopted a target to increase this to 40% by 20503. UBC has a total canopy cover that is in the top third of Metro's member municipalities, below the District of North Vancouver (40.7%), and above the City of Coquitlam (33.4%).

The canopy cover of trees varies across the campus. The highest canopy cover (53.1%) is the academic campus south of 16th avenue, while canopy cover across the rest of the academic campus (north of 16th avenue) falls in the middle at 29.5%. In the neighbourhoods, the highest canopy cover is in East Campus neighbourhood at 51.1%, whereas the more urban areas such as University Boulevard have around 10% canopy cover. This is in part due to the neighbourhood location and size, but also due to the size and age of trees that are growing there. For example, nearly 25% of trees in East Campus are over 45 m tall (Table 3), contributing to the neighbourhood's high tree canopy cover. UBC's newest neighbourhoods have some of the lowest canopy cover. For example, University Boulevard has the lowest canopy coverage of the UBC neighbourhoods at 10.6%. Most trees in this neighbourhood are young and small (76% are under 10 m tall). Another new neighbourhood, Wesbrook Place, has the youngest trees. The tree canopy cover in these neighbourhoods is expected to increase over time as the trees mature. Land use in the Acadia and Stadium neighbourhoods are currently dominated by academic uses, student housing, athletic, and works yards. These are expected to change as these neighbourhoods are developed further. Ahead of development, a neighbourhood planning process will consider vegetation and tree condition. Trees in some areas on campus have been planted in soil cells above infrastructure such as parking garages. These newer systems and technologies should be explored to better understand their impact on canopy cover and tree health.

[2] Metro Vancouver (2019). Regional Tree Canopy Cover and Impervious Surfaces, 44 pages. Retrieved from: http://www.metrovancouver.org/services/regional-planning/PlanningPublications/EcologicalHealth-TreeCanopyCoverImperviousSurfaces.pdf

[3] Metro Vancouver (2022). Metro 2050: Metro Vancouver Regional Growth Strategy

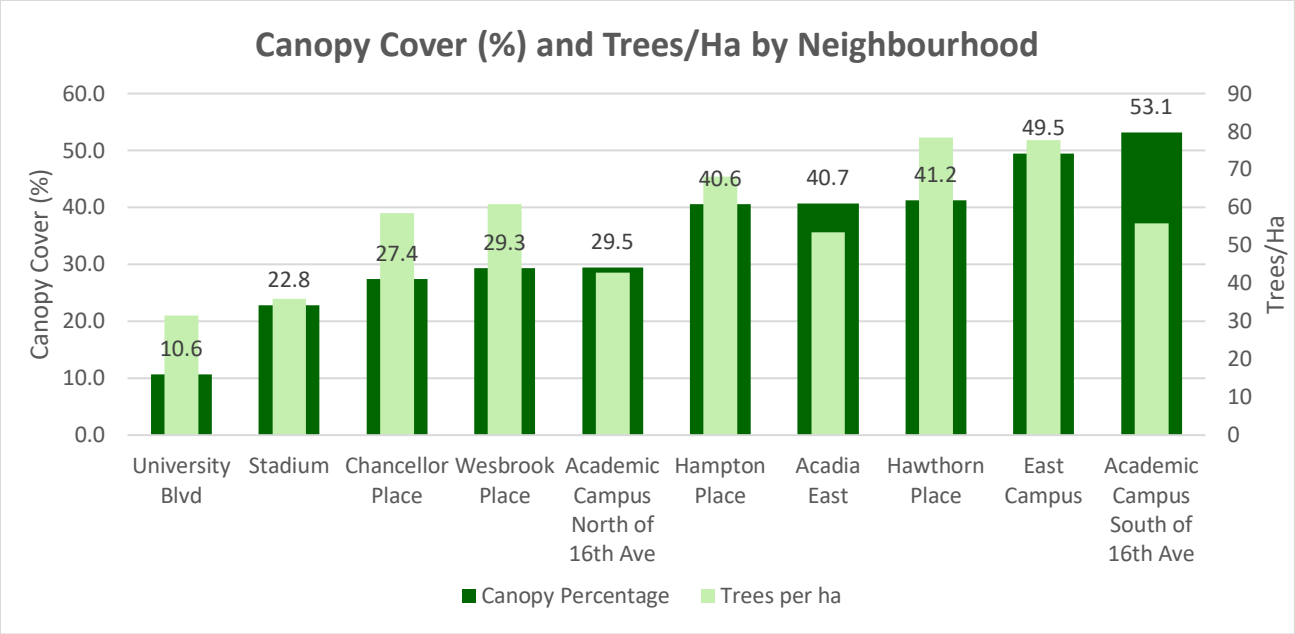

Figure 5. Canopy Cover (%) and Trees/Ha on Campus.

Table 3. Breakdown of canopy coverage by height class for each campus neighbourhood.

Neighbourhood	Tree Height Class	Canopy Area (ha)	Tree Count	Neighbourhood	Tree Height Class	Canopy Area (ha)	Tree Count
Academic Campus North of 16th Ave	0 – 10 m	7.6	2779	**Hampton Place**	0 – 10 m	0.69	252
	10 – 20 m	24.4	3578		10 – 20 m	2.18	340
	20 – 30 m	15.1	1395		20 – 30 m	1.47	151
	30 – 45 m	7.8	697		30 – 45 m	0.15	17
	45 m+	5.8	442		45 m+	0.10	13
Academic Campus South of 16th Ave	0 – 10 m	1.9	592	**Hawthorn Place**	0 – 10 m	0.84	325
	10 – 20 m	6.1	948		10 – 20 m	3.06	551
	20 – 30 m	13.3	1370		20 - 30 m	0.19	20
	30 – 45 m	12.8	1040		30 - 45 m	0.71	89
	45 m+	7.9	502		45 m+	0.79	78
Acadia East	0 – 10 m	0.46	183	**Stadium**	0 - 10 m	0.30	125
	10 – 20 m	1.63	260		10 - 20 m	0.78	105
	20 – 30 m	2.56	241		20 - 30 m	0.25	20
	30 – 45 m	1.37	117		30 - 45 m	0.08	9
	45 m+	0.23	13		45 m+	0.36	23
Chancellor Place	0 – 10 m	0.78	294	**University Blvd**	0 - 10 m	0.22	88
	10 – 20 m	1.15	202		10 - 20 m	0.11	22
	20 – 30 m	0.46	36		20 - 30 m	0.06	6
	30 – 45 m	0.09	7		30 - 45 m	0	0
	45 m+	0.02	3		45 m+	0	0
East Campus	0 – 10 m	0.18	83	**Wesbrook Place**	0 - 10 m	2.66	1,333
	10 – 20 m	0.45	79		10 - 20 m	3.85	1,014
	20 – 30 m	0.11	12		20 - 30 m	1.69	203
	30 – 45 m	0.17	16		30 - 45 m	2.27	205
	45 m+	0.72	58		45 m+	4.48	319

Figure 6. Tree canopy breakdown as coniferous, deciduous, or dead based on 2022 LiDAR.

Figure 7. Tree canopy height across campus.

Figure 8. Tree canopy cover across campus.

Ecological Baselining

The following are summaries of data collected during the baselining fieldwork which focus on the soft landscape dataset. Many of the definitions and categories split polygons based on whether they are considered a "natural area". DHC recognizes that defining areas as natural or not can be viewed as omitting historical indigenous land use. Historical definitions of 'natural' were often used to exclude and minimize the impact First Nations had on the landscape. For this assessment, natural areas were generally defined as any physical area that contains sufficient native species, ecological communities, or habitat features to support native biodiversity.

Terrestrial Habitat Type

Terrestrial habitat type is based on the composition and general maturity of the plant community. As these areas age and develop, the habitat they provide for wildlife changes. This can be affected by land use, time since disturbance, site productivity and the type of vegetation in a stand. Most soft landscape areas on campus were classified as herb and grass or as shrub communities (totalling 60%, Table 6). This is largely due to the abundance of gardens and lawns on campus. Interestingly, old and mature forests account for 28% of soft landscapes by area, but only 2% of soft landscape polygons. This suggests that while mature forests remain, they occupy comparatively fewer but larger areas. Old mature forests include portions of the UBC Botanical Garden, UBC Farm, and retained stands around Wesbrook Place neighbourhood.

Table 4. Terrestrial habitat type for soft landscapes on campus.

Terrestrial Habitat Type	Estimated age range (years)*	Total area (ha)	Percent of Soft Landscape	Percent of UBC Campus
Herb and Grass	-	87.9	39%	22%
Shrub	-	47.0	21%	12%
Pole Sapling Forest	5-35	1.5	1%	0%
Young Forest Short	35-50	5.1	2%	1%
Young Forest Tall	50-80	16.8	7%	4%
Mature Forest	80-120	44.4	20%	11%
Old Mature Forest	120-240	17.5	8%	4%
Old Growth Forest	>240	0	0%	0%
N/A	-	6.1	3%	2%

*Age was visually estimated based on various trees in the stand, height, diameter and growth habit, trees were not cored to determine age.

Photo 2. Naturalized landscaping near the Totem Park residence building.

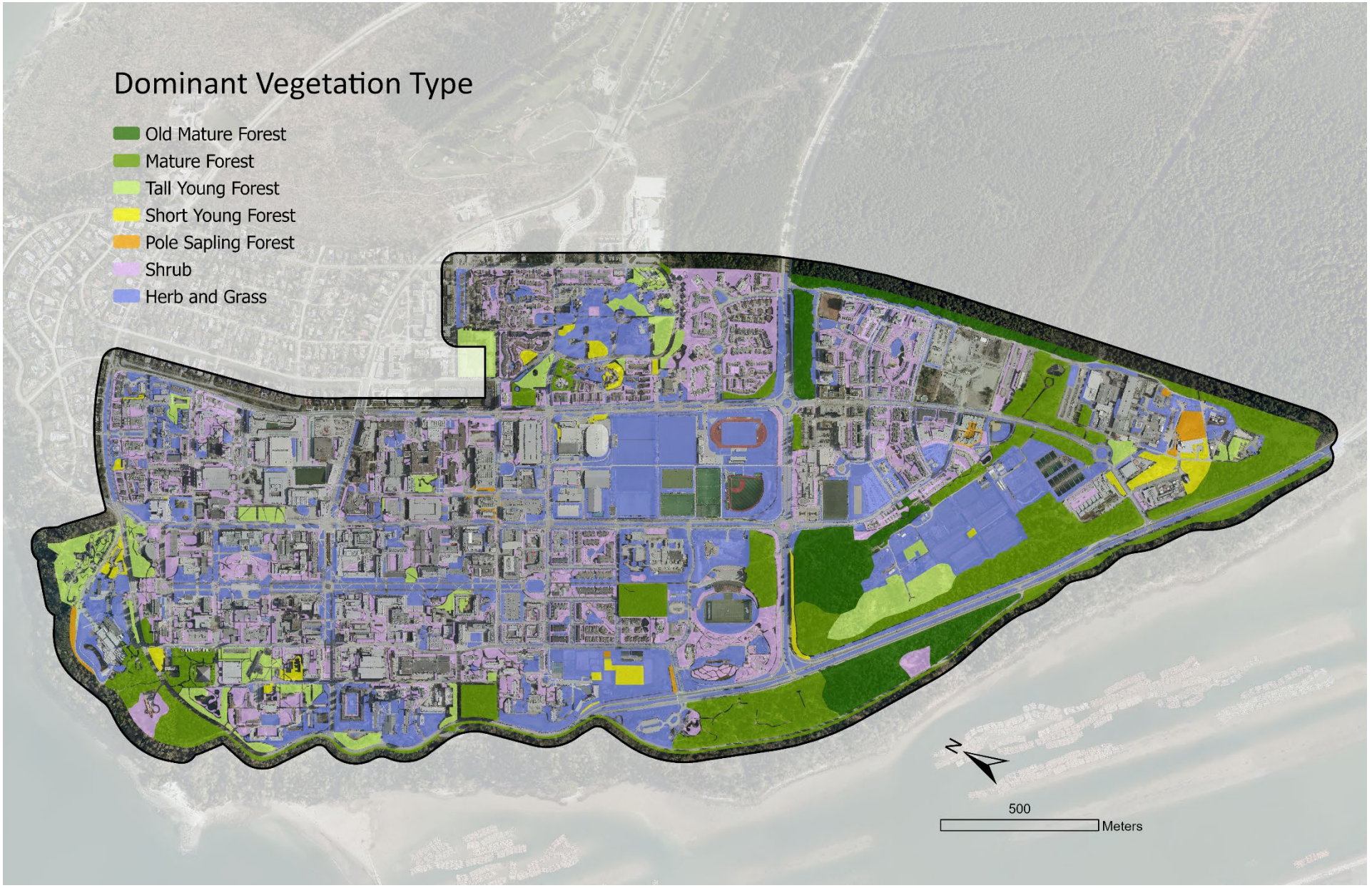

Figure 9. Dominant vegetation type of soft landscapes on campus.

Disturbance

Each soft landscape polygon was categorized based on the level of disturbance, defined by the following criteria:

Natural	A majority (>90%) of the area is in a natural state. Ground disturbance is low and invasive species cover is low.
Semi disturbed	30-90% of the area is in a natural state. There are some areas with ground disturbance and invasive species cover is in patches or around the perimeter of the area.
Disturbed	>70% of the area has been altered. (Invasive species infestation, soil disturbance, dumping, other human impacts)
Artificial	Human-constructed environmental features with primarily ornamental plant species. Poor or limited habitat features. Actively maintained

The natural, semi-disturbed, and disturbed categories were only applied to natural areas. All other soft land use types were defaulted to the artificial ranking (Figure 4). Recently naturalized gardens such as the south of Totem Park Residence and around the Beaty Biodiversity Museum were also ranked as artificial, even though they have high proportions of native species.

Photo 3. Wood sorrel planted as a groundcover in the UBC Botanical Garden.

Figure 10. Disturbance category for soft landscapes on campus.

Photo 4. A mature forest with a disturbed understory likely due to trampling west of the C. K. Choi Building.

Most areas on campus have been disturbed by human activity in some capacity. Initial logging and clearing in the mid-late 1800s removed all original old growth forests on the Point Grey Peninsula. The current forests are second-growth that have regenerated without further (or limited) disturbance. These were classified as natural for this assessment and represent approximately 4% of soft landscapes on campus (Table 4). These are generally closed conifer stands with trees that are just over a hundred years old. Many of these stands include some trails, have been impacted by trampling or the establishment of invasive plants. Over 2/3rds of soft landscapes on campus are considered artificial.

Table 5. Disturbance ranking across soft landscapes on campus.

Disturbance	Total area (ha)	Percent of Soft Landscape (%)
Natural	8.82	4%
Semi disturbed	45.96	20%
Disturbed	16.60	7%
Artificial	155.02	68%

Ecological Condition

The ecological condition of soft landscapes on campus were evaluated using the following criteria:

Very high	Large natural area with limited disturbance is well connected and includes a variety of habitat types.
High	Intact natural area with some levels of disturbance, connections, and habitat types. Not limiting to wildlife, but not providing good habitat.
Moderate	Semi-disturbed natural areas, minor connections, and habitat types. Partially limiting to wildlife.
Low	Disturbed or developed area that provides limited habitat. Includes some canopy, but this may be young or sparse. Small patch size. Suitable for urban tolerant species.
Very Low	Disturbed or developed area that provides very limited or no habitat. Suitable for urban tolerant species.

Most assessed sites on campus were ranked as low or very low during the assessment (Table 5). This is largely due to the predominance of lawns, heavily landscaped areas, and small fragmented patch sizes. Outside of the larger natural areas, human disturbances, fragmentation, and limited native food availability constrain which wildlife species can inhabit these areas. Areas on campus that are ranked as high or very high tend to be large, relatively intact natural areas along campus edges which provide habitat for species less tolerant of urban conditions (Figure 5).

Table 6. Ecological condition ranking across soft landscapes on campus.

Ecological Condition	Total area (ha)	Percent of Soft Landscape	Percent of UBC Campus
Very high	24.4	11%	6%
High	34.1	15%	8%
Moderate	40.5	18%	10%
Low	54.0	24%	13%
Very Low	67.5	31%	17%
Null*	5.8	3%	1%

*Null included active construction sites, where land use could not be assessed.

Figure 11. Ecological condition of soft landscapes on campus.

Ground Temperature

As climate change progresses, BC has been experiencing higher-than-average temperatures, with peak summer temperatures well above historical averages. Over the past few summers, there has been an increase in "heat dome" events, where a high-pressure atmosphere traps hot air over an area. Temperatures during the heat dome that occurred in BC from June 25th to July 1st, 2021, were up to 20˚C higher than normal. Provinces across Canada recorded 103 all-time heat records[4]. Studying how ground temperatures vary across campus will inform planning to best mitigate against the effects of these heat events in the future. Studying extreme heat events provides a better understanding of variation across campus compared to studying normal conditions.

These higher-than-average air temperatures have consequences. The June 2021 heat dome has been considered the deadliest weather event in Canada to date, with 619 heat-related deaths confirmed in BC alone during this event[3].

Land surface temperature at UBC at 7:00 PM during the 2021 heat dome event ranged from 19.4°C to 29.5°C (Figure 7). Parts of campus that have the highest tree canopy coverage were the coolest, while artificial turf fields were the hottest. Neighbourhoods with a high canopy coverage such as Acadia East and Hawthorn Place (40.9 and 51.5% respectively) were considerably cooler than sparsely treed areas such as around the UBC Hospital. Wesbrook Place had the lowest temperature of the neighbourhoods (20.9 °C, in forested areas), and the second highest (29.1 °C at the UNA Community Field).

Table 7. Mean, minimum, and maximum temperatures by academic area or neighbourhood during the 2021 heat dome event.

Academic Areas or Neighbourhood	Temperature °C on June 30th, 2021, at 7:00 PM		
	Mean	Minimum	Maximum
Academic Campus North of 16th Ave	25.1	19.4	29.1
Academic Campus South of 16th Ave	22.5	19.5	28.1
Acadia East	24.9	23.5	26.6
Chancellor Place	25.3	24.8	26.0
East Campus	25.1	24.0	26.4
Hampton Place	24.9	21.9	26.4
Hawthorn Place	25.0	22.8	26.8
Stadium	26.4	22.2	29.5
University Blvd	26.8	26.0	28.1
Wesbrook Place	24.8	20.9	29.1
Campus-wide	**24.6**	**19.4**	**29.5**

[4] Government of Canada (2023). Surviving the heat: The impacts of the 2021 western heat dome in Canada. Retrieved from: https://science.gc.ca/site/science/en/blogs/science-health/surviving-heat-impacts-2021-western-heat-dome-canada

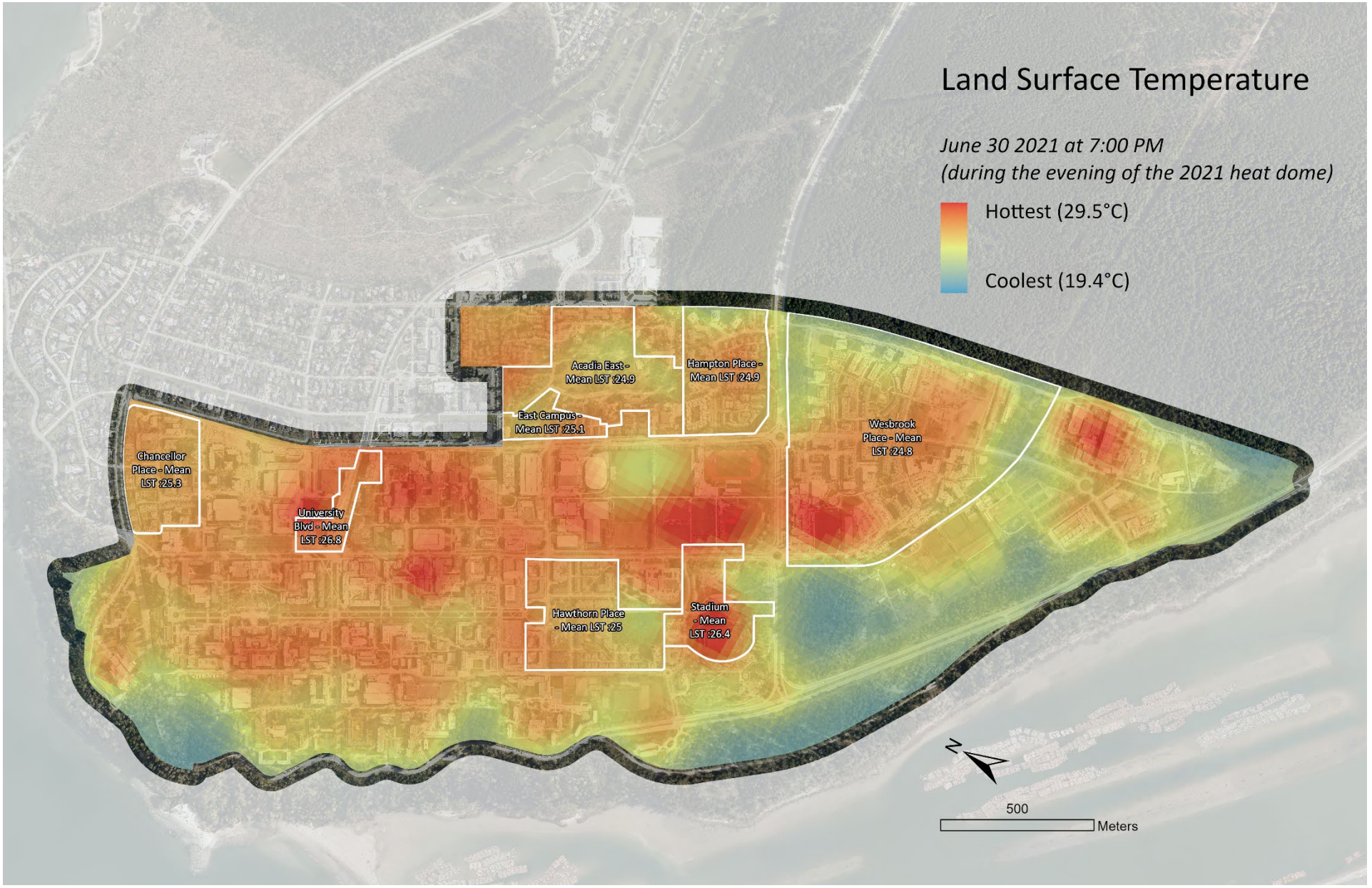

Figure 12. Land surface temperatures on campus at 7:00 PM during the 2021 heat dome.

Species on the Point Grey Peninsula

The Point Grey Peninsula is home to a wide variety of plants and animals. Data from eBird and iNaturalist were combined to develop a list of species that have been observed on the Peninsula (Table 8). Spatial filters were applied to each dataset to include only areas west of Blanca Avenue. iNaturalist data was filtered to include research-grade only. Only human observations were included, meaning data predicted by models was excluded. This analysis found 1254 recorded species or subspecies. This dataset skews heavily towards bird observations, particularly due to the inclusion of the eBird dataset. Data collected from citizen science programs also tend to be biased toward species that are easily recognizable, charismatic, and active during the day. Species whose primary habitats overlap with human activity (such as species which use backyard birdfeeders, or urban areas) also tend to be overrepresented.

Table 8. Breakdown of Kingdom and Phylum in the eBird and iNaturalist dataset.

	Count of species	Number of Occurrences
Animalia	**636**	**132,042**
Annelida	3	3
Arthropoda	298	1265
Chordata	305	130,566*
Cnidaria	2	3
Echinodermata	1	8
Mollusca	27	197
Bacteria	**1**	**2**
Proteobacteria	1	2
Chromista	**6**	**66**
Ochrophyta	6	66
Fungi	**170**	**614**
Ascomycota	34	94
Basidiomycota	136	520
Plantae	**434**	**5,007**
Bryophyta	48	217
Chlorophyta	1	6
Marchantiophyta	19	51
Rhodophyta	4	9
Tracheophyta	362	4,724
Protozoa	**7**	**40**
Mycetozoa	7	40
Grand Total	**1,254**	**137,771**

*130,190 of these occurrences are under class Aves.

3.1.2 Species at Risk on Campus

Species at Risk information is collected through various organizations and levels of Government. Provincially, species at risk are tracked through the BC Conservation Data Centre (BCCDC). The BCCDC maintains a colour-coded list of species and ecosystems that are at risk of being lost (Red), of special concern (Blue), or secure or not at risk (Yellow). Occurrence data is displayed spatially when available, however many species (such as highly mobile or cryptic species) cannot be reliably mapped.

Photo 5. An example of a species at risk that has been identified on campus – the Western screech owl.

The Committee On the Status of Endangered Species In Canada, or COSEWIC, also ranks species as extinct (X), extirpated (XT), endangered (EN), threatened (T), special concern (SC), not at risk (NAR), or data deficient (DD). Table 9 outlines species that have been observed and recorded in the BCCDC Database or are in the Species Point Grey Peninsula dataset described in section 3.4. Some species are listed as Yellow in the BCCDC database (not at risk) but are listed as Special Concern by COSEWIC. These species were still included in Table 9. Neither dataset should be considered exhaustive since both have limitations.

Appendix 2 lists additional species which could occur on campus but have not been recorded in either database. This list is not exhaustive, and their likelihood of occurring on the Point Grey peninsula is based on available habitats on the peninsula (including Pacific Spirit Regional Park and Musqueam IR2).

Understanding what species at risk occur on campus (or the Point Grey Peninsula) and protecting their habitats will help preserve these species for future generations. Restoration or habitat enhancement activities can also incorporate species at risk to improve populations. Some species at risk are afforded additional protection by regulations such as the Federal *Species at Risk Act* (2002) and the *Migratory Bird Regulations* (2022).

Table 9. Species at Risk listed by BCCDC or COSEWIC which have been identified within 2 kilometres of the UBC Vancouver Campus. Identifications include mapped occurrences in the BCCDC database and the Species on the Point Grey Peninsula database (Research grade iNaturalist/eBird observations)

Type	Common Name	Scientific Name	Provincial (COSEWIC*) Status	Primary Habitat	Comments	Likelihood of Presence
Birds	Great Blue Heron (*Fannini* ssp.)	*Ardea herodias fannini*	Blue (SC)	Terrestrial	The Great Blue Heron *fannini* subspecies forages along the seacoast, in fresh and saltwater marshes, along rivers and in grasslands. Smaller numbers of herons forage in kelp forests, from wharves and at anthropogenic water bodies, such as ornamental ponds and fish farms. Most herons nest in woodlands near foraging areas. They build their nests in a variety of species of mature/large trees, including Red Alder, Black Cottonwood, Bigleaf Maple, Sitka Spruce and Douglas-fir. From March to October, most adults and juveniles forage along beaches; in winter, they make use of prairies and marshes. Extant population in Pacific Spirit Park and at Asian Centre UBC.	Likely
Birds	Western Screech-Owl (*Kennicottii* ssp)	*Megascops kennicottii kennicottii*	Blue (T)	Terrestrial Forests	The Western Screech-Owl is found at low elevations in Pacific coastal forests. In Canada, it is found in coastal British Columbia (except Haida Gwaii) and in the valleys of southern British Columbia from Lillooet, Kamloops, Lumby, Slocan, Creston and Cranbrook south to the US border. The kennicottii subspecies is found in a variety of coniferous and mixed forests but is often associated with riparian zones with Broadleaf Maple or Black Cottonwood. This species will nest in natural tree cavities or holes excavated by larger woodpeckers and will use appropriate nest boxes. Last observation 1998 in Pacific Spirit Park. The population is possibly extant.	Possible
Birds	Horned Grebe	*Podiceps auritus*	Yellow (SC)	Aquatic Habitats	Uses marshes, ponds and lakes, coasts and estuaries. This species breeds in Eastern BC and east to Manitoba, as far north as Alaska and south as North Dakota. Migrating and overwintering individuals will use coastlines (both western and eastern coasts of North America).	Possible
Birds	*Evening Grosbeak*	*Hesperiphona vespertina*	Yellow (SC)	Terrestrial Forests	Gregarious species, travelling and foraging in large flocks. Primarily uses coniferous and mixed forests. Year-round range extends throughout southern and eastern BC, as well as across North America.	Possible
Birds	Black Swift	*Cypseloides niger*	Blue (E)	High altitudes, Cliffs	Often foraging at high altitudes, Black Swifts fly over open country and forests in mountainous areas and lowlands, pursuing aerial insects. They nest near or behind waterfalls and in caves, located in canyons and sometimes on sea cliffs. Their nest sites are characterized by the presence of flowing water, high relief, inaccessibility, darkness, and an unobstructed flight path.	Possible

Type	Common Name	Scientific Name	Provincial (COSEWIC*) Status	Primary Habitat	Comments	Likelihood of Presence
Birds	Long-Tailed Duck	*Clangula hyemalis*	Blue	Aquatic and Riparian Habitats	Migratory duck which spends its winters in coastal waters and inland lakes along North America's coasts (Washington and northward on the west coast). Breeding occurs in the tundra and taiga.	Possible
Birds	Marbled Murrelet	*Brachyramphus marmoratus*	Blue (T)	Old-growth forests and Ocean	Marbled Murrelets forage in the inshore marine environment, primarily in protected waters where both sand lance and surf smelt occur. They travel long distances between at-sea locations and nest sites. They require old-growth forests adjacent to marine waters for their nests, which they place high in the trees. The birds do not build nests but use a large limb covered with deep moss that serves as a platform in which they make a depression for their single egg. It is estimated that a large percentage of old-growth forests within this species' range have been removed over the last 150 years.	Possible
Birds	Northern Goshawk	*Accipiter gentilis laingi*	Red (T)	Terrestrial Forests	The species prefers forest stands with large amounts of mature or old-growth trees or stand characteristics, but it may breed in younger stands. Northern Goshawks specifically need forests with high canopy closure. In addition, small canopy openings (i.e. the space resulting from the fall of one or two trees) are often associated with their nest sites. In Canada, nests are mainly found in trembling aspen, Douglas-firs, Black Cottonwood, Western Larch and Ponderosa Goshawks on Vancouver Island primarily nest in Douglas-firs and western hemlocks.	Possible
Birds	Rough-legged Hawk	*Buteo lagopus*	Blue (NAR)	Terrestrial Open Habitats	Habitats include grasslands, fields, marshes, sagebrush flats, and open cultivated areas; sometimes rat-infested garbage dumps. This species will nest on cliffs (typically) or in trees on mountainsides or in forests with plenty of open ground. Nests more commonly along coasts and on marine islands. Winter range is restricted to the low valleys of southern British Columbia: primarily the lower Fraser Valley, with smaller numbers in the Thompson, Okanagan, and Creston valleys.	Possible
Birds	Caspian Tern	*Hydrogrogne caspia*	Blue (NAR)	Aquatic and Riparian Habitats	Habitat includes seacoasts, bays, estuaries, lakes, marshes, and rivers. Nests on sandy or gravelly beaches and shell banks along coasts or large inland lakes; sometimes with other water birds. Pacific coast populations formerly nested mainly in inland marshes, now mainly on human-created habitats (e.g., salt pond dikes and levees) along the coast.	Unlikely

Type	Common Name	Scientific Name	Provincial (COSEWIC*) Status	Primary Habitat	Comments	Likelihood of Presence
Birds	Double-crested Cormorant	*Phalacrocorax auratus*	Blue	Aquatic and Riparian Habitats	Habitat includes lakes, ponds, rivers, lagoons, swamps, coastal bays, marine islands, and seacoasts; usually within sight of land. Nests on the ground or in trees in freshwater situations, and on coastal cliffs (usually high-sloping areas with good visibility). Commonly inhabits Port Moody intertidal areas.	Unlikely
Birds	Surf Scooter	*Melanitta perspicillata*	Blue (NAR)	Aquatic and Riparian Habitats	Habitat includes primarily marine littoral areas, less frequently in bays or on freshwater lakes and rivers. Nests in brushy tundra, in freshwater marsh, or wooded areas near ponds, bog, or streams. Nests on the ground in an area protected by vegetative cover.	Unlikely
Birds	California Gull	*Larus californicus*	Red	Aquatic and Riparian Habitats	Habitat includes primarily marine littoral areas, less frequently in bays or on freshwater lakes and rivers. Nests in brushy tundra, in freshwater marsh, or in wooded areas near ponds, bogs, or streams. Nests on the ground in an area protected by vegetative cover.	Unlikely
Birds	Purple Martin	*Progne subis*	Blue	Terrestrial Open Habitats	Purple Martins forage over towns, cities, parks, open fields, dunes, streams, wet meadows, beaver ponds, and other open areas. This species nests in tree cavities, rock crevices, and abandoned woodpecker holes in mountain forests or Pacific lowlands. Successfully nesting in an artificial habitat is known at Rocky Point.	Unlikely
Insects	Johnson's Hairstreak	*Callophrys johnsoni*	Red (SC)	Terrestrial	Johnson's Hairstreak is found in low-elevation, structurally diverse forests that are heavily affected by dwarf mistletoe. The larvae of this butterfly feed on the shoots of dwarf mistletoe, which is generally found on western hemlock trees in BC. Johnston's Hairstreak frequent forest openings, riparian areas, and forest edges with abundant wildflowers. Populations have been in decline for decades due to industrial insecticide use and mistletoe-eradicating forest management programs. Last observation 1990 in Pacific Spirit Park. Verified extant.	Possible
Mammal	Pacific Water Shrew	*Sorex bendirii*	Red (E)	Aquatic Riparian Areas	Pacific Water Shrews are usually found near sluggish low-elevation streams, marshes and other wetlands. Although occasionally found up to 350 m from streams, detailed studies have found most to be within 50 m of water. Their forest habitats may be dominated by coniferous trees like Douglas-fir or mixed stands of conifers, red alder, and other deciduous trees and shrubs where the forest floor has abundant fallen and rotting logs, as well as a good cover of fine litter. Pacific Water Shrews have long narrow home ranges parallel to streams, therefore lengthy tracks of riparian habitat	Unlikely

Type	Common Name	Scientific Name	Provincial (COSEWIC*) Status	Primary Habitat	Comments	Likelihood of Presence
					are probably needed to support a population. Last Observation 1973 – UBC Endowment Lands. Historic observation on Musqueam IR2.	
Mammal	Trowbridge's Shrew	*Sorex trowbridgii*	Blue	Terrestrial Forests	Generally found in mature forests with abundant ground litter, forested canyons and ravines, and swampy woods near salmonberry thickets. Will frequent riparian fringe areas (but not streamside) or cut forests if sufficient ground cover is present. Populations can persist in many types and ages of forested habitats, although they are not found in isolated but seemingly otherwise suitable habitat patches. Last observation 1951 – Likely extirpated from the area. Historic observation on Musqueam IR2.	Possible
Plant	Roell's Brotherella	*Brotherella roelli*	Red (E)	Terrestrial Forests	Roell's Brothella is a moss that occurs in cool, humid mixed deciduous forests and conifer, second-growth forests on stream terraces, swampy floodplains, and occasionally in ravines and creeks. Many current observations of this species occur within city parks. Primary substratum includes red alder, big leaf maple, dogwood trees, and rotten logs and stumps. Last observation 2007 in Pacific Spirit Park. Historic observation on Musqueam IR2.	Possible
Plant	Vancouver Island Beggarticks	*Bidens amplissima*	Blue (SC)	Ponds	Vancouver Island Beggarticks are found in narrow alluvial shoreline margins of lakes, ponds, creeks, bogs, tidal estuaries, and other areas that undergo annual fluctuating water levels. Areas that support this species are characterized by shallowly sloping wetland edges, minimal ground cover, and little competition. Last observation 1998 at Iona Park.	Unlikely

*No code in brackets indicates the species has not been assessed by COSEWIC

Invasive Plant Inventory

Photo 6. English Ivy can outcompete native ground cover and climbs up trees. It is the second most abundant invasive species on campus.

Invasive plant species have been established throughout the region. These species can spread rapidly, out-compete native species, and alter habitat for wildlife. They cause habitat loss for native species, modify ecological processes, and alter hydrology and aesthetics. Some invasive species pose human health risks. They can cause skin burns, dermatitis, allergic reactions, and they can cause safety concerns by obstructing sightlines and road signs along transportation corridors[5]. In addition, invasive species can reduce access to natural areas, damage infrastructure, and increase maintenance costs.

The results of the invasive plant inventory are summarised in Table 10. This includes information on current and proposed regulations on certain species and their risk rating as identified by the Invasive Species Council of Metro Vancouver (ISCMV)[6]. The risk rating assigned to any invasive species by the ISCMV is determined by multiple factors. Species that are more aggressive or pose a risk to public health will be given higher priority. Other factors that can lead to the prioritization of one species over another can include environmental, economic, safety, social, political or logistical concerns. The most abundant invasive species on campus is Himalayan blackberry (*Rubus armeniacus*), with 230 occurrences covering approximately 58,800 m^2 (Figure 13). The second most abundant invasive species is English Ivy (*Hedera helix*), with 133 occurrences covering over 15,000 m^2. The inventory included the entire UBC campus as well as the area within 10 metres of campus. Therefore, some of the invasive species that were observed may not be present on campus but adjacent to it.

Throughout the region, many invasive species continue to be sold in nurseries and planted in gardens. On Campus, the fourth most abundant invasive species is Portuguese laurel (*Prunus lusitanica*), which has been widely planted as a hedge and in gardens. This species covers over 5,300 m^2, with 200 occurrences.

[5] Invasive Species Council of BC "Why Should You Care (n.d.)". Retrieved from https://bcinvasives.ca/take-action/why-you-should-care/

[6] ISCMV, "Metro Vancouver Invasive Plant Prioritization Rankings (August 2020)." Retrieved from: https://iscmv.ca/docs/Metro_Vancouver_Invasive_Plant_Prioritization_Rankings_August_2020_(website).pdf

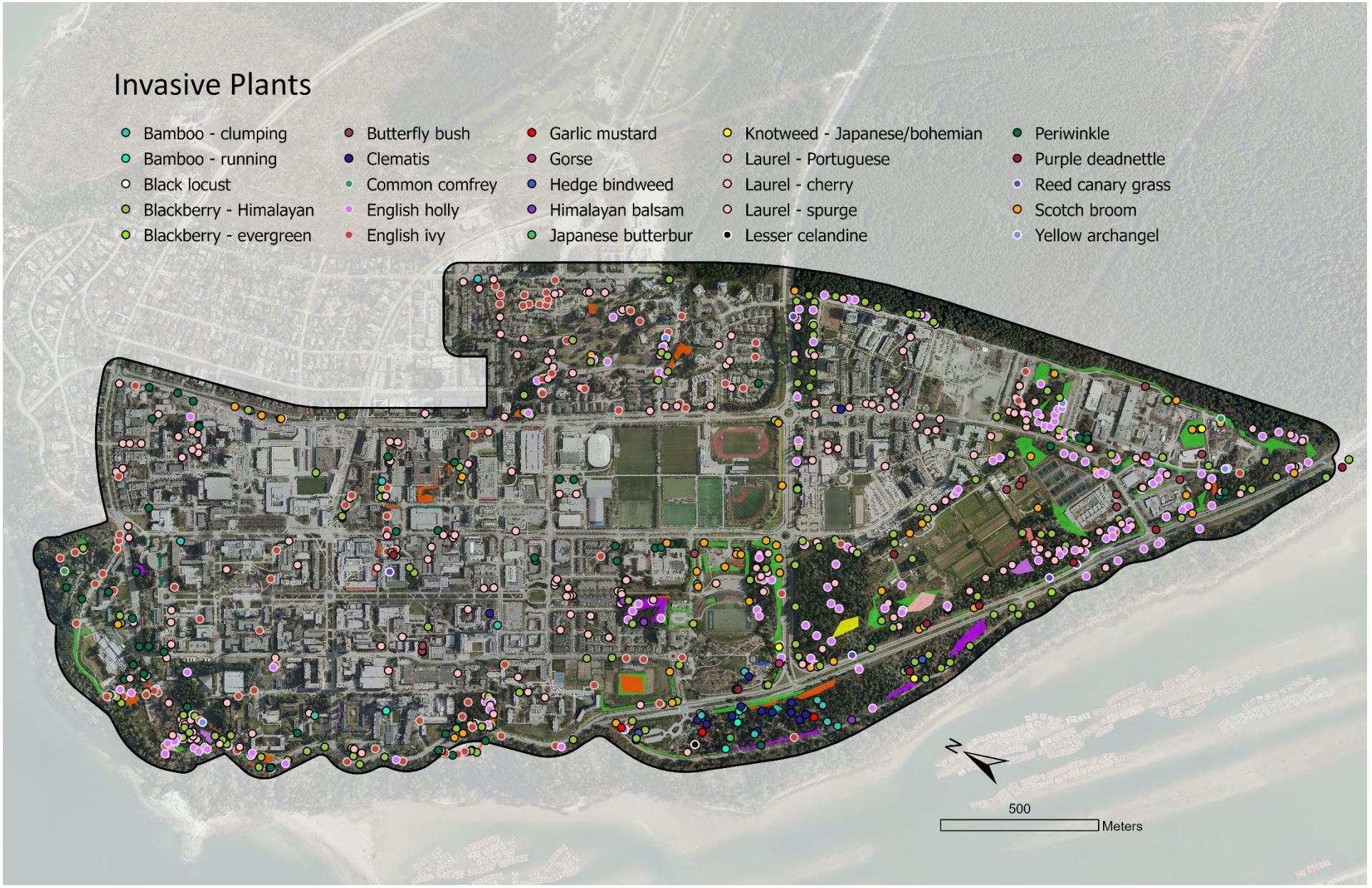

Figure 13. Invasive plant occurrences on campus.

Table 10. Invasive plant species identified on campus.

Common Name	Scientific Name	Risk Rating	Area Mapped (m^2)	Number of Occurrences	Aquatic	Regulation	Provincial Priority	On Campus
Blackberry, Himalayan	*Rubus armeniacus*	82%	58819	230			Regional Control	X
Knotweed, Japanese/Bohemian	*Reynoutria japonica/Fallopia x bohemia*	80%	54	3		WCA	Regional Control	X*
English Ivy	*Hadera helix*	78%	15014	133				X
Clematis / Old Man's Beard	*Clematis vitalba*	74%	370	16				X
Blackberry, Evergreen Cutleaf	*Rubus laciniatus*	72%	25	1				X
Gorse	*Ulex europaeus*	72%	5	1		WCA	Management	X
Scotch Broom	*Cytisus scoparius*	72%	717	51			Regional Control	X
Reed Canarygrass	*Phalaris arundinacea*	70%	500	7	Y			X
Butterfly Bush	*Buddleja davidii*	66%	107	15				X
Garlic Mustard	*Alliaria petiolata*	66%	37	3		WCA/PPNW	Containment	X
Celandine, lesser	*Ficaria verna*	64%	12	1				X
Spurge Laurel (Daphne Laurel)	*Daphne laureola*	64%	19	12			Management	X
English Holly	*Ilex aquifolium*	62%	3322	152				X
Butterbur, Japanese	*Petasites japonicus*	58%	25	1				X
Hedge Bindweed (Morning Glory)	*Calystegia sepium*	56%	29	4				X
Yellow Archangel (Lamium)	*Lamium galeobdolon*	56%	2519	7			Regional Control	X
Laurel, Cherry (English Laurel)	*Prunus laurocerasus*	54%	1198	42				X
Laurel, Portuguese	*Prunus lusitanica*	52%	5322	200				X
Comfrey, Common	*Symphytum officinale*	50%	6	2				X
Policeman's Helmet / Himalayan Balsam	*Impatiens glandulifera*	46%	5910	10			Regional Control	X
Periwinkle, Common	*Vinca minor*	42%	2865	66				X
Bamboo, Running	Various	N	210	14				X
Bamboo, Clumping	Various	N	98	7				
Black Locust	*Robinia pseudoacacia*	N	4	2				X
Purple deadnettle	*Lamium purpureum*	N	656	11				X

N: Not assessed in the ISCMV ranking exercise.
WCA: Weed Control Act
PPNW: Proposed Prohibited Noxious Weed List
**Bohemian and Japanese Knotweeds were not distinguished in the field*

Potential Historical Streams on Campus

The City of Vancouver (among many other cities worldwide) culverted and buried streams as it developed. Historic streams were directed into stormwater networks, infilled, or rerouted to manage stormwater. Perspectives around the value of natural watercourses within urban landscapes has shifted. Cities are now exploring options to daylight and restore historic watercourses. Examples include the City of Vancouver's ongoing efforts to restore and daylight sections of Still Creek, and First Creek in Tatlow and Volunteer Parks.

There was no definitive evidence of buried streams on campus. Historically mapped watercourses have been identified in Pacific Spirit Regional Park, many of which flow through their original drainage pattern[7]. The only major hydrological change in and around Campus appears to be where Cutthroat Creek was historically redirected into Musqueam Creek on Musqueam IR2.

Numerous gullies exist along the cliffs of the Point Grey Peninsula, which correspond to small watercourses and slope failures. Due to the highly erodible Quadra Sands that comprise these cliffs, historic watercourses would likely have run down through these gullies. The original extent of their alignments through the upland campus is difficult to predict.

[7] Lesack, P., & Proctor, S. J. (2011). Vancouver's Old Streams, 1880-1920. UBC Research Data. Retrieved August 31, 2023, from https://open.library.ubc.ca/collections/researchdata/items/1.0319897

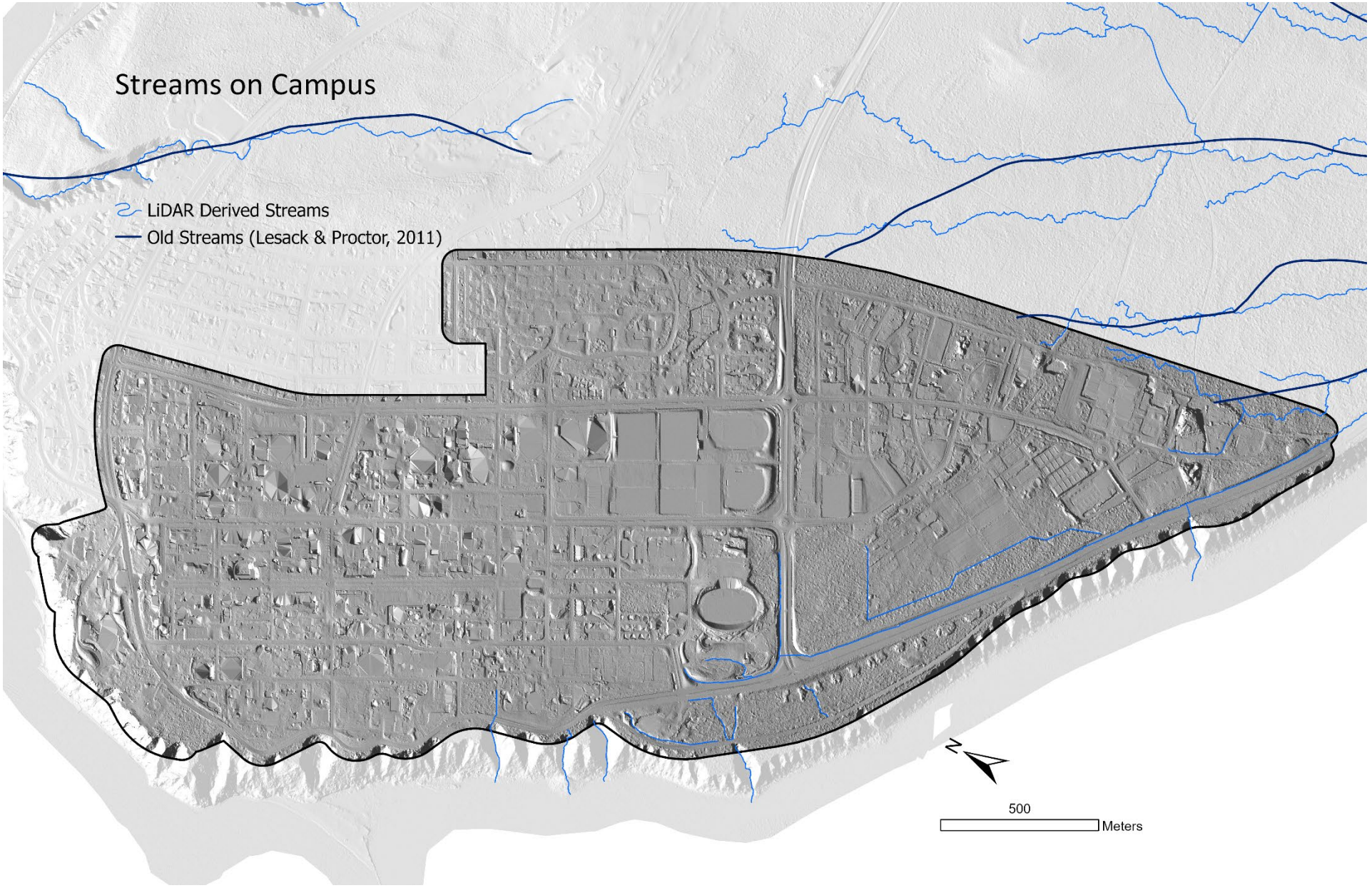

Figure 14. LiDAR-derived watercourses on campus and old streams data from Lesack & Proctor (2011) over a hillshade layer. Stream locations were not verified during the fieldwork.

4.0 Opportunities

The baseline analysis informed the development of the Vision, in particular, the Big Idea, "Restorative and Resilient Landscapes". This Big Idea illustrates several key strategies for enhancing ecological health and biodiversity on campus. Areas of opportunity highlighted by the analysis and reflected in the Vision include:

- The majority of "very high" and "high" value ecological areas are protected as green space.
- The focus of neighbourhood development for the next decade is Wesbrook Place South, which includes 1.3 ha (15%) very high and 2 ha (22%) high ecological areas. Campus Vision 2050 proposes to preserve and enhance most of these higher ecological areas in Wesbrook Place South, with details to be determined as part of a neighbourhood plan process (which would include a tree condition survey to help prioritize trees for retention, alongside other factors).
- For later phases of Campus Vision 2050 implementation, there is one area where a high value stand will be impacted. This is where the draft Stadium Neighbourhood Plan proposes the partial removal of a stand to accommodate the relocation of Thunderbird Stadium. The draft plan compensates for this loss through establishing a large ecological park.
- Many areas identified as "high", "moderate" and "low" ecological conditions are enhanced in the Vision (e.g. Main Mall, tree patches in Acadia, Rhododendron Wood, the Bosque), and expanded (e.g. the central connector, the diagonal connector).
- Most of the suggested connections in the potential biodiversity network are maintained, created, and/or expanded in the Vision.

The analysis also identified some goals to be explored as part of more detailed planning and implementation. Many of these will require further study, which will be pursued as part of the campus plan and future neighbourhood planning processes:

- Increase tree canopy cover across campus to align with Metro 2050 canopy cover goals.
- Consider the protection and replacement of trees during academic and neighbourhood planning and development.
    - Create a campus-wide tree inventory to track tree condition, removal, and replacement.
    - Consult with Arborists early in the planning process to identify and prioritize trees.
    - Develop a tree protection policy to reduce unnecessary tree removals and require replacement.
- Improve native habitats and biodiversity across the campus.
    - As ornamental gardens are managed over time, increase the composition of native species to improve biodiversity.
    - Restrict the planting of invasive plants in landscapes.
    - Remove invasive plant species, prioritizing high-risk rating species as part of enhancing natural areas.
    - Convert underused open grassy areas (boulevards, beneath street trees, and lawns) into pollinator meadows across campus. Use native seed mixes to reduce maintenance costs and provide the most benefit to native pollinators.
    - Establish a formal trail network through treed stands, to avoid trampling.

    - Plant native shrub and herb species to restore understory plant communities and enhance biodiversity.
    - Develop a list of native plant species to include in landscaping, restoration projects and pollinator meadows. An initial list of plant species that are native to this area and are recommended is included in Appendix 3. UBC is working with Musqueam on aMusqueam-UBC plant list which includes Musqueam Traditional Territory plants and identifies their traditional names and uses. These lists should be combined together into a master plant list.
- Provide naturalised connections within urbanized landscapes for wildlife to travel between surrounding habitat areas.
    - A map of potential connections through UBC is provided (Figure 10 “Biodiversity Network”)

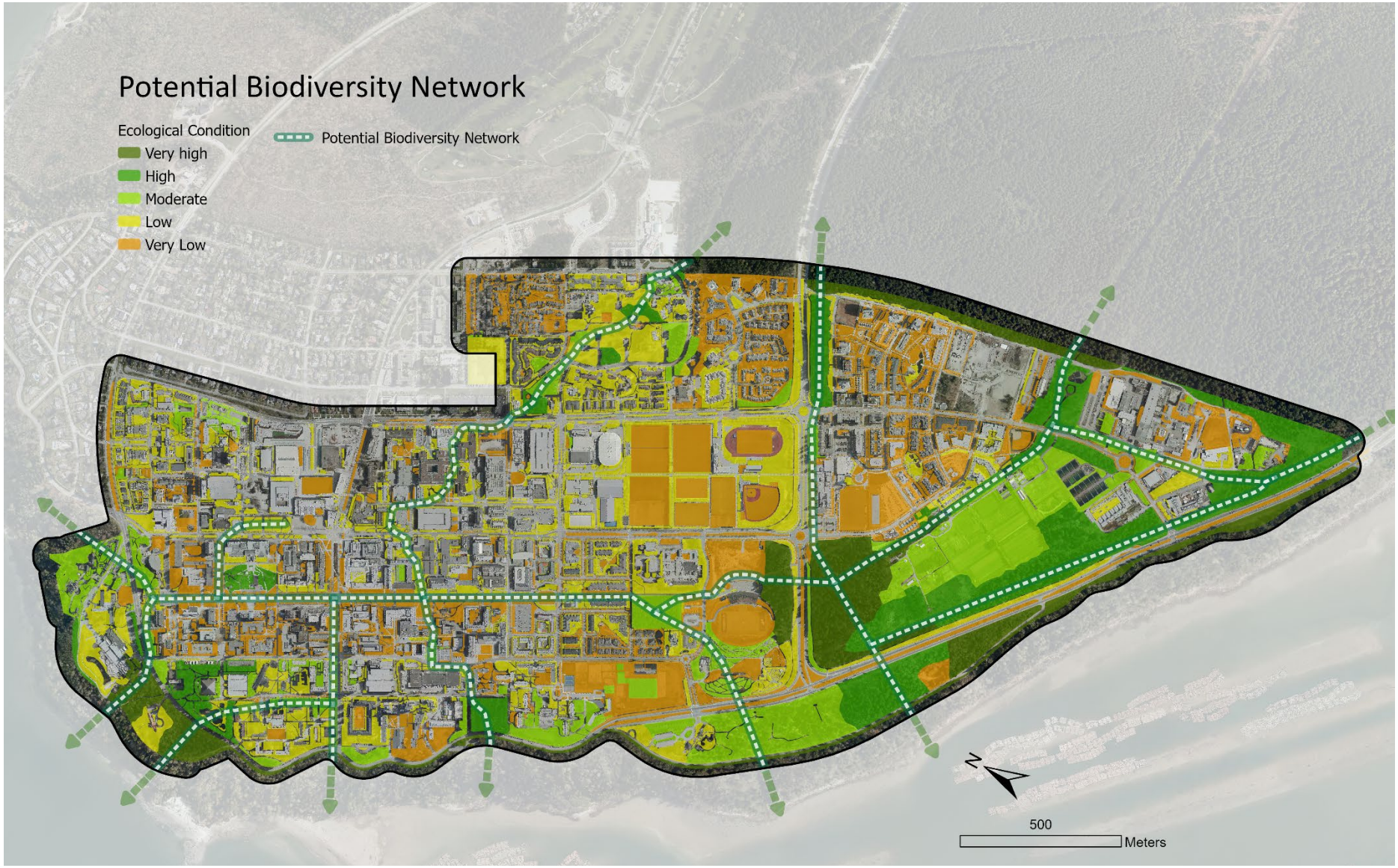

Figure 15. Potential Biodiversity Network for UBC Campus.

Appendix 1 - Field Data Dictionary

Field	Code	Description
Ecological Condition	Very high	Natural area with limited disturbance, well connected and includes a variety of habitat types. Large patch size
	High	Intact natural area with some levels of disturbance, connections and habitat types. Not limiting to wildlife, but not providing good habitat
	Moderate	semi- Disturbed natural area, minor connections and habitat types. Not/partially limiting to wildlife.
	Low	Disturbed or developed area which provides limited habitat. Includes some canopy, but this may be young or sparse. Small patch size. Suitable for urban tolerant species.
	Very Low	Disturbed or developed area which provides very limited habitat if any. Suitable for urban tolerant species.
Vegetation Type	Coniferous Forest	Natural plant community dominated by >66% conifer tree species
	Deciduous Forest	Natural plant community dominated by >66% deciduous tree species
	Mixed Forest	Natural plant community dominated by a mix of conifer and deciduous tree species
	Urban Trees	Areas dominated by native or ornamental trees constrained within developed landscapes.
	Farm	Area used primarily for agriculture, vegetables, or research
	Field (artificial)	Artificial grass fields used for sports.
	Field (grass)	Turf grass sports and playing fields.
	Garden	Area used primarily for growing ornamental flowers or shrubs
	Lawn	Open area dominated by grasses, used for passive recreation
	Shrubs	Area dominated by native and non-native shrubs and herbs
Dominant native ground vegetation	Text	Common names for species
Understory native vegetation cover %	#	% ground cover native veg
Understory invasive vegetation cover %	#	% ground cover invasive veg
Terrestrial Hab _type	Old Growth Forest	(>240 yrs)
	Old mature	(120-240 yrs)
	Mature Forest	(80-120 yrs)
	Young Forest Tall	(50-80 yrs)
	Young Forest Short	(35-50 yrs)
	Pole Sapling Forest	(5-35 yrs)
	Herb and Grass	
	Shrub	
Structure	Single storied	Closed stand dominated by dom and codom trees
	Multistoried	Closed stand with all crown classes well represented
	Irregular	Open overstory (<30% cover) and well developed suppressed and regen layers
Disturbance	Natural	Majority (>90%) of the area is in a natural state. Ground disturbance is low and invasive species cover is low.

	Semi disturbed	30-90% of the area is in a natural state. There area some areas with ground disturbance and invasive species cover is in patches or around the perimeter of the area.
	Disturbed	>70% of the area has been altered. (Invasive species infestation, soil disturbance, dumping, other human impacts)
	Artificial	Human constructed environmental feature with primarily ornamental plant species. Poor or limited habitat features. Actively maintained
Habitat Enhancement Opportunities	Invasive Species Management (Manual)	
	Invasive Species Management (Herbicide)	
	Native species Planting	
	Pollinator Meadow potential (low use grassy area)	
	Invasive Management & Native Planting	
	Aquatic habitat (restoration or creation)	
	Stand thinning for biodiversity	
	Other	
Habitat Enhancement Comments	Text	Note any additional comments or concerns for restoration
Level of effort	Low	Easy restoration site - easy invasive species removal, and/or simple native species planting. Site already naturalized.
	Medium	More difficult invasive removals may require minor removal of surfacing. Soils are intact.
	High	may require machinery and some soil placement. May require native vegetation or tree removals.
	Very high	Requires heavy machinery, removal of vegetation, regrading, and soil placement. May require planting early succession species to rebuild soil characteristics
Other comments	Text	Comments on ratings, suggestions etc.

Appendix 2 - Animal Species at Risk with potential to occur on the Point Grey Peninsula.

Species name	Provincial (COSEWIC*) Status	Habitat	Likelihood of Inhabiting UBC/buffer
Mammals			
Townsend's Mole (*Scapanus townsendii)*	Red (E)	Natural habitats where Townsend's Moles live include moist meadows, river flood plains, prairie and shrub habitats and Douglas-fir forests. This species prefers silt loam soils that are moist and well-drained with no water table. Grasslands provide favourable habitats because they are highly structured and provide a stable environment for tunnelling, and are insulated against extreme temperatures. Disturbance of their natural habitat has caused them to seek alternate habitats such as forests dominated by red alder and Douglas-fir with an undergrowth of salal, bracken, Pacific dogwood and trailing blackberry.	Possible
Snowshoe Hare (*Lepus americanus washingtonii)*	Red	Prefer the dense cover of coniferous or mixed forests, with abundant understory vegetation. Non-fragmented, adequately sized patches of forests, deciduous woodlands, orchards, tree plantations, and riparian woodlands provide the preferred range of foraging and breeding habitats. Non-forested areas are usually avoided, as are stands of seedlings and very mature forests that have little undergrowth. Hares require relatively undisturbed areas in which to raise their litters, often a shallow depression lined with belly fur under downed wood or a brush pile.	Possible
Long-tailed Weasel, *altifrontalis* subspecies (*Mustela frenata altifrontalis)*	Red	Habitat ranges from crop fields to small wooded areas to suburban areas. They are not found in dense forests but typically burrow in hollow logs, rock piles, and under structures. The most common habitat areas are edge areas (bordering forest and fields) as it provides them with the most food and cover.	Possible
Southern Red-backed Vole, *occidentalis* subspecies (*Myodes gapperi occidentalis)*	Red	Known from Point Grey, north of the Fraser River estuary, from Stanley Park to Burns Bog. This species is found primarily in deciduous, coniferous, or mixed forests with abundant woody debris, often near wetlands. They prefer cool, moist, mature forests with abundant shrub and ground cover in which to build nests under woody debris.	Likely
Townsend's Big-eared Bat (*Corynorhinus townsendii)*	Blue	On the West Coast, Townsend's big-eared bats are found regularly in forested regions and buildings, and in areas with a mosaic of woodland, grassland, and/or shrubland. Maternity and hibernation colonies primarily in buildings and caves. Hibernation extends from early fall through early spring. Individuals commonly arouse in winter, changing position within a hibernaculum or moving to a nearby cave or mine.	Likely

Species name	Provincial (COSEWIC*) Status	Habitat	Likelihood of Inhabiting UBC/buffer
Fisher (*Pekania pennant)*	Blue	Fishers inhabit late-successional upland and lowland forests, including coniferous, mixed, and deciduous forests and some early successional forests with dense overhead cover. Tree hollows/cavities are important maternal den sites. They generally avoid areas with little forest cover or significant human disturbance and conversely prefer large areas of contiguous interior forest. Fishers are associated with riparian areas, which are generally less disturbed and more productive, thus having dense canopy closure, large trees and general structural complexity.	Possible
Trowbridge's Shrew (*Sorex trowbridgii)*	Blue	Generally found in mature forests with abundant ground litter, forested canyons and ravines, and swampy woods near salmonberry thickets. Will frequent riparian fringe areas (but not streamside) or cut forests if sufficient ground cover is present. Populations can persist in many types and ages of forested habitats, although they are not found in isolated but seemingly otherwise suitable habitat patches.	Likely
Reptiles and Amphibians			
Northern Red-legged Frog (Rana aurora)	Blue (SC)	The Northern Red-legged Frog requires both aquatic breeding and terrestrial foraging habitats at low elevations (usually below 500 m, although the species can occur as high as 1040 m). Eggs are laid on submerged parts of plants within permanent and temporary seasonal wetlands that have sun exposure, water at least 30 cm deep, and low flow. Adults and juvenile frogs disperse up to 5 km away from wetlands into moist forest habitats, where they find refuge in moist burrows, under large pieces of downed wood, and within understory vegetation. Overwintering habitat includes below-ground refuges in forests and wetlands. Last observation 2005 in Musqueam Park. Extant population.	Likely
Western Painted Turtle (Chrysemys picta pop.1)	Red (T)	Western Painted Turtles are highly aquatic and are found in shallow waters of ponds, lakes, oxbows, and marshes, in slow-moving stream reaches, and in quiet backwater sloughs of rivers. Usually, their habitat contains muddy substrates with emergent aquatic vegetation, exposed vegetation root mats, floating logs, and open banks. Nesting habitats are on land adjacent to aquatic foraging habitats, usually within 200 m of the water body, typically on gentle south-facing slopes. Eggs are laid in well-drained sites with soil, sand or gravel substrates that have minimal or no plant cover. An extant population is at Iona Park.	Unlikely
Birds			
Barn Owl (*Tyto alba)*	Blue (T)	Barn Owls require landscapes that provide adequate foraging habitat for their primary prey (voles and mice), and suitable sites for nesting. Primary foraging habitats include old agricultural fields, rough pastures, hayfields, grassy roadsides, and grassy marshes. A wide variety of natural and artificial nest structures are used by Barn Owls, including cavities in live and dead trees, chimneys, elevated platforms in barn lofts, silos, hangars, water towers, bridges/overpasses, attics, and nest boxes.	Possible

Species name	Provincial (COSEWIC*) Status	Habitat	Likelihood of Inhabiting UBC/buffer
Black-crowned Night Heron (*Nycticorax nycticorax)*	Red	Habitats include marshes, swamps, wooded streams, mangroves, shores of lakes, ponds, lagoons; salt water, brackish, and freshwater situations. Roosts by day in mangroves or swampy woodland. Eggs are laid in a platform nest in groves of trees near coastal marshes or on marine islands, swamps, marsh vegetation, clumps of grass on dry ground, orchards, and in many other situations. Nests are usually with other heron species.	Unlikely
Green Heron (*Butorides virescens)*	Blue	Habitats include swamps, mangroves, marshes, and margins of ponds, rivers, lakes, and lagoons. Eggs are laid in a platform nest in a tree, thicket, or bush over water or sometimes in dry woodland or orchard; nests in both freshwater and brackish situations.	Unlikely
Band-tailed Pigeon (*Patagioenas fasciata)*	Blue (SC)	In British Columbia, the Band-tailed Pigeon breeds from near sea level to 760 m elevation. It typically breeds in natural and human-made habitats, including edges and openings in mature forests, city yards and parks, wooded groves, open bushland, orchards and golf courses. In coastal regions, Band-tailed Pigeons show strong fidelity to mineral sites, where they drink mineralized water and ingest minerals encrusted on the soil surface. Mineral sites are critical seasonal habitats as sources of sodium. Areas with flowering and berry-producing trees and shrubs provide foraging habitat.	Possible
Olive-sided Flycatcher (*Contopus cooperi)*	Yellow (SC)	The Olive-sided Flycatcher is most often associated with open areas containing tall live trees or snags for perching. These vantage points are required for foraging. Open areas may be forest clearings, forest edges located near natural openings (such as rivers or swamps) or human-made openings (such as logged areas), burned forests or openings within old-growth forest stands; these forests are characterized by mature trees and large numbers of dead trees. Generally, forest habitat is either coniferous or mixed wood.	Likely
Barn Swallow (*Hirundo rustica)*	Yellow (SC)	Before European colonization, Barn Swallows nested mostly in caves, holes, crevices and ledges in cliff faces. Following European settlement, they shifted largely to nesting in and on artificial structures, including barns and other outbuildings, garages, houses, bridges, and road culverts. Barn Swallows prefer various types of open habitats for foraging, including grassy fields, pastures, various kinds of agricultural crops, lake and river shorelines, cleared rights-of-way, cottage areas and farmyards, islands, wetlands, and subarctic tundra.	Possible
White-throated Swift (*Aeronautes saxatalis)*	Blue	Habitat includes primarily mountainous country, especially near cliffs and canyons where breeding occurs; forages over forests and open areas in a variety of habitats (Subtropical and Temperate zones). Nests in rock crevices in cliffs and canyons. Sometimes nests in buildings, and on sea cliffs.	Possible

Species name	Provincial (COSEWIC*) Status	Habitat	Likelihood of Inhabiting UBC/buffer
American Bittern (*Botaurus lentiginosus)*	Blue	Occurs in areas where temperatures stay above freezing and waters remain open, especially in coastal regions where the ocean moderates the climate. Wintering habitat is much like breeding habitat, and overwintering populations are heavily dependent on managed wetland areas, such as those occurring at wildlife refuges, and occasionally in brackish coastal marshes. Nesting is primarily in large freshwater and (less often) brackish marshes; breeding in wetlands with tall emergent vegetation.	Unlikely

*No code in brackets indicates the species has not been assessed by COSEWIC

Appendix 3 - Recommended native species for restoration, landscaping, and habitat enhancements.

Scientific Name	Common Name	Attributes											
		Rich and moist Natural Areas	Medium Dry Natural Areas	Gardens and Landscaped areas	Pollinator Meadow	Bioswales, Rain Gardens and Wetlands	Pollinator	Fruits/Nuts	Edible Fruits/Nuts/Parts	Climate Adaptation Species	Shade tolerance	Comments
Trees												
Abies grandis	Grand fir	X		X						X		
Acer macrophyllum	Bigleaf maple	X		X			X					
Alnus rubra	Red alder	X	X									Nitrogen fixing and suitable for poor soils. Shade intolerant
Arbutus menziesii	Arbutus		X	X			X	X		X	Intolerant	Plant on open rocky sites
Betula papyrifera	Paper birch	X	X									
Picea stichensis	Sitka spruce	X		X					X			Spruce tips can be used in cooking and are edible
Pinus albicaulisaulis	Whitebark Pine		X	X								
Populus balsamifera	Black cottonwood	X									Intolerant	
Prunus emarginata	Bitter cherry	X					X					
Pseudotsuga menziesii	Douglas-fir		X	X							Intolerant	Acorns are edible, require preparation
Quercus garryana	Garry oak		X	X				X		X	Intolerant	Plant in open, meadow types
Thuja plicata	Western redcedar	X		X								
Tsuga heterophylla	Western hemlock	X										
Shrubs & Ferns												
Acer circinatum	Vine maple	X	X	X			X					
Amelanchier alnifolia	Saskatoon		X	X			X	X	X	X	Intolerant	Berries are edible

Scientific Name	Common Name	Rich and moist Natural Areas	Medium Dry Natural Areas	Gardens and Landscaped areas	Pollinator Meadow	Bioswales, Rain Gardens and Wetlands	Attributes					
							Pollinator	Fruits/Nuts	Edible Fruits/Nuts/Parts	Climate Adaptation Species	Shade tolerance	Comments
Arctostaphylos uva-ursi	Kinnickinick						X	X	X			Berries are edible
Aruncus sylvestris	Goatsbeard	X	X				X					
Athyrium filix-femina	Lady fern	X		X					X			Fiddleheads are edible
Blechnum spicant	Deer fern	X	X									
Cornus sericea	Red-osier dogwood	X		X		X	X					Plant in clusters
Corylus cornuta	Beaked hazelnut		X	X			X	X	X			Nuts are edible, should be roasted first
Crataegus douglasii	Black hawthorn	X					X	X	X			Berries are edible
Dryopteris expansa	Spiny wood fern		X	X					X			Rhizomes are edible, should be cooked
Gaultheria shallon	Salal		X	X			X	X	X			Plant in clusters, berries are edible
Holodiscus discolor	Oceanspray		X	X			X	X		X	Semi-intolerant	
Lonicera involucrata	Black twinberry	X					X	X				
Mahonia aquifolium	Tall Oregon grape		X	X			X	X	X	X	Semi-intolerant	Berries are edible
Mahonia nervosa	Dull Oregon grape		X	X			X	X	X			Berries are edible
Malus fusca	Pacific crabapple	X					X	X	X			Fruit is edible
Oemleria cerasiformis	Osoberry	X	X				X	X	X			Berries are edible
Philadelphis lewisii	Mock orange		X	X			X	X			Intolerant	
Physocarpus capitatus	Pacific ninebark	X		X		X	X					

Scientific Name	Common Name	Attributes										
		Rich and moist Natural Areas	Medium Dry Natural Areas	Gardens and Landscaped areas	Pollinator Meadow	Bioswales, Rain Gardens and Wetlands	Pollinator	Fruits/Nuts	Edible Fruits/Nuts/Parts	Climate Adaptation Species	Shade tolerance	Comments
Polystichum munitum	Sword fern	X	X	X								
Rhododendron macrophyllum	Pacific Rhododendron						X			X		
Ribes bracteosum	Stink currant	X					X	X				
Ribes sanguineum	Red-flowering currant	X	X	X			X	X	X	X	Intolerant	Berries are edible
Rosa gymnocarpa	Baldhip rose		X	X			X	X	X		Semi-intolerant	Rosehips are edible
Rosa nutkana	Nootka rose		X	X			X	X	X	X	Semi-intolerant	Rosehips are edible
Rubus parviflorus	Thimbleberry	X		X			X	X	X		Semi-intolerant	Berries are edible
Rubus spectabilis	Salmonberry	X		X			X	X	X			Berries are edible
Rubus ursinus	Trailing blackberry	X	X				X	X	X			
Salix Sp	Willow (Pacific, Scouler, Sitka)	X		X		X	X					
Sambucus racemosa	Red elderberry	X		X			X	X	X			Berries are edible, should be cooked
Spiraea douglasii	Hardhack	X		X		X	X					Plant in clusters
Symphicarpos albus	Snowberry		X				X	X		X		
Vaccinium ovatum	Evergreen huckleberry			X			X	X	X	X		Berries are edible
Vaccinium parvifolium	Red huckleberry		X				X	X	X			Plant in organic substrates, berries are edible
Rubus leucodermis	Black Raspberry		X	X			X	X	X	X		Berries are edible

Scientific Name	Common Name	Rich and moist Natural Areas	Medium Dry Natural Areas	Gardens and Landscaped areas	Pollinator Meadow	Bioswales, Rain Gardens and Wetlands	Attributes					
							Pollinator	Fruits/Nuts	Edible Fruits/Nuts/Parts	Climate Adaptation Species	Shade tolerance	Comments
Herbs												
Achillea millefolium	Yarrow		X		X		X		X	X	Intolerant	Leaves are edible, very strong flavour
Achlys triphylla	Vanilla leaf	X					X					
Allium cernuum	Nodding onion		X		X		X	X	X	X	Semi-intolerant	Bulb and greens are edible
Anaphalils margaritacea	Pearly Everlasting				X		X			X		
Aquilegia formosa	Columbine				X		X					
Aster alpigenus	Alpine aster		X		X		X				Semi-intolerant	
Aster conspicuus	Showy aster				X		X					
Aster subspicatus	Douglas aster		X		X		X				Semi-intolerant	
Camassia leichtinii	Great camas				X		X	X	X	X		Bulb is edible - CAUTION NOT TO CONFUSE WITH DEATH CAMAS
Carex obnupta	Slough sedge					X						
Claytonia sibirica	Siberian's miner's lettuce	X					X		X	X		Leaves are edible
Cornus canadensis	Bunchberry	X					X					Needs constant moisture, shade
Dicentra formosa	Pacific bleeding heart	X					X					
Epilobium angustifolium	Fireweed	X	X		X		X			X		
Equisetum hyemale	Tall scouring-rush					X						
Eriophyllum lanatum	Wooly sunflower		X		X		X				Intolerant	

Scientific Name	Common Name	Rich and moist Natural Areas	Medium Dry Natural Areas	Gardens and Landscaped areas	Pollinator Meadow	Bioswales, Rain Gardens and Wetlands	Attributes					
							Pollinator	Fruits/Nuts	Edible Fruits/Nuts/Parts	Climate Adaptation Species	Shade tolerance	Comments
Fragaria vesca	Woodland strawberry				X		X	X	X	X		Fruit is edible
Heliopsis helianthoides	Ox-eyed Sunflower				X		X					
Juncus effusus	Common rush					X						
Lupinus nootkatensis	Lupine				X		X					
Lupinus polyphyllus	Large-leaved lupine	X	X		X		X				Semi-intolerant	
Lysichiton americanum	Skunk cabbage					X						
Maianthemum dilatatum	False lily-of-the-valley	X					X					
Sagittaria latifolia	Arrowhead					X	X					
Scirpus microcarpus	Small-flowered bulrush					X						
Solidogo canadensis	Goldenrod	X	X		X		X				Intolerant	
Tiarella trifoliata	Three leaved foamflower	X					X					
Trientalis borealis	Broad leaved starflower	X					X					
Trillium ovatum	Western white trillium	X					X					
Typha latifolia	Cattail					X			X			Young shoots are edible
Urtica dioica	Stinging nettle	X					X		X			Leaves are edible, Caution in handling and should be cooked
Viola glabella	Stream violet	X					X					
Asarum canadense	Wild Ginger	X		X	X		X		X			Rhizome is edible