

BIODIVERSITY DESIGN GUIDELINES

MAINTAINED

LANDSCAPES



6

Context

Maintained landscapes refer to the more intensively managed naturalized areas within the city, which include parks, gardens, lawns, medians, boulevards, cemeteries, utility corridors, and interface areas. These landscapes present an opportunity to enhance Surrey's overall biodiversity and increase connectivity to other green spaces and natural areas.

Key Considerations:

- ☑ Minimize impervious (hard) surfaces.
 - ☑ Diversify planting by replacing grass with native and non-invasive plants.
 - ☑ Diversify planting to maximize seasonal flowering periods.
 - ☑ Add vertical structure (e.g., ground, shrub, and tree layers) to increase biodiversity.
 - ☑ Prioritize low maintenance and hardy plants (e.g., tolerant to drought, salt, flood) that are adaptable to future climate conditions.
 - ☑ Consider whole life cycle requirements of invertebrates and other species for food and shelter. Retain some leaf litter as over-wintering habitat for insects and
- avoid cutting back floral beds and other landscaped areas until spring (tall plants can provide winter cover habitat for pollinators and forage for birds).
- ☑ Leave areas of exposed soil for ground nesting bees and other invertebrates. Preferably interspersed within grass clumps on slopes, mounds and banks. Well-drained, sandy soil is best for bees. Loamy soils and those soils with plenty of organic matter are beneficial for invertebrates all around.
 - ☑ Allow nutrient cycling and natural succession to take place.
 - ☑ Minimize mowing except where purposefully trying to modify habitat to



Francis Park, Surrey
Credit: Fleetwood Community Association

deter wildlife presence. Avoid mowing at important times of the year for pollinators. Waiting until the end of August to mow allows most wildflowers time to seed.³

- ☑ Minimize insecticide, herbicide, and rodenticide use. Biodiversity enhancements should not be planned in areas where pesticides are used.
- ☑ Plan maintained landscapes such that they function to connect natural areas (e.g., as corridors and stepping stones).

- ☑ Control invasive plant and pest species through regular maintenance.
- ☑ Design plantings to minimize human-wildlife conflicts. Schedule maintenance of plant and ground cover outside of sensitive time periods where wildlife may be using the habitat
- ☑ Observe bird nesting window (March 1 to August 30) to avoid disturbance/mortality of ground-nesting birds.
- ☑ Establish at least 50% natural shrub cover for wildlife.

DID YOU KNOW?

Maintained landscapes can provide valuable habitat for a diversity of plant and animal species. However, these landscape features also have unique conditions that can negatively affect biodiversity. Pollution, inadequate soil and/or root volume, vehicular traffic¹, utility lines, lights, and human activity create a more challenging environment in which to maintain biodiversity.

Care should be taken to consider biodiversity trade-offs (i.e., costs and benefits), with the aim of minimizing potential human-wildlife conflicts in maintained landscapes. It may be necessary to assess risk on a location by location basis to determine if, and what, wildlife should be encouraged or deterred. Such considerations will, in turn, inform the habitat objectives, planting palettes, and suitability of other biodiversity enhancements.

FURTHER READING:

Programs that support pollinators include Plantlife's No Mow May ³, Xerces Society's Leave the Leaves ², and the Canadian Wildlife Federation's Grow It!, Don't Mow It ⁴!

Relevant Surrey Documents:

- Park Design Guidelines (2020)
- Arterial Median Landscape Guidelines (2018)
- Parks Standard Construction Documents (2017)
- Official Community Plan (2013)
- Engineering Department Design Criteria Manual (2020)
- Biodiversity Conservation Strategy (2014)

ICON LEGEND:



Small Mammals



Birds



Plants



Herptiles



Insects



Invertebrates

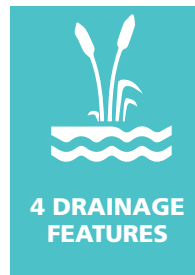
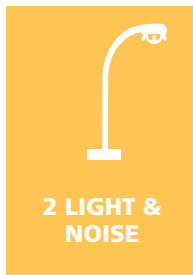


Pollinators

Cost legend:

Relative Cost: \$ (low), \$\$ (medium), and \$\$\$ (high).

Module linkages:



6.1 MEDIANS & BOULEVARDS

Overview

Boulevards are the planted (landscaped) strips along road edges that often incorporate sidewalks. Medians are landscaped strips separating opposing lanes of traffic.

Boulevards and medians have the potential to act as green corridors that connect larger green spaces across the city and allow wildlife to move more readily through the urban matrix. They are used by birds, small mammals, and invertebrates for food, shelter, nesting, and roosting habitat. Constructing wildlife passages and improving sight lines for motorists along boulevards and medians can also help reduce the risk of mortality due to vehicle collisions.

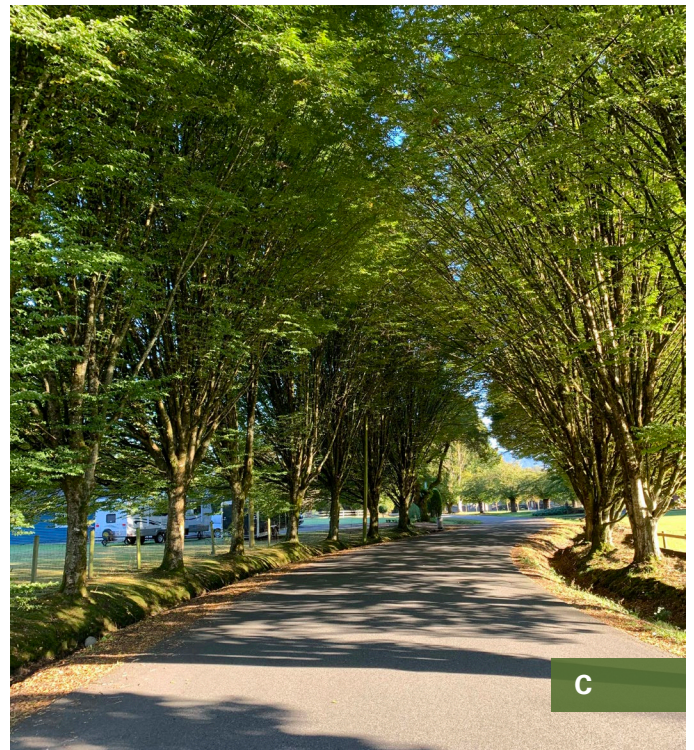
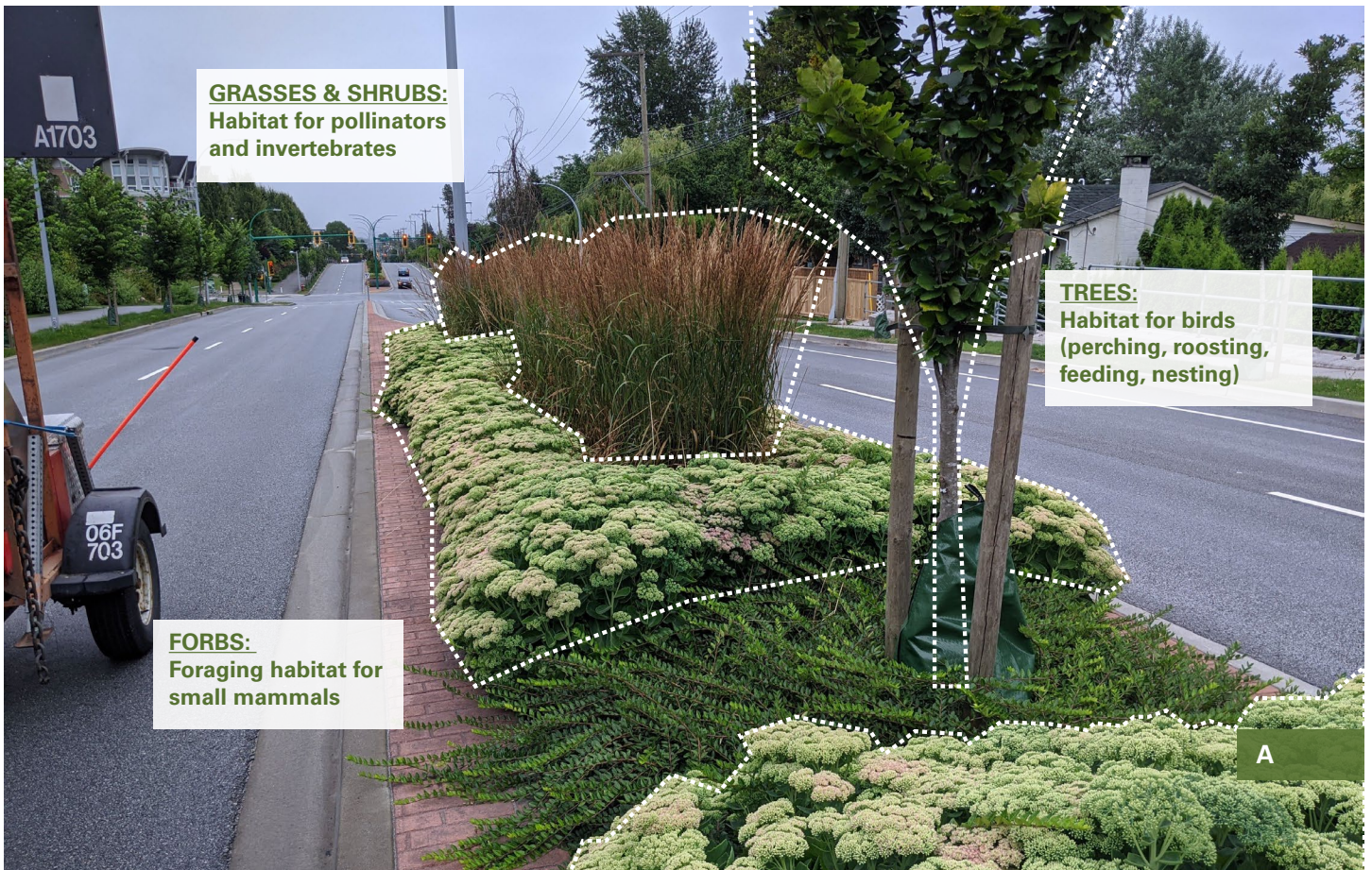
Opportunities to enhance boulevards and medians for biodiversity will vary. Factors that must be considered include plantable area, visibility requirements, traffic, volumes and speeds, what wildlife species are present, and other potential disturbances. The diversity of plant life within boulevards and medians will influence the wildlife that will make use of an area. Care should always be taken to select plant species that are resilient to road conditions, foot traffic, and changing climatic conditions (e.g., increased winter flooding and summer drought).

General Design Guidelines:

- ☑ Provide a diverse community of trees, low shrubs, herbs, and grasses appropriate for the size of the planting area.
- ☑ Protect sight lines where visibility and safety is a concern by selecting low-growing plants less than 1m tall at maturity.
- ☑ Use species that are beneficial for pollinators.
- ☑ Select wide-canopy tree species to support the movement of arboreal (i.e., tree dwelling) wildlife.
- ☑ Avoid illuminating trees and naturalized habitat to minimize disturbance of wildlife.
- ☑ Prune trees over time to make branches arch overtop of roadways to improve wildlife habitat and connectivity (particularly for birds and tree-dwelling mammals).
- ☑ Plant trees so that branches will overlap at maturity.
- ☑ Maintain a minimum boulevard width of 4m wherever possible.
- ☑ Enhance vertical structure by adding topography and layering trees and shrubs.

Focal Guilds and Species: 

Cost: \$\$-\$\$\$



A - Surrey median - Credit: City of Surrey
 B - Low-biodiversity Median Example, Surrey - Credit: Leila Zeppelin
 C - Tree tunnels, Maple Ridge - Credit: Heather Bears

6.1.1 NARROW & WIDE MEDIANS

Narrow medians are less than 3.8m wide and also include smaller traffic circles in cul-de-sacs and neighbourhood streets. Current guidelines specify median planting only in Accent Point/Gateway locations or within Town/Neighbourhood Centres. Although these spaces are constrained, there are opportunities to enhance biodiversity by including plants that attract pollinators, invertebrates, and birds. Narrow medians are generally not suitable for tree planting unless adequate volume is provided.

Where to implement:

- ☑ Medians less than 3.8m wide as designated in Table 1: Median Types and Design Guidelines in the Arterial Median Landscape Guidelines and small traffic circles.

Wide medians are greater than 3.8m and include larger traffic circles. They have adequate soil volume to allow for tree planting. A diversity of low plants can be combined with trees to support pollinators and provide foraging opportunities for birds and small mammals. Wider landscaped strips also provide opportunities to incorporate beneficial green infrastructure, such as bioswales, which can simultaneously enhance biodiversity and manage stormwater.

Where to implement:

- ☑ All medians at least 3.8m wide (see Table 1: Median Types and Design Guidelines in the Arterial Median Landscape Guidelines).

Design Guidelines:

- ☑ Follow general design guidelines for boulevards and medians.
- ☑ Include habitat structures that fit scale and road conditions. Wide medians provide opportunities to introduce additional habitat structures including downed wood and insect hotels.
- ☑ Focus habitat enhancements within medians that can serve as a linkage between habitats on either side of the roadway.
- ☑ Use low-growing, low maintenance plants as lawn alternatives (see recommended plants in Appendix A).

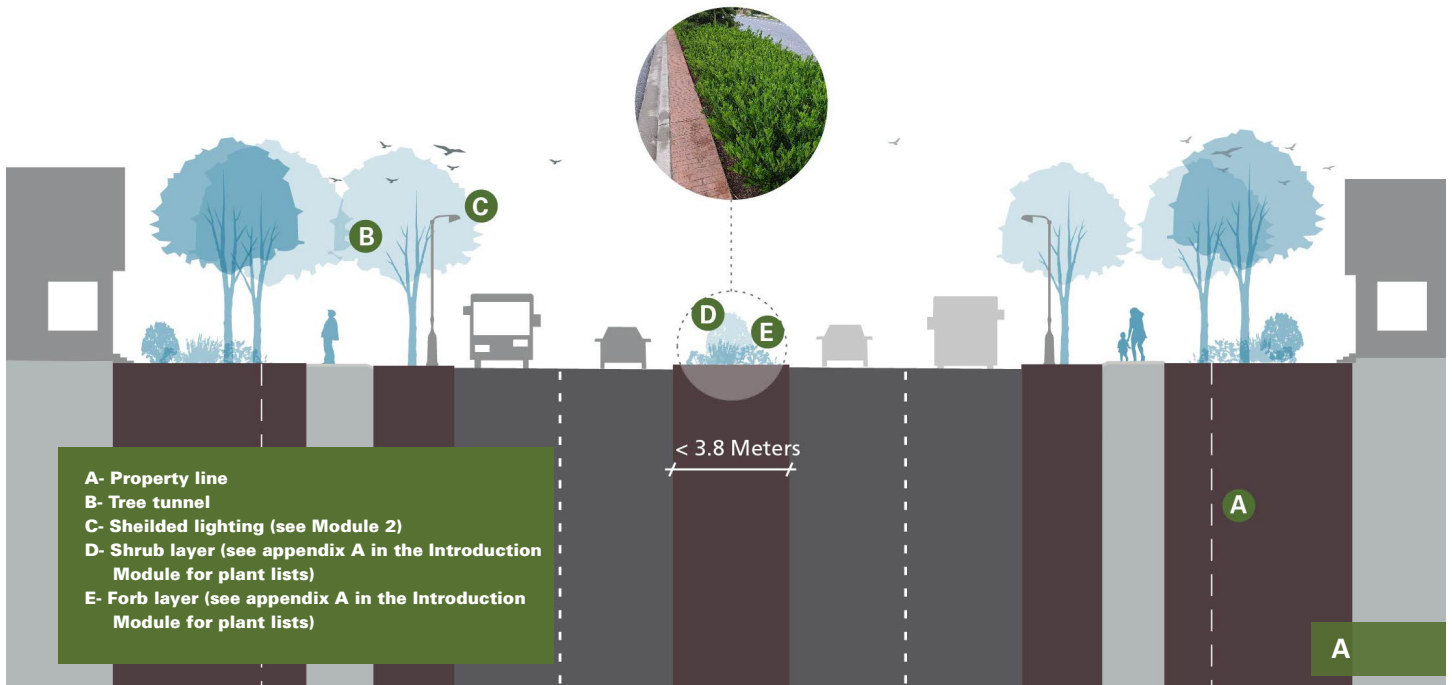
Focal Guilds and Species:



Cost: \$\$-\$\$\$

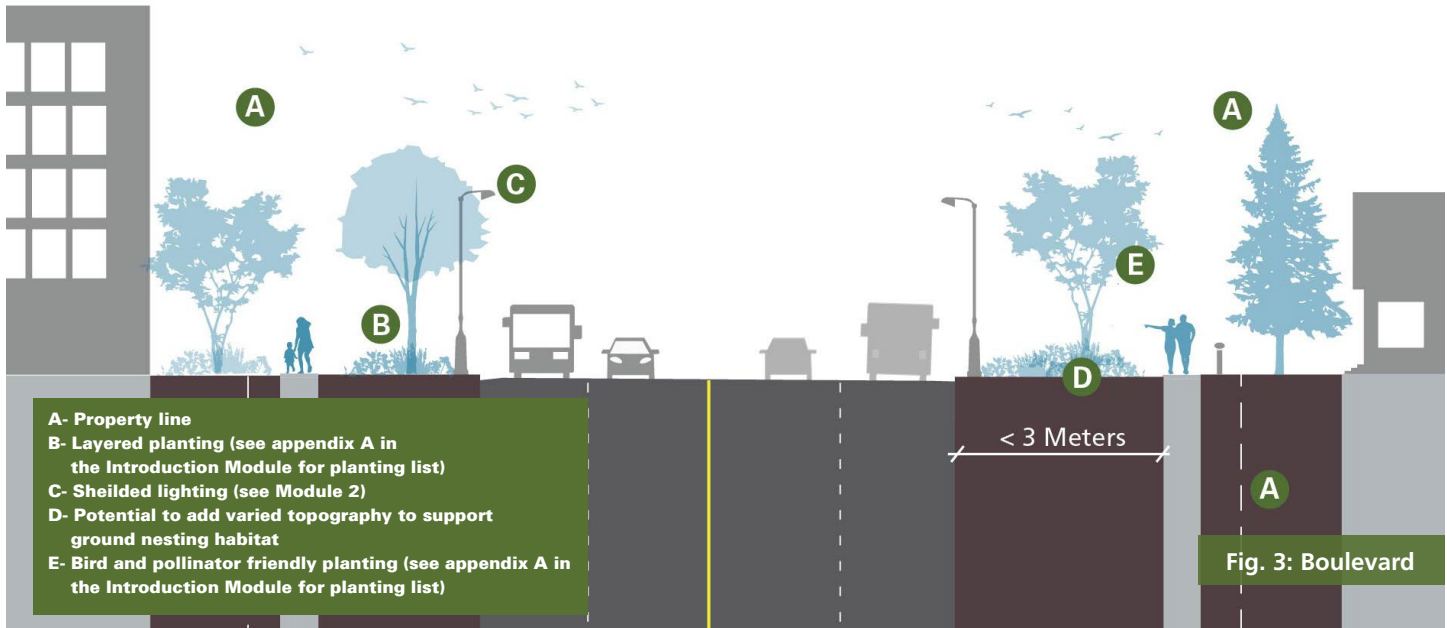
Co-benefits:

- ☑ Enhance the pedestrian/cycling experience, thereby encouraging walking and cycling.
- ☑ Provide shade and cooling.
- ☑ Reduce urban heat island effect.
- ☑ Manage stormwater.
- ☑ Store carbon.
- ☑ Reduce traffic speeds.
- ☑ Filter road pollutants, capture stormwater, and improve air quality.



A - Fig. 1: Narrow median
 B - Fig. 2: Wide median

6.1.2 BOULEVARDS



Roadside Shrub Habitat

Roadsides can provide habitat value above and beyond traditional lawns by including trees, short and tall shrubs and forbs. Adding topographical features and taller shrubs/trees can help mitigate bird-vehicle collisions. Roadside plantings should be hardy and resistant to foot traffic.

Where to implement:

- ☑ All boulevards.
- ☑ Local, collector, and arterial roads.

Design Guidelines:

- ☑ Provide a variety of habitat types (e.g., meadow, shrub, treed) to maximize opportunities for foraging, perching, and nesting. Include tall grasses, low and tall shrubs, and trees (see recommended plants in Appendix A).

- ☑ Include a mix of deciduous and coniferous trees, complemented by more open habitat like shrub or meadow.
- ☑ Plant trees and shrubs in clusters rather than individually.
- ☑ Enhance vertical structure by modifying the shape and features of land surfaces (i.e., creating small mounds, hills, crests, and valleys) and layering trees and shrubs.
- ☑ Incorporate additional habitat structures like downed wood, where appropriate.
- ☑ Consider sight line requirements when planting trees and shrubs.
- ☑ Ensure lighting is wildlife friendly, wherever possible.

Focal Guilds and Species:

Cost: \$\$-\$\$\$



DID YOU KNOW?

Biodiversity enhancements can be tailored to meet the habitat needs of target wildlife species/ guilds, while considering factors such as visibility, cover, and species' mobility to optimize habitat quality. Design strategies to minimize wildlife mortality due to traffic may also be required. For example, separating birds from traffic by planting taller trees, implementing physical barriers where appropriate, or planting non-fruiting trees/removing fruiting trees may help reduce collisions.⁶ Reducing road lighting/light pollution can also reduce disturbance impacts to birds and mitigate bird-wildlife collisions.⁷

Assess the risk! In some areas, such as hotspots where raptors or other species have a high mortality risk due to traffic, it may not be appropriate to attract raptors or ground nesting birds to meadows and low shrub environments. In such cases, designs to prevent ground vegetation may be preferable. In some situations/contexts, net benefits for some species (e.g., pollinators) may exist while net costs exist for other species (e.g., birds). In such cases, careful selection of plants used by pollinators, but not by birds for foraging or nesting, can be effective. Studies have shown that boulevards generally have a similar or greater number and density of plant and pollinator species (including those at risk) as adjacent habitats. The benefits of providing pollinator habitat along boulevards generally outweigh the costs associated with pollution and vehicle-pollinator collisions. Managing boulevards by reducing mowing to two or fewer times per year, increasing boulevard width, increasing native plant diversity, minimizing invasive and non-native plants, and managing street lighting, can enhance benefits while mitigating important risks.⁸



Habitat boulevard
Credit: Heather Bears

6.2 EDGE INTERFACES

Overview

Edge interfaces are the transition zones between two or more landscape types; for example, the edge between an agricultural and industrial area, or between a natural area and a residential area. These edges often have unique conditions and microclimates caused by increased exposure to sun, wind, and higher temperatures and humidity. These areas are suitable for more naturalized landscaped strips, including shelterbelts, hedgerows, or crop trees planted for agroforestry. Edges provide opportunities to enhance biodiversity, while also providing important benefits for landowners. For example, vegetative screens act as a buffer that captures airborne pollutants and filters contaminants.

The diversity of plant and animal species within edge habitats can be greater than adjacent areas due to the presence of a variety of habitat conditions. Species that inhabit these edges are often more tolerant of increased levels of human disturbance.

General Design Guidelines:

- ☑ Use full-sun tolerant plants due to increased sun exposure.
- ☑ Select a combination of native plants and/or non-native and non-invasive where suited.
- ☑ Join hedgerows and shelterbelts with adjacent habitat (e.g., trees, forests, water sources) to improve connectivity.¹¹

- ☑ Include a diversity of plants (e.g., forbs, low and tall shrubs, trees) to achieve a prolonged blooming period and greater vertical structure.
- ☑ Include flowering trees and shrubs to enhance the aesthetic value.
- ☑ Maximize the buffer width in interface zones to reduce edge effects.
- ☑ Establish hedges/screens along edges where foot access should be controlled to protect sensitive biodiversity values.
- ☑ Incorporate habitat structures including downed wood and rock piles.
- ☑ Minimize impervious surfaces.

Co-benefits:

- ☑ Reduce farm emissions (dust, odour, particulates).
- ☑ Create visual buffer and windbreak.
- ☑ Control erosion.
- ☑ Provide shade and cover.

FURTHER READING:

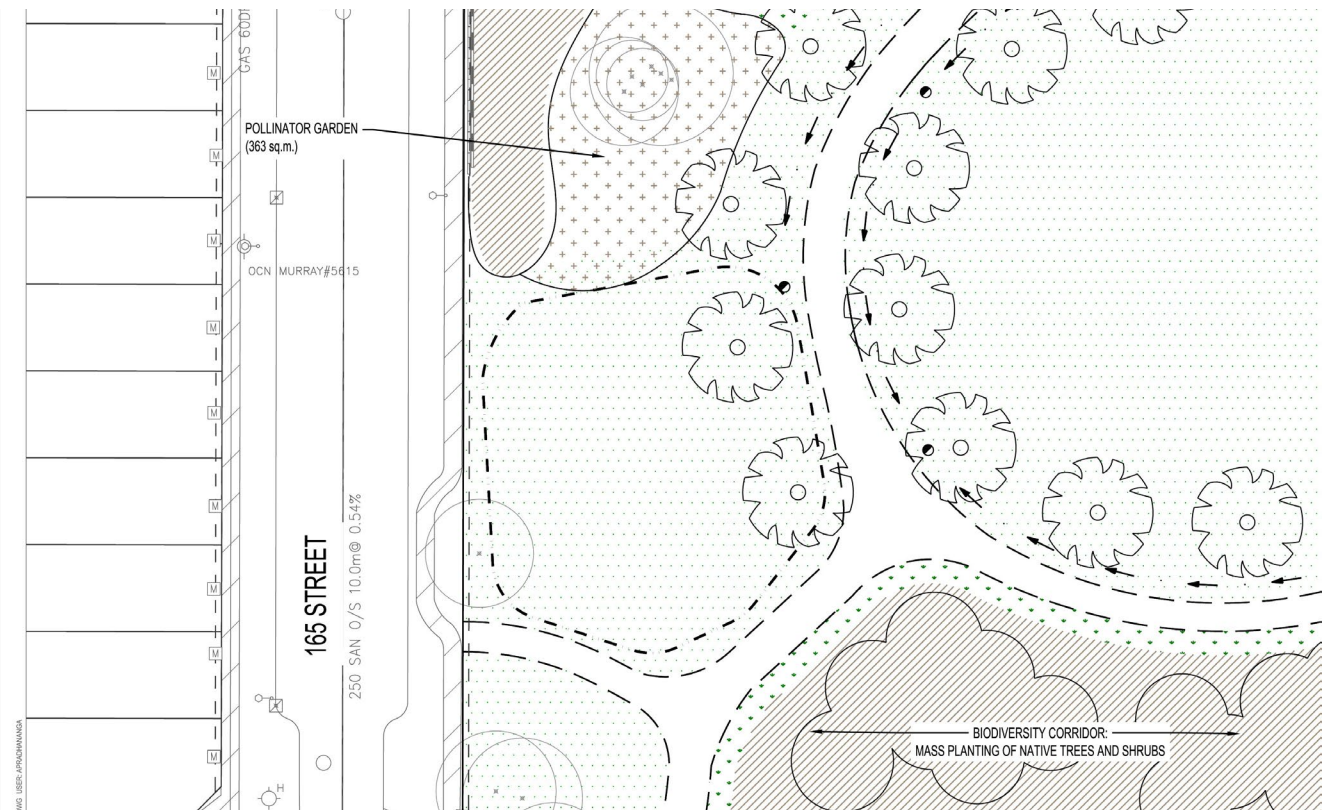
BC Ministry of Agriculture Guide to Edge Planning (2015)¹²

CASE STUDY

EDGEWOOD PARK

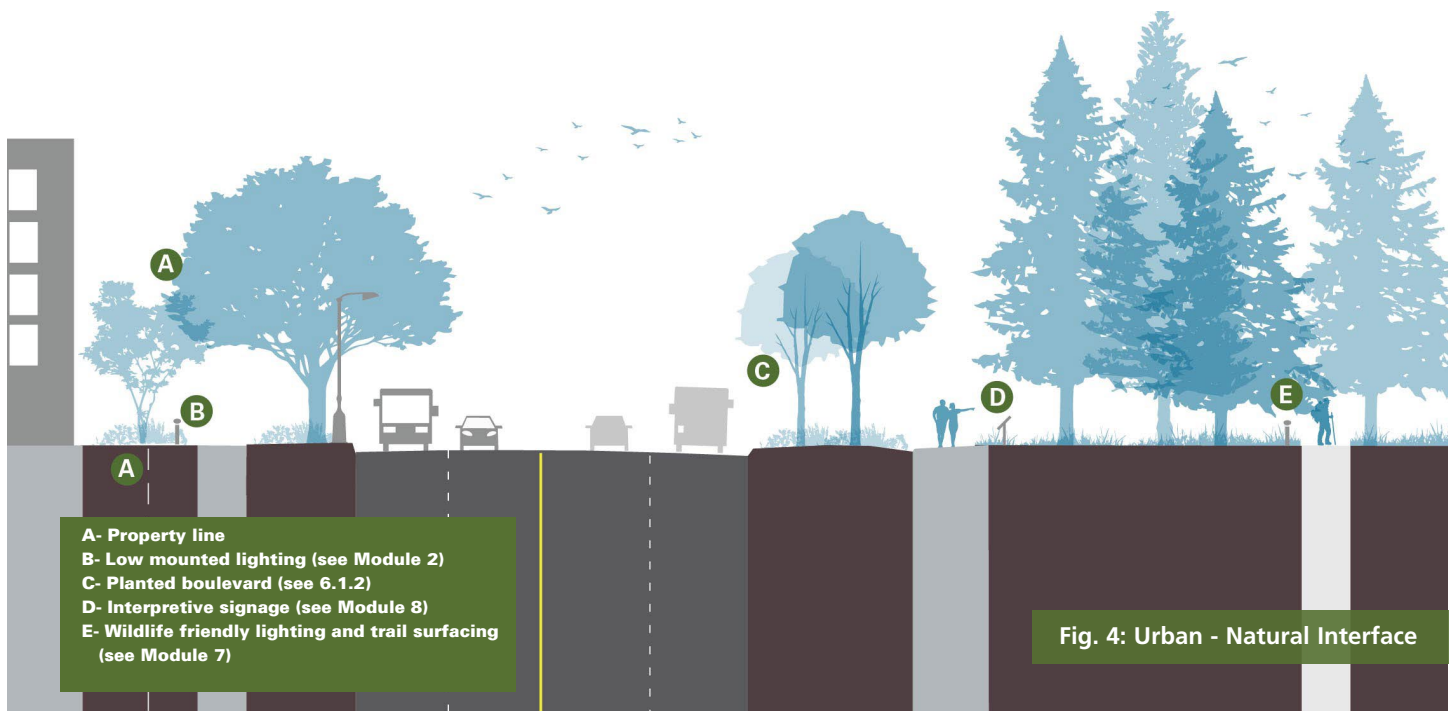
Surrey, BC

Edgewood is a neighbourhood park in Sunnyside Heights. The park includes a 330m² pollinator meadow adjacent to a newly planted biodiversity corridor. The pollinator meadow is situated on a south-facing, sandy mound. Selected plant species mimic vegetation found on coastal sandy dunes. The pollinator meadow is intended to be self-seeding once established; however, because planting is experimental the project will be monitored for up to 2 years to determine what establishes and to assess what adjustments may be required. In addition to pollinator plants, leaf litter from adjacent trees will be incorporated into the meadow to provide habitat cover for invertebrates during the winter.



Credit: City of Surrey

6.2.1 URBAN - NATURAL AREA INTERFACE



Overview

The interface between urban and natural areas provides an opportunity to link backyard habitats and other maintained landscapes (including parks) with the City's Green Infrastructure Network. Many of these interface areas are included in Surrey's Sensitive Ecosystem Development Permit Area (SEDP), which provides a unique opportunity to work with developers and homeowners to enhance biodiversity.

Design Guidelines:

- ☑ Retain natural features where possible.
- ☑ Encourage establishment of native plants in place of lawn.

- ☑ Introduce habitat structures and natural features (see Module 1 for examples).
- ☑ Include green infrastructure (e.g., bioswales) to enhance biodiversity and manage stormwater (See Module 4).
- ☑ Establish hedges and barrier plantings to discourage human encroachment into natural areas where high value habitat exists.

Focal Guilds and Species:

Cost: \$\$-\$\$\$





6.2.2 AGRICULTURE - URBAN INTERFACE

Overview

The interface between agricultural and urban areas provides habitat, a movement corridor, and a visual screen. A planted buffer can also filter out contaminants and sediments coming from farmland or capture runoff from urban areas. Introduction of pollinator plants and habitat structures such as wildlife trees or raptor poles can provide benefits including crop pollination and control of pest species (with increased presence of raptors, for example).

Other economic opportunities for farmers (e.g., agroforestry opportunities such as establishing plants with seeds that can be collected for niche markets) can also be explored in interface zones.


Roadside attractants that increase risk of wildlife mortality should be managed appropriately.¹³ Care should also be taken to ensure farm practices are not detrimental to biodiversity. For example, biodiversity enhancements that encourage raptors should be avoided in areas where dangerous rodenticides and pesticides are being used. Opportunities to partner with landowners to implement environmental best practices promoted by the BC Environmental Farm Plan program⁹ and Farmland Advantage¹⁰ are encouraged.




Design Guidelines:

- ☑ Select tree and shrub species that have reduced likelihood of attracting insect pests or pathogens that may be harmful to nearby agricultural crops. Alternatively, companion planting (i.e., trap crops) can provide benefits by drawing pests away from cash crops where they can be more easily managed. Trap crops can be established along edge interfaces and around the perimeter of cash crops.
- ☑ Provide linear habitat that forms corridors for species to move through.
- ☑ Include habitat structures that support raptors (where it can be confirmed that rodenticides are not used in neighbouring farms) and pollinators (see Module 1: Habitat Structures).
- ☑ Maximize the width of vegetative buffer (minimum 15m on urban side) to help capture airborne particulates.

- ☑ Include green infrastructure including bioswales to enhance biodiversity and manage runoff and stormwater (see Module 4: Drainage).
- ☑ Include downed wood and other habitat structures to support biodiversity, where acceptable.

Focal Guilds and Species: 

Cost: \$\$-\$\$\$ 

CASE STUDY

MOUND FARM PARK

Surrey, BC

The City of Surrey has been working with Ducks Unlimited Canada to develop a made-in-Surrey Agriculture and Biodiversity Stewardship program. As a pilot project, Surrey Parks implemented biodiversity objectives in recent leasing requirements for farming activities at Mound Farm Park. These objectives included:

- ☑ Demonstrating familiarity with community issues and indicating how their activities and practices will enhance and/or complement the biodiversity conservation objectives for the lands.
- ☑ Avoiding activities which may damage or impact surrounding natural habitat features and ecological processes.
- ☑ Providing potential conservation and management benefits throughout the year for a range of wildlife species such as songbird, waterfowl, shorebird, raptor, bat, and pollinator populations.
- ☑ Reducing pesticide and fertilizer runoff contamination to adjacent aquatic habitat, enhancing soil productivity through the use of mixed cover crops (e.g., clover, alfalfa); and reducing excessive noise and light pollution disturbance.



6.3 UTILITY CORRIDORS

Overview

Utility Corridors provide long, contiguous habitat corridors that have the potential to support local and regional connectivity. Human disturbance is often minimal, apart from occasional maintenance and recreational trail use. Landscaping within a utility corridor should focus on low growing shrubs and forbs, where suitable.

General Design Guidelines:

- ☑ Adhere to requirements and limitations for plantings in proximity to underground/above ground utilities.
- ☑ Create planting zones within the utility corridor: prioritize low-growing grasses and wildflowers underneath powerlines to permit easy access and allow clearance; prioritize shrubs and low growing trees in border zones (i.e., along corridor edge) to block larger trees from establishing; and prioritize trees outside of corridors.¹⁴
- ☑ Develop long contiguous corridors with similar habitat and vegetation communities.
- ☑ Maintain early successional habitat but limit mowing to annual or longer rotations, if possible, to control encroaching shrubs and trees.

- ☑ Select low maintenance, flood, and drought tolerant species.
- ☑ Target and control invasive species.
- ☑ Vary topography to create natural hollows, hummocks, and different microhabitats.
- ☑ Maintain plants and ground cover outside of the bird nesting season (March 1 to August 31).
- ☑ Enhance biodiversity through use of habitat structures (e.g., brush piles, downed wood) and drainage features.
- ☑ Ensure access points for maintenance are adequately maintained.
- ☑ See Appendix A for planting recommendations.

Co-benefits:

- ☑ Provide opportunities for recreation (e.g., trails).
- ☑ Control erosion.
- ☑ Manage stormwater.
- ☑ Reduce urban heat island effect.
- ☑ Store carbon.

FURTHER READING:

Avian Power Line Interaction Committee (APLIC). *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*

DID YOU KNOW?

In areas where birds experience a high collision or electrocution risk, flight insulators and perch deterrent devices can be used to decrease bird strikes, bird mortality, and the potential for power outages and infrastructure damage. Attaching spinning flappers (made with coloured, reflective blades) to utility lines has been proven to a very effective deterrent compared to other devices such as traditional coloured spirals.¹⁵ New utility designs that increase the spacing between line phases to accommodate the wing spans of the largest birds in the area can also reduce the risk of electrocution.¹⁶



Bird Deterrent
Photo Credit: OSU

6.3.1 BC HYDRO RIGHT-OF- WAY

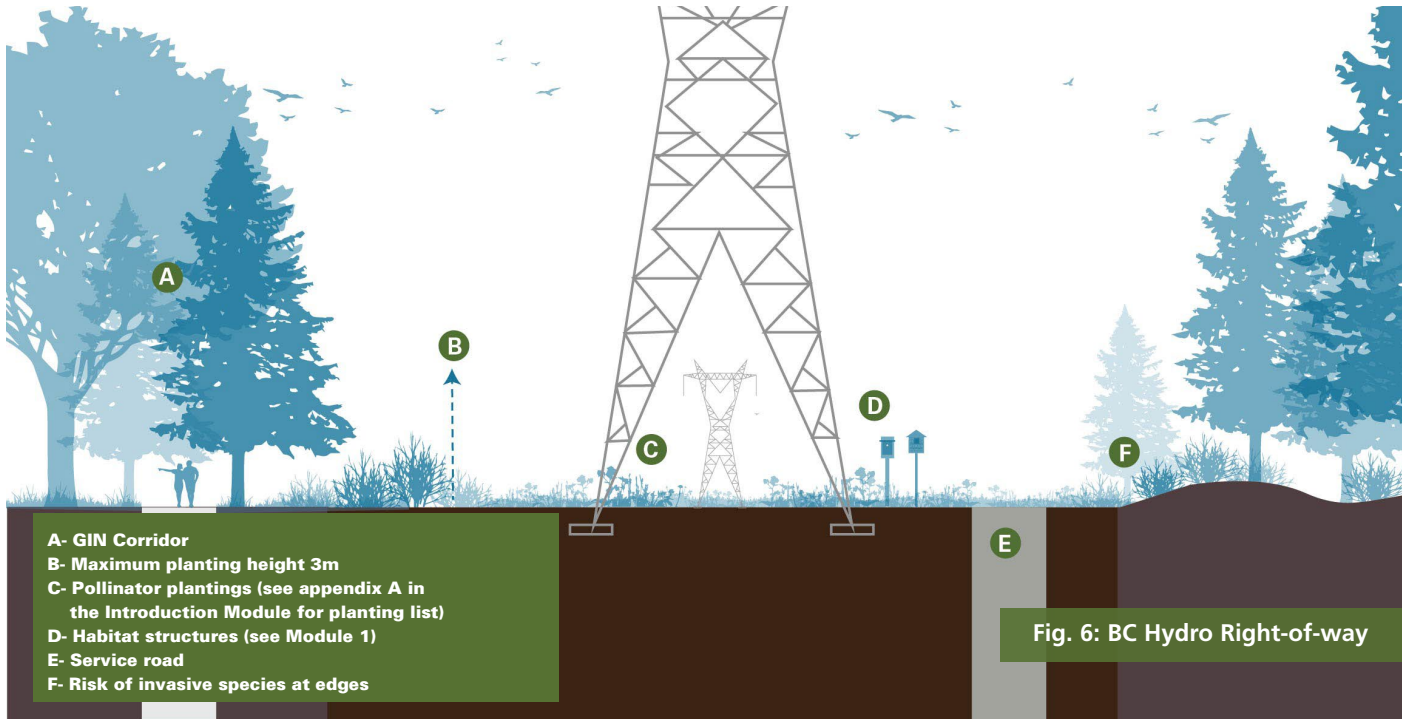


Fig. 6: BC Hydro Right-of-way

* Diagram adapted from [BC Hydro](#)

Overview

Height limitations within hydro right-of-ways require low growing plants that will not conflict with utility lines. Sun exposure within these corridors may require more drought tolerant species. Opportunities exist within such right-of-ways to create extensive shrub-meadow habitats that are often underrepresented in urban areas.

Design Guidelines:

- ☑ Follow regulatory guidance for plant height to minimize conflicts with utility lines.
- ☑ Follow Avian Power Line Interaction committee (APLIC) design guidance when considering the types of trees to plant, and specifically their height at maturity, which

will influence flight lines of birds. Ideally, trees will be setback from and be above transmission lines to reduce the risk of birds colliding with lines when moving between habitat patches.

- ☑ Establish pollinator meadows.
- ☑ Avoid planting tall shrubs and trees with weak root systems that could fall and interfere with overhead power lines.
- ☑ Incorporate multi-use trails. where suitable.

Focal Guilds and Species:

Cost: \$\$-\$\$\$



REFERENCES

- ¹ Van, Rodney, et al. Handbook of Road Ecology. Somerset Wiley Ann Arbor, Michigan Proquest, 2015.
- ² Wheeler, Justin. "Leave the Leaves! | Xerces Society." Xerces.org, 6 Oct. 2017, xerces.org/blog/leave-the-leaves. Accessed 13 Jan. 2021.
- ³ Plantlife. "Say No to the Mow!" Plantlife, www.plantlife.org.uk/uk/discover-wild-plants-nature/say-no-mow. Accessed 17 Jan. 2021.
- ⁴ Canadian Wildlife Federation. "Grow It! Don't Mow It!" Cwf-fcf.org, cwf-fcf.org/en/explore/pollinators/grow-it/. Accessed 13 Jan. 2021.
- ⁵ Cabanek, Agata, et al. "Biophilic Streets: A Design Framework for Creating Multiple Urban Benefits." Sustainable Earth, vol. 3, no. 1, 8 July 2020, 10.1186/s42055-020-00027-0. Accessed 12 July 2020.
- ⁶ Jacobson, Sandra L. Mitigation Measures for Highway-Caused Impacts to Birds. USDA Forest Service, 2005.
- ⁷ Glista, David J., et al. "A Review of Mitigation Measures for Reducing Wildlife Mortality on Roadways." Landscape and Urban Planning, vol. 91, no. 1, May 2009, pp. 1–7, 10.1016/j.landurbplan.2008.11.001. Accessed 2 Aug. 2020.
- ⁸ Phillips, Benjamin B., et al. "Enhancing Road Verges to Aid Pollinator Conservation: A Review." Biological Conservation, no. 250, July 2020, p. 108687, 10.1016/j.biocon.2020.108687.
- ⁹ British Columbia Ministry of Agriculture, Food and Fisheries. "Environmental Farm Plan Program - Province of British Columbia." Wwww2.Gov.Bc.Ca, www2.gov.bc.ca/gov/content/industry/agriculture-seafood/programs/environmental-farm-plan.
- ¹⁰ Farmland Advantage. "Home Page." Farmland Advantage, 2016, www.farmlandadvantage.com/. Accessed 13 Jan. 2021.
- ¹¹ Terry, Shistar. Hedgerows for Biodiversity. Beyond Pesticides.
- ¹² British Columbia Ministry of Agriculture. Guide to Edge Planning: Promoting Compatibility Along Agricultural – Urban Edges. 2015.
- ¹³ Keken, Z., et al. "Roadside Vegetation Influences Clustering of Ungulate Vehicle Collisions." Transportation Research Part D: Transport and Environment, vol. 73, Aug. 2019, pp. 381–390, 10.1016/j.trd.2019.07.013. Accessed 12 Jan. 2021.
- ¹⁴ Johnston, Jacob. "Managing Utility Corridors for Wildlife Habitat." Habitat Network, 20 Nov. 2017, content.yardmap.org/learn/managing-utility-corridors-wildlife/. Accessed 27 Jan. 2021.
- ¹⁵ Szondy, David. "Power Line 'Flappers' Prove Best Deterrent for Preventing Bird Deaths." New Atlas, 25 June 2020, newatlas.com/science/flappers-deterrent-power-line-bird-deaths/. Accessed 27 Jan. 2021.
- ¹⁶ Avian Power Line Interaction Committee (APLIC). Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Edison Electric, APLIC, and the California Energy Commission, 2006.