City of New Westminster

Biodiversity and Natural Areas Strategy

Report by Diamond Head Consulting

April 2022



NEW WESTMINSTER

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Traditional Acknowledgement

We recognize and respect that New Westminster is on the unceded and unsurrendered land of the Halkomelem speaking peoples. We acknowledge that colonialism has made invisible their histories and connections to the land. As a City, we are learning and building relationships with the people whose lands we are on.

Acknowledgements

The lead Consultant that developed this Strategy was Diamond Head Consulting Ltd. The City would like to thank the many community members of New Westminster who have contributed to this Strategy by providing guidance, direction and feedback. This includes the members of the public who attended workshops in September 2020 and everyone who participated in the online surveys and storyboard. The following groups and departments provided input, feedback and support for the Strategy and consultation process:

- Mayor and Council
- Tsleil-Waututh Nation
- Environment and Climate Action Advisory Committee
- Development Services
- Engineering
- Parks and Recreation Department

Executive Summary

Biodiversity is the variety of life found in an ecosystem and is an indicator of the integrity of a natural system. In an urban context, achieving a high level of biodiversity requires that cities are planned and built to not only support humans, but to include the ecosystem services that all life depends on.

The City of New Westminster recognizes the importance of the remaining natural areas, urban parks, and green spaces and their contribution towards biodiversity, the health and well being of residents, and mitigating the impacts of climate change. The integration of healthy, intact natural ecosystems is an important part of ensuring the City remains resilient and sustainable as it continues to grow. The City is taking measures to improve biodiversity and natural areas through the development of this Biodiversity and Natural Areas Strategy.

This Strategy analyses the state of natural areas and biodiversity in the City and provides a suite of recommended actions and guidelines that will help the City to prioritize protection, enhancement, and restoration of natural areas and support the species that live there. It was developed with input from staff of the City of New Westminster from various departments, local First Nations, and the broader community. It provides recommendations for operations, planning, and policy that will protect, connect, and restore the existing natural area assets. A consolidation of the recommended actions noted within the Strategy are provided in Table 1. The implementation of these actions will help the City to achieve a higher level of biodiversity over time.

Table 1. Summary of recommended actions within the Strategy.

Recommended actions to protect existing natural habitat areas:	
1	Amend the existing Brunette River development permit area (DPA) to include supplemental development permit guidelines specific to the Braid and Canfor reaches.
2	Strengthen development permit guidelines to improve biodiversity conservation in urban areas.
3	Continue to work with the Port of Vancouver to designate foreshore properties as "Conservation" zones along the Fraser River (as part of the Port's Land Use Plan) to protect and enhance habitat.
4	Review and update the City's Watercourse and Riparian Areas Protection policies and explore alternative programs (e.g., Salmon-Safe) to increase protection measures for the Fraser and Brunette Rivers and ditches in Queensborough.
5	Adopt a policy of minimum no-net loss of natural habitat area on City-owned lands and work towards achieving net environmental gain.
6	Complete a study to identify suitable wildlife refuge areas within larger natural area parks and along the Fraser and Brunette River foreshore areas.
7	Develop a City-wide invasive species inventory and mitigation strategy.
8	Include the designation of wildlife habitat/refuge areas within the next update to the Parks and Recreation Comprehensive Masterplan.
Recommended actions to connect natural areas together:	
9	Support the implementation of the Green Infrastructure Network (GIN) and prioritize enhancements for biodiversity and acquisition of new green space for habitat within this network.
10	Restore and protect the potential habitat hub and corridor areas identified in the GIN.
11	As the Crosstown Greenway is developed, natural habitat elements should be incorporated into its design and adjacent residences engaged to protect these features.
Recommended actions to acquire new natural areas:	
12	Include natural areas as a key criterion in future park acquisition plans. Adopt a goal of protecting 10% of the City's land base as protected natural areas.
13	Carry out a feasibility study to explore different city mechanisms such as Development Cost Charges, Community Amenity Contributions and taxes for the acquisition and restoration of priority lands.
14	Explore funding and partnership opportunities with First Nations, non-profit organizations, and Federal and Provincial governments to acquire, enhance, protect and manage high value natural areas and to protect species at risk.
15	Identify land parcels as part of a City-wide acquisition strategy that would be most suitable for acquisition and/or habitat compensation projects.

Recommended actions to enhance biodiversity by land use type:	
16	Enhance natural areas parks to create more structurally diverse, high value forests with water features to encourage use by species that require refuge from people.
17	Enhance public spaces to create habitat areas integrated with passive recreation for species that coexist with people.
18	Integrate habitat features along City greenways and lanes to support birds, small mammals and insects.
19	Encourage all residential landowners including those managed by strata corporations to enhance open spaces (e.g., yard, balcony), to provide habitat for species tolerant of people and make changes around the home that will reduce impacts to wildlife.
20	Review development application processes, guidelines and tools to ensure biodiversity is a key criterion for inclusion into high density development projects. Explore developing new policy or permitting requirements (or incentives) to increase green space areas and include more ecological plant alternatives.
Recommended actions related to key enhancement strategies:	
21	Install additional pollinator gardens in open spaces, vacant and under-utilized areas of land within City parks and the public realm.
22	Explore opportunities to enhance habitat within the City's cemetery including pollinator gardens, water features and potentially hedgerows.
23	Install raingardens when upgrading infrastructure in the City.
24	Install habitat adjacent to designated open channels and sloughs in Queensborough.
25	Partner with external organizations to enhance habitat on unused land (e.g., ROWs).
Recommended actions to educate, support engagement and seek partnerships/incentives:	
26	Continue to host the biodiversity webpage as a place to inform residents on new initiatives, events and other information pertaining to biodiversity.
27	Regularly connect with the City's Environment & Climate Action Committee on biodiversity initiatives and issues.
28	Promote programs and education platforms that encourage residents to enhance habitat on their properties, such as iNaturalist Canada.
29	Continue to support hands-on stewardship activities and achieve more wide-spread promotion in the community.
30	Continue subsidy programs to encourage the planting of trees on private lots.
31	Seek incentive and partnership opportunities with external organizations and advocate for biodiversity improvements.
Recommended actions to monitor biodiversity:	
32	Establish a monitoring program that includes the tracking of one or more of the suggested indicators to track the state of biodiversity in the City over time.

1 | Introduction

The City of New Westminster was once the place of natural diversity where old growth forests met with the floodplain and wetlands of the Fraser and Brunette Rivers. These natural areas have been lost over time as colonists arrived and the City grew. There is recognition now of the importance of our remaining natural areas, urban parks and green spaces, and their contribution towards biodiversity, the health and well being of residents, and mitigating the impacts of climate change.

Biodiversity is the variety of life found in an ecosystem and is an indicator of the integrity of a natural system. Natural areas with high levels of biodiversity means many forms of life have the habitat and resources they need to survive. Biodiversity, therefore, can indicate that an area's ecosystems, and the services they provide, are relatively intact. In an urban context, achieving a high level of biodiversity means that we need to build our cities not only to support humans, but to include the ecosystem services that all life depends on.

This Strategy analyses the state of natural areas and biodiversity in the City and provides a suite of recommended actions and guidelines that will help the City to prioritize protection, enhancement, and restoration of natural areas and support the species that live there. It was developed with input from staff of the City of New Westminster, from various departments, First Nations, and the broader community. It is consistent with and builds upon existing policy that directs sustainable growth and adaptation to climate change at the municipal, provincial and federal levels.



Photo 1. A tree swallow on a pacific dogwood (Shutterstock).

2 | What is Biodiversity, and Why is it Important?

Biodiversity is the variety of life found in an ecosystem or habitat. It is the "**variability among living organisms which includes the diversity within species, between species, and among ecosystems**". Biodiversity is often measured as the number of species in an area and number of individuals of each species. It can be used as an indicator of the integrity of a natural ecosystem. In an urban context, achieving a high level of biodiversity requires that cities are designed not only to support humans, but to include the ecosystem services that all life depends on.

As human population grows, urban areas have densified and occupied more land, creating a landscape with fragmented natural areas, a high cover of impervious surfaces, and invasions of plants and animals that are not endemic to this region. As the separation between urbanized areas and naturalized areas becomes more abrupt, people can become less aware of our role within and reliance upon the natural world. We as a society are becoming increasingly more aware that connecting with nature and wildlife directly benefits our well-being and mental and physical health[1,2].

The level of biodiversity in Metro Vancouver has been decreasing as a result of the changes in our landcape[3]. To reverse this trend, there is a need to provide more available space for nature and higher quality habitat for those species that are less tolerant of our impacts. Canada has been committed to addressing biodiversity nationally since at least 1992, when the United Nations Convention on Biological Diversity was signed and ratified. Shortly thereafter, the Canadian Biodiversity Strategy was developed, identifying biodiversity goals and targets for all of Canada[4]. As urbanization grows and the impact of climate change on biodiversity accelerates, cities will need to contribute to and support global biodiversity conservation. It can be argued that urban environments can be part of the solution to the global biodiversity crisis and can in fact provide important refuges for a diversity of plants and animals[5].

This Biodiversity and Natural Areas Strategy (the Strategy) works to address these goals at the local level, providing the City with recommended actions, strategies, priorities and guidelines (i.e., nature-based solutions) that will enhance the integrity of natural areas in the City and better support the species that live there. The Strategy was developed with input from staff from various departments of the City of New Westminster and the broader community. It is consistent with and builds upon existing policy that directs sustainable growth and adaptation to climate change at the municipal, provincial, and federal levels.

[1] Morita, E., S. Fukuda, J. Nagano, et al. 2007. Psychological Effects of Forest Environments on Healthy Adults: Shinrin-Yoku (Forest-Air Bathing, Walking) As a Possible Method of Stress Reduction. Public Health 121, 1:54-63.
[2] K. Wolf. 2008. City Trees, Nature and Physical Activity: A Research Review. Arborist News, vol. 17, no. 1, pp. 22-24, 2008.
[3] Biodiversity Conservation Strategy Partnership. 2008. Strategic Directions for Biodiversity Conservation. Retrieved July 16, 2020 from http://www.metrovancouver.org/services/regional-planning/PlanningPublications/StrategicDirectionsBiodiversityConservation.pdf
[4] Minister of Supply and Services Canada. 1995. Canadian Biodiversity Strategy. Retrieved Nov. 27, 2020 from https://biodivcanada.chm-cbd.net/documents/canadian-biodiversity-strategy
[5] The Biological Deserts Fallacy: Cities in Their Landscapes Contribute More than We Think to Regional Biodiversity, February 2021. Retreived Nov. 27, 2020 from https://academic.oup.com/bioscience/article/71/2/148/6102678.



“If we take care of nature, nature will take care of us.”

David Attenborough

Photo 2. Family of beavers (Shutterstock).

3 | The New Westminster Area Before Colonialism

Since time immemorial, the lands currently known as New Westminster have been the home and traditional territories of Halkomelem (hən̓q̓əmin̓əm, Halq'eméylem, Hul'q'umi'num') and Sḵwxwú7mesh sníchim-speaking peoples. Before colonization, over 100,000 people lived here peacefully; organizing their communities and societies according to several social, economic, and cultural customs[6]. While many of these customs were determined by geography, language groups, family ties and lineage, the core of these customs ultimately came down to land and the rich biodiversity of the territory – including where it was accessed, how it was used, and by whom.

Pre-colonization, Halkomelem and Sḵwxwú7mesh societies were largely organized by kinship ties, marriage and family lineage. "Traditional territories were expansive, encompassing multiple villages that shared the same language"[7], and these villages were made up of families and people who shared familial relationships. These connections were extremely important in determining aspects of Halkomelem and Sḵwxwú7mesh peoples' lifestyles; such as where they could live, hunt and harvest food, territories they could freely travel to, the traditional knowledge they could inherit, and the cultural traditions that they learned and practiced. People gathered resources in certain territorial areas based on which family they belonged to. If travellers did not have any family ties to a specific area, they were required to ask permission before hunting, fishing, or gathering from the land near another's territory[8]. Resources such as salmon and other traditional foods, ceremonial materials, and medicinal items were distributed and shared primarily based on family and community connections.

In many ways, these family-centric systems worked well because of the deep respect that the Halkomelem and Sḵwxwú7mesh peoples have for the land and the inherent value of the species that occupied it. The biodiversity of the territory was plentiful, with as many as 145 species of shellfish, animals, birds, and terrestrial and aquatic plants[9], all of which sustained the families and communities who inhabited various traditional territories. Peoples' livelihoods, food sources, and cultural continuity were all tied to the natural world that they lived alongside; utilizing and harvesting various plants and animals for food, medicine, and technology. While Halkomelem and Sḵwxwú7mesh peoples hunted and harvested for sustenance, they did not do so frivolously; animals were hunted for meat as well as for hides, skins, antlers, and bones used for warmth, fabric, building and tools[10]. As the original inhabitants of the territory, the Halkomelem and Sḵwxwú7mesh peoples treated the water, plants, animals and earth as sacred parts of life that were to be fairly shared, rather than resources to be consumed and used only for human benefit or gain. In this way, the biodiversity and health of ecosystems was respected and upheld. Families managed and cared for the land, plants and animals in a way that reflected their understanding of the intrinsic value that biodiversity brings not only to humans, but to all living things. The importance of maintaining a healthy and fruitful environment was understood as being important regardless of how useful it was to the humans who inhabited the territory.

The diets, activities and lifestyles of Halkomelem and Sḵwxwú7mesh peoples were also largely influenced by their geographic proximity to the river. "Anthropologists describe pre-contact Coast Salish people as marine oriented hunter-gatherers, or hunter-gatherer-fishers"[11] because they relied

[6] Indigenous History in Burnaby Resource Guide, Burnaby Village Museum, 2019, p.4.
[7] Indigenous History in Burnaby Resource Guide, Burnaby Village Museum, 2019, p.1.
[8] Ibid.

[9] Indigenous History in Burnaby Resource Guide, Burnaby Village Museum, 2019.
[10] Ibid
[11] Morin, 2015, p. 22.

heavily on the waters of this region. Permanent and seasonal villages resided at the junction of what are today called the Fraser and Brunette Rivers as this area was a prime fishing location[12]. There communities harvested many different species of aquatic foods, animals, fish and plants. The territory also saw relatively mild winter seasons, and so the food and natural resources important to Halkomelem and Sḵwxwú7mesh livelihoods and diets were abundant year-round throughout the territory. The flows of the rivers influenced the types of flora, fauna and fish that lived there. For example, the river created brackish waterways, sloughs, bays, rich floodplain cottonwood islands and inter-tidal wetlands throughout its delta and as a result, sandbars would appear and disappear. Cottonwood trees, once established, stabilized the river's course by growing roots and piling leaves onto the lower banks, building them up year after year, and small creeks and streams poured from the uplands where dense forests established on glacial remains. With these landscapes largely untouched and unchanged by the people who lived on the territory, many diverse forms of marine plant and animal life were able to thrive. The relationship that families and communities had to the land before colonial contact was characterized by principles of respect and non-interference, rather than consumption and anthropogenic utility.

Halkomelem and Sḵwxwú7mesh families continue to live in the City of New Westminster area and the many adjacent municipalities that have developed within their unceded territories. Despite colonial pressures and attempts at Indigenous erasure, the knowledge about traditional ways of living and the history of biodiversity in the Lower Mainland, once held and occupied only by the Halkomelem and Sḵwxwú7mesh peoples, has survived. However, since colonial contact and after colonial institutions took hold in the area now known as New Westminster, the biodiversity, health of ecosystems, and human and cultural connections to the land have deteriorated. Overdevelopment of land and climate change have consequently shifted the ways that occupants of the territory view the importance of the natural world, and the health of land and biodiversity have significantly suffered.

[12] Indigenous History in Burnaby Resource Guide, Burnaby Village Museum, 2019.



Photo 3. White-crowned sparrow (Shutterstock).

4 | The Current State of Biodiversity in the City

After the incorporation of the City in 1860, most of the existing forested uplands and rich delta habitats were replaced by development and industry, altering the landscape as the city grew to meet the needs of the settlers/colonizers. These needs included timber for housing, transportation connections by sea and rail for goods, and dyking to prevent floods from the Fraser and Brunette Rivers. Clearings in the native forest for parklands were created and planted with exotic species like beech, horse chestnut, and eastern maples to create European-style parks. Forests had been replaced by farms, houses, and institutions, and industry crowded the waterfront. The City's growth was momentarily set back by a large downtown fire in 1898. By 1940, most of New Westminster's lands were developed.

For several decades, New Westminster was one of the region's most industrialized and polluted cities. Poplar Island, the site of a First Nations burial ground and later a wartime shipyard, became forest after the shipyard's demolition. It is now the largest undyked (natural shore) island in the lower Fraser River. Since the 1990s, the City and Metro Vancouver have constructed new waterfront parks and trails, enhanced the shoreline with tree planting and helped improve the condition of the remaining natural areas across the City. New policies have been adopted that recognize the importance of a healthy environment to the city and its residents.

Currently, naturalized second-growth forests occupy about 50 hectares (~3%) of the city. These are largely protected on public land within Hume Park and Glenbrook Ravine. The largest intact natural forested area is on Poplar Island which is the last natural island in the Fraser River's North Arm. These three remaining natural areas are recognized as high priority habitat areas within Metro Vancouver's Regional Biodiversity Strategy (2001, 2006) and the regional Sensitive Ecosystem Inventory (SEI) (2010, 2012).

In addition to these three core natural areas, there are several significant forested urban parks in the city including Queen's Park, Moody Park and Tipperary Park. These large parks have significant numbers of mature trees; however, the condition of understory vegetation is disturbed, consisting predominantly of maintained grass and landscaped garden areas.



Photo 4. Circa 1913. "Looking up the Fraser at New Westminster" (New Westminster Archives, 32721)

The Fraser River and Brunette River are prominent geographical features in New Westminster. The Fraser River foreshore extends along the south side of the city and surrounds Queensborough on Lulu Island. This riparian interface is one of the city's most ecologically significant features, however, it is highly disturbed from a long history of industrial development.

The urbanized landscape varies across New Westminster. Some neighbourhoods have a high cover of impervious land and provide little growing space for vegetation or habitat for wildlife. Lower density areas have a mosaic of gardens and trees that provide habitat for species that are more tolerant of the built environment.

Industrial and residential development has brought about the loss and disconnection of habitat along the Fraser and Brunette Rivers. Urban development and densification continues to place pressure on the amount and quality of habitat. Other challenges include an increase in invasive species (which can out-compete native species) and climate change, which will bring frequent periods of drought, heatwaves, and increased risk of fire. Taking steps to address these impacts and look for opportunities to bring nature back into the built environment will be imperative towards becoming a more biodiverse city.



Photo 5. Recent Fraser River foreshore development in Queensborough (DHC).



Photo 6. Aerial overview of the City of New Westminster (Shutterstock).

The Migratory Flyway

The Lower Mainland is within the Pacific Flyway – the most important migration route for Pacific migratory waterfowl. It is estimated that 300 species of birds migrate back and forth along this route annually (Ducks Unlimited 2019). Millions of waterfowl congregate in the Fraser River delta each year, some taking up temporary residence and others stopping to refuel and rest.

Neotropical migrants travel back to the Lower Mainland after overwintering in Mexico, Central and South America. These include warblers, swifts, nighthawks, swallows, vireos, thrushes, flycatchers, tanagers, and hummingbirds. Species that spend the summers in the Arctic travel to the Lower Mainland to overwinter including: shorebirds, sea ducks, loons, grebes, kestrels, sharp-shinned hawks, merlin, short eared and snowy owl, pine grosbeaks, common redpolls, white and golden crowned sparrows, and northern shrikes.



Photo 7. Rufous hummingbird (Shutterstock).

4.1 | Ecological Inventory Mapping

An ecological inventory was developed for the City in 2015[13]. This inventory was updated in 2020 as part of this Strategy to reflect changes in the landscape. This inventory identifies habitat types that are mapped across the city (Figure 1). These include naturalized as well as semi-natural habitats. Natural habitat areas include relatively intact communities of native plants and trees such as those found in Glenbrook Ravine and Hume Park. Semi-natural habitats are green areas that have been significantly altered by settler activity but have the ability to support some species. Examples of semi-natural habitat include gardens, urban trees and park spaces, turf grass, thickets of non-native shrubs, ditches and sloughs.

The total area covered by natural habitat types across the city is ~3%. Most large natural areas are dominated by young deciduous forests. The cover of semi-natural habitat types is an additional ~11% and consists mainly of managed grass, invasive shrubs, and areas with urban tree cover. The remaining areas of the city are highly urbanized and are known as the "Urban Matrix." These areas provide fragmented low-quality habitat used by a small group of specialized species adapted to take advantage of modified landscapes.

Since the ecological inventory was first completed in 2015, the cover of natural forest habitat types has decreased from 62 to 49 hectares. This loss has been primarily a result of development impacts. There has, however, been an increase in the amount of garden space from 3.9 to 5 hectares. Most other habitat types have remained relatively unchanged during this 4-year period.

Table 2. Habitat types within the City of New Westminster in 2020 (excluding the Fraser River*).

	Habitat Type	Area (ha)	% of Habitat Area
Natural Areas	Deciduous forest	42	18.5%
	Mixed (evergreen-deciduous) forest	7	3.2%
	Wetland	6	2.8%
	Brunette River	5	2.3%
	Ponds	1	0.4%
	Streams	<1	0.1%
	Evergreen forest	<1	0.1%
Semi-Natural Areas	Managed grass	83	36.4%
	Urban trees	47	20.6%
	Shrub (primarily invasive species)	26	11.6%
	Garden	6	2.4%
	Herbaceous cover and grass	3	1.2%
	Sloughs	<1	0.3%
	Ditches	<1	0.1%

*The Fraser River consists of 57% of the habitat area within the city's boundaries. It has been removed from this analysis to better reflect the habitat found within the city itself.

[13] Diamond Head Consulting, Raincoast Applied Ecology. 2015. Ecological Inventory for New Westminster. https://www.newwestcity.ca/database/files/library/New_Westminister_Ecological_Inventory_Report___June_23._2015_small.pdf

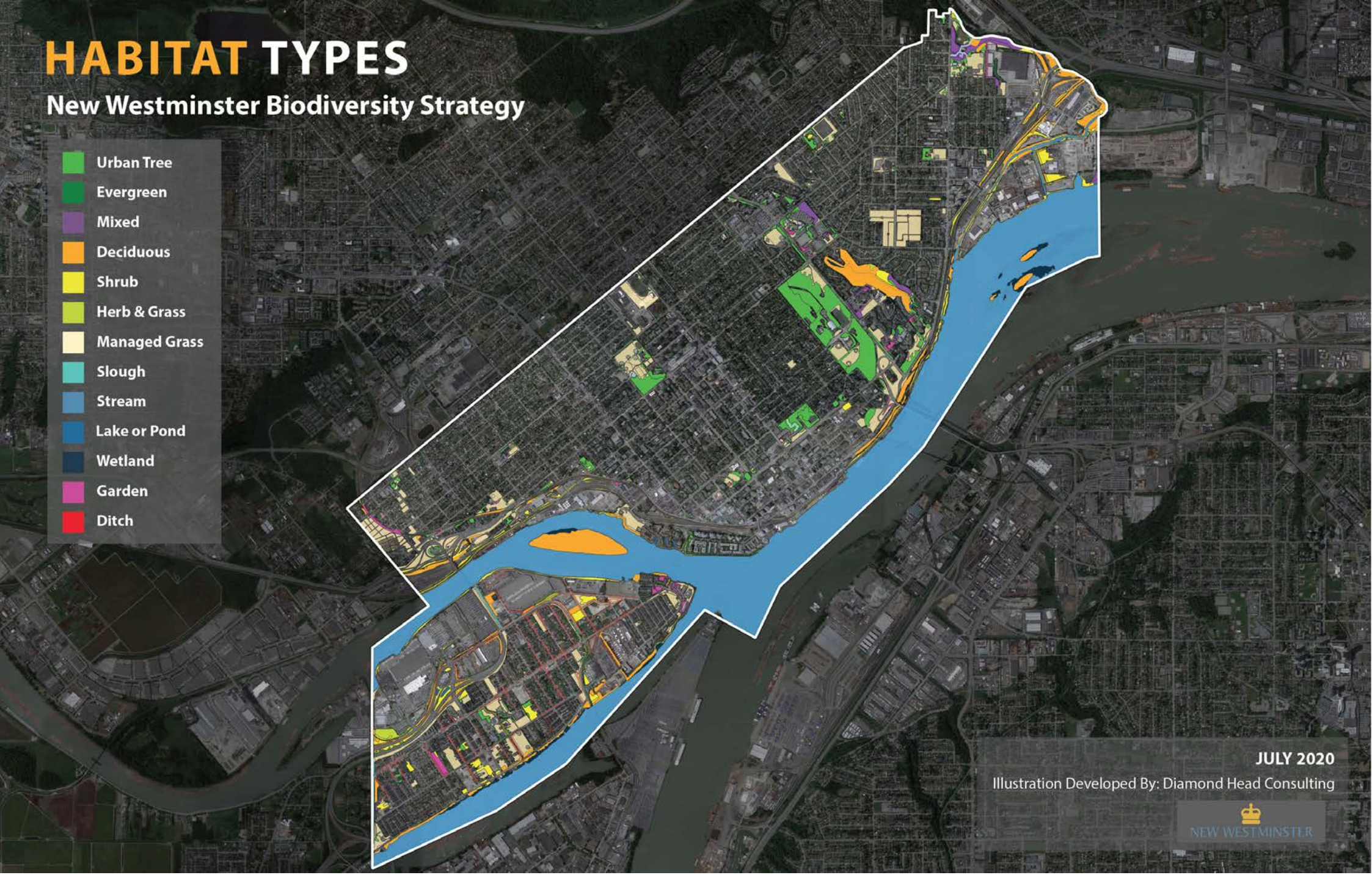


Figure 1. Ecological inventory map of habitat types in New Westminster.

4.2 | Biodiversity Ranking

New Westminster is an old city with well-established urban areas and public parks. While there is limited area available to increase the amount of natural habitat, there is opportunity to improve the quality of existing habitat and increase the city's capacity to support more wildlife. To understand what areas of the city currently support the highest levels of biodiversity, an analysis of the ecological inventory was completed.

A list of local native wildlife species including birds, mammals, amphibians, and reptiles was compiled by professional biologists. These species include those that could potentially inhabit the city if there was suitable habitat available. Species that are found in habitat types that are not in the City were excluded, as well as some larger mammals that are unlikely to return to the City such as bears, cougars, and wolves. In this analysis, it was not possible to feasibly account for all the species that exist at the lower level of the food chain such as invertebrates and microbiota; it can be assumed, however, that the presence of higher order species indicates that the species lower on the same food chain likely exist.

An assessment was completed to determine the potential for these species to live within each habitat type. This provided a comparative value for each habitat type's ability to support biodiversity. To account for the influences of urban development, a series of modifiers was applied to each habitat area.

This included its size and fragmentation as well as its proximity to water sources. The final relative biodiversity value of the habitat areas in New Westminster are illustrated in Figure 2. For more detail on the methodology behind the biodiversity ranking, refer to Appendix 2.



Photo 8. Tipperary Park Ponds.

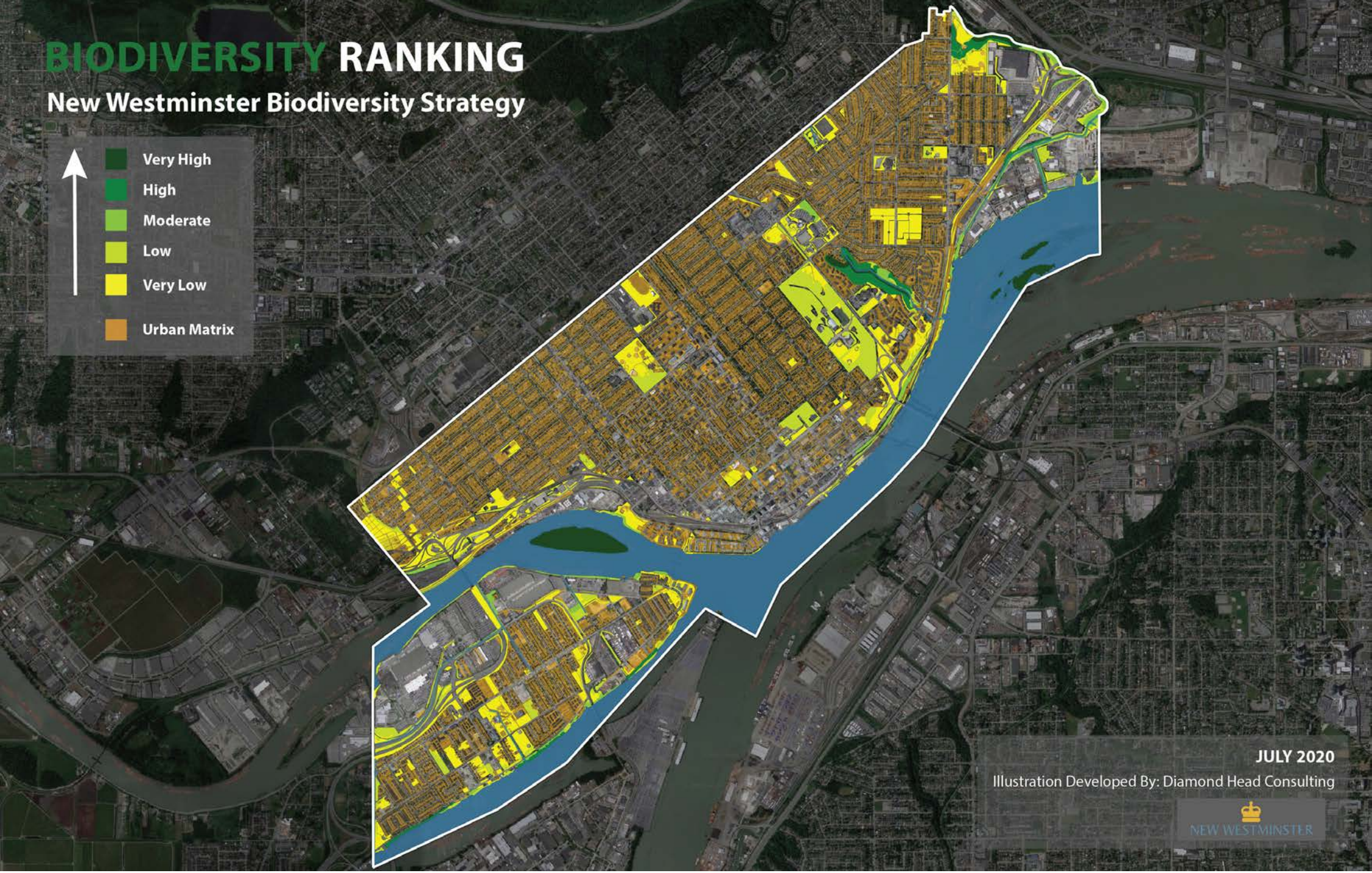


Figure 2. Biodiversity ranking map for habitat in New Westminster.

4.3 | Species-at-Risk in the City

Species that are considered at-risk include those that are vulnerable to human activity and natural events and which could become extinct from the landscape without human intervention. Species that are at-risk tend to be those that rely on habitat features that are rare such as wetlands, intertidal areas, old-growth forests, native grasslands and meadows. In the Lower Mainland there are numerous species that thrived in this area prior to European settlement but are now struggling to survive due to a lack of habitat and are considered at-risk.

The federal government identifies species of special concern in Schedule 1 of the Species at Risk Act (SARA). The BC Conservation Data Centre (CDC) tracks and ranks plants, animals, and ecological communities that are rare, threatened or have declining populations. CDC red-listed species (or ecosystems) are those at risk of being lost and blue-listed are of special concern. At present, the CDC has records of a number of species at risk known to inhabit the city. These includes the red-listed Lower Fraser River population of the white sturgeon and the red-listed Nooksack Dace, which inhabits the Brunette River. In-stream enhancement work has been ongoing to help support the survival of this population of Nooksack Dace. Rare plants have been found growing in the foreshore marshes on the margin of the Fraser River. These include the red listed Henderson's Checker-mallow and Roell's brotherella and the blue-listed Vancouver Island beggarticks. The red-listed Barn owl has been recorded inhabiting Queensborough.

There are a number of species at risk that are not recorded with the province but are likely to inhabit the city. A comprehensive list of the red and blue-listed animal species that could potentially inhabit the city are summarized in Appendix C.



Photo 9. Barn owl in flight.

Barn Owls

Barn owls have been recorded living in Queensborough and hunt in the open grass and shrub communities. As part of an effort to support these owls, the City installed an owl house for them along the Stanley Greenway. Eliminating the use of anticoagulant rodenticide is another way the City has acted to further protect owls, which rely on a diet of small mammals.

4.4 | The Fraser and Brunette Rivers

The natural history of New Westminster was founded on the dynamic productivity and ecological richness of the Fraser and Brunette Rivers. Where the city now sits is where, historically, waters from productive marshes and forests of the Fraser Valley converged before diverging into the salt water of the Salish Sea. Today, millions of salmon, as well as unique species such as the endangered Fraser River sturgeon, migrate past the city using these rivers. Through urbanization, the foreshore of the Fraser and lower Brunette Rivers have been developed and modified to support industry growth and transportation in the region. The interface of these rivers within the city is now degraded from this long history of use.

The terrestrial area that is directly adjacent to water is known as riparian habitat. Such habitat can support some of the highest levels of biodiversity in the natural world. The interface of the water and the land is typically dynamic and rich as water levels rise and fall. These provide critical access to water and support dense and diverse plant communities, providing food and protection cover for both aquatic and terrestrial wildlife. Prior to contact with European settlement, riparian areas adjacent to the Fraser and Brunette would have been highly diverse and rich in species at all levels of the food chain. These areas were disturbed early in the colonization and urbanization of the City for flood control and access for industrial activity.

A GIS analysis was completed that examined the natural state of all areas within 30m of the high-water mark of these rivers. On the mainland of the city it was found that only 25% of the riparian habitat of the Fraser River is in a natural state as defined in Section 3, with the remaining 75% disturbed or developed. In Queensborough, this disturbed condition was found to be 50% and along the Brunette River it was 52%. The restoration of degraded riparian areas provides the greatest opportunity to enhance biodiversity in the city.



Photo 10. The Fraser River foreshore provides an opportunity to protect a high value corridor connecting New Westminster to the broader region.

5 | Consultation for the Development of the Strategy

Planning for this Strategy required consultation with the public, community stakeholders, City staff, advisory committees and First Nations. An online interactive mapping exercise was created to capture ideas from the public and build community awareness of the Strategy. Due to the COVID-19 pandemic at the time this Strategy was being developed, online meetings were held with:

- Key staff from various City departments,
- The community during an "Open House" meeting,
- The Environment and Climate Advisory Committee,
- The Environment and Climate Task Force, and
- The Facilities, Infrastructure and Public Realm Task Force.

Engagement with community stakeholders played an important role in developing key ideas that led to the creation of the strategies and recommended actions. Details of this engagement process are provided in Appendix 4. In summary, many participants highlighted the importance of natural and semi-natural areas to support biodiversity and the broader benefits they provide to residents. The importance of enhancing public and private land to increase habitat was also discussed. Ideas to enhance biodiversity ranged from planting existing grassy areas with diverse shrubs and plants that support habitat for wildlife and pollinators, to providing more continuous habitat and pedestrian connections between green spaces across the City. Participants also expressed great interest in seeing the community more involved in restoring natural areas.

Engagement with First Nations followed processes mirroring the development of the City's Reconciliation Framework. In keeping with these processes, in early 2021 a formal invitation to engage the Biodiversity Strategy was extended to neighbouring First Nations that have expressed interests in the New Westminster area. The following nations were contacted requesting their involvement:

- Katzie
- Kwantlen
- Kwikwetlem
- Musqueam
- Qayqayt
- Squamish
- Sto:lo Nation
- Sto:lo Tribal Council
- Tsawwassen
- Tsleil-Waututh

Kwantlen, Musqueam and Tsleil-Waututh Nation (TWN) all expressed an initial interest in participating in the process with TWN providing comprehensive feedback on specific areas of the draft document. All feedback provided has been incorporated into this plan.

6 | Envisioning the Future of a Biodiverse City

As the city continues to grow and densify, preserving the remaining natural areas and habitat features becomes more challenging. However, development and land use changes also provide opportunities to acquire and restore natural areas and to enhance the built environment to support wildlife. The City envisions a future that includes more trees, more quality habitat and better access to natural areas and spaces for residents.

The recently completed Environmental Strategy & Action Plan (2018) provides a vision for the sustainable management of the environment and the protection of its natural areas that has been adopted for this Strategy:

"New Westminster is a responsible leader that takes bold action on climate change, protects and restores its natural areas, and minimizes the environmental footprint of its highly urbanized community."

Accompanying vision statements from the Strategy include:

- We, the community of New Westminster, recognize our existence within, and our dependence upon, the natural environment, including the air, water, soil and habitat.
- We will find ways to protect and enhance our waterways, encourage biodiversity and create a more environmentally sustainable and resilient urban community.
- We will take measurable actions to green our urbanized community.
- We are a community that recognizes the value of working in collaboration with our citizens, neighbouring communities and other partners.
- We will strive to use resources wisely and are ready to take on the environmental challenges that the future will bring.

The City's 2041 OCP speaks to valuing natural habitat that supports biodiversity and responds to climate change. It recognizes that the city is urbanized and the challenges that comes with that. The OCP identifies the need to protect and restore sensitive ecosystems and the biodiversity that they support. It also outlines the value of expanding natural areas not only for biodiversity but also for the well-being of the residents of New Westminster.

Initiatives to better restore the natural areas that once existed in the city are further supported in the Urban Forest Management Strategy adopted in 2017. It includes the ambitious goal to increase canopy cover across the city from 18% to 27% in the next 20 years. The City recently declared a climate emergency and adopted seven bold steps for climate action to help achieve carbon neutrality by 2050. Enhancing the integrity of natural areas and the level of biodiversity in the city will support this climate response through creating healthy forests with associated carbon sequestration, stormwater absorption and increased community connection to nature. By adopting these recent plans and policies, the City is striving to develop a network of protected and interconnected natural areas that are accessible to our community.

6.1 | Social Values - Equity and Inclusion

As the City moves towards improved biodiversity, a set of social values have been adopted to help guide it through the process of achieving the goals, strategies and actions. The values will help to reach the vision through seeking social equity, inclusivity and shared knowledge in the care of the land as part of implementing the Strategy. These values are:

- Seeking Social Equity
- Hearing from a Diversity of Voices
- Shared Knowledge and Stewardship

By seeking social equity it is acknowledged that levels of effort towards improving biodiversity (e.g., dedication of land for habitat, and access to green spaces) can be disparate in different neighbourhoods of highly urbanized cities. Termed the "luxury effect", urban areas with higher biodiversity and the benefits it provides (e.g., number of trees present) have been found to be positively correlated with wealthier neighbourhoods. There is some evidence of this in the city but going forward the City is committed to ensuring natural spaces and features are more equitably distributed and accessible.

The City also recognizes the importance of hearing from diverse members of the community and will look for ways to engage a variety of citizens in the program implementation. It will foster co-development of programs through a sharing of knowledge from all voices in our community.

The City will also take steps to improve biodiversity founded in shared knowledge and stewardship. Through stewardship and caring of the land, either as individuals or in groups, residents will develop a closer connection to nature and its resources and begin to value nature and learn our dependence on it for their livelihoods. The City will initiate partnerships with Indigenous peoples and local communities in stewardship efforts through a process that fully respects and champions local rights and is open to traditional knowledge and connections.

6.2 | Goals for the Biodiversity Strategy

Following the establishment of the vision a set of Goals were developed to better define how biodiversity will be improved and how success will be monitored over time. It will be important that the steps taken to achieve our goals are undertaken within a social value lens, as outlined in the previous section.



Protect and enhance the city's natural areas and shorelines to improve ecosystem health and biodiversity.

This emphasizes the need to continue to protect and take steps to enhance the few remaining and treasured environmentally sensitive natural areas in order to improve biodiversity.



Increase the amount and quality of habitat across the city to improve biodiversity and human well-being.

There is a need to increase the space for habitat and improve the quality of habitat such as in the streetscape, boulevards, and urban parks. In doing so, it is recognized that natural spaces are important for wildlife but are also important for human health and well-being.



Create resiliency by advancing nature-based climate solutions.

There is a need to create resiliency of natural spaces and take action to reduce the City's vulnerability to climate change impacts. Essentially, this goal is a call to seek innovative solutions and take action in order to help us achieve our vision and goals.

This strategy has three high-level Goals, and six accompanying Principles or objectives of biodiversity conservation. A set of 26 Recommended Actions are described that will help improve biodiversity and guide the next 10 years of planning. The Strategy also includes 16 Priority Strategies (see Section 12) that have been identified by neighbourhood.

6.3 | Principles of Biodiversity Conservation

A city that supports biodiversity is one that has integrated the natural environment. The landscape of this city would include large protected natural areas intermixed with urban development and include connections along naturalized corridors. To work towards this, the following six principles for biodiversity protection and management have been adopted. These principles are used to frame the recommended action and priority neighbourhood strategies within this Strategy.

1. **Protect:** Protect natural areas and shorelines that include sensitive habitat and provide the greatest diversity of habitat;
2. **Connect:** Improve the connections between natural areas both within the city and the region;
3. **Acquire:** Strategically acquire and restore land to add to the city's natural areas and green spaces;
4. **Enhance:** Increase the quality and function of protected areas to increase their capacity to support species;
5. **Educate:** Expand the understanding of our connectivity to and the importance of wildlife and natural areas for our health and well-being;
6. **Monitor:** Track action taken in the implementation of the Strategy and evaluate the impact on species diversity and their distribution in the city.

The following chapters are framed within these six principles and contain recommended actions that should be considered to protect existing and where possible enhance the level of biodiversity in the City.



Photo 11. There are fragmented areas of foreshore habitat that remain along the Fraser River.

7 | Protect Natural Areas in the City

The City of New Westminster currently protects its remaining larger natural areas as parks. These areas provide habitat for species that are not as tolerant of urban development and require refuge from human activity. These are known as habitat "hubs" and include Hume Park and Glenbrook Ravine Park. Poplar Island is also an important natural area; however, it is an island and is only accessible to species that can fly or swim to it. Poplar Island is owned by the Province, designated as a nature reserve and outside of the City's jurisdiction[14].

These habitat hubs are anchors for biodiversity planning, providing high-value habitat that is used by a diversity of species. The City also has a number of large parks including Queen's, Moody Park, Ryall and Tipperary that are more disturbed, with well-established mature tree cover but few native plants at the ground level. These parks have the potential, through restoration, to become significant habitat areas. Although not designated as city parks, the Fraser and Brunette Rivers and their foreshore habitat are regionally important watercourses. These are protected by various jurisdictions and recognized for their role supporting tourism and recreation in the region.



Photo 12. American robin eggs (DHC).

[14] New Westminster Parks, Culture & Recreation, 150 years in the Making 1859-2009.

7.1 | Role of Development Permit Areas and Guidelines

Protecting the remaining natural areas in the City is fundamental to achieving the goals of this strategy. The OCP recognizes Development Permit Areas (DPAs) and associated guidelines as a tool to encourage new development to incorporate specific features that help to achieve OCP objectives. DPAs can be developed to protect and enhance existing natural features such as the Fraser River and Glenbrook Ravine, as well as support naturalized transition areas adjacent to these features.

Guidelines for DPAs and buffers, especially along the Fraser River, should be reviewed to help promote and clarify principles for improving biodiversity during redevelopment. Stronger requirements could be added to these guidelines or processes to ensure that development projects provide features and functions to support biodiversity and protect shorelines (e.g., Green Shores program[15]). Guidelines could include the protection of existing natural features, where they exist, and the installation of new landscape features that are secured through the landscape deposit process such as landscaping with native species, tree cover expectations and pervious surfacing. Guidelines for DPAs adjacent to natural area parks (e.g., DPAs 1.1, 1.4) should include additional landscaping expectations that will help soften the transition between the urban realm and natural areas in ways that promote biodiversity.

Protection measures for the Brunette River and its riparian habitat were outlined in 2016 as part of a Brunette River Masterplan. To strengthen protection along the Brunette River corridor, DPA 7.1 was created to direct development to follow guidelines as part of the Master plan. This DPA only recognizes the Sapperton Reach portion of the corridor but the DPA should be expanded to include the remaining river reaches to help strengthen biodiversity.

The redevelopment or renovation of single detached houses in the city is not reviewed against DPA Guidelines, so the protection of habitat for biodiversity on these properties should instead be encouraged through education and engagement (see Section 11).



Photo 13. An American robin (Shutterstock).

New Westminster Breeding Bird Atlas 2012-2013

An assessment of breeding birds within the city was completed in 2012 and 2013[16]. This study found 73 breeding bird species within the city, mostly concentrated in city parks. The most frequently encountered include Northwestern crow, House sparrow, House finch, American Robin, Black-capped chickadee, Violet-green swallow, Spotted Towhee and the non-native European Starling and Rock pigeon.

[15] https://stewardshipcentrebc.ca/green-shores-home/gs-programs/gssd/

[16] New Westminster Breeding Bird Atlas 2012-13, Robert W. Butler, Andrew Couturier, Eva Jenkins, and Colin McKenzie https://pwlf.ca/wp-content/uploads/2019/04/Butleretal2.pdf



Photo 14. The Fraser River foreshore is highly disturbed with potential for restoration as adjacent areas develop.

7.2 | Watercourse Riparian Area Protection

The Province, through the Riparian Areas Protection Regulation (RAPR), requires that all development adjacent to watercourses protect a minimum riparian area setback. These setbacks can be required by the City at the time of development. The primary watercourses in the city are the Fraser and Brunette Rivers. There are however numerous smaller watercourses that exist such as the ditches and sloughs in Queensborough.

The City requires new development to obtain the necessary approvals, including compliance with the requirements of relevant environmental approval agencies and the City's development permit area guidelines. There are a number of governing bodies that have control over watercourses and foreshore areas in New Westminster (e.g., Metro Vancouver, Port of Vancouver). The City's existing riparian area bylaw should be updated and stronger requirements for protection, setbacks and restoration for streamside habitats should be explored. The City could also adopt programs such as Salmon-Safe certification or Green Shores which can help to protect salmon habitat and water quality.

7.3 | Preventing Loss of Habitat in Parks and Other City-Owned Land

To protect the remaining habitat that exists within City-owned lands, all proposed infrastructure upgrades, parks development, and land sales (or leases) should be reviewed by City staff to consider how redevelopment would impact natural features and to ensure that there is no resulting net loss of natural habitat. For instance, where new a permanent feature such as a sports field, washroom or trail is constructed, a degraded area of equivalent size should be restored to a natural state as compensation. Also, the impacts of projects undertaken by external jurisdictions, such as bridge upgrades or water supply tunnels, should be reviewed by staff to ensure there is no net habitat loss. This will ensure that the current amount of natural habitat that remains in the city is not lost over time.

City parks may also undergo development through the creation of new features and facilities and any development adjacent to a natural area could impact its integrity. Development activities that take place normally occur as part of an adopted park master plan (e.g. Queen's Park Master Plan). When these plans are updated, the City should ensure they incorporate policies to minimize the disturbance of natural areas and enhance biodiversity.

To specifically protect habitat for wildlife, the City can designate wildlife refuge areas in underutilized areas of parks or on other City-owned land. These areas would be off-limits to the public and be identified with split-rail fencing and signage. This will ensure that this refuge habitat is protected, especially during sensitive times of the year such as breeding and rearing periods. It is recommended that at least one refuge area be designated for Hume Park, Glenbrook Ravine, and Queen's Park. There should also be refuge areas designated along the Fraser and Brunette River foreshore areas as they are restored. A detailed assessment should be completed by a qualified biologist to identify the areas that would be more valuable as refuges for wildlife.

Metro Vancouver's Sensitive Ecosystem Inventory has identified ecologically significant lands in New Westminster including Glenbrook Ravine, Poplar Island, and the riparian areas of the Brunette River (Figure 3). These are recognized by Metro Vancouver as providing key ecosystem services to the region including carbon storage and floodwater absorption. They are increasing the City's resilience to climate change and protecting vital habitat and connectivity for biodiversity.



Figure 3. Areas within New Westminster identified as sensitive under Metro Vancouver's Sensitive Ecosystem Inventory.

Invasive plant and animal species threaten native species by competing for resources, displacing them and degrading habitat. The City has an active program for treating noxious invasive species (e.g., knotweed) and has recently developed an invasive species management plan for Glenbrook Ravine park. However, a comprehensive invasive species inventory should be developed for all City-owned lands and a strategy be developed to mitigate impacts with a long-term vision and considering available resources.

Recommended actions to protect existing biodiversity in natural areas:	
1	Amend the existing Brunette River development permit area (DPA) to include supplemental development permit guidelines specific to the Braid and Canfor reaches.
2	Strengthen development permit area guidelines to improve biodiversity conservation in urban areas.
3	Continue to work with the Port of Vancouver to designate foreshore properties as a "Conservation" zones along the Fraser River (as part of the Port's Land Use Plan) to protect and enhance habitat.
4	Review and update the City's Watercourse and Riparian Areas Protection policies and explore alternative programs (e.g., Salmon-Safe) to increase protection measures for the Fraser and Brunette Rivers and ditches in Queensborough.
5	Adopt a policy of minimum no-net loss of natural habitat area on City-owned lands and work towards achieving net environmental gain.
6	Complete a study to identify suitable wildlife refuge areas within larger natural area parks and along the Fraser and Brunette River foreshore areas.
7	Develop a City-wide invasive species inventory and mitigation strategy
8	Include the designation of wildlife habitat/refuge areas within the next update to the Parks and Recreation Comprehensive Masterplan.

Photo 15: Poplar Island is one of the most valuable habitat areas for wildlife in the city.



8 | Connecting Natural Areas Together

Habitat connectivity and providing travel corridors is vital to ensure that all species are able to meet their life requirements (e.g., habitat, food and water sources) and it also minimizes inbreeding ensuring that these populations are genetically diverse. There are some natural travel corridors that exist across the city such as the Fraser River foreshore and high-value habitat hubs that support a variety of species (e.g. Glenbrook Ravine), but they are often fragmented and vary in their condition and quality.

A network of key habitat and corridors was identified to provide the foundation of natural elements that would allow a variety of species to continue to live and travel throughout the city. This network is called the Green Infrastructure Network or GIN (Figure 4). Larger natural areas that provide refuge areas for wildlife were identified – these are known as habitat hubs. Corridors that connect these hubs were also identified in the GIN. Corridors allow wildlife to travel between hubs and take advantage of other habitat areas. Hubs and corridors that may currently be low in value but could be enhanced over time.

The riparian foreshore corridors of the Brunette and Fraser Rivers are currently very disturbed; however, their restoration would provide the greatest potential to support biodiversity and species movement not only across the City but in the region as a whole. There are drainage ditches and sloughs in the Queensborough neighbourhood that are currently mowed and could be enhanced as corridors. Some urban parks designed for passive recreation have areas along their perimeters that are not well-used and could be restored to more natural communities to support species movement. Smaller corridors for small mammals, insects and birds can be provided through urbanized areas by enhancing vegetation (e.g., multi-layered) along linear infrastructure such as roadways, sidewalks, and greenways.

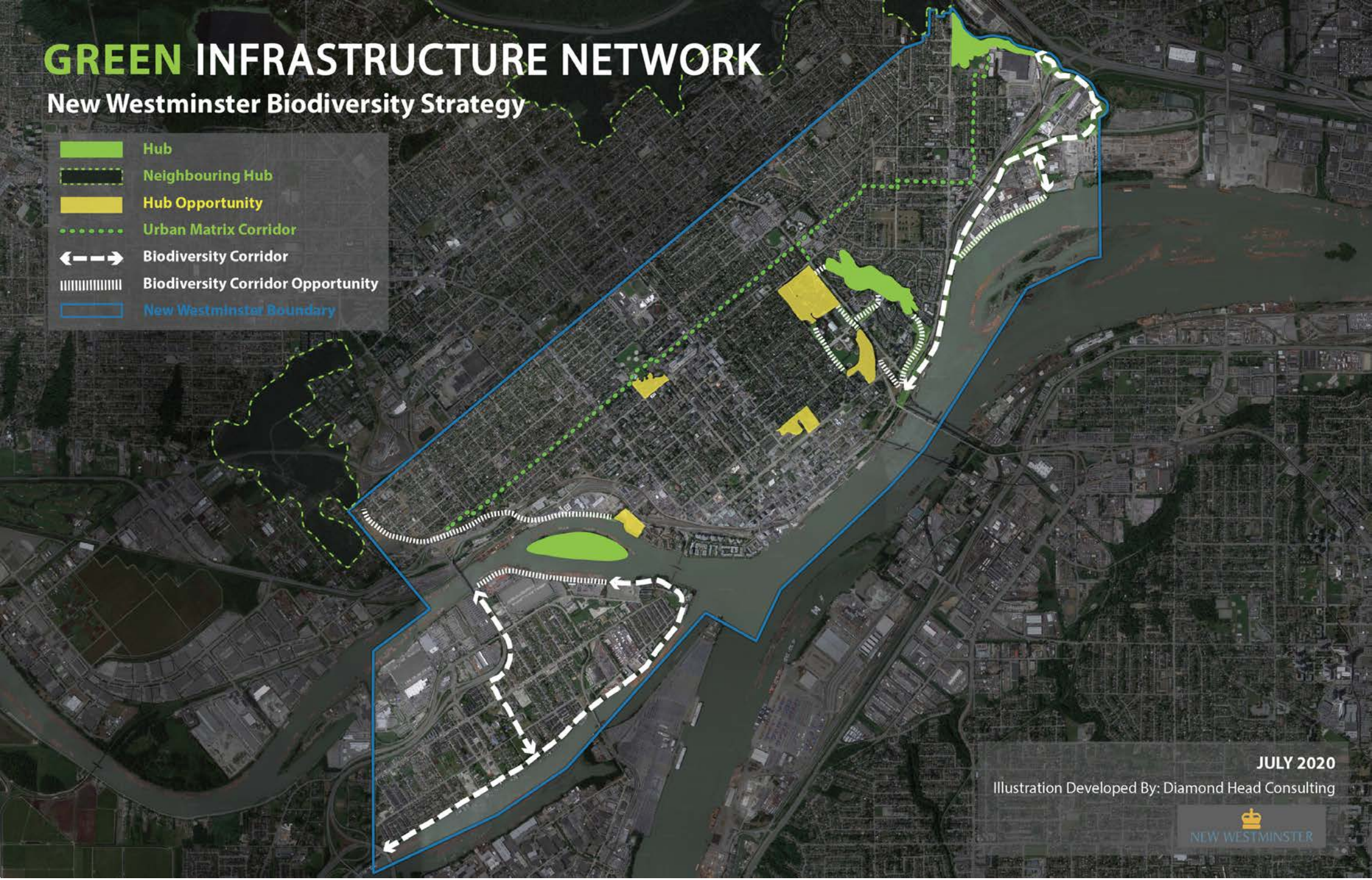
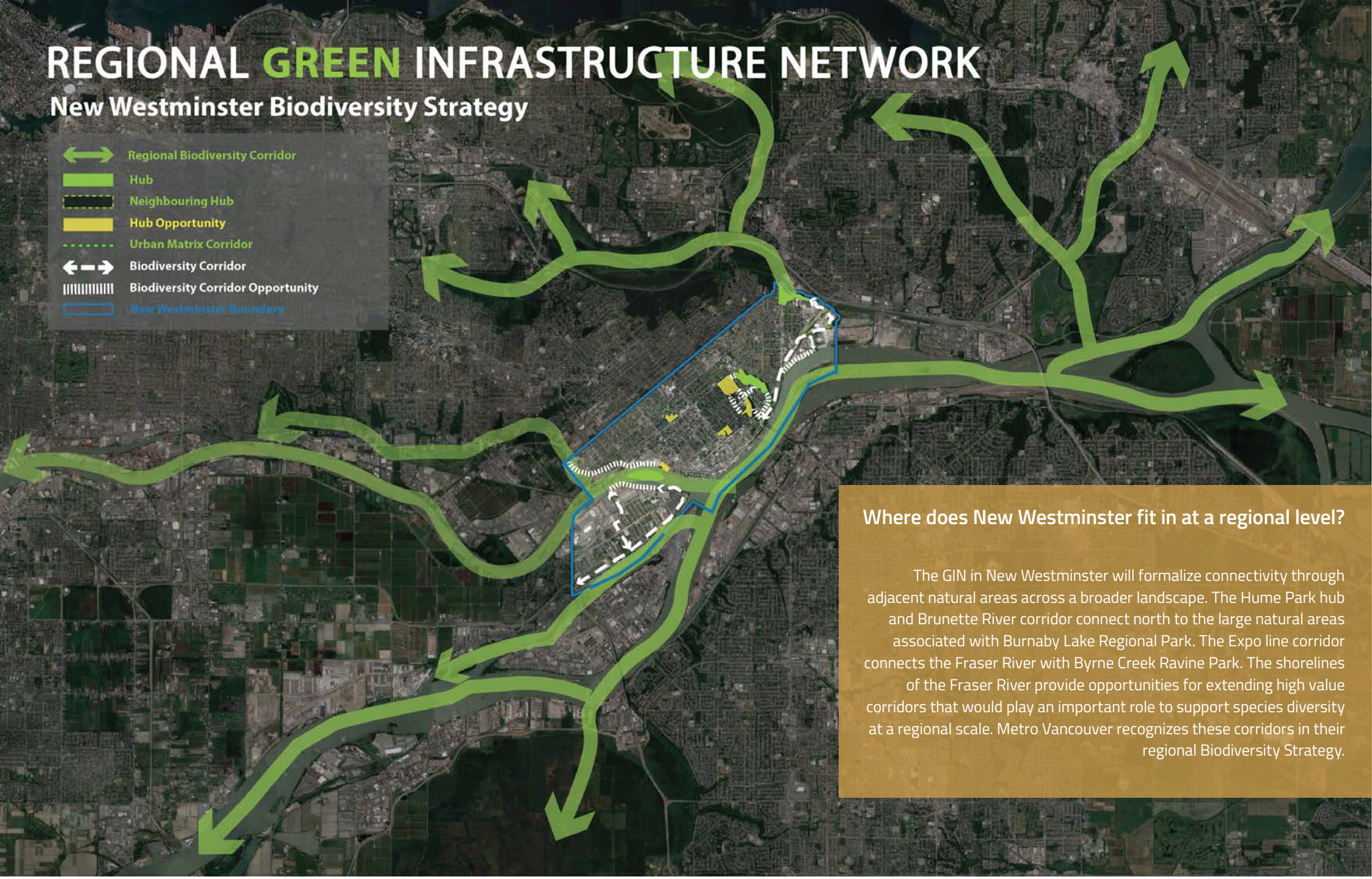


Figure 4. Green Infrastructure Network for the City of New Westminster.



Where does New Westminster fit in at a regional level?

The GIN in New Westminster will formalize connectivity through adjacent natural areas across a broader landscape. The Hume Park hub and Brunette River corridor connect north to the large natural areas associated with Burnaby Lake Regional Park. The Expo line corridor connects the Fraser River with Byrne Creek Ravine Park. The shorelines of the Fraser River provide opportunities for extending high value corridors that would play an important role to support species diversity at a regional scale. Metro Vancouver recognizes these corridors in their regional Biodiversity Strategy.

Figure 5. The City is central to a regional level biodiversity network.

8.1 | Role of Development Permit Areas and Guidelines

A different type of corridor has been identified along the Crosstown Greenway which extends through the Urban Matrix and provides a continuous route east to west with less vehicle traffic. An enhancement of vegetation along this corridor will promote the travel of avian species as well as small mammals and insects. These enhancements will have the extended benefits of shading and beautification. Informational brochures should be distributed to residents that live along this greenway to encourage them to enhance their properties and help protect the trees and plants that are established.

This GIN network provides the foundation to support biodiversity in the city. The areas within this network should be considered priority for enhancement, acquisition, and restoration.



Photo 16. Large sloughs in Queensborough present an opportunity to establish travel corridors for wildlife.

Recommended actions to connect natural areas together:	
9	Support the implementation of the GIN and prioritize enhancements for biodiversity and acquisition of new green space for habitat within this network identified.
10	Restore and protect the potential habitat hub and corridor areas identified in the GIN.
11	As the Crosstown Greenway is developed, natural habitat elements should be incorporated into its design and adjacent residences engaged to protect these features.

9 | Acquire New Natural Areas

The amount of natural area that currently exists within the City covers only 3% of the land base (i.e., 50 hectares). In order to enhance biodiversity and key ecological habitat, the City should pursue opportunities to acquire new habitat. Through acquisition as well as restoration, a future target of 10% of the City's land base could be protected as natural area parks. Currently, the 2008 Parks and Recreation Comprehensive Plan focuses on more active use of parks with less consideration for passive natural areas. When the Parks and Recreation Plan is updated, active and passive recreational infrastructure should be balanced with the naturalization of new areas within parks. The City should also integrate biodiversity as a criterion into acquisition planning.

The purchase of new lands by the City requires significant up-front funding. A study should be undertaken to help identify whether Development Cost Charges (DCC), Community Amenity Contributions (CAC) or Voluntary Amenity Contributions (VAC) are appropriate to use towards for land acquisition/ dedication for new park areas. New areas can also be secured through the conveyance of lands during development or the protection of lands managed by other organizations. Additional funding to support biodiversity could also be attained through a city-wide Green tax or other mechanisms such as development levies or setting conditions for development (e.g., riparian setbacks). Priority areas to secure should include those adjacent to the Fraser and Brunette Rivers as well as those that connect upland natural areas to these Rivers. The City's 2018 Environmental Strategy & Action Plan outlines an action for the City to explore the development of a land acquisition strategy to identify opportunities to acquire key habitat areas during re-development.



Photo 17. Example of a regenerating forest (DHC)

Securing land to protect natural areas and their ecological value continues to be a priority for governments and conservation organizations, and collaborative acquisition is more frequent as land costs can be high. However, non-profit conservation organizations such as the Habitat Conservation Trust Foundation, Nature Trust of BC and the Land Conservancy of BC can play a key role in helping to secure high value habitat. Land acquisition by the City should focus on opportunities that would help develop and/or enhance the GIN and highly ranked habitat areas (i.e. securing riparian setback areas when lands are developed). This will ensure that City or external funding resources are used in the most cost-efficient and beneficial manner. Co-management of these lands with local First Nations should be considered as a way to achieve shared biodiversity goals, cultural opportunities and recreational access for all users.

Vancouver Fraser Port Authority is a landowner of areas adjacent to the Fraser River. The City works with the Port to jointly approve land use and development along the foreshore. Opportunities should be explored with the Port to purchase some of these lands for the purpose of developing natural areas parks. Land parcels including vacant and underutilized lands could be identified in advance should opportunities for purchase or habitat compensation arise. This should be included as part of a city-wide land acquisition strategy.

Recommended actions to acquire new natural areas:	
12	Include natural areas as a key criterion in future park acquisition plans. Adopt a goal of protecting 10% of the City's land base as protected natural areas.
13	Carry out a feasibility study to explore different city mechanisms such as Development Cost Charges, Community Amenity Contributions and taxes for the acquisition and restoration of priority lands.
14	Explore funding and partnership opportunities with First Nations, non-profit organizations, and Federal and Provincial governments to acquire, enhance, protect and manage high value natural areas and to protect species at risk.
15	Identify land parcels as part of a City-wide acquisition strategy that would be most suitable for acquisition and/or habitat compensation projects.

10 | Enhance the Integrity of Habitat in the City

Green spaces and natural areas in the city should be enhanced to provide wildlife with the fundamental elements they require to survive. Habitat requirements vary with each species, however, almost all species will require cover and protection as well as access to water and food. These habitat requirements can vary throughout the year as many species that inhabit the Lower Mainland are migratory and only use our habitats seasonally. To maximize the diversity of species, these basic requirements for survival must be available.



Photo 18. Songbird nest (DHC).

Green spaces and natural areas in the city should be enhanced to provide wildlife with the fundamental elements they require to survive. Habitat requirements vary with each species, however, almost all species will require cover and protection as well as access to water and food. These habitat requirements can vary throughout the year as many species that inhabit the Lower Mainland are migratory and only use our habitats seasonally. To maximize the diversity of species, these basic requirements for survival must be available.



Photo 19. Douglas Squirrel (DHC).

Food requirements are highly variable between species. Food requirements can include nuts, berries, leaves or bark from vegetation, fungi, insects and their larvae, other wildlife or microbiota. It is difficult to account and provide for this range, however, it is assumed that if there are healthy populations of species at the higher end of the food chain, those lower down are being provided for as well. Species at the lower end of the food chain tend to be herbivores or insectivores which rely on a healthy and diverse plant communities which best grow on healthy native soils. Ensuring this foundation exists is the best way to provide for all species in the food chain.



Photo 20. Green-winged Teal (Shutterstock).

All species on earth require water for survival. Some can travel long distances to find water, while others must live close to it. Some species can survive long periods of time without water while others need it frequently. Access to water can be the primary limiting factor for the survival of certain species in urban environments.

10.1 | Enhancing Biodiversity by Land Use Type

The Green Infrastructure Network provides the foundation for supporting a diversity of species. However, these natural areas are small and disconnected compared to the natural state of the forest that existed prior to urbanization. Most of the natural areas in New Westminster consist of young to mature forests that often lack some of the critical habitat features that make older forests so diverse and rich. Older, more biodiverse forests have a range of tree sizes and species, structural diversity in the canopy with openings and trees growing at all heights, a dense understory vegetation community with a diversity of species, an abundance of woody debris across the ground and standing dead "wildlife" trees. While these values are missing from most of the young forests in the City, there are ways to create some of these characteristics or promote their development.

Many parks and protected areas that have fringe areas that currently support grass or shrub communities dominated by low-value invasive species. Some of these areas are not well used for recreation and could be restored to a more natural plant community. The Urban Matrix consists of the urbanized areas throughout New Westminster. While these areas are already developed, there are still many opportunities through redevelopment, landscaping and building retrofits or solutions to improve their habitat or reduce mortality (e.g., bird-window collisions[17]). A biodiversity toolkit has been developed that identifies opportunities and provides guidelines to improve the environment for species across different land uses in the City. The identified land uses include natural areas parks, the Fraser and Brunette Rivers, urban parks, city streets and greenways, residential and high density developments. The following is a summary discussion of potential improvements within these land uses.

[17] https://academic.oup.com/condor/advance-article/doi/10.1093/ornithapp/duab027/6308198 23 June 2021

Natural Area Parks

Larger natural area parks such as Glenbrook Ravine and Hume Park were found to have the highest biodiversity value (Figure 2). These areas are the remnants of historical natural ecosystems but are now smaller, fragmented patches because of urbanization. Although relatively natural in terms of the city's habitats, these areas are heavily influenced by people and pets, the invasion of non-native plants and animals, and disturbances from adjacent land uses. The integrity of these natural areas is constantly under pressure.

Most of the city's natural parks consist of young to mature forests and often lack some of the critical habitat features that make older forests so diverse and rich (e.g., range of tree sizes and species, structural diversity, a dense understory with a diversity of plant species, woody debris across the ground, standing dead "wildlife" trees). While these values are missing from most of the young forests in the city, there are ways to enhance these areas to create some of these characteristics or promote their development. Opportunities to enhance natural area parks are illustrated in Figure 6 and described below.

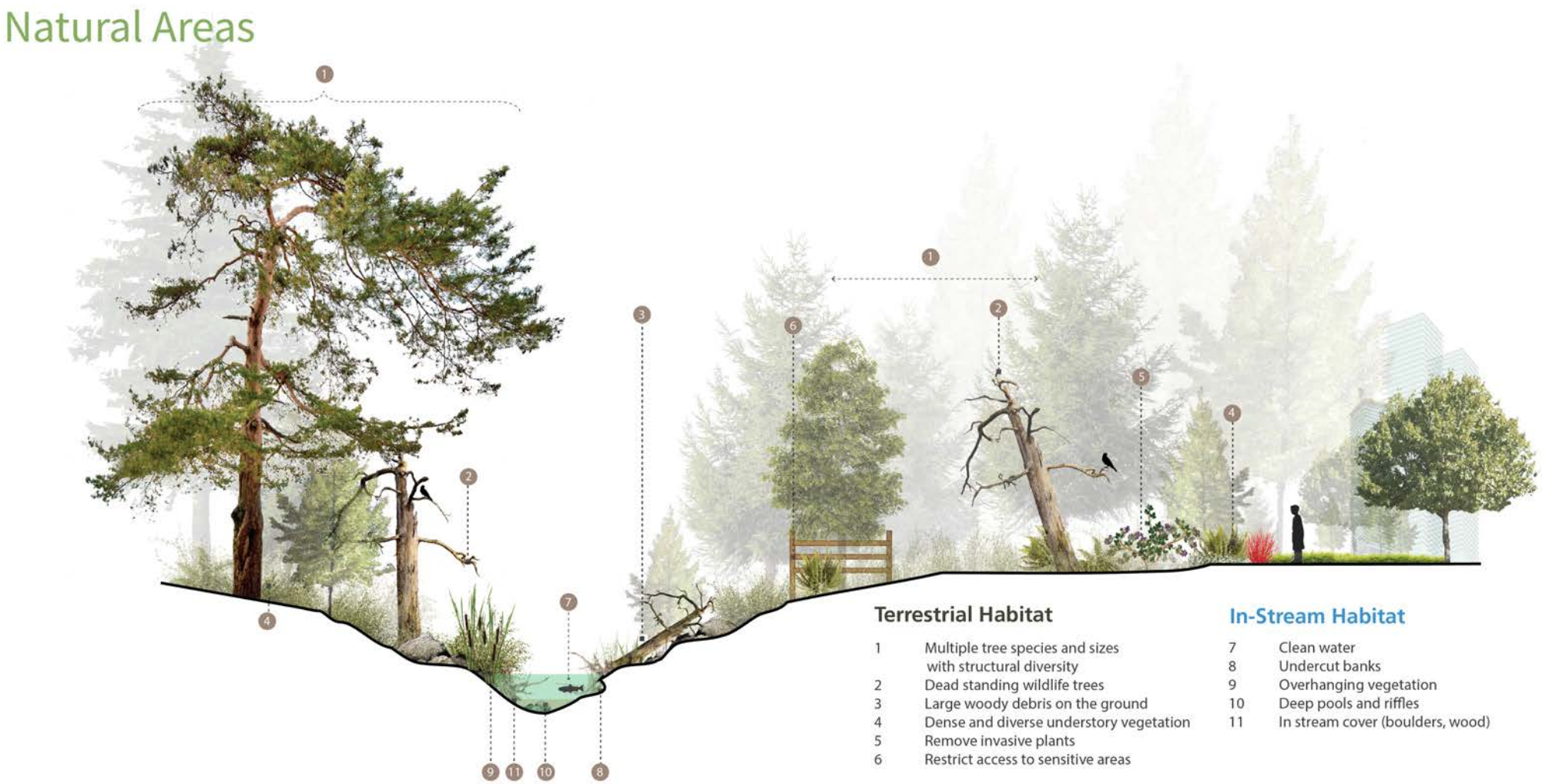


Figure 6. Enhancement opportunities in natural area parks.

Increase the diversity and size of trees and ground vegetation species

Most forests in New Westminster are dominated by pioneer deciduous trees and plant species that specialize in growing quickly after areas are disturbed. There are very few natural conifer dominated stands in the City. To increase tree species diversity, native conifer species should be planted. These should include those that are typically found in older forests, such as western redcedar, western hemlock, Douglas-fir, and Sitka spruce. Shrub species should be planted that have not yet established in these natural areas. Preference should be given to shrubs that provide forage and cover.

Protect wildlife trees

Dead and decayed trees provide high value forage and nesting habitat that is often missing from urban parks. Whenever possible retain and protect dead standing trees that do not pose a risk to people or property.

Install large woody debris on the ground

Large woody debris provides important cover habitat for small mammals and amphibians helping them to move safely across the forest floor. As logs decay they also create a variety of microclimates for plant species and act as nurse logs for a number of species that specialize in growing on organic mediums.

Enhance forest canopy structure

Where young forests are dense with little structural diversity and low ground vegetation cover, small openings can be created to allow light to reach the forest floor. This promotes ground vegetation growth. These openings also create forest edges that are favoured by many bird species.





Photo 21. Whenever possible the City retains the lower stems of trees when they must be cut. In Queen's Park a number of these have developed into high value wildlife trees.

Remove invasive plants infestations

Invasive plants generally overtake and dominate open areas. They provide low quality habitat and generally do not support high levels of biodiversity. Remove all invasive plants and replant with a diversity of native plants.

Restore unsanctioned trails

Human activity along unsanctioned trails degrade the forest floor, but some access to natural areas should be allowed. Some of the more unused trails should be closed (e.g., especially during nesting season) or restored back to a natural state but some of the more well-worn paths can be kept open to allow access.

Restrict access to sensitive ecology

Limit public and pet access to watercourses, wetlands and their riparian areas as well as any sensitive plant communities. This prevents trampling of high value habitat and helps reduce pet/wildlife conflicts. This can be done through a combination of light fencing (i.e. split rail), installation of thorny vegetation and educational signage.

Provide access to water

All wildlife requires safe access to clean water. Stormwater should be directed to run through natural areas in features that expose open water. The City will work with Metro Vancouver to encourage daylighting the stream under Glenbrook Ravine Park in the future when the combined sewer is separated.

Co-exist peacefully with urban wildlife

Citizens can peacefully co-exist with urban wildlife, from squirrels to coyotes. Larger animals, such as bears and cougars, are rare in New Westminster, but they can still travel through parts occasionally. Should wildlife become aggressive or are a safety concern, Provincial Conservation Officers should be notified and the City should work with the officers to plan for the humane relocation of individuals, if necessary. To report wildlife that is aggressive or causing property damage, the public may call the Conservation Officer Service.



Photo 22. The City leaves the stems of trees that have fallen. This example in Queen's Park shows logs that provide cover in an area with little understory vegetation.

Species Considerations

The larger natural areas in the City are where we can provide and protect habitat for the greatest number and diversity of species. In urban areas however, we recognize that there are some species that are not compatible with our modified environments. Larger mammals such as black bear, black-tailed deer and cougar require larger natural areas. In New Westminster, it is not recommended that these types of larger species be encouraged due to the limited natural areas and likelihood of conflicts with residents and pets. The natural habitat in the City is suitable to support a number of medium size mammals such as coyote, raccoon, weasel and skunks. These species live within natural areas and make use of adjacent developed areas. Certain animals that have very special habitat requirements such as beaver can inhabit natural areas but often cause conflicts including damage to infrastructure and flooding. We can support these animals in some areas while monitoring their activities. Small mammals such as mouse, vole, squirrel, shrew and mole can make use of small habitat areas within the Urban Matrix. However, they are often isolated and at risk by predators and human impacts. Flying animals including a range of birds, bats and insects are able to avoid some of the movement barriers in a City setting and make use of fragmented habitat. They can fly to areas to access water and food as well as cover for reproduction. These types of animals are well suited to inhabit our Cities with us.



Photo 23. Coyotes enjoying some sunshine adjacent to Hume Park.

Urban Parks

Many urban parks provide passive and active recreation for residents. These areas often have large open spaces with turf grass and patches of mature trees. Many have managed garden or landscape areas with defined borders. While the primary objective of these areas is to provide recreational opportunities for residents, there are opportunities in these areas to provide additional habitat for wildlife without compromising current uses.



Photo 24. The south end of Queen's Park supports a diversity of trees but with an understory of mostly mowed grass and invasive shrubs.

Queen's, Tipperary and Moody Parks are all urban parks that have areas that could be enhanced to provide habitat areas for wildlife. These parks have been identified as potential hub areas in the Green Infrastructure Network. These parks have areas with well established mature trees but often lack ground vegetation cover and water features. Enhancing the habitat in these parks can be strategically designed so that the amenities for people are not lost. Trees and shrubs can be planted in areas currently underused by visitors. Habitat features such as nest boxes, logs, wildlife trees and perches provide an opportunity for viewing wildlife. In many of these parks there is no access to water sources. Promoting the use of green infrastructure or the installation of water features will greatly enhance habitat for wildlife in these parks. Opportunities to enhance biodiversity within the City's urban parks are illustrated in Figure 7 and described below.

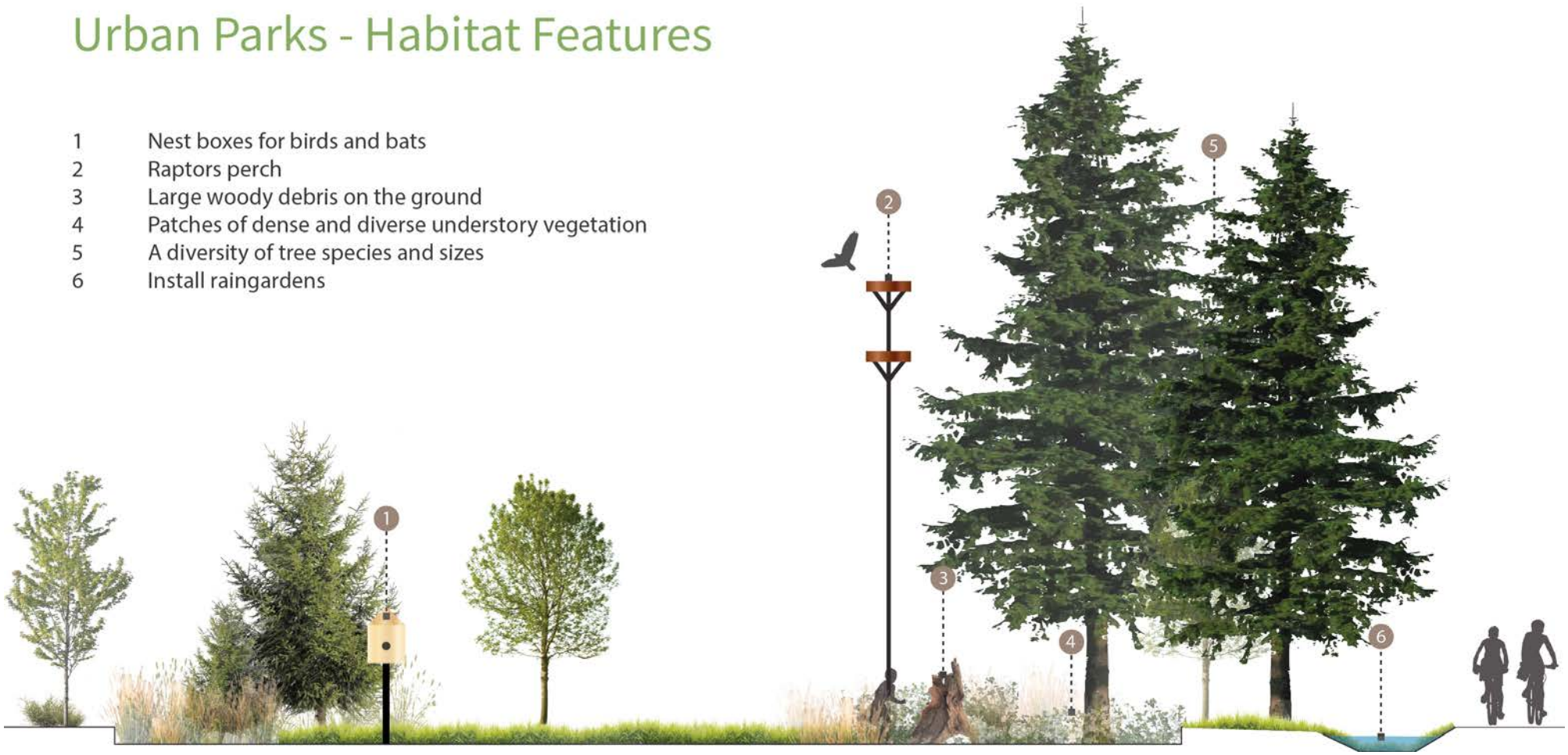


Figure 7. Enhancement opportunities in urban parks.

Protect mature trees

In many urban parks the root zones of mature trees are compacted, and surface roots can be damaged from the traffic of visitors and lawn mowers. The areas immediately around large high value trees should be converted to native ground vegetation. This promotes greater nutrient cycling for the tree and ensures its critical root system is protected.

Increase the diversity of trees

Many urban parks provide mature tree cover with few understory or regenerating trees. Plant shade tolerant trees in the understory to increase species diversity and improve vertical structure. Promote conifer species whenever possible.

Install large woody debris on the ground

Large woody debris provides important cover habitat for small mammals and amphibians helping them to move safely across the forest floor. As logs decay they also create a variety of microclimates for various plant species and act as nurse logs for plants that specialize in growing on organic mediums.

Increase the cover and diversity of ground vegetation species

Install patches of native understory vegetation. These can include small patches around mature trees, linear hedgerows along the perimeter of parks as well as larger patched designed as wildlife refuge areas. Connect this ground vegetation strategically through parks to support wildlife movement.

Install nest boxes for birds and bats

Urban parks usually provide little opportunities for cavity nesting birds or surfaces suitable for bats to roost. Install nesting boxes for birds and roosting boxes for bats. These provide good opportunities for wildlife viewing.

Remove Invasive plants and animals

Invasive plants can quickly overtake and dominate certain areas. They provide low quality habitat and generally do not support high levels of biodiversity. Remove all invasive species and replant with a diverse native plant community. Some wildlife species can establish themselves and outcompete native species. While sometimes difficult to eradicate, targeted efforts should be made to remove invasive wildlife species.

Install raptors perches

Many of the open grass and shrub areas associated with urban parks provide suitable hunting areas for raptors. Installing tall perches in strategic locations along forest edges will promote the use of these areas and provides opportunities for wildlife viewing.

Provide access to water sources

All wildlife requires safe access to clean water. Stormwater should be designed to expose open water or create wet soil conditions. Install small wetlands and ponds where possible. Promote the use of engineered stormwater features such as rain gardens.

Prevent toxins

Avoid the use of chemical treatments in parks including herbicide, insecticides, pesticides, fungicides, rodenticides and inorganic fertilizers.

Retain leaves for composting on site

In the fall, leaves that fall to the ground should be retained in parks and left to decompose, recycling nutrients and providing important organic matter input. These should be piled into natural parts of the park but should not exceed a depth of 30cm.



Photo 25. The northwest corner of Queen's Park supports mature trees but has little to no understory vegetation.



Invasive Wildlife

Along with native wildlife, urban areas also attract some species that did not originate from this region. These have traveled here, often with the help of humans, and successfully established themselves. They are highly adaptable and often will outcompete our native species. Examples of these species include Eastern gray squirrel, red-eared Slider (turtle), European starling, Norway rat and American Bullfrog. When planning to support wildlife these “Invasive” species can take advantage and outcompete our native wildlife.

Photo 26. Red-eared Slider turtles in the Glenbrook ravine pond.

Impacts of Rodenticide to Native Wildlife

Sometimes we want to keep pesky animals, like the invasive Norwegian rat, from our gardens and parks. Unfortunately, using anticoagulant rodenticides has had unintended consequences, and resulted in reports of poisoning of native wildlife in several BC municipalities. Invasive rats are used as prey by native raptors, including many owls, which contributes to natural population control of rats. Rodenticides have been found in the bodies of dead owls in Surrey, Delta, Coquitlam, on the north shore, and Vancouver Island. In July 2020, Saanich council voted to ban the use of anticoagulant rodenticides corporately. Changing municipal use of rodenticide is a good way to reduce the amount of toxin in the environment and creates awareness to encourage private landowners to use a similar approach.



Photo 27. Barred owls have been found poisoned in urbanised areas of BC.

City Streets and Boulevards

The majority of the Urban Matrix is a web of roads and boulevard areas that provide for public transportation and infrastructure. Roads consist of pavement with no vegetation and do not contribute towards supporting wildlife. The vehicle traffic they carry is often detrimental to wildlife, as it creates noise, light and a risk of collisions. The boulevard areas adjacent to roadways, however, provide an opportunity to contribute some habitat features and mitigate these impacts. These areas often consist of turf grass with little to no value for wildlife. Linear bands of trees, shrubs, pollinators, wet swales and ground cover allow some wildlife to move across the City.



Photo 28. Boulevard bioswale planting.

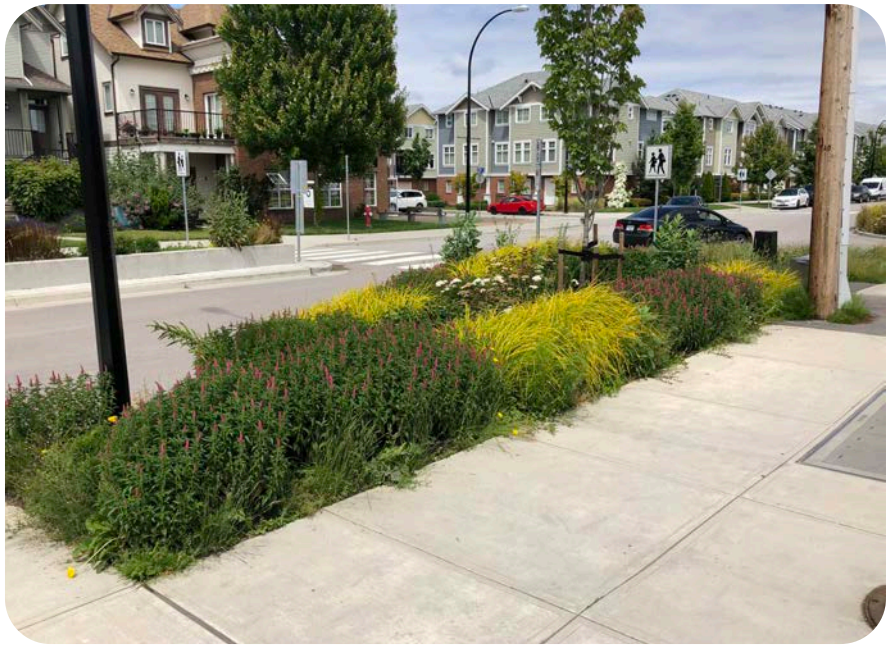


Photo 29. Pocket plantings along Ewen Ave in Queensborough.

The Master Transportation Plan (MTP) provides guidelines for the long-term planning of transportation through the City. One of the priorities of this plan is to promote walking and cycling. The MTP aims to provide a network of pedestrian and bike friendly greenways that connects to all key destinations of the City including the City's natural areas. These corridors provide opportunities not only for the transportation of people but for wildlife as well. There are plans to upgrade a number of greenways in the City that could offer opportunities to enhance habitat. These greenways include: Agnes Greenway (to be installed in 2021), Uptown Streetscape Vision and Rotary Crosstown Greenway (to be upgraded in 2022/23), which has been identified as a designated urban wildlife corridor in the Green Infrastructure Network for the City. As these greenways are planned and designed, they should incorporate habitat to support the travel of avian species, small mammals, and insects.

Enhancing city street and boulevards is also supported through the adopted Climate Action Budgeting Framework and seven bold steps that will help the City to achieve its goal of becoming a zero carbon city by 2050[18]. Creating a people-centered public realm will include the reallocation of 10% of the street space for transportation or public gathering, which must include the integration of the natural environment.

Many of the initiatives that aim to make walking and biking more enjoyable and safer will also enhance wildlife habitat. This includes boulevards or buffers between pedestrians and vehicles as well as narrowing crossings with the use of median islands and curb extensions. Street trees are also recommended to be incorporated into sidewalk designs to create better vehicle pedestrian separation, improve air quality and provide shade. The Tree Planting Master Plan supports these initiatives by providing targets and guidelines for planting trees on collector, arterial, local roads and greenways. Opportunities to enhance wildlife habitat in public realm and greenway design are illustrated in Figure 8 and described below.



Photo 30. Boulevard areas provide an opportunity to cerate linear habitat features such as this example along Crosstown Greenway.

[18] In 2019, the City adopted Climate Emergency Bold Steps #6 and #7: Robust Urban Forest and Quality People Centred Public Realm, respectively, to help guide climate change planning.

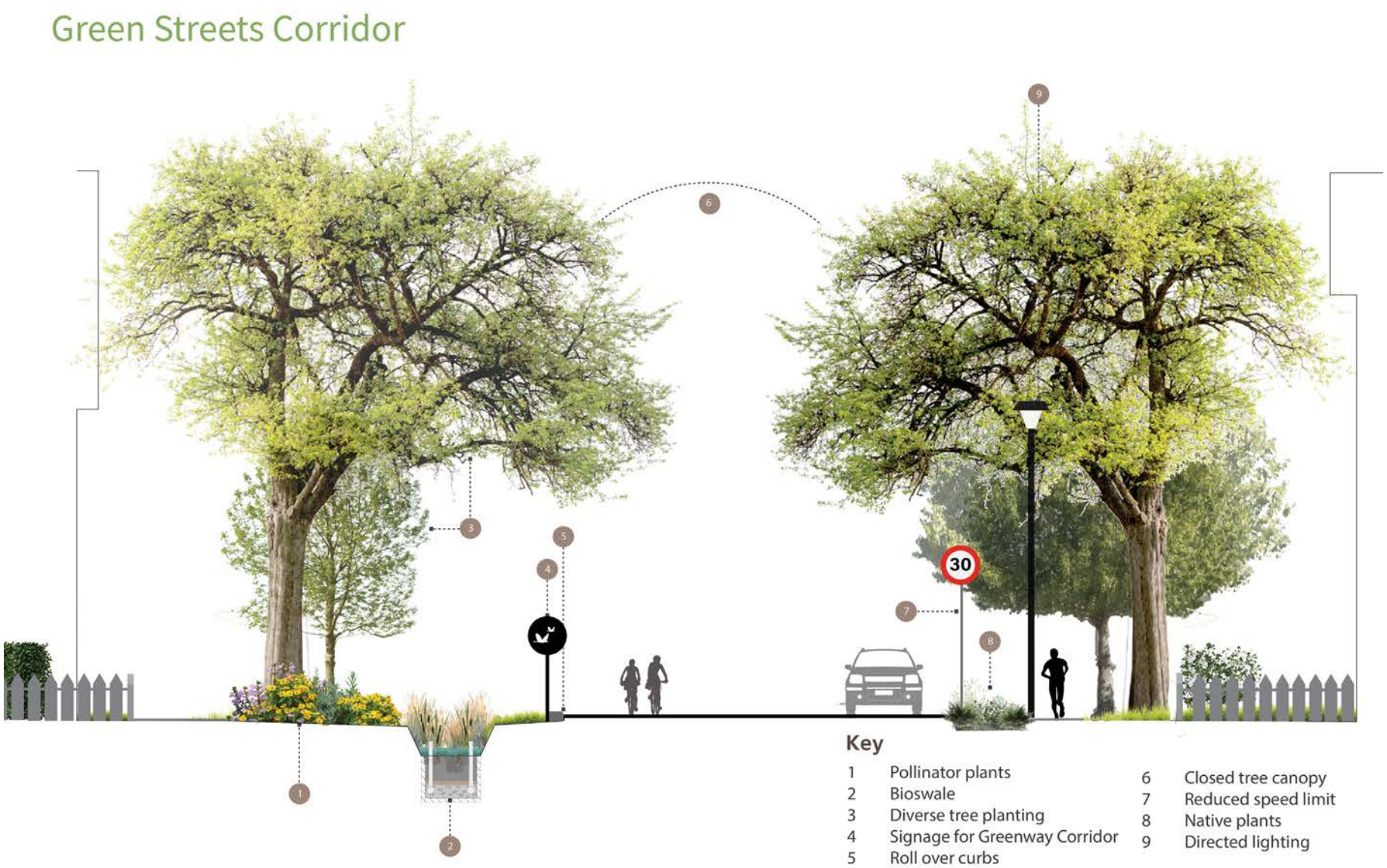


Figure 8. Enhancement opportunities along City streets and greenways.

Plant boulevard trees

Plant a diversity of tree species along streets and greenways. Follow the Tree Planting Master Plan for species selection. Some should provide nuts and fruits. A mix of canopy heights will also provide cover at different heights above the ground. Ideally tree canopies should touch across and along the street providing a continuous canopy.

Plant groups of ground vegetation

Most boulevards consist of mowed turf grass. Groups of ground vegetation will provide both cover and food. These should include drought tolerant species that are mostly perennial and provide pollen, fruit, nuts and seeds.

Encourage boulevard gardens

Residents should be encouraged to establish and maintain garden areas on the boulevards in the front of their residences. Guidelines can be developed that will ensure these meet the safety requirements for the roads and sidewalks.

Install habitat cover objects

Cover objects should be installed along boulevard areas in association with ground vegetation. Logs will provide cover and safe travel corridors as well as promote a greater diversity of plants. They can also help provide barriers between road traffic and pedestrians. Boulders and rock piles provide a different type of habitat cover that is not commonly found in the Urban Matrix.

Install street bump outs (i.e. curb extensions) with pocket and rain gardens

Install street bump outs and pockets of vegetation and/or green infrastructure for stormwater management. These can slow traffic and provide for narrower and safer street crossings for both people and wildlife.

Install green infrastructure to manage stormwater

Swales and small ponds along streets will promote natural infiltration of water into soils and provide a water source for wildlife. These can be linear or small depressions. They must be designed to be consistent with the requirements of the City's Integrated Stormwater Management Plan.

Avoid barriers along roads

Roads should be designed to allow for wildlife to travel across them. Roll-over curbs are preferred. Medians should be vegetated with no concrete dividers.

Install educational signage

Use educational signs and boards to notify public of the intent of the wildlife habitat being provided. Along GIN corridors, signs should be posted, vehicle speeds limits enforced. Road crossings can be identified with a distinct color on the pavement or icons of wildlife.

Install wildlife crossings

When roads are redesigned or upgraded in high wildlife areas, culverts could be considered to provide safe crossings for wildlife. The size should depend on which species are expected to use it, ideally at least 1 m tall and 2-3 m wide. Culverts should be straight, flush with the surrounding environment, with a natural substrate (non-metal) and have vegetated entrances and exits.

Control street lighting

Use light reduction techniques on streetlights where possible. This should include directional control and timing of lighting through the night. Install International Dark-Sky Association approved lighting fixtures for outdoor applications. Fencing and hedgerow plantings of conifers can also be installed to help block the light from traffic.

Increase soil volume and pervious surfaces

Tree and plant health is dependent on the volume and quality of soils that they grow in. Their roots require access to abundant water and nutrients. As opportunities arise, increase the volume and quality of soils along boulevards and promote pervious surfaces to allow water to soak into the soils.



Photo 31. Centre median and boulevard plantings recently installed at Ewen Ave and Boundary Road in Queensborough.

Residential Properties

As part of the Urban Matrix, residential properties which include single-family as well as townhouse type complexes managed by strata corporations, generally support a lower number of species. The species that tend to survive in these environments include those which are adapted to this altered, fragmented and discontinuous landscape. The types of wildlife that are best suited to inhabit these areas include those that are able to fly over built structures, hardscapes and barriers and are able to survive in smaller spaces and find food, water and cover to reproduce. Terrestrial species found in residential areas include coyotes, skunks and racoons that are able to move through neighbourhoods effectively, often traveling at night.

Of the birds, mammals and amphibians found in the lower mainland, only about 1/3 can be expected to make use of habitat within the Urban Matrix. The majority of these species are birds. In addition, there is a high diversity of insect species that are able to adapt to urban landscapes. While buildings often occupy a large portion of a residential property, there are a variety of options for enhancing the land around these structures. Installing habitat features, for instance, not only supports wildlife but can provide additional benefits to residents such as shading and cooling, noise mitigation and improved air quality. This enhanced space can also provide opportunities for wildlife viewing and encouraging time spent outdoors which promotes mental and physical wellbeing. Care should also be taken also reduce any risks or impacts to wildlife, such as window bird strikes, by incorporating bird-friendly window designs. Opportunities to enhance biodiversity in a typical residential yard are illustrated in Figure 9.

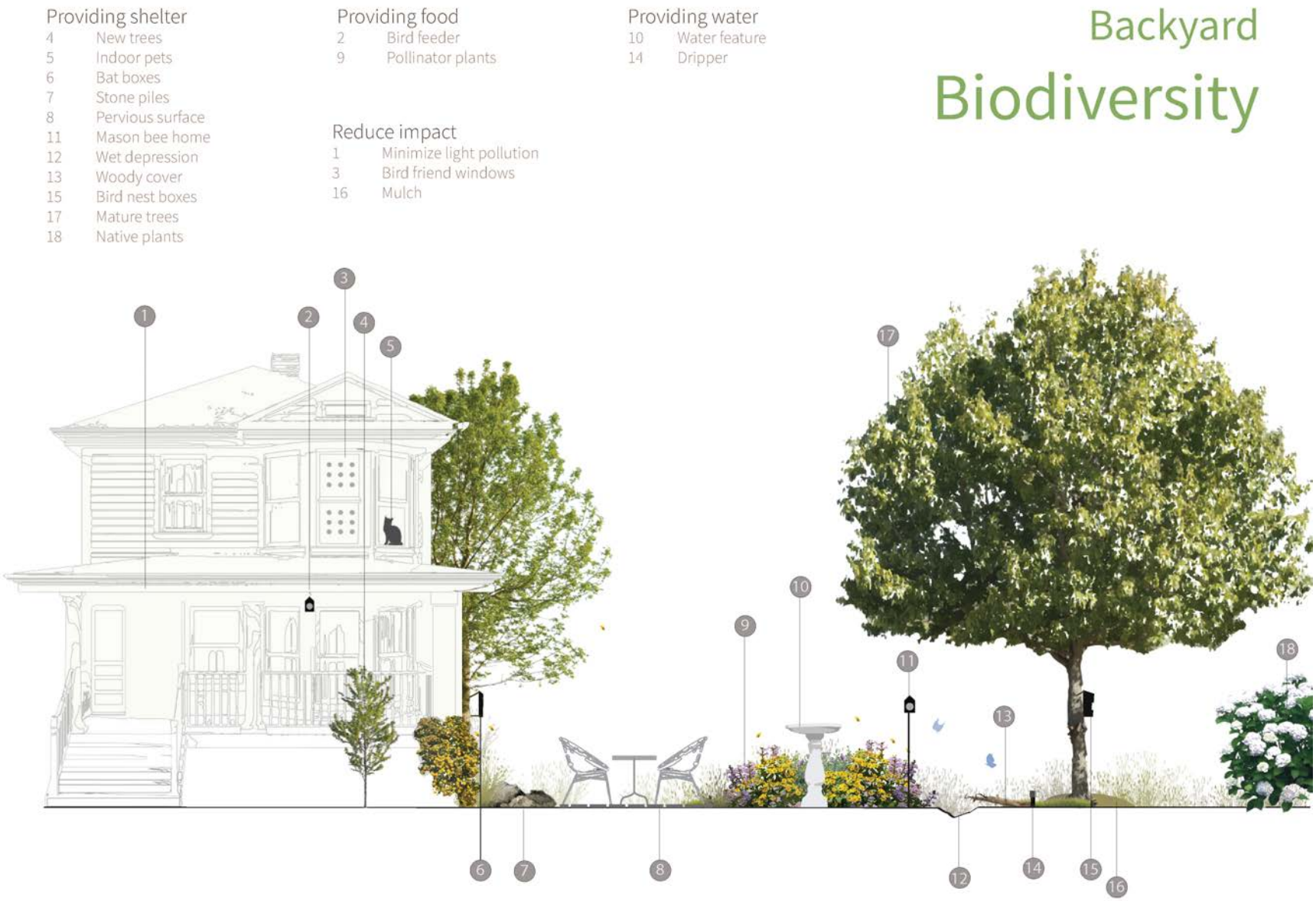


Figure 9. Enhancement opportunities in residential backyards.

Install bird nesting boxes

Birds are the most successful wild animals that inhabit the Urban Matrix. Forage and water are often available while suitable nesting sites can be a limiting factor for these species. In the wild, birds that require cavities to nest find suitable sites in dead standing trees, which are not commonly found within urbanized cities. Installing nesting boxes provides this nesting opportunity as well as wildlife viewing opportunities for residents.

Install bat boxes

Bats are important to the stability of the food chain, consuming about their body weight in insects every night. Many of our native species are considered at risk due to habitat loss and disease. They do require protected roosting sites that are warm, dry and safe. This can be provided for by installing bat boxes. These should be installed in open, sun exposed areas. Bat houses can be bought or homemade; refer to the BC Bats guide for Building Homes for Bats for designs and ideas. Supporting bats not only helps to protect them but also helps to control unwanted insects such as mosquitos.

Install a mason bee home

Pollinators such as mason bees are important components of ecosystems pollinating the plants that then produce seeds, berries and nuts to feed wildlife. Mason bee homes can be installed to provide shelter for wild bees, or native bee cocoons can be purchased and cared for to establish a colony at home.



Photo 32. Pollinator species can take advantage of smaller habitat areas such as backyard gardens.

Install a rock pile

Insects, small mammals, amphibians and snakes will use nooks and crannies to nest and hide from predators. Rocks will heat up during the day and provide warmth for coldblooded species and insects.

Provide mulch cover

Make use of all organic materials to provide piles that will decompose over time. These are used by microbes, insects, small mammals and amphibians. Many species of insects use organic materials in garden spaces to overwinter.

Plant trees

If there is sufficient space, plant large and mid-size trees. Include both deciduous and coniferous trees as well as those producing nuts and fruits.

Plant a shrub garden

Plant a garden of shrubs including a mix of deciduous and coniferous species. Provide some with nuts and berries as well as pollen producers. Preferably a large component of these should be native species which will be hardy and adapted to this climate.

Remove Invasive plants

Invasive plants are still sold in nurseries and used in landscaping. These can escape these gardens and spread to neighbouring area and parks. All invasive plants should be removed from residential gardens. Refer to Metro Vancouver's best management practices for invasive species - metrovancouver.org/services/regional-planning/conserving-connecting/invasive-species/Pages/default.aspx.



Photo 33. Enhancements in the Urban Matrix allow for many birds and insects to thrive.

Plant a pollinator garden

Plant herbs and shrubs that provide pollen for birds and insects. Provide a diversity of species that bloom at varying times throughout the year. Plant milkweed to help support Monarchs as this is the only plant that their caterpillars will feed on.

Install a water feature

Water is critical for all wildlife. Create a bird bath or pond and ensure it has fresh water especially through the summer months. Refresh this water on a regular basis.

Create a wet depression

Depressions which seasonally fill with water can increase the range of habitat types in your backyard. A different range of plants will grow in these areas. They will also provide habitat for aquatic insects which are important food for birds. Amphibians will also make use of these areas. In particular when it is drier out.

Install water drippers

Installing water drippers provides water for the many species which need moisture during periods of drought. This is an efficient way to provide an alternate water supply while minimizing evaporation and water waste.

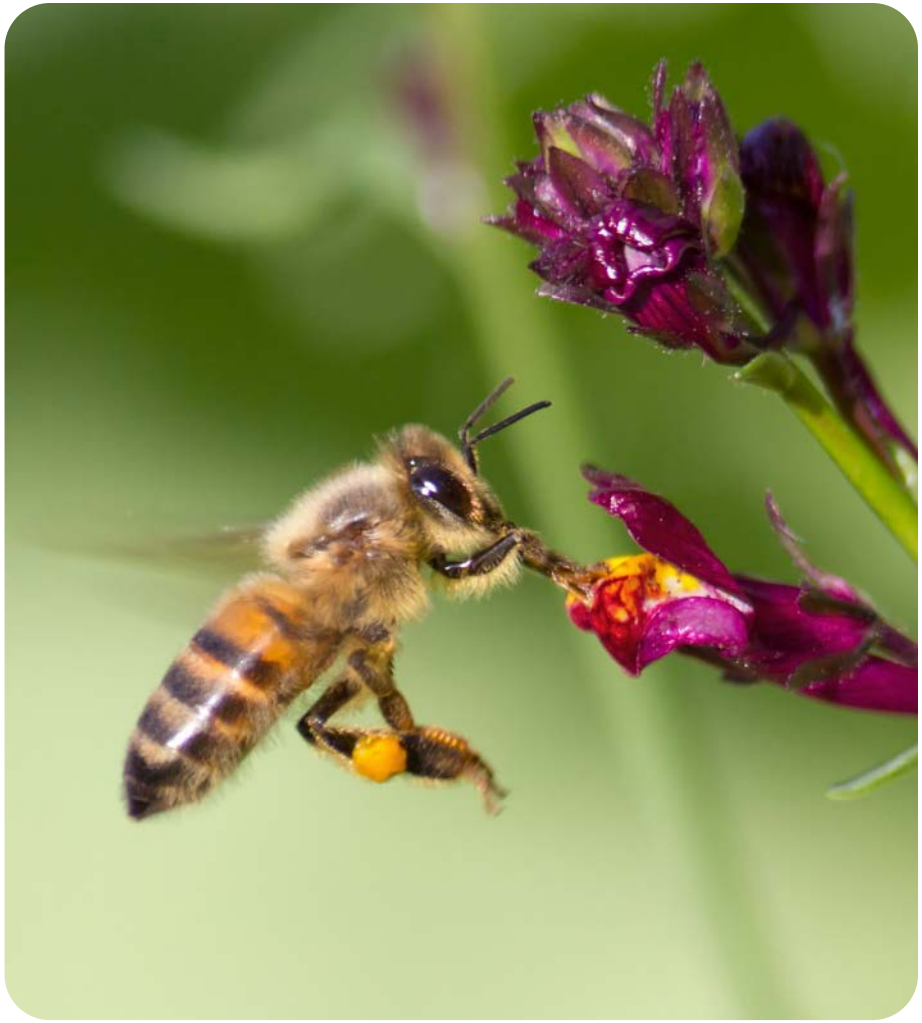


Photo 34. Home gardens can provide excellent food sources for pollinators

Provide woody ground cover

Leaving fallen branches or placing logs to decay on the ground can provide a diverse habitat for insects, fungi and foraging wildlife. Many plants, fungus and lichens specialize in environments without soil.

Install a bird feeder

Providing food for birds is one of the easiest ways to support them in our urban areas. Food sources should consist of seeds and nuts in as natural a state as possible. Different types of seeds will attract different bird species. Providing more than one feeder with different seed mixes will attract a greater diversity of birds to your yard. Clean these feeders regularly. Also ensure feeders are designed to minimize spilling which can attract and feed unwanted wildlife.

Install a hummingbird feeder

Provide nectar sources for hummingbirds. Homemade nectar is easy to prepare and does not require red dye to be effective. The increase in feeders in the lower mainland has improved the survivability of resident hummingbirds over the winter months.

Allow garden and grass trimmings to decompose

Allowing garden waste, grass trimmings and leaf litter to decompose in place allows natural cycling of nutrients and provides space for insects and birds to forage for food. Dumping of green waste from yards into natural areas or onto slopes or banks should be discouraged and communicated to residents.

Build with bird friendly windows and lighting

Design buildings and glass to reduce the potential for bird collision. This includes the installation of visual markers and managing reflections and light sources. Refer to the City of Vancouver Bird Friendly Design Guidelines, or equivalent guidelines, for design options.

Avoid the use of all chemicals

Do not use any chemicals in the yard including insecticides, herbicides, pesticides, fungicides and rodenticides. Use natural fertilizers and control techniques instead.

Keep cats indoors

Cats are aggressive predators that kill the birds and small mammals and amphibians. Ideally cats should be kept indoors, and in particular, during the most active nesting season of March to August.

High Density Development

Much of the development that is currently underway in the City increases density through the installation of high-rise buildings. This can reduce the potential land available for habitat. Creating habitat in these types of projects can be challenging because of the need to achieve multiple and often conflicting objectives within small tracks of land. The City has a few development permit areas (DPAs) and associated guidelines that development applicants are required to meet. Within these guidelines there is often support for protection of the natural environment and biodiversity; however, the details of what is expected to achieve is not well defined.

The development application process provides the opportunity to ensure that wildlife habitat is a consideration when planning new development projects. Even for areas that are developed, there are still many opportunities through redevelopment, landscaping and building retrofits to improve habitat. Where development increases density though height, there can be opportunity to protect some ground level area for habitat. There are also unused spaces on structures such as roofs and exterior walls that provide an opportunity to provide some habitat. Establishing vegetation on these surfaces provides a type of habitat that is often limited but can support birds and insects. Opportunities to enhance biodiversity in higher density developments where space is limited are described below.

Green Roofs and planters

Roofs are typically unused areas that are available to compensate for the structure's footprint on the ground. Green roofs provide habitat for insects and birds. Sedums and native grasses can be installed or planting plants in boxes. Rooftop gardens are a great opportunities to enhance biodiversity while engaging residents. Where possible, larger containers can be used to support trees on roofs or patio areas. Tree species should be carefully chosen that are adapted to small spaced and won't grow too large.

Plant trees

Planning to establish trees where there is available space provides habitat as well as shading for residents. Carefully consideration should be given to the species chosen as well as the size and space needed for root growth to keep it healthy over the long term.

Plant a native shrub or community garden

Ensure that a component of the landscaping includes a native garden with a mix of deciduous, coniferous and drought tolerant plants (xeriscaping). Consider providing some with nuts and berries as well as pollen producers. Creating spaces for community gardens, even on rooftops, should also be encouraged.

Install a water feature

Water is critical for all wildlife. Including a freshwater feature within the landscaping provides access to water throughout the year. Preferably this water would capture a reuse clean rainfall and not be supplemented by potable water.

Install habitat cover objects

Cover objects should be installed within the landscape in association with gardens. Logs will provide cover and safe travel corridors as well as promote a greater diversity of plants. Boulders and rock piles provide a different type of habitat cover that is not commonly found in the Urban Matrix.

Natural decomposition and grass alternative

Allowing garden waste, grass trimmings and leaf litter to decompose in place allows natural cycling of nutrients and provides space for insects and birds to forage for food. Require that contractors in charge of maintenance use organic materials for mulch in gardens. Microclover or native grasses can be planted as an alternative to a grass lawn. Dumping of green waste from properties into natural areas or onto slopes/banks should be discouraged and communicated to residents.

Build with bird friendly windows and lighting

Design buildings and glass to reduce the potential for bird collision. This includes the installation of visual markers and managing reflections and light sources. Refer to the City of Vancouver Bird Friendly Design Guidelines, or equivalent guidelines, for design options.

Avoid the use of all chemicals

Do not use any chemicals in the landscape including insecticides, herbicides, pesticides, fungicides and rodenticides. The City has a Pesticide Use Bylaw that regulates the use of pesticides for aesthetic purposes on residential and public land. Use natural fertilizers and control techniques instead.



Photo 35. Open common space associated with high density development offers opportunities for naturalized landscaping (DHC).

Guidelines for the Fraser and Brunette Rivers

The ecosystems adjacent to rivers, lakes and wetlands are some of the most biodiverse in the City. The regionally significant Fraser and Brunette Rivers are recognized for their ability to support a dynamic, rich community that includes both resident and migratory species of aquatic, avian and land animals. These rivers are agents of change, rich with nutrients and with the power to reshape the land. Wildlife are drawn to these rivers for food and water, and predators are drawn to these areas by an abundance of prey.

Restoring natural areas along these rivers will provide the greatest value for increasing biodiversity in the City. There are, however, significant challenges to address. These rivers are under the jurisdictional control of not only the City but also Metro Vancouver and the Vancouver Fraser Port Authority. The Fraser River is exempt from the provincial Riparian Areas Protection Act; however, the City requires a 30m setback from the top of bank for all new development applications. There has also been extensive industrial and urban development along the shoreline of these Rivers leaving limited natural habitat. Improving remaining habitat in these areas is often opportunistic and dependent on development planning negotiations with private landowners, industry and regulatory agencies. Despite these challenges, there are opportunities and considerations to enhance biodiversity in the riparian areas of the Fraser and Brunette Rivers.

Acquire and restore degraded land within 30 m of the Rivers

Much of the areas adjacent to the Rivers is disturbed or developed. As opportunities arrive, acquire lands and restore them to a natural state. Locate development footprints as far away as possible from these Rivers. The minimum riparian setbacks for these Rivers should be 30 m from their top of bank. This is in line with provincial Best Management Practices.

Remove invasive plants infestations

Invasive plants are prevalent along the riparian areas adjacent the Rivers. They provide low-quality habitat and generally don't support high levels of biodiversity. Remove all invasive plant species targeting the areas closest to the water and replant with a diversity of native plants. Avoid the use of herbicide for treatments within 1 m of the highwater mark. This work should be coordinated with efforts underway by Metro Vancouver.

Install artificial perches next to the Rivers for raptors

Install vertical poles with structures designed for raptors. These can include perch sites as well as potential nesting platforms. Species to target include red tailed hawk, bald eagle and osprey.

Install artificial nest boxes next to the Rivers

Install nest boxes for birds along the Rivers. These should be designed for a variety of species and spaced to avoid competition.

Restrict access to sensitive foreshore areas

Where the foreshore area includes wetland or floodplain interface areas, limit public and pet access. This prevents trampling of high value habitat and helps reduce pet-wildlife conflicts. Install permanent split rail wood fencing with educational signage along riparian setback areas.

Enhance instream habitat

Along the Brunette River, coordinate with efforts by Metro Vancouver to continue to install and maintain logs and boulders to create instream habitat features. Plant trees and shrubs along its banks to stabilize soils, create overhangs and provide shade, leaf litter and cover.

Stabilize and armour slopes using naturalized process

Stabilize any sources of erosion or bank instability. When designing erosion control measures along riverbanks for flood control, use green approaches whenever possible. Landscaping cloth or green bags made of polymer should be minimized as the material degrades into microplastics and can create a barrier to stormwater absorption. Organic alternatives such as coco matting should be considered. Consider reusing dredged material from the River for shoreline softening. These efforts should be coordinated with Metro Vancouver, DFO and/or the Port of Vancouver. Green Shores practices should be considered.

Reclaim and restore contaminated sites

Contaminants from industrial lands should be remediated as opportunities arise.

Create intertidal wetlands

Although structures are required for the management of flooding, explore opportunities as development is proposed to create intertidal wetland areas adjacent to these Rivers.



Photo 36. There are many areas along the Fraser foreshore that are dominated by invasive plants. These areas should be converted to native plant communities with continuous tree cover.



Photo 37. Artificial nest boxes provide valuable habitat for some species.

Recommended actions to enhance biodiversity by land use type:	
16	Enhance natural areas parks to create more structurally diverse, high value forests with water features to encourage use by species that require refuge from people.
17	Enhance public parks to create habitat areas integrated with passive recreation for species that coexist with people.
18	Integrate habitat features along City greenways and lanes to support birds, small mammals and insects.
19	Encourage all residential landowners including those managed by strata corporations to enhance open spaces (e.g., yard, balcony) to provide habitat for species tolerant of people and make changes around the home that will reduce impacts to wildlife.
20	Review development application process, guidelines and tools to ensure biodiversity is a key criterion for inclusion into high density development projects. Explore developing new policy or permitting requirements (or incentives) to increase green space areas and include more ecological plant alternatives.



Photo 38. The lower reaches of the Brunette River have narrow areas of riparian vegetation with extensive invasive species cover and few trees.

10.2 | Key Strategies to Enhance Biodiversity

Guidelines are provided in Appendix 1 for enhancing biodiversity for typical land uses found in the City. In addition to these and the ones provided in the previous section, there are a number of key strategies that the City can pursue that will help improve habitat value across the City.

Pollinator Gardens

Pollinators perform critical roles in our ecosystems, transferring pollen from plant to plant ensuring their reproduction and the production of fruits, berries and seeds. Pollinator species include many insects such as bees and butterflies, but also include birds such as hummingbirds. In the Urban Matrix, plant communities are fragmented and spread apart from each other. Pollinators are even more important in their role to keep these plants healthy. The presence of a healthy pollinator community is a good indicator of the health of an ecosystem.

Installing plant communities that support pollinator species will promote biodiversity in the city. The City has already installed three pollinator gardens in Queen's Park, Sapperton park and one is currently being installed at London and 22nd street. These have been successful projects that are also helping to promote public awareness of the importance of pollinator species. The City should continue to consider installing additional pollinator gardens in open areas of parks that are poorly used and on third party lands that may be vacant for a period of time.



Photo 39. Gardens designed for pollinators can be hardy and aesthetic.

Creating pollinator gardens should focus on native plant species that are known to produce ample pollen. It is also important to provide plants that flower throughout the seasons, from early spring to late fall to provide a food source when other flowers are no longer in bloom. Recommended native pollinator plants to be considered when installing these gardens are provided in Table 2.

Native Pollinator Shrubs		Native Pollinator Herbs	
Acer circinatum	Vine maple	*Asteraceae sp.*	Asters
Amelanchier alnifolia	Saskatoon	*Lonicera ciliosa*	Western trumpet honeysuckle
Cornus sericea	Red-osier dogwood	*Phacelia linearis*	Threadleaf phacelia
Gaultheria shallon	Salal	*Aquilegia formosa*	Columbine
Holodiscus discolor	Oceanspray	*Allium schoenoprasm*	Chives
Mahonia aquifolium	Tall Oregon grape	*Dicentra formosa*	Pacific bleeding heart
Mahonia nervosa	Dull Oregon grape	*Fragaria virginiana*	Wild strawberry
Philadelphis lewisii	Mock orange	*Camassia leichtinii*	Great camas
Ribes sanguineum	Red-flowering currant	*Lupinus nootkatensis*	Lupine
Rosa gymnocarpa	Baldhip rose	*Equilobium angustifolium*	Fireweed
Rosa nutkana	Nootka rose	*Heliopsis helianthoides*	Ox-eyed sunflower
Rubus parviflorus	Thimbleberry	*Digitalus purpurea*	Foxglove
Rubus spectabilis	Salmonberry	*Aster conspicuus*	Showy aster
Salix sp.	Willow (Pacific, Scouler, Sitka)	*Solidago Sp.*	Goldenrod
Sambucus racemosa	Red elderberry	*Fragaria vesca*	Woodland strawberry
Symphocarpos albus	Snowberry	*Eriohyllum lanatum*	Woolly sunflower
Vaccinium parvifolium	Red huckleberry	*Anaphalils margaritacea*	Pearly everlasting
Erica sp.	Heather species	*Achillea millifolium var. lanulosa*	Western yarrow
Corylus cornuta	Beaked hazelnut		
Malus fusca	Pacific crabapple		
Rubus ursinus	Trailing blackberry		

In addition to providing nectar, pollinator gardens should provide homes for pollinators. Native bumblebees can nest in rock piles, organic debris or nests abandoned by other species such as birds. Mason bees make their homes in natural holes or those in wood that have been created by other insects. Ground nesting bees or even overwintering bumblebee queens can be at risk from trampling. When identified, ground nesting sites should be fenced off and protected.

Butterflies have two life stages which have different requirements: mature butterflies require nectar and caterpillars requires foliage. When designing pollinator gardens the City should consider the following:

- Install pollinator plants in areas away from traffic
- Install nesting habitat for bees including tall grass, wood piles, and protected ground with hard packed clay textured soils
- Leave areas with tall grasses through to summer
- Install signs in areas where ground nesting bees are inhabiting
- Provide wet depressions or swales for access to water



Photo 40. Hanging baskets in Queen's Park and Fraser River walkway



Photo 41. Mason bee house.



Photo 42. A pollinator garden installed in Queen's Park.

Pop-up Plants for Pollinators!

Where space is limited, temporary pollinator gardens can be installed for the growing season in planters. In the City of West Vancouver, planter boxes are installed for the summer months along greenways. Here, they play multiple roles creating breaks between pedestrians and bikes, enhancing the landscape and providing habitat and food for wildlife. New Westminster installs hanging planters in public spaces which provide nectar in some areas of high density.

Photo 43. Example of annual planters supporting pollinators along West Vancouver's Ambleside Greenway.



Rain Gardens and Green Infrastructure

One of the critical and limiting factors restricting species survival in urbanized environments is access to water. All life on earth requires water at some point in their life cycle. Providing opportunities to access water in the City greatly enhances biodiversity and installing raingardens can be a good strategy[19].

Green infrastructure (GI) is a term used for more naturalized designs to manage stormwater in urban settings. It typically includes both engineered and natural components that mimic natural water flow and promote rainwater infiltration. These can provide valuable sources of water even at a small scale. The City has successfully incorporated raingardens into recent designs for parking lots and roadways. Whenever possible, open water features are encouraged to support species. This will also help the City to achieve its goals to adapt to climate change as raingardens can reduce the risk of flooding.



Photo 44. A rain garden installed at Queen's Park.

[19] Installation of these types of features must consider the requirements, guidelines and BMPs within the City's Integrated Stormwater Management Plan (ISMP).

Supporting Monarch Butterflies

The endangered Monarch butterfly is migratory, overwintering in California and spending summers farther north throughout the US and Canada. They are highly dependent on milkweed, which provides both habitat and food source. The Monarchs can only lay their eggs on this plant, which the caterpillars then feed on after leaving their cocoon. Planting milkweed in accessible areas is the best way to support this species.



Photo 45. A Monarch butterfly on milkweed.

Most rain gardens are designed with the objective of retaining water, allowing water to infiltrate naturally for a period of time before overflowing to a stream or the grey infrastructure systems. To benefit wildlife, raingardens should be designed with a depressed bottom that promotes exposed water or saturated topsoils. This allows for a greater diversity of plant species to survive including many wetland species that are absent from the urban landscape.

Rainwater can also be a source of pollutants as rain runs across urban landscapes picking up and carrying pollutants to downstream waterbodies. Conveying rainwater into raingardens or other green infrastructure facilities helps to filter out these pollutants. Future development should include stormwater design features that will protect water quality, fish and wildlife habitat, and overall watershed health. The City should encourage development to qualify for Salmon-Safe certification[20].



Photo 46. A rain garden installed in a new parking lot in Queen's Park.

[20] https://salmonsafe.org

Naturalizing the City's Cemetery

The City-owned Fraser Cemetery is a large open space with fragmented hedgerows and open grown trees. While this space is designed for memorial services, the enhancement of natural features can be complimentary. The perimeters of the Cemetery could be enhanced with hedgerow plantings to provide movement corridors. Pollinator gardens could be designed to provide habitat while improving landscaping for visitors. Water features could be installed, including green infrastructure to manage stormwater.



Photo 47: The City of Vancouver has installed pollinator gardens at Mountain View Cemetary.



Photo 48. The perimeter of Fraser Cemetery (left) offers opportunity for installing hedgerows and pollinator gardens.

Drainage Ditches

Access to water is critical for all wildlife species and is often a limiting factor to survival in urban areas. Ditches, while created to manage stormwater, provide a needed source of water in urban areas. In the Queensborough area, in particular, there are many open ditches and sloughs that retain open water throughout the year due to the high-water table. Due to the soil conditions in this historic floodplain of the Fraser River, water quality is generally poor to support aquatic species. However, they provide water for wildlife such as amphibians or insects that are an important part of the food chain.

As this area is developed, many ditches are slated to be enclosed and replaced with buried pipes. Whenever possible it is recommended that certain watercourses be retained and enhanced for wildlife as ground cover and forage adjacent to water allows for many smaller mammals, amphibians, and insects to thrive. The width of an enhancement area can be as narrow as 2-5m and still provide valuable habitat.

Naturalizing ditches can also improve the water quality in the ditch. For instance, prioritizing plantings on the south side of a ditch would create shade which could help keep the water cool.

Most ditches are mowed on both sides to ensure water can flow and it allows the City to access the ditch for maintenance. Planting a native plant community, in a safe manner, on at least one side of a ditch would create valuable habitat for wildlife. Planting continuous shrubs along these features could also discourage harmful dumping of household waste.



Photo 49. Ducks in Queensborough.



Photo 50. The privately owned side of this ditch supports a dense hedgerow which provides high value habitat for wildlife.



Photo 51. On City owned lands, one side of ditches sould be naturalized for 2-5m back from the ditch bank (DHC).

Reclaiming Unused Lands

There are right-of-ways that follow major highways and arterial roads as well as vacant lands on properties controlled by BC Hydro, TransLink and railways that provide an opportunity to provide habitat throughout the Urban Matrix. Many of these areas are dominated by grasses and invasive shrubs; however, these areas could be enhanced to support plant communities and habitat features that support wildlife while still ensuring the objectives of sight lines and maintenance are met. There are some stormwater retention ponds in Queensborough along Highway 91 that were constructed within these right-of-ways. These support a high level of biodiversity. These areas are mostly managed by the Ministry of Transportation so the City would have to coordinate with the Ministry on the design, installation and maintenance of any new ponds and wetlands created. There are opportunities associated with the Pattullo Bridge replacement project to incorporate habitat features along right-of-ways and the planned land bridge that will span the bridge infrastructure.

Recommended actions related to key enhancement strategies:	
21	Install additional pollinator gardens in open spaces, vacant and underutilized areas of land within city parks and the public realm.
22	Explore opportunities to enhance habitat within the City's Cemetery including pollinator gardens, water features and potentially hedgerows.
23	Install raingardens or other green infrastructure facilities when upgrading infrastructure in the City and encourage installations as part of new development.
24	Install habitat adjacent to designated open channels and sloughs in Queensborough.
25	Partner with external organizations to enhance habitat on unused land (e.g. right-of-ways).



Photo 52. A storm water pond exist along Highway 91 that has been left to naturalize. This feature is an example of a high value habitat that can be created from a right-of-way.

11 | Priority Strategies by Neighbourhood

New Westminster is a City of neighbourhoods, each with their own history, character, varying state of urbanization and development pressure. In order to develop strategies that are meaningful to the various neighbourhoods across the city, it was important to first group similar planning areas. Four neighbourhood groupings were developed that are consistent with those identified in the City's Tree Planting Master Plan 2020-2030 (2019)[21]:

- Queensborough
- Brow of the Hill and Downtown
- Massey-Victory Heights, Brunette and McBride Sapperton
- Connaught Heights, West End, Moody Park, Glenbrook North and Queen's Park

Each neighbourhood grouping was ranked for level of biodiversity. Based on this, a set of priority strategies were developed for each. Neighborhood groups and their associated biodiversity ranking is illustrated in Figure 10. A set of priority strategies were developed for each neighbourhood to reflect how best biodiversity can be improved in the grouping.

[21] In the Tree Planting Master Plan these groupings of neighbourhood had similar needs with respect to tree canopy cover which can be considered a good indicator of biodiversity.

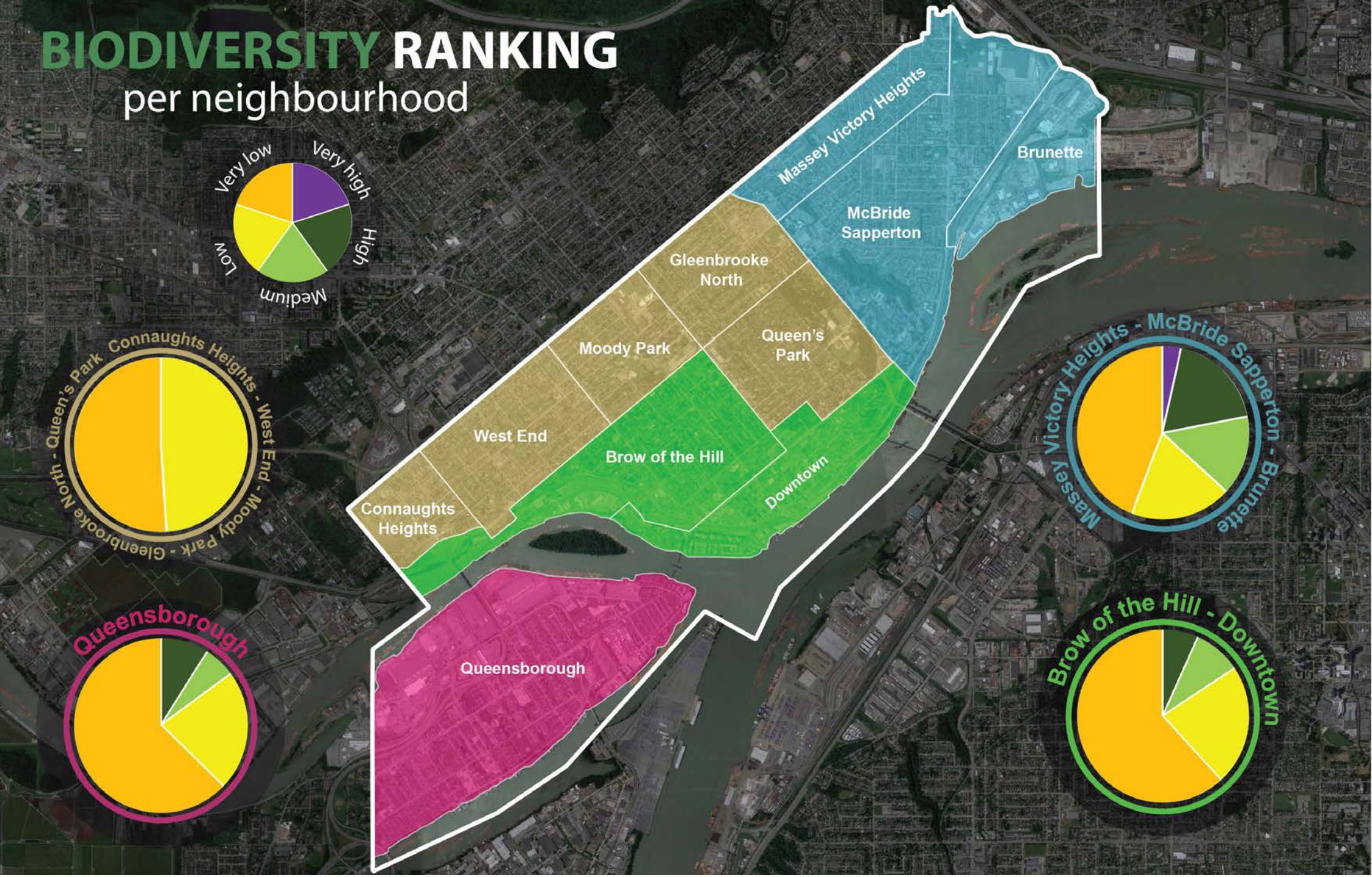


Figure 10. Biodiversity levels by neighbourhood group in the City of New Westminster.

11.1 | Queensborough

Queensborough is a diverse neighbourhood of single-family homes, more recent multi-family and high-rise development, and some industrial and commercial areas. Sitting at the eastern end of low-lying Lulu Island, this area has a high water table. Much of the land here is drained by open ditches and channels with pumping stations to manage water levels. The topography is flat as this area was a natural lowland floodplain of the Fraser River prior to urbanization. In its natural state, this area would have supported high levels of biodiversity. The forest and shrub community would have been dense, dynamic and highly productive, growing on the rich and wet soils. There was a complex network of channels and wetlands throughout that would be continually evolving as the water levels in the Fraser River changed throughout the year. This active ecosystem would have attracted a wide range of wildlife from all levels of the food chain.

Most of the habitat currently found in Queensborough provides lower levels of biodiversity. Grass and invasive shrub cover combine to ~65% of the total available habitat for wildlife. Deciduous and mixed forest (~14%) is found growing mainly along the Fraser River foreshore at the south side of the island. This south side supports some high value Fraser River wetland areas. These interface wetlands are less common in the Region as the banks of the Fraser River have been historically armoured for flood control and industrial activity. Maintained gardens provide non-native habitat value and are mostly associated with strata developments and the well-established Port Royal Community Garden. These gardens provide habitat features for urban-tolerant wildlife and help to support pollinators. Tree canopy cover was found to be 6% in 2016, much less than the City-wide average of 18%.



Photo 53. Many of the drainage features in Queensborough are open-air with pump stations to control water levels. The riparian areas of these features are mostly mowed grasses that provide low habitat value.

Priority #1 – Restore the Fraser River foreshore

Queensborough is surrounded on three sides by the Fraser River and has the longest sections of shoreline with the potential to be naturalized and enhanced. While some areas exist as natural wetlands, much of this shoreline is disturbed, modified, or infested with invasive plant species. Many areas of the foreshore are not under the City's jurisdiction. Through future development planning, the City should prioritize the acquisition or covenant of the areas within 30 m of the Fraser River.

Where the City owns disturbed areas of this foreshore, restoration efforts should remove waste, mitigate invasive plant species, and restore native plant communities. Habitat features should be installed in these riparian setbacks including wildlife trees, raptors perches, large woody debris and nesting boxes for bats and birds. Restoration work must consider requirements to maintain existing dikes and armouring. The Green Shores[22] program provides references to help naturalize flood infrastructure. Work on the foreshore that extends below the high water mark must be coordinated with the Vancouver Fraser Port Authority and the Department of Fisheries and Oceans.



Photo 54. Areas of the Fraser River foreshore are highly disturbed with waste and invasive species.

Priority #2 – Enhance tree cover

Queensborough has a relatively low tree cover of approximately 6%. Priority areas for increasing tree cover to support biodiversity include all areas within 30 m of the Fraser River and the proposed GIN corridors. Secondary priorities should include the edges of Ryall Park and along the slough that runs through Thompson's Landing Park.

[22] https://stewardshipcentrebc.ca/green-shores-home/gs-programs/

Priority #3 – Increase the cover of natural area habitats

There is little available natural forest habitat in this neighborhood. Areas dominated by invasive shrubs and urban trees should be converted to mixed forest types and managed lawn to pollinator meadows. Opportunities exist along the perimeter edges of existing parks and some roadsides. Priority areas include those along the proposed GIN corridors and in Ryall Park.

Priority #4 – Protect and enhance red and yellow coded open ditches and sloughs

There are numerous open ditches and sloughs that provide access to water for wildlife. Most of these are maintained and have banks that consist of mowed grass. Red and yellow-coded ditches and sloughs must be protected (e.g., Riparian Area Bylaw) and where possible, the banks restored to a native plant community. Priority for restoration should be the south or west sides of ditches, which will increase shading to these watercourses.

Restoration must consider land ownership as well as City operations related to the maintenance of ditches. Prescriptions should consider shrubs and plants that are able to regrow after mowing such as willow and dogwood species.



Photo 55. Much of the habitat in Queensborough, such as in Ryall Park, consists of mowed grass and urban trees with little ground cover.



Photo 56. The riparian areas along red-coded ditches are generally poor habitat consisting of mowed grass.

[22] https://stewardshipcentrebc.ca/green-shores-home/gs-programs/

11.2 | Brow of the Hill and Downtown

These areas are the oldest areas of the City and include the south-facing slopes over the Fraser downstream of the Pattullo Bridge. The land use in the downtown area consists mainly high-density residential and commercial use. The southwest area of Brow of the Hill along the Fraser foreshore supports industrial activity, including a forest products mill and several railyards. These are active and densely urbanized neighbourhoods that provide little natural habitat for wildlife. Tipperary Park is the only large City-owned parcel in this area and consists mostly of urban trees growing over turf grass and gardens. This park does have a constructed stream and pond complex providing well-needed access to water for the wildlife that do inhabit this park.

Park areas of managed grass and urban trees make up about half of the habitat inventoried in this area. There is ~20% cover of shrub including mostly invasive species growing along the edges of industrial right-of-ways. The Waterfront Esplanade along the Fraser River provides little habitat due to armouring of this foreshore area and constructed piers and boardwalks. The Fraser foreshore area to the west of the Esplanade, is somewhat natural at Muni Evers Park where there is a 20-30 m wide deciduous forest adjacent to the River. The foreshore west of this is highly industrial with little natural habitat. Tree canopy cover in this area, calculated in 2016, was low at 10%.

Photo 57. Much of the Fraser River foreshore is densely developed with little habitat value.



Priority #1 – Restore a habitat hub at Muni Evers Park

At the Quayside Dog area there is a narrow band of deciduous trees growing adjacent to the Fraser River then bordered by a large field. This area should be restored to a habitat hub area within the GIN. The area extending north 50 m from the Fraser River should be restored to a native mixed forest riparian community. An intertidal wetland should be constructed within this field connected to the Fraser River. This area has the potential to become a highly diverse natural area that would form a key component of the GIN. These opportunities must consider current plans to install affordable housing in this area as well as flood control infrastructure.

Photo 58. There is an opportunity to create a high value habitat hub along the Fraser River at the Quayside Dog Park.



Priority #2 – Naturalize the Fraser River Foreshore

The Fraser River foreshore area that extends along the mainland has been highly disturbed from its natural state through a history of armouring for flood control and industrial activity. A large part of this foreshore is established as public parks such as the Westminster Pier and Waterfront Esplanade. Naturalization of these developed areas is challenging. However, some habitat features would enhance these areas, which are readily used by many bird species. Wherever possible small pockets of native vegetation and trees should be established. These can be within containers or engineered structures within areas of continuous rip rap along the Fraser River foreshore.



Photo 59. Many areas along the foreshore consist of rip rap and invasive plants.

Priority #3 – Enhance Tree Cover

Tree cover in these neighbourhoods is low at 10%. Priority areas to support biodiversity include all areas within 30 m of the Fraser River and the proposed GIN hub at the Quayside Dog area and the part of the BC Parkway that connects this hub north to the SkyTrain right-of-way.

Priority #4 – Establish a native shrub community under the SkyTrain

The right-of-way under the SkyTrain through this area generally consists of low value habitat. Much of this area is turf grass with pockets of gardens and invasive shrubs. This has been identified as an opportunity for a corridor to extend through the west side of the City connecting Poplar Island to the Byrne Creek natural area in Burnaby. The areas under the SkyTrain are under the jurisdiction of the Translink. They cannot be forested due to overhead conflicts however could be restored to a linear dense shrub community. Restoration efforts in these right-of-ways would need to be coordinated closely with Translink.



Photo 60. Many areas under the SkyTrain consist of grass or invasive shrubs providing low habitat value.

11.3 | Massey-Victory Heights, Brunette and McBride Sapperton

These areas are well-established areas dominated by single-family homes. Sapperton also features multi-family housing development and a commercial high street. The high-density community of Victoria Hill is located west of Glenbrook Ravine and the border with adjacent Queen's Park. Brunette includes commercial and industrial lands adjacent to the Brunette and Fraser Rivers. This area includes Hume Park, which is adjacent to residential and industrial areas. The railway parallels the Fraser through this area, separating uphill residential neighbourhoods from industrial lands on the historic floodplain.

There is a healthy diversity of habitat features found in this area. The Brunette River is a significant natural feature that defines this neighbourhood's character. It supports a diversity of aquatic and terrestrial species including one of the remaining critical habitat areas for the endangered Nootsack Dace. Hume Park is a core habitat area along the north end of the Brunette River, containing some of the most naturalized lands in the City. A native mixed-wood forest is protected within the park. There are some trees of significant size in this park. As the Brunette River flows from Hume Park, towards the Fraser River it becomes more disturbed and impacted by industrial development. The Fraser River foreshore in this eastern part of the City is disturbed from a long history of industrial development; however, a small linear regional park (Sapperton Landing Park) owned by Metro Vancouver has been preserved along the River for wildlife habitat. Glenbrook Ravine Park is a large natural area park and is one of the City's core habitat areas. Recent efforts to enhance the natural integrity of this park have included invasive species removal and native species replanting.

Forests makes up about 1/3 of the habitat in this area mainly within Hume and Glenbrook Ravine Parks. Managed grass and urban trees are common making up ~45% of the habitat within this neighbourhood group and is found within the cemetery, smaller parks and throughout the Victoria Hill area. Invasive shrubs are common in the industrial areas and along the railway right-of-way. Tree canopy cover in these neighbourhoods was overall relatively high at 19% in 2016. However, there was little tree cover in the industrial areas between the Brunette and Fraser Rivers.



Photo 61. Riparian area of Brunette River in Hume Park.

Priority #1 – Restore the riparian areas of the Brunette River

Most of the Brunette River's riparian zone is disturbed by historical industrial development, infrastructure and invasive plant species downstream of Hume Park. Through future development planning, the City should prioritize the acquisition or covenant of the areas within 30 m of the Brunette River. Where the City owns disturbed areas of this backshore, restoration efforts should remove waste, mitigate invasive plant species, and restore native plant communities. Habitat features should be installed in these riparian setbacks including wildlife trees, raptors perches, large woody debris, and nesting boxes. Restoration efforts must consider jurisdictional influences in this area including the Ministry of Transportation, TransLink, rail agencies and Metro Vancouver.

Priority #2 – Restore the Fraser River Foreshore

The Fraser River shoreline is highly disturbed extending along an industrial area and the railway. It has been modified by industry and infested with invasive plant species. In addition, many areas of this foreshore are not under the City's jurisdiction. Through future development planning and consultation with regulatory authorities, the City should prioritize the acquisition or covenant of the areas within 30 m of the Fraser River. Where the City owns disturbed areas of this foreshore, restoration efforts should remove waste, mitigate invasive plant species and restore native plant communities. Habitat features should be installed in these riparian setbacks including wildlife trees, raptors perches, large woody debris, and nesting boxes.

Photo 62. Many areas within the riparian zone of the Brunette River are highly disturbed and could be restored to a healthy plant community.



Priority #3 – Establish Hume and Glenbrook Park as invasive species free zones

Efforts have been underway and should continue to remove invasive plants from Hume and Glenbrook Ravine Parks and restore these important areas to natural plant communities. Adopt and promote these areas as invasive species free zones.



Photo 63. There are some large areas of invasive Blackberry that threaten the integrity of Glenbrook ravine.

Priority #4 – Restore natural floodplain ecosystems within the Hume Park lower baseball field

This field was a historic floodplain for the Brunette River. Recent restoration efforts have established native planting along the Brunette River. This riparian zone should be extended back to 30 m. The existing walkway could be retained within this setback. At the south end of the field there is a perimeter ditch. This should be turned into a linear wetland complex that connects to the river and receives floodwater. This work can be integrated with the development of the Hume Park Masterplan.



Photo 64. The southern ditch of the lower baseball field could be enhanced to a wetland complex.

11.4 | Connaught Heights, West End, Moody Park, Glenbrook North and Queen's Park

These neighbourhoods consist mainly of high-density single and multi-family residential and commercial buildings. The developed areas in these neighborhood provide little natural habitat. There are two significant park areas. Moody Park is a large park in the Uptown area and consists mainly of urban trees with turf grass. Queen's Park is the largest urban park in the City with a high tree cover, but a highly disturbed understory. Most of the habitat found in this neighborhood group consists of urban trees and turf grass which combine to provide 97% of the inventoried habitat. There are restoration efforts underway in the northeast part of Queen's Park. Tree canopy cover from 2016 was calculated as 21%.

Priority #1 – Recognize and restore areas of Queen's Park as a habitat hub

Queen's Park supports extensive areas of tree cover with small pockets of understory vegetation. Large areas of the forest understory are highly disturbed and consist of compacted areas or grass. Forested area has potential to provide a high level of biodiversity if restored. The treed area between the stadium baseball fields and Royal Avenue as well as the forest area in the northwest area along 1st Street should be declared wildlife refuge areas and enhanced with native understory shrubs, plants and shade tolerant trees. These areas could be fenced off to discourage entry by people and pets and a trail identified adjacent to the area for access.

Priority #2 – Create a wetland/pond complex in Queen's Park

Queen's Park offers a large semi-natural area for wildlife, however there is little access to water for wildlife. A wetland and pond complex could be constructed within one of the large open turf areas adjacent to the forest. This can be used to help manage stormwater runoff from impervious surfaces (see the City's 2017 Integrated Stormwater Management Plan – Potential Demonstration Projects).



Photo 65. Many areas of Queen's Park have little to no understory vegetation.

Priority #3 – Recognize and restore areas of Moody Park as a habitat hub

Moody Park supports several treed areas with very little understory vegetation. Large areas of the forest understory are highly disturbed and consist of grass. A part of this area should be declared wildlife refuge areas and enhanced with understory plants and successional tree planting. The restored area should be identified with fencing to discourage access by people and pets.

Priority #4 – Establish a native shrub community under the SkyTrain corridor

The right-of-way under the SkyTrain through the western portion of this area generally consists of low value habitat. The City's greenways connect to and follows this right-of-way with pockets of shrubs and planting. This has been identified as an opportunity to enhance biodiversity through this corridor to extend through the west side of the City. The areas under SkyTrain cannot be forested due to overhead conflicts but could be restored to a linear dense shrub community. Restoration efforts in these right-of-ways would need to be coordinated closely with Translink. Grimston Park should also be included as part of this biodiversity enhancement.



Photo 66. There is an opportunity to create a wetland/pond complex in Queen's Park.



Photo 67. Most larger parks such as Moody Park consist of mature urban trees with mowed grass below.

12 | Implementation

This Biodiversity Strategy is a key building block in our continued effort to ensure we protect our existing natural spaces and increase the quality of these spaces for the ecological world and humans alike. The recommended actions and strategies presented in this report show the City the way to play its part in the regional, national and international effort to conserve biodiversity. Taking a role to create awareness about biodiversity and engaging others in initiatives and stewardship activities (while taking advantage of incentives and partnerships) will be important today and during the years to come.

12.1 | Education and Engagement

Connecting the public with nature facilitates our wellbeing and strengthens our collective understanding of our interdependency with nature. It helps develop a sense of place with our local community and provides an opportunity for outdoor recreation. An informed community will collectively help achieve the vision and goals of this Strategy.

Much of New Westminster is developed, with limited public access to nature outside of a few large natural areas. Enhancing habitat in the Urban Matrix is critical as the majority of the City is privately owned and developed. In order to improve biodiversity at a City-wide scale, many private landowners will need to be engaged to create habitat or provide a movement corridor for wildlife. The City can also help educate its citizens through the installation of educational or interpretive signage in natural areas.

Residents can be inspired to take action if they feel like they are part of a larger collective. Programs such the Canadian Wildlife Federation's garden habitat certification program or iNaturalist Canada provide ways for individuals to become engaged. The former is an on-line tool that raises awareness about wildlife-friendly gardens, allowing residents to share how they have enhanced their outdoor spaces (and can see how others have as well). iNaturalist Canada, is a place where residents can document wildlife that visit their outdoor space and upload photos at their website. Residents can learn the names of the species in their backyard thanks to photo recognition software and an online community of knowledgeable people that can help confirm identifications.

These types of engagement programs should be promoted to residents such as at city events or through the City's website. A webpage was created during the development of the Strategy and should continue to remain active as a place to include links to programs, as the ones mentioned above, and to inform the public on new initiatives, events and other information pertaining to biodiversity.

The City's Environment and Climate Action Committee is also a forum that the City can use to educate and engage citizens more broadly on biodiversity initiatives and issues. Further opportunities to educate and advocate for biodiversity will be explored, particularly with schools, Indigenous communities and existing community networks.

12.2 | Stewardship

Programs that facilitate positive interactions with nature foster the development of community identity, bring people from different backgrounds together, and increase social inclusion as outlined in Social Values – Equity and Inclusion. Stewardship is about respecting the environment as well as actively taking responsibility for human and ecosystem health as local Indigenous communities have been stewards of the land since time immemorial. Stewardship of the land can take guidance from local Indigenous communities through engagement with knowledge keepers and elders.

Action to protect and enhance biodiversity and restore our natural areas or other green spaces in the City can be taken done working individually or in collaboration. Given the City is an important caretaker of its natural spaces it can create opportunities and support residents to experience nature and offer more hands-on opportunities to conserve these spaces.

Volunteers have played an important role in the stewardship of the natural areas in New Westminster. For example, local community groups have taken the lead to organize restoration events at Glenbrook Ravine Park, or shoreline clean-ups along the Fraser River in Queensborough with support from the City (e.g., via City's grant program). The Sapperton Fish and Game Club is a community organization that has been restoring fish habitat in the Brunette River since 1969 and have won awards for their success.

The City's Adopt-A-Tree stewardship program can provide a simple way for residents to individually participate in protecting street trees. Support for these hands-on stewardship activities should continue into the future, and partners should work together on ways to achieve more wide-spread promotion in the community.

Ultimately, public support and participation is best achieved when residents are educated in the aspects and importance of the natural environment and offered opportunities to be actively involved, such as through stewardship activities.



Photo 68. Volunteer pulling invasive blackberry from Glenbrook Ravine Park.

12.3 | Incentives, Partnerships & Support

Cities can offer incentives to its citizens to help promote the installation of habitat features, plants and trees. The City hosted a tree sale in 2020 to help promote its tree planting targets outlined in the Urban Forest Management Strategy. Other options include offering tree vouchers that subsidize the purchase of trees from nurseries. Participating nurseries must be engaged and there are typically requirements to monitor the planting sites. An alternative to vouchers is to provide a refund for planted trees. Applicants apply for this refund after purchasing and planting approved trees and from participating nurseries. Other incentives to consider for promoting biodiversity on private lands include tax relief if target areas of the property support native plant communities. The planting of native and resilient trees should be encouraged for biodiversity.

There are non-profit organizations that partner with governing bodies to help protect and manage natural areas. Previously in Lower Hume Park, Evergreen partnered with the City to implement the "Uncover your Creeks" program which involved riparian restoration activities and water quality monitoring of the Brunette River. Neighbouring local or regional governments can also partner or cost-share on environmental projects with a shared collective outcome. For instance, the City partnered with Metro Vancouver as part of their Ecological Health Plan to enhance and protect habitat areas associated with the Brunette River. The City, as part of partnerships with organizations such as the Ministry of Transportation or TransLink, can advocate for the inclusion of biodiversity measures into external projects. The City should continue to pursue available funding and partnerships with government and non-profit organizations to protect sensitive habitat along river corridors.

The City supports wildlife and co-habitation with species and will continue to work with the Province and its conservation officers to ensure wildlife is adequately managed for public safety or protected as part of senior level regulations (e.g., Migratory Birds Convention Act).

Recommended actions to educate, engage and seek partnerships, incentives and support:	
26	Continue to host the biodiversity webpage as a place to inform the residents on new initiatives, events and other information pertaining to biodiversity.
27	Regularly connect with the City's Environment & Climate Action Committee on biodiversity initiatives and issues.
28	Promote programs and education platforms that encourage diverse range of residents to enhance habitat on their properties, such as iNaturalist Canada.
29	Continue to support hands-on stewardship activities and achieve more wide-spread promotion in the community.
30	Continue subsidy programs to encourage the planting of trees on private lots.
31	Seek incentive and partnership opportunities with external organizations and advocate for biodiversity improvements.

13 | Monitoring for Biodiversity

Developing an effective monitoring program will help the City track the effectiveness of working towards the vision, goals and the principles of biodiversity. Monitoring implementation of the recommended actions will help to reach the three goals of the Strategy and are intended to strengthen biodiversity in the City while also improving the health and well-being of our residents. Monitoring to improve biodiversity should also include a mechanism to detect changes in the environment (i.e., habitat and species present) over time and ecological indicators can be identified to assist in this process. Early detection of environmental change can raise awareness of potential trends and provide time to respond. Indicators are used to understand the condition of the environment (e.g., natural areas) to support biodiversity and evaluate management performance. Indicators can also be used to track the presence of certain species. For an ecological indicator to be effective it must be easy to measure and be an attribute that reflects the overall ecological health of an area. The following are indicators that are recommended to be assessed periodically.

Natural Area Cover: The ecological inventory provides metrics on the amount of natural and semi natural habitat features found in the City. This inventory was completed in 2015 and then updated in 2020 for this Strategy. It was found that the total area of natural habitat had declined over this time. Updating the ecological inventory every 5 years will allow the City to monitor if it is achieving a goal of no net loss of habitat.

Canopy Cover: Tree canopy cover is the percentage of an area covered by trees when viewed from above. This was assessed as part of the Urban Forest Strategy in 2017. It was found that the canopy cover was 18% city-wide, with considerable variation between neighbourhoods. A target of 27% has been set as a goal to reach by 2037. Re-measuring this metric in the future will provide an indication of the loss (or gain) of habitat in the City.

Annual bird count: Bird counts such as the Christmas Bird Count managed and the Great Backyard Bird Count take place during the winter of every year. These volunteer events should be promoted in New Westminster and can be used to track bird species diversity.

Indicator Species: The presence of certain wildlife "indicator" species can signal the health of an ecosystem. Potential species to monitor the health of habitat types in New Westminster are recommended in Table 4. iNaturalist can be used as a platform to monitor species presence or new occurrences.

Table 3. Indicator species and monitoring methods.

Indicator Species	Habitat Type	Survey Method
Song sparrow *(Melospiza melodia)*	Shrub communities	Singing birds
Anise swallowtail *(Papilio zelicaon Lucas)*	Pollinator communities	Visual survey for adults
Ruby-crowned kinglet *(Regulus calendula)*	Deciduous forests	Singing birds
Swainson's thrush *(Catharus ustulatus)*	Deciduous forests	Singing birds
Red-breasted nuthatch *(Sitta canadensis)*	Coniferous forests	Singing birds
Barred owl *(Strix varia)*	Coniferous forests	Call back surveys
Pileated woodpecker *(Dryocopus pileatus)*	Mixed forests	Evidence of foraging
Common yellowthroat *(Geothlypis trichas)*	Wetlands	Singing birds
Cutthroat trout *(Oncorhynchus clarkii)*	Freshwater river	Minnow traps/Snorkel survey
Coho salmon *(Oncorhynchus kisutch)*	Freshwater river	Minnow traps/Snorkel survey

Recommended actions to monitor biodiversity:	
32	Establish a monitoring program that includes the tracking of one or more of the suggested indicators to track the state of biodiversity in the City over time.

Appendix 1 | Detailed Biodiversity Ranking Method

A list of 221 species was compiled of wildlife that could potentially inhabit New Westminster if the City's lands were in a natural state. This includes birds, mammals, amphibians and reptiles. Species that are found in habitat types that are not in the City were excluded, as well as some larger mammals that are unlikely to return to the City such as bears, cougars, and wolves. It was not possible to feasibly account for all the species that exist at the lower level of the food chain, such as invertebrates and microbiota. It was assumed, however, that the presence of larger, "charismatic" species included in this analysis are indicators that these species lower on the same food chain exist.

This species guild analysis helps to determine the comparative capability of these habitat types to support a diversity of species, assuming the habitat types were in an Indigenous (pre-European settlement) state. Table 5 summarizes the findings of this baseline biodiversity analysis. Each natural habitat type was ranked out of a total of 100, relative to each other. Highly disturbed urban habitat cover types have been ranked based on professional judgement.

The baseline biodiversity ranking for each habitat type indicates the relative number of species that would be expected to inhabit this area if it were in a natural state with no urban development. To account for the influences of urban development, a series of modifiers was applied to each habitat type. Patches of habitat that are closely connected together were grouped to calculate their collective size. The ranking of these areas was then modified to reflect the size and fragmentation of each area (Table 6).

Table 4. Baseline Biodiversity Ranking for each habitat type.

Habitat	Baseline Biodiversity Rank
Deciduous forest	100
Mixed forest	100
Wetland/Marsh	90
Freshwater river	65
Evergreen forest	60
Garden	50
Ponds	40
Ditch/Slough	40
Unmanaged shrub (mostly invasive)	40
Unmanaged herb and grass	30
Urban trees	30
Managed grass	10

Table 5. Biodiversity ranking multiplier based on patch size.

Patch Size (ha)	Multiplier
>50	1.0
25-50	0.9
10-25	0.8
2-10	0.6
0.5-2	0.5
0.1-0.5	0.2
<0.1	0.1

Riparian habitat is the interface zone that links aquatic and terrestrial ecosystems. Riparian areas generally are known to support high levels of biodiversity. Habitat areas that are adjacent to watercourses or wetlands were increased in value to reflect this. Riparian areas within each habitat type were identified and multiplied by a modifier to reflect their influence, with higher-value watercourses having a larger modifier (Table 7).

The final relative biodiversity value of the habitat areas in New Westminster are illustrated in Figure 3. This map also illustrates the urbanized areas of the City as the "Urban Matrix." The Urban Matrix provides a low level of habitat for a small group of specialized species adapted to take advantage of non native habitat features and modified landscapes.

Table 6. Riparian habitat modifiers.

Watercourse classification	Riparian setback	Multiplier
Large fish-bearing rivers includes the Brunette and Fraser	30 m	1.5
Non fish bearing steams, sloughs, wetlands and ponds	15 m	1.3
Non fish bearing ditches	10 m	1.1

Appendix 2 | Plant Species Recommendations

Table 7. Recommended restoration species.

Scientific Name	Common Name	Rich and wetter sites	Moderate drier sites	Pollinator species	Climate adaptation species
Trees					
Alnus rubra	Red alder	X	X		
Betula papyrifera	Paper birch	X	X		
Thuja plicata	Western redcedar	X	X		
Abies grandis	Grand fir	X			X
Acer macrophyllum	Bigleaf maple	X			
Picea stichensis	Sitka spruce	X			
Populus balsamifera	Black cottonwood	X			
Prunus emarginata	Bitter cherry	X			
Tsuga heterophylla	Western hemlock	X			
Arbutus menziesii	Arbutus		X		X
Quercus garryana	Garry oak		X		X
Pseudotsuga menziesii	Douglas-fir		X		
Shrubs					
Acer circinatum	Vine maple	X	X	X	
Oemleria cerasiformis	Indian plum	X	X		
Ribes sanguineum	Red-flowering currant	X	X	X	
Cornus sericea	Red-osier dogwood	X		X	
Crataegus douglasii	Black hawthorn	X			
Lonicera involucrata	Black twinberry	X			
Physocarpus capitatus	Pacific ninebark	X			

Scientific Name	Common Name	Rich and wetter sites	Moderate drier sites	Pollinator species	Climate adaptation species
Malus fusca	Pacific crabapple	X		X	
Ribes bracteosum	Stink currant	X			
Rubus spectabilis	Salmonberry	X		X	
Rubus parviflorus	Thimbleberry	X		X	
Salix Sp	Willow (Pacific, Scouler, Sitka)	X		X	
Sambucus racemosa	Red elderberry	X		X	
Spiraea douglasii	Hardhack	X			
Amelanchier alnifolia	Saskatoon		X	X	X
Corylus cornuta	Beaked hazelnut		X	X	
Gaultheria shallon	Salal		X	X	
Holodiscus discolor	Oceanspray		X	X	X
Philadelphis lewisii	Mock orange		X	X	X
Mahonia aquifolium	Tall Oregon grape		X		
Mahonia nervosa	Dull Oregon grape		X	X	
Rosa gymnocarpa	Baldhip rose		X	X	
Rosa nutkana	Nootka rose		X	X	
Symphocarpos albus	Snowberry		X	X	
Vaccinium parvifolium	Red huckleberry		X	X	
Lonicera ciliosa	Western trumpet Honeysuckle		X	X	X
Rubus ursinus	Trailing blackberry	X	X	X	

Scientific Name	Common Name	Rich and wetter sites	Moderate drier sites	Pollinator species	Climate adaptation species
Ferns					
Athyrium filix-femina	Lady fern	X			
Blechnum spicant	Deer fern	X	X		
Dryopteris expansa	Spiny wood fern		X		
Polystichum munitum	Sword fern	X	X		
Herbs					
Claytonia sibirica	Siberian's miner's lettuce	X			
Dicentra formosa	Pacific bleeding heart	X		X	
Maianthemum dilatatum	False lily-of-the-valley	X			
Cornus canadensis	Bunchberry	X			
Epilobium angustifolium	Fireweed	X	X		
Achlys triphylla	Vanilla leaf	X			
Tiarella trifoliata	Three leaved foamflower	X			
Trientalis borealis	Broad leaved starflower	X			
Urtica dioica	Stinging nettle	X			
Viola glabella	Stream violet	X			
Trillium ovatum	Western white trillium	X			

Appendix 3 | Species at Risk in the City

The following is a list of mammals, birds, reptiles and fish that are at risk and could potentially inhabit the City. This should not be considered an exhaustive list, but one that highlights some of the significant species.

Table 8. Species of mammals, birds, reptiles, amphibians and fish that are at risk and may inhabit the City.

Common Name	Species Name	Status	Habitat
Mammals			
Townsend's Mole	*Scapanus townsendii*	Red (1)	Obligate – Subterranean Frequent – Agriculture; grassland/shrub; riparian Occasional – Terrestrial (mixed forest) Open habitats with heavier soils/higher water content, primarily fossorial
Pacific Water Shrew	*Sorex bendirii*	Red (1)	Obligate – Riparian; aquatic; wetland Frequent – Terrestrial (conifer forest) Occasional – Palustrine Riparian areas associated with streams/creeks/wetlands in mature forests Provincial and Federal Recovery and Management Plans in place
Long-tailed Weasel, altifrontalis subspecies	*Mustela frenata altifrontalis*	Red	Frequent – Agriculture; terrestrial (forest); grassland/shrub; riparian; wetland Occasional – Alpine/tundra; rock
Southern Red-backed Vole, occidentalis subspecies	*Myodes gapperi occidentalis*	Red	Frequent – Terrestrial (conifer forest); riparian; wetland
Townsend's Big-eared Bat	*Corynorhinus townsendii*	Blue	Obligate – Subterranean (caves) Frequent – Anthropogenic; terrestrial (forests); Occasional – Grassland/shrub Maternity and hibernation colonies in caves and tunnels
Fisher	*Pekania pennant*	Blue	Frequent – Terrestrial (forest); riparian Occasional – Alpine/tundra; wetland Upland/lowland forests, avoid areas with little forest cover, prefer large contiguous interior forest; Tree hollows/cavities are important maternal den sites

Common Name	Species Name	Status	Habitat
Trowbridge's Shrew	*Sorex trowbridgii*	Blue	Frequent – Terrestrial (conifer and mixed forest); riparian Mature forest with abundant ground litter
Reptiles and Amphibians			
Western Pond Turtle	*Actinemys marmorata*	Red (1)	Aquatic; riparian (permanent and intermittent); wetland Nesting on sandy banks and bars up to a few hundred meters from water
Western Painted Turtle – Pacific Coast population	*Chrysemys picta pop. 1*	Red (1)	Obligate – Lacustrine; riparian; wetland Frequent – Anthropogenic
Red-legged Frog	*Rana aurora*	Blue (1)	Obligate – Wetland; palustrine Frequent – Grassland/shrub; riparian; aquatic Occasional – Terrestrial (deciduous forest) Breeding in shallow, lake littoral zones, ephemeral/permanent pools, bogs/fens in proximity to forest Tadpoles associate with benthic habitats, riparian area important for metamorphosized froglets
Birds			
Western Grebe	*Aechmophorus occidentalis*	Red (1)	Frequent – Lacustrine; marine; palustrine; wetland Nesting on large inland bodies of water in or close to water deep enough to allow bird to swim submerged Has been observed in Port Moody intertidal areas.
Peregrine Falcon, anatum subspecies	*Falco peregrinus anatum*	Red (1)	Frequent – Agriculture; grassland/shrub; lacustrine; riparian; rock; wetland Occasional – Anthropogenic; alkali ponds; aquatic Various open situations with suitable nesting cliffs
Barn Owl	*Tyto alba*	Red (1)	Frequent – Agriculture Occasional – Anthropogenic; terrestrial (mixed forest); grassland/shrub; riparian; wetland Forage and breed in dense grass fields Nesting is in cavities which can be human-made; roosts in dense conifers or nest boxes (if available) Known to inhabit Queensborough Island
Black-crowned Night Heron	*Nycticorax nycticorax*	Red	Frequent – Lacustrine; riparian; wetland Occasional – Agriculture; anthropogenic; aquatic Nests with other heron species, roosts in mangroves or swampy woodland

Common Name	Species Name	Status	Habitat
Green Heron	*Butorides virescens*	Blue	Frequent – Lacustrine; riparian; wetland Occasional – Anthropogenic; palustrine; aquatic Nesting in fresh and brackish water. Has been found inhabiting Shoreline park and Suter Brook (prior to development).
Great Blue Heron, fannini subspecies	*Ardea herodias fannini*	Blue (1)	Frequent – Terrestrial (conifer and mixed forest); lacustrine; marine; palustrine; riparian; wetland Occasional – Agriculture; anthropogenic; grassland/shrub Nesting in tall/large trees; forage in shallow waters (<0.5m deep)
Rough-legged Hawk	*Buteo lagopus*	Blue	Frequent – Grassland/shrub; wetland Occasional – Agriculture; anthropogenic Nesting on cliffs or trees, forests with plenty of open ground
Band-tailed Pigeon	*Patagioenas fasciata*	Blue (1)	Frequent – Terrestrial (forests); springs Occasional – Agriculture; anthropogenic Forage in diverse habitats not used for nesting, mineral springs/gravelling sites important during nesting season Known to inhabit
Western Screech Owl, kennicottii subspecies	*Megascops kennicottii kennicottii*	Blue (1)	Frequent – Agriculture; anthropogenic; terrestrial (conifer and mixed forest); riparian
Olive-sided Flycatcher	*Contopus cooperi*	Blue (1)	Frequent – Lacustrine; riparian Occasional – Terrestrial (conifer and mixed forests); wetland Indicator of coniferous biome
Barn Swallow	*Hirundo rustica*	Blue (1)	Frequent – Agriculture; anthropogenic; lacustrine; aquatic; wetland Occasional – Terrestrial (forests); grassland/shrub; palustrine; riparian Open situations, frequent near water
White-throated Swift	*Aeronautes saxatalis*	Blue	Lacustrine; rock; riparian Primarily mountainous terrain; forages over forest and open areas; Nesting and breeding in rock crevices in cliffs and canyons
American Bittern	*Botaurus lentiginosus*	Blue	Obligate – Wetland Frequent – Lacustrine Occasional – Agriculture; riparian Nesting is primarily in inland freshwater wetlands; breeding in wetlands with tall emergent vegetation

Common Name	Species Name	Status	Habitat
Black Swift	*Cypseloides niger*	Blue (1)	Obligate – Rock Frequent – Lacustrine; aquatic; wetland Forage over forest and in open areas; nesting in waterfalls/wet cliffs, sea cliffs/caves
Caspian Tern	*Hydrogrogne caspia*	Blue	Frequent – Anthropogenic; lacustrine; marine; aquatic Occasional – Riparian; wetland Nesting on sandy or gravelly beaches; pacific coast pop nest primarily in inland marshes
Double-crested Cormorant	*Phalacrocorax auritus*	Blue	Frequent – Marine; palustrine; rock Occasional – Anthropogenic; terrestrial (forest); aquatic Nesting on ground or trees in freshwater situations, also nests on coastal cliffs (high slopes, good visibility) Commonly inhabits Port Moody intertidal areas.
Surf Scoter	*Melanitta perspicillata*	Blue	Frequent – Marine; palustrine; lacustrine; Wetland; Riparian forest Occasional – Herbaceous and shrub riparian areas Nests in riparian vegetation Non breeding habitat is marine
California Gull	*Larus californicus*	Blue	Frequent – Marine; lacustrine Occasional – Riparian
Purple Martin	*Progne subis*	Blue	Frequent – Marine; palustrine; wetland Occasional – Agriculture; anthropogenic; terrestrial (forest) Frequent near water Nesting in tree cavities and rock crevices. Successfully nesting in artificial habitat is known at Rocky Point
Fish			
Cutthroat trout	*Oncrohynchus clarkii*	Blue	Freshwater rivers
Nootsack Dace	*Rhinichthys cataractae*	Red	Freshwater rivers Known to inhabit the Brunette River
White Sturgeon (Lower Fraser River Population)	*Acipenser transmontanus pop. 4*	Red	Freshwater rivers Known to inhabit the Fraser River

Appendix 4 | Engagement Summary

This Biodiversity Strategy builds upon and complements the Urban Forest Strategy, Environmental Strategy and the City's Ecological Inventory. This project sought consultation with the public, key stakeholders, First Nations and staff. The COVID-19 outbreak caused restrictions affecting project timelines; however, consultation was still undertaken as part of the planning process that engaged the public while respecting public health measures related to the ongoing pandemic.

Engagement objectives for this project were structured along two levels of public participation including:

- To consult the community in developing a vision and providing ideas for protecting natural areas and habitat elements to support wildlife within the City;
- To inform the community about:
  - the role of the Strategy in the community and to inform future development in the City;
  - the change that is taking place due to development pressures and climate change, and the need for the protection and enhancement of natural areas and habitat elements, including on private property;
- To build community awareness and support for the Strategy.

To meet the objectives, the community at large was consulted through a public engagement session and project website. Targeted stakeholder consultation occurred to engage staff, an existing City Committee, and First Nations.

Public Engagement Summary

Public consultation informs residents of an initiative or project and provides an opportunity for them to submit feedback. Ideally, it leads to knowledge transfer, among participants and the organizers, involving the public in the decision-making process. Broad community participation in the creation of the Strategy aimed to consult the community in its development. For this Strategy, relevant stakeholders were consulted through committee meetings, such as the Environment & Climate Action Committee, staff were consulted through organized Zoom sessions and targeted 1-on-1 outreach, and the public was consulted through a virtual open house and the City website. An in-person workshop was not possible due to the Covid-19 pandemic, and so alternative methods of engagement were utilized such as the project website, interactive mapping exercise and online public open house.

Project Website & Story Map

In order to provide a repository of information and to make up for the absence of in-person engagement planned during a community event, the City developed a project page with basic information and links for people to refer to. This included basic information about the project such as a brief description, the policy context, updated natural areas inventory, preliminary biodiversity rankings, and an interactive map. This map was set up using ESRI's Story Map, which provided an opportunity for members of the public to provide insight into their favourite places in the City and areas that need improvement. https://www.newwestcity.ca/services/environment-and-sustainability/environmental-initiatives/biodiversity-and-natural-areas-strategy

The Story Map was live from August 18th to October 23rd, 2020. During that time, 19 members of the public provided input. Six submitted favourite locations (green stars) and thirteen identified areas that need improvement (red diamonds) (Figure 11). However, three of the areas identified as needs improvement were mislabelled. The final count was nine favourite locations and ten areas recommended for improvement.

Favourite Places

Favourite places identified to view wildlife included natural areas such as Hume Park and Glenbrook Ravine, modified semi-natural areas such as Queen's Park and the Fraser River foreshore, as well as urban structures such as telephone poles along Victoria Street. These vastly different locations have something in common - they provide food, water, and/or shelter for wildlife. Animals such as herons, otters, beavers, eagles, seals, northern flickers and other nesting birds have all been spotted by the public in these locations.

Natural spaces identified were appreciated for more than just their benefits to biodiversity – benefits for the public was recognized as well. These included opportunities for education, wildlife viewing, blending art and biodiversity, and recreation including kayaking and canoeing. Additional specific locations identified include:

- Queen's Park: Both the pollinator garden and the Learning Circle were identified as great spots to gather, observe and/or learn.
- Fraser River foreshore: An area adjacent to the marina with a short pathway, cottonwoods & benches was identified, along with the more general walk along the river.
    - "This walk along the river often provides viewings of aquatic birds (including families of goslings in the spring) as well as seals. In the thickets and shrubs along the path, other birds can be seen. There is nice variety of wild shrubs and plants".

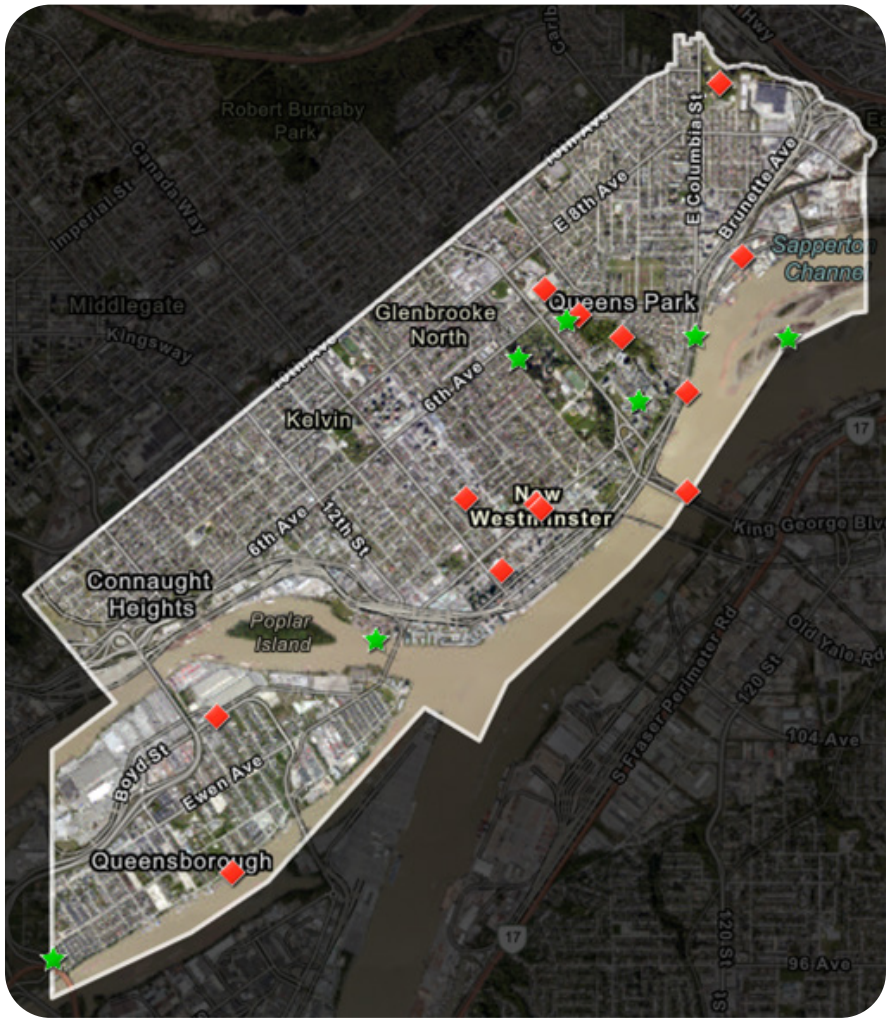


Figure 11. New Westminster Story Map.

- Tidal islands off Sapperton Landing: This area was identified as a haven for urban wildlife including Beavers, Otters, Eagles, Herons, and many other local bird species. Accessible by kayak or canoe.
- Hume Park: the variety of important habitat at Hume Park was identified.
- Glenbrook Ravine: Glenbrook ravine was identified as a favourite place, both as what it currently offers but also what it used to be and could be again.
    - "Glenbrook Ravine had a large variety of wildlife including birds, ground squirrels, coyotes, koi fish, turtles, ducks, geese and other migratory animals located along the Ravine or in the streams and pond at the south end. It is also a popular area to visit especially during this pandemic for exercise, fresh air and to take in the cool shade and lush greenery which is mentally relaxing and so beneficial to your human psyche and wellbeing."



Photo 69: An area adjacent to the Fraser River foreshore.



Photo 70. Tidal island off Sapperton Landing.



Photo 71. A blue heron sitting in the ditch along Boyd St.



Photo 72. An image of a tile located along the Fraser River.

Needs Improvement

A number of themes emerged from the locations identified as needing improvement. Broadly, they fell into recommendations around parks, watercourses, connectivity and greening the developed portions of the City.

<u>Parks</u>

Queen's Park, Glenbrook Ravine and Hume Park where all identified as important natural areas within the City, recognized as both favourite places for wildlife viewing and areas that need improvement. Suggestions from the public included understory planting, installing bird habitat features and bat boxes, invasive species removal, improving riparian habitat and developing new water features.

Specific recommendations include:

- Queen's Park: Restoring the understory south of the running trail.
- Glenbrook Ravine: Removing invasive plants such as English ivy and Himalayan blackberry and replanting with native berries (salmonberry, thimbleberry & trailing blackberry were requested), nettle and medicinal plants. The selection of these species can double as an educational opportunity, as well as an opportunity to protect existing wildlife, attract other wildlife and increase biodiversity. There were also calls to daylight a creek (which is actually surface water runoff) in the Ravine and a wetland nearby.
- Hume Park: Comments for Hume Park focused on improving Brunette River and its riparian areas, as well as the lower Hume Park field. It was suggested that wild grasses could be used instead of mowed grass, supporting greater biodiversity and native species.

Watercourses

Watercourses were repeatedly identified as key features for supporting biodiversity and for public access. Daylighting of streams and water features throughout the City was recommended. Daylighting Glenbrook Ravine Creek was specifically highlighted, with lost streams throughout the City identified for daylighting (https://newwestloststreams.ca). Recommendations to improve the riparian area of the Fraser River and Brunette River included removing Himalayan blackberry and other invasive plants, re-wilding by planting trees and understory vegetation, improving water quality and reducing pollution. It was emphasized that Brunette River is healthier upstream, and that the City should aim to match upstream health in the City of Burnaby.



Photo 73. Photo provided by a survey respondent, displaying a previous watercourse in New Westminster that has since been buried.

Connectivity

Connections between green spaces and along the riverfronts within the City were identified as missing and greatly needed. Separated walking paths were recommended along the Fraser River and throughout the city between green spaces. A "connected, forested corridor between places, such as (Glenbrook) Ravine and Queen's Park, or the riverfront at Sapperton Landing" were also suggested.

Greening the City

The downtown/uptown area of the City was identified as the heart of the City, and an area with too much pavement. Green streets, tree plantings, water features and the acquisition of additional green spaces were recommended.

Some suggested that they would be willing to lose more formal parts of the park in order to increase the natural green space.

Public Engagement Session

An online public engagement session occurred over zoom on September 16, 2020. 15 people were in attendance, in addition to several DHC and City staff. DHC staff presented on the current state of biodiversity in the City, challenges associated with managing it, and a summary of the proposed strategy to improve it. Conceptual graphics from the toolkits were presented, as well as relevant examples of biodiversity interventions.

The public asked questions to further their understanding of the presented materials and the current state of biodiversity in the City. Key questions were asked by DHC staff to encourage an open discussion on opportunities for protection and enhancement. Key recommendations from the public that emerged from the discussions include:

- Enhancing existing public spaces:
  - Enhancing grass areas in parks and along sidewalks. Included the suggestion to use hardier plants in grass areas such as creeping thyme
  - Additional pollinator gardens
  - Add water features
  - Enhance Hume park riparian areas
  - Ditches around Queensborough should be enhanced to return to being good amphibian habitat – miss the frogs that used to be there.
  - Bringing salamanders back to Queen's Park
  - Decommissioning road pavement in greenway routes
  - Continue planting trees in parts of the City currently lacking them
- Creating new natural areas:
  - The City needs additional natural areas
  - Look into funding opportunities. For example, a land conservancy program to which residents could bequeath land
  - Increase the number of green spaces for better integration with wildlife. After developing new natural areas, could consider refuge areas for nature (no public access)
- Daylighting streams:
  - As CSOs are separated, daylight some of them. Ex. Glenbrook Ravine. Implied it's on Metro Vancouver's radar to do in 2050+.
  - Use the Canada games redevelopment as an opportunity to daylight streams
  - Add wetlands to develop amphibian habitat
  - Set green infrastructure/stormwater management requirements to increase the amount and use of water features
- Enhancing private property:
  - Setting up a program through which individual residents with land could declare their properties to be wildlife refuges by meeting some basic requirements
  - Incentivising private residents and apartment blocks / stratas to increase habitat on their lands
  - Establishing habitat on roof tops, a la Le Corbusier's
  - Setting a minimum requirement for the permeability of a site – specifically, prohibiting concrete backyards.
- Legal protections of land
  - Make sure all parks are zoned as parks so they cannot be developed in the future
  - Requirements for new developments around reducing concrete, enhancing green spaces, reduce the maximum built area allowed (without compromising density)

- Public restoration projects
  - There is generally a large interest in the community to participate in many of these events, the struggle is getting the word out
  - Currently a mix of events led by the City and by community volunteers. Continue to work together to share volunteers and resources
  - Consider a variety of ways of sending out the message (emails, website, social media)

Stakeholder Engagement Summary

Environment & Climate Action Advisory Committee Engagement Approach
Two workshops occurred with the advisory committee over the online video platform Zoom.

Meeting 1. The first workshop occurred on May 27th, 2020 and included a presentation of the technical analysis of the state of biodiversity in the City. Conceptual graphics from the toolkits were presented. Examples of biodiversity interventions were reviewed. Key questions were asked to encourage an open discussion of member's opinions on opportunities for protection and enhancement.

The meeting was facilitated using an online white board (Mural) to enable transparent note taking and allow participants to submit sticky notes in a similar fashion to an in-person event.



Photo 74. Examples of biodiversity interventions reviewed in the meeting.

Outcome: Natural parks such as Glenbrook Ravine, semi-natural parks such as Queen's Park, and boulevard gardens and movement corridors were all identified as having value to nature and the public. The beauty, sounds, smells, and social interactions that arise from these areas were all discussed and highly valued.

The majority of the conversation was focused on how to move the City of New Westminster forward, towards the visions identified in the OCP, Environmental Strategy and Urban Forest Management Strategy. Ideas touched on a variety of topics, including: enhancing the Brunette & Fraser Rivers; reducing the impact of land use; reducing noise impacts on wildlife; enhancing vegetation and connectivity; improving food security through native berries; equitable access to natural areas throughout the city; developing new water features and addressing the impacts of climate change.

First Nations

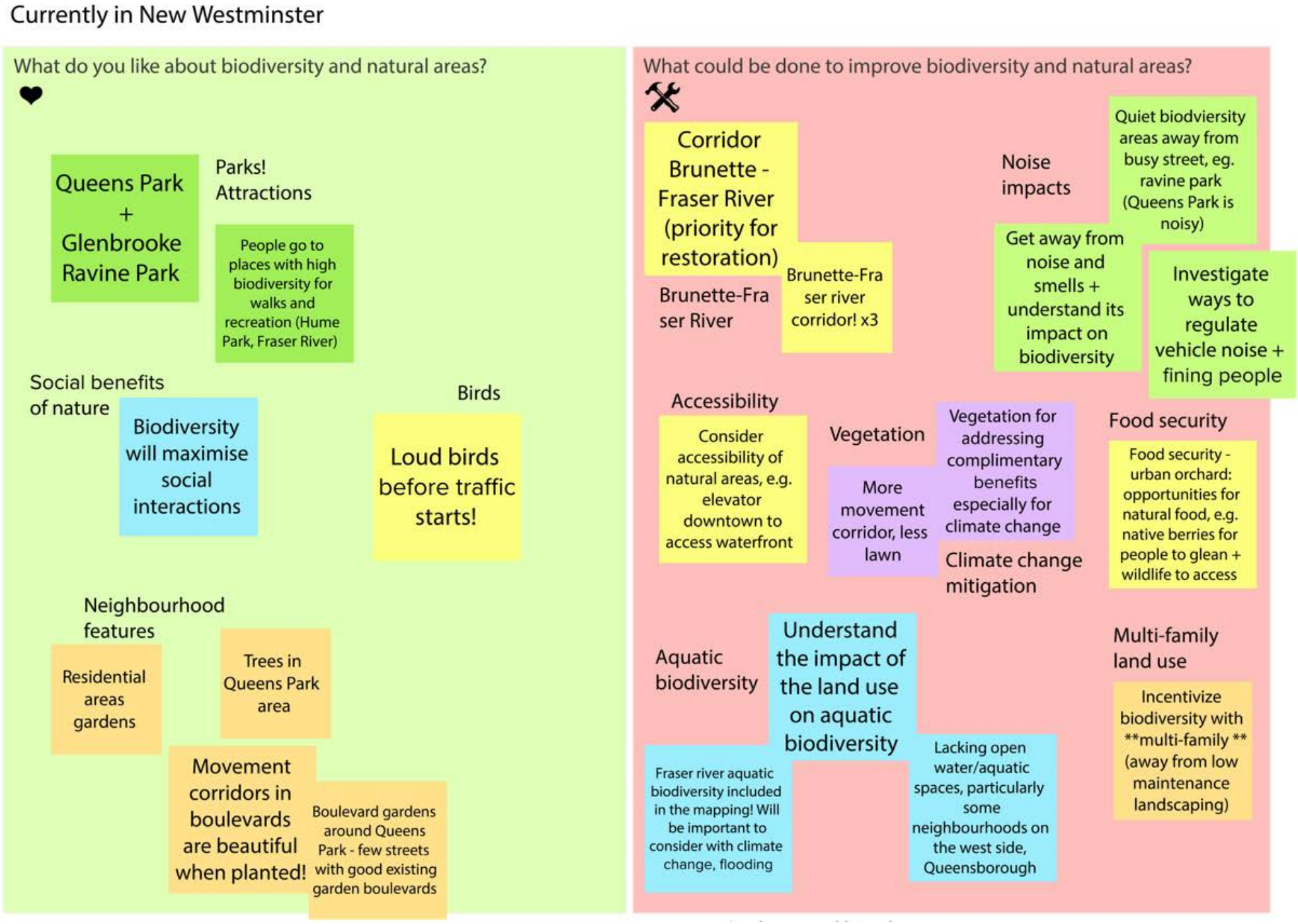


Figure 12. “Sticky notes” of ideas generated at the committee meeting.

During the public engagement session, statements were read from two local First Nations members. These individuals were unable to attend the meeting; however, the statements led to informal conversations with them after the engagement session. Ideas for the Biodiversity and Natural Areas Strategy were discussed, along with opportunities for future collaboration.

These conversations identified a stakeholder group who had a lot of local knowledge to share, who had not been engaged through the formal engagement process for this project. In light of this, additional consultation was determined necessary. In consultation with City staff, a letter was drafted to seek whether First Nations communities would like the opportunity to provide input on the Strategy. Specific questions were posed, along with opportunity for more general feedback.

Internal City Engagement Approach

Staff Workshops

The staff workshops were held on Zoom and collected information from staff about how they view the management of natural areas and habitat elements within the City (perceived successes, challenges, resources, service gaps and priorities). The technical findings of the biodiversity analysis (including the value ratings and proposed green infrastructure network) were presented, along with conceptual graphics showing the intent of the toolkit. The general structure and content of the workshops were adapted to focus on relevant content for each department. Departments engaged include:

- Parks and Recreation, June 3rd, 2020
- Engineering, June 23rd, 2020
- Planning Division (key staff), July 14, 2020

The departmental workshops allowed our team to identify synergies, challenges or important considerations for the development of the Strategy and recommendations. Follow up staff interviews were conducted as needed.

Throughout the Biodiversity Strategy engagement process, the importance of education was emphasized. Multiple opportunities for public education were identified. The following ideas and themes were discussed at the public engagement event:

- Youth education should be prioritized. Youths will have the longest-term impact and will share what they learn with their parents and peers. Youth could be engaged through schools and community programs.
- Use parks as an opportunity to showcase the natural environment and the history of the area through art, programing, and signage.
- Knowledge transfer goes both ways; recognize the value of local resident and Indigenous knowledge, along with more traditional experts.
- Parks and natural area usage appear to have increased substantially since the 2020 Covid-19 pandemic started. Capitalize on this higher-than-normal use to educate the public and enhance the City's natural areas.
- Use signage to display the impacts of various land uses on biodiversity. These signs could be posted in parks and everyday locations, highlighting the positive impact a private garden can have, the use of wildlife trees, bioswales and their benefits over grey infrastructure, etc.
- Use social media to connect with and educate residents. Image-based ones like Instagram or video-based like TikTok can help to capture and share the sights and sounds of nature. Continue to use more traditional forms of media to communicate with a range of residents.





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