Environmental Best Management Practices for Urban and Rural Land Development

4

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Section Four
Environmental Planning and Development at the Site Level

British Columbia
Ministry of Water, Land and Air Protection
Ecosystem Standards and Planning
Biodiversity Branch

Summary

Best management practices for environmental planning and development at the site level include:

Community and watershed context

- Plan site development in a community context

Detailed site inventory

- Identify environmental features before designing the development
- Identify hazard lands

Site planning and design

- Avoid development in sensitive areas
- Design the development to retain important ecosystem features
- Design the development to retain important ecosystem functions
- Retain buffers around sensitive areas
- Connect habitat areas with wildlife corridors
- Design the site to maintain the hydrology and water quality
- Plan trails carefully
- Create 'green' buildings

During development

- Protect ecosystem features and functions during construction
- Use natural landscaping techniques

Protection after development

- Retain natural ecological processes
- Monitor environmental impacts

Restoration and enhancement

- Restore and enhance habitats
- Avoid or minimise the use and spread of non-native vegetation, especially invasive plant species

Creation of new habitats

- Create new habitats in rural areas
- Create and maintain habitats in urban areas

Stormwater management

- Put water back in the ground
- Preserve or improve water quality
- Hold back water through rate control or detention

Erosion and sediment control

- Develop an erosion and sediment control plan
- Control erosion and sediment during construction

Wildfire considerations

- Reduce risk from wildfires

Wildlife human conflicts

- Site developments to avoid conflicts
- Remove or reduce wildlife attractants

Environmental Planning and Development at the Site Level

"Wildlife" includes all wild plants AND animals.

This section of *Environmental Best Management Practices for Urban and Rural Land Development* is written for people who are responsible for urban and rural land development at the site level— local governments, the development community and landowners.

Sections 5–7 discuss urban and rural land development on sites that are highly sensitive, because they are environmentally sensitive areas, habitats for special wildlife and species at risk, and/or aquatic and riparian ecosystems. This section discusses environmental planning and development for other urban and rural development sites. Although these sites may be deemed less environmentally sensitive, they may still play a significant role in the local environment and are important for biodiversity and community greenspace.

Site-level planning should reflect community and landscape level planning, as discussed in Section 3: Environmental Planning at the Community Level.

4.1 Benefits of Environmental Protection at the Site Level

Woodpeckers like standing dead trees.
PHOTO: TRUDY CHATWIN

Good environmental planning at the site level brings many benefits to the community, the local government and the developer. For example:

- Retention of trees and green space helps to increase property values and create properties that are more desirable;
- Integrated stormwater management can reduce the costs associated with traditional stormwater management approaches;
- Urban trees provide services such as reducing air pollution, cooling in the summer and protection from winter storms as well as providing habitat for birds and bats that keep insect populations in check; and
- Walking and cycling pathways in communities encourage reduced use of vehicles (helping to reduce greenhouse gases) and provide a community that people enjoy living in.

For more information, see Appendix A: Benefits of Environmental Protection.

Developers Benefit from Environmental Protection

- **Higher prices:** Homeowners are willing to pay a premium of 5–15% (and sometimes more) for properties near natural open space (*Quayle and Hamilton 1999, Curran 2001*).
- **Faster approvals:** Developers can spend a great deal of time (and money) in the approvals process. Where a proposed development has clear environmental benefits, it is more likely to have public support and approval, and will move faster through the approval process (*Curran 2001*).
- **Faster sales:** Houses sell more quickly where they are close to greenspace. For homebuyers, access to natural open space is one of the most important features in a residential neighbourhood (*Quayle and Hamilton 1999, Curran 2001*).
- **Marketing edge:** The U.S. National Association of Homebuilders encourages the planting of trees because this increases the marketability of new developments (*Petit 1998*).

For more information, see Appendix A: Benefits of Environmental Protection.

4.2 Objectives

The Ministry's goals are to:

- Maintain and restore the ecological diversity of fish and wildlife species and their habitats; and
- Protect the environment and human health and safety by ensuring clean and safe water, land and air.

Local governments and the development community should meet the following environmental objectives during urban and rural land development:

- Develop and implement site plans that protect biodiversity, clean air and clean water, for the benefit of the current and future residents and the flora and fauna of the community;
- Gather inventory information that identifies:
  - All **environmentally sensitive areas**[1] on and near the site, including terrestrial, aquatic and riparian ecosystems;
  - All known **species at risk** on and near the site, including both **federally-listed** and **provincially-ranked** species;
  - **Wildlife corridors;**
  - **Hazard lands**, including areas subject to flooding, erosion, wildfire and 'problem' wildlife; and
  - **Hydrology** and **soil morphology**.
- Design developments that protect and enhance environmentally sensitive areas, habitat for plants and animals (including common species and species at risk) and wildlife corridors, including concentrating developments in alternate sites where necessary;
- Locate developments away from areas that may be subject to erosion, flooding, wildfires and undesirable human-wildlife encounters;
- Prevent and manage adverse effects on the air, water and land quality through pollution prevention, management of stormwater, and waste management; and
- Work with the community to maximise the benefits of good environmental planning at the community and site level.

Local governments should address these issues within their Official Community Plan and other planning and public consultation processes. Developers should be able to demonstrate to local governments and the public how they have addressed these concerns and incorporated them into their development before, during and after the construction process.

4.3 Legal Requirements

Urban and rural land developments at the site level are governed by several Acts and regulations:

- The British Columbia *Wildlife Act* provides protection for all wildlife.
- The B.C. *Fish Protection Act* and Streamside Protection Regulations regulate setbacks from streams and other watercourses.

[1] **Definitions** are provided in Appendix 4-1 and in the Glossary

The Streamside Protection Regulation is currently under review. For more information see http://wlapwww.gov.bc.ca/habitat/fish_protection_act/index.html

- The federal *Species at Risk Act* provides for the protection of federally listed species at risk and their critical habitats.
- The federal *Fisheries Act* provides penalties for destruction or degradation of fish habitat, including sediment and riparian clearing.
- The federal *Migratory Bird Convention Act* provides penalties for possessing birds or nests.
- The *Canada Wildlife Act* prohibits possession or harming wildlife (including plants) except as permitted by regulations.

4.4 Best Management Practices

Best management practices for site-level environmental protection are centred on planning and designing to minimise environmental impacts, ensuring environmental protection during and after construction, and where possible enhancing and restoring natural features. The impacts of development will vary according to the type of ecosystem and site-to-site considerations, so the advice of an **appropriately qualified professional** is recommended.

4.4.1 Community and Watershed Context

Plan site development in a community context

Decisions made at a site-by-site level can affect the natural environment well beyond the boundaries of that site. The cumulative impact of seemingly innocuous decisions at the site level can cause major—and frequently unintended—results.

Proposals for land development at the site level should consider the potential impacts on the environment at the larger scale. How is the site in question part of the environmental 'big picture'? What impacts would changing the hydrology of an area have on downslope floodplains, wetlands and aquatic ecosystems? Would the development **fragment** wildlife habitat or affect wildlife movement patterns?

☑ Ensure that site level plans and design meet or exceed the environmental goals and objectives at the community or watershed level. If there are no specified community or watershed level plans, ensure that the site development will not negatively impact on neighbouring properties.

☑ Identify potential off-site impacts prior to development, and design the development to avoid or mitigate these impacts.

4.4.2 Detailed Site Inventory

Identify environmental features before designing the development

Environmental mapping and inventory should be conducted before designing the development layout and before initiating land clearing activities.

☑ Gather available information from community or regional level mapping and inventories, including local government environmental atlases where they exist. Information may be available about the site through Sensitive Ecosystem Inventories, Fish Wizard, Sensitive Habitat Inventory and Mapping, Ministry of

Water, Land and Air Protection regional websites and other regional and local information sources (see Appendix B: Sources for Environmental Mapping and Inventory). Not all maps and inventories are digitally available—seek out other documented information including unpublished sources.

☑ The Conservation Data Centre (CDC) is also a useful source of information for identifying known and potential occurrences of special wildlife or species at risk in your area (you can request information on species of concern for a specific area). Coverage by the CDC is not equally good in all areas so be aware that a lack of CDC listing does not mean the species is not found in that location.

☑ Review available information to determine whether additional information needs to be gathered. Remember that regional mapping is at a scale that may miss important sites—just because no environmentally sensitive area is identified does not mean that there are no ecological values on that site. Lack of inventory also does not indicate a lack of sensitive habitats or species.

☑ If the available information is inadequate for site level planning (or has gaps), have a detailed **bio-inventory** of the site prepared by an appropriately qualified professional. The report should include identification of all environmentally sensitive areas, important wildlife habitats, wildlife corridors, the presence of any species at risk, recommended buffers, links to adjacent greenspaces, site hydrology, soil morphology and other information. Note that the timing of the bio-inventory is important, as some species may only be visible or may only use the area at certain times of year. In some cases it may be necessary to inventory the site in more than one season to fully assess its ecological values. For suggested Terms of Reference for the development of a bio-inventory, see Appendix C: Terms of Reference for Bio-Inventory.

☑ Provide the results of the bio-inventory to the local government, and any findings of species at risk to the Conservation Data Centre and regional Ministry of Water, Land and Air Protection species at risk staff.

☑ If community level information is not available, use air photos or other means to identify ecological values on surrounding lands.

Locate developments away from areas subject to flooding.
PHOTO: MARLENE CASKEY

IDENTIFY HAZARD LANDS

Use terrain stability mapping and floodplain mapping to identify potential hazard areas.

4.4.3 Site Planning and Design

AVOID DEVELOPMENT IN SENSITIVE AREAS

☑ Design the development to avoid sensitive areas and their buffers (see below).

☑ For aquatic and riparian ecosystems (e.g. wetland, streamside and coastal areas), environmentally sensitive areas, and habitat areas for special wildlife and species at risk, follow the identified best management practices (see Sections 5–7).

☑ Work with the local government to identify suitable planning tools and incentives to protect sensitive areas and buffers. Options may include:

- Conservation covenants
- Parkland dedication
- Management agreements
- Acquisition by the local government or a land trust
- Density transfer or bonusing

For more information see *Giving It Away: A Guide to Best Practices for Conservation Covenants,* *The HAT Manual: Protecting Natural Areas in the Capital Region,* the *Eco-gifting website* and *Green Legacies: A Donor's Guide for B.C.*

Ecosystem **features** are the physical attributes that create many different types of habitat for different species. For example, snags (standing dead trees), ground cover, and large woody debris in streams are all ecosystem features.

Design the development to retain important ecosystem features

To protect ecosystems—and the plants and animals that live in them—we need to protect the ecosystems' **features** AND **functions**.

☑ Consider cluster housing to maximise retention of greenspace and sensitive habitats.

☑ Design the site to maintain treed fence lines, hedgerows and windbreaks, and ensure that they are connected to forest patches, backyard habitats and/or large **habitat reservoirs**. They form wildlife corridors and **edge habitat** for many wildlife species.

☑ Design green patches to maximise habitat values. In general, round patches provide better **interior habitat**, which is vital for some native birds that depend on forest interiors for protection from predators, nesting and/or feeding. Along streams, long strips of habitat provide wildlife corridors as well as habitat for many native species.

☑ Design buildings, infrastructure and other development so that established trees can be retained, with enough distance to protect the root systems. The tree's 'drip line' (the extent of the branches) can be used as an approximate guide to the area of root systems. Mature trees add to the property value.

☑ If hazard trees need to be removed, follow the guidelines of the *Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal.*

☑ Avoid **fragmenting**[1] wildlife habitats.

☑ Develop a 'site map' of these features to be referred to during construction.

Ecosystem **functions** are the processes that keep an ecosystem operating. Examples include infiltration of surface water, evapo-transpiration, and nutrient cycling.

Design the development to retain important ecosystem functions

☑ Maintain natural hydrologic cycles in wetlands, ponds, streams and natural seepage areas to retain biodiversity and wetland function.

☑ Build well away from floodplains and allow natural flooding cycles to occur so that flood-dependant ecosystems can persist. Some wildlife species depend on the ecosystems that develop in response to natural flooding.

1 For a discussion of fragmentation, see Section 3.4.4: Ecosystem and Species Protection

Table 4-1: Target Buffer Distances

This table provides suggested **minimum** buffer distances for some species and ecosystems. These distances are based on scientific research and professional observation, and are intended to minimise disturbance to the species or ecosystem in question. The target buffer for undeveloped lands is larger than for rural and urban lands. In undeveloped areas, animals have likely had less contact with humans and are less tolerant of human presence. In urban areas, the distances are smaller, recognising that species and ecosystems have likely developed greater tolerance to human activity, and also that the high demand for land may preclude large buffers. During their breeding season, birds are especially sensitive to activities such as machine landscaping and construction. If construction is taking place during the breeding season, the 'quiet' buffer is an **additional** buffer that should be used.

Sensitive Feature	Target Buffer Distances Measure buffer from	Undeveloped [1]	Rural [2]	Urban [3]	Breeding season "quiet" buffer [4]
Eagle nests	The base of the tree	200 metres	100 metres	1 1/2 tree lengths [5]	100 metres
Other Raptors [6] nests	The base of the tree; cliff top or base	500 metres	200 metres	1 1/2 tree lengths or 50m from cliff	200 metres
Great Blue Heron nests [7]	A line drawn around the outer perimeter of all nest trees	500 metres	200 metres	60 metres	200 metres
Amphibians [8]	Outer perimeter of wetlands under fully saturated conditions	150 metres	100 metres	30 metres	N/A
Reptiles [9]	Snake hibernacula; prime habitats	150 metres	100 metres	30 metres	N/A
Riparian protection areas along all watercourses [10]	Top of Bank or high water mark if bank undefined [11]	60 metres	60 metres	Follow Streamside Protection Regulation [12]	N/A
Wetlands [13]	Measured from the outer perimeter	150 metres	100 metres	30 metres	N/A
Sensitive ecosystems [14]	Measured from the outer perimeter	200 metres	60 metres	30 metres	N/A
Species at risk	Follow the Recovery Plans or, where not available, an appropriately qualified professional's recommendations for each species				
Bear habitat	Especially dens, primary feeding areas and travel corridors	Minimum block size of 20 ha including critical habitats	N/A	N/A	N/A
Moose/elk/bighorn sheep habitat	Especially high use areas – wetlands, winter and summer habitats	500 metres	N/A	N/A	N/A

KEY TO TABLE 4-1

[1] "Undeveloped" applies to large tracts of undeveloped forest or grasslands, that are being developed into 5 hectare or smaller lot sizes.
[2] "Rural" applies to lots sizes from 1-5 ha that are being further subdivided.
[3] "Urban" applies to lots 1 ha or less that are being further subdivided.
[4] This is an additional buffer that should be used if land contouring or construction is taking place during nesting season.
[5] One and a half times the height of the tree.
[6] See *Best Management Practices Guidebook for Raptors in British Columbia* for species-specific recommendations.
[7] Ross Vennesland, Ministry of Water, Land and Air Protection. 2004. pers comm..
[8] See *Best Management Practices for Amphibians and Reptiles* for species-specific recommendations.
[9] See *Best Management Practices for Amphibians and Reptiles* for species-specific recommendations.
[10] Millar et al 1997.
[11] Top of Bank is defined in the Glossary.
[12] This applies whether or not the watercourse is fish-bearing.
[13] This includes ephemeral (seasonally dry) wetlands as well as open bodies of water. If amphibians or other species are present, use the largest of the suggested buffer widths. (Semlitsch and Bodie 2003).
[14] Where identified regionally.

RETAIN BUFFERS AROUND SENSITIVE AREAS

The Ministry of Water, Land and Air Protection estimated that one Lower Mainland community could have avoided stormwater flooding damage of about $2.5 million on one stream alone had riparian buffers been left in place (*MWLAP 2001*).

Buffers are a leave area around a sensitive feature. Their purpose is to provide protection for that core feature by reducing the impact of potentially adverse effects from the outside. This can include access by humans and their pets, changes in microclimate, access by predators, etc. Buffers help to maintain the long term values—both environmental and economic—of an environmentally sensitive area.

Buffers should preclude permanent structures AND promote the retention of natural vegetation as part of the buffer.

☑ Establish buffers around all sensitive features. Target buffer widths are provided in Table 4-1. The Ministry also advises using an appropriately qualified professional to identify buffer widths, as circumstances may vary on a site by site basis.

☑ For Environmentally Sensitive Areas, Special Wildlife and Species at Risk and Aquatic and Riparian Ecosystems, see the information provided in Sections 5–7.

☑ In new developments, buffers should be of sufficient width to discourage access by humans and their pets to the environmentally sensitive area, reduce invasion by alien species and protect interior habitats from degradation. The width of the buffer will depend on its purpose and the sensitivity of the habitat you are trying to protect.

☑ In brownfield developments and re-developments, buffers should be as wide as possible to facilitate renewal of natural processes. Restoration of natural vegetation should be encouraged.

☑ Where park land is adjacent to the proposed development site, buffers should be placed as needed to prevent unacceptable impacts within the park.

☑ Set aside buffers as Crown or local government land where possible, as this makes long-term protection easier. For other options for the protection of these areas, see Avoid development in sensitive areas, Section 4.4.3. If the buffer is on private land, it should be protected and enforced using a conservation covenant or similar tool.

Connect habitat areas with wildlife corridors

☑ Maintain and create wildlife corridors between the natural areas on the development site and those on adjacent properties. Riparian areas and natural gullies often function well as wildlife corridors. Other areas such as utility corridors and golf courses may provide corridors for some species.

Wildlife Corridors

"Wildlife corridors provide animals with an opportunity to move freely between two or more habitat patches or habitat types in an otherwise fragmented landscape. This movement is essential to provide genetic links between populations and prevent inbreeding, and to compensate for temporary population declines in one of the habitat patches. The habitat needs of all priority species should be incorporated into the design of the corridor. Corridors must be suitably wide, with appropriate habitat features to provide security cover during movement. Corridors usually consist of linear habitats such as streamside riparian areas, often composed of two or more ecosystem types to provide complexity to the corridor. Development and roads should avoid these zones, and mitigation will be required where roads and other developments transect the corridor" (*Clarke et al 2004)*.

Design the site to maintain the hydrology and water quality

See also Section 4.4.7: Stormwater Management.

☑ Design the site so that the natural hydrological cycles (hydrographs) are maintained during and after development. Note that considerable baseline data may be needed to assess pre- and post- development conditions.

☑ Incorporate features that will minimise the amount of impervious surface and encourage groundwater recharge, such as narrower road widths, vegetated swales and pervious paving materials. For more details, see *Stormwater Planning: A Guidebook for British Columbia*, Chapter 7.

☒ Do not use local streams or wetlands for unmanaged stormwater discharge as the increased flows can significantly increase erosion.

Impacts of Impervious Surfaces

When rain falls on a forest floor, less than 1% flows directly overland into watercourses. About 55% soaks into the ground, moving into the groundwater or travelling through the ground into lakes and streams. About 45% is absorbed by plants or evaporates from the ground. Land development changes this water balance, creating hard impervious surfaces such as roads, parking lots and roofs. Following development, about 25%–75% of the rainfall goes directly into the stream via storm drains. This may create problems in the stream as the increased water quantity can cause erosion and destroy wildlife habitat, while the water quality deteriorates if the stormwater contains oils and other pollutants from the roads and driveways. Groundwater supplies also suffer as there is less groundwater recharge. (*Stormwater Planning: A Guidebook for British Columbia*)

PLAN TRAILS CAREFULLY

Trails in natural areas provide opportunities for the enjoyment of nature. However:

☑ Design trails and other accesses to avoid sensitive features such as ponds, wetlands, nesting sites and wildlife corridors.

☑ Ensure that trails do not fragment wildlife habitats.

☑ Keep hiking trails and walkways narrow so they do not prevent a barrier to movement of wildlife (such as reptiles and amphibians) and use elevated boardwalks or install "toad tunnels" to cross travel corridors.

☑ For more information on designing trails near sensitive features, see *Access Near Aquatic Areas: A Guide to Sensitive Planning, Design, and Management* and *Best Management Practices for Recreational Activities on Grasslands*.

CREATE 'GREEN' BUILDINGS

☑ Construct buildings to conform with **LEED™** (Leadership in Energy and Environmental Design) standards for 'green' buildings. For information on funding and standards for the building and retrofit of green buildings, see the Green Buildings B.C. program. For information on LEED™, see the LEED (Leadership in Energy and Environmental Design) Green Building Rating System™.

4.4.4 During Development

Protection is MUCH cheaper than restoration.

Protection of existing ecosystems is MUCH cheaper than ecosystem enhancement and restoration. And, in many cases, it is not technically possible to restore ecosystems to their original functioning state.

PROTECT ECOSYSTEM FEATURES AND FUNCTIONS DURING CONSTRUCTION

☑ Construct permanent or temporary fencing around sensitive features and their buffers.

☑ Restrict land clearing or development activities between April 1 and July 31, to avoid disturbance or destruction during the active nesting period of most bird species, in compliance with the *Wildlife Act* (section 34c). Note that some species of birds have multiple broods and may be nesting outside of this time period.

Minimise the size of the cleared area.
PHOTO: TRUDY CHATWIN

☑ Retain as much natural vegetation as possible. Minimise the size of the cleared area required for construction.

☑ Prevent any disturbance within the root zone (drip line) of established trees.

☑ Preserve snags, downed logs, stumps and other forest features unless they present a danger to workers or the public. Consider topping any identified danger tree (at 5 m to 10 m or more) as an alternative to removal, and retaining this as a **wildlife tree**. Where hazard removal is unavoidable, the work should be as non-intrusive as possible. Felled trees should be left on the ground to provide habitat for wildlife including a wide variety of invertebrates. Note that a hazard tree *assessor* is the only qualified professional for assessing danger trees, but that this assessor may not be

Downed trees provide habitat for salamanders and other wildlife.
PHOTO: MARLENE CASKEY

sensitive to wildlife needs. For more information see *Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal.*

USE NATURAL LANDSCAPING TECHNIQUES

☑ Use salvaged woody debris (logs, stumps) to enhance habitat in preserved patches and along wildlife corridors. This minimises disposal costs and enhances wildlife values.

☑ Use native plants and trees (suited to local climatic and terrain conditions) for landscaping as much as possible. This will minimise the possibility of introducing an invasive species, and will save money on maintenance costs as native species will be adapted to local climates (e.g. areas of summer drought or winter cold).

☑ Where possible use native plantings on public lands to demonstrate to residents the benefits of native plantings for maintenance and as wildlife habitat (i.e. demonstrate "**Naturescape**" principles).

☒ Never use any **invasive** species (e.g. English ivy, English holly, periwinkle, purple loosestrife, etc.) in landscaping, as these could spread into nearby natural areas and displace native vegetation and wildlife. As much as possible, remove any invasive species that are already on the development site. For more information see the Alien Species website.

☑ Use drought resistant species and very small lawns to minimise watering needs.

☑ Retain the natural soils and put them back onsite during landscaping.

☑ Ensure that all lawn areas have at least six inches of topsoil replaced after development is complete. This will promote deeper-rooted lawns and plants that will require less water in summer and be able to absorb more stormwater in winter.

☑ Reduce soil compaction by avoiding machinery use except where necessary.

☑ Obstruct pet access to sensitive habitats by constructing fencing and maintaining dense shrubby vegetation.

4.4.5 Protection After Development

RETAIN NATURAL ECOLOGICAL PROCESSES

Ecosystems, and the species that live in them, may be dependant on natural processes such as nutrient cycling, frequent or infrequent fires, or flooding.

☑ Ensure that the natural (pre-development) hydrological cycles are maintained during and after development. Changes in drainage patterns may impact wildlife, for example by putting year-round water into an area where species are adapted to summer droughts or by changing the quality of the water.

☑ Consider (where applicable) the development of plans that include low-intensity ground fires. Many species that inhabit these ecosystems need the old, open stands that were common to parts of British Columbia prior to current fire management regimes. **Controlled burns must only be carried out by an appropriately**

qualified professional. Frequent controlled burns will not be as hot as wildfires, posing considerably less risk to nearby homes. Controlled burning should be conducted as part of a well planned ecological restoration program within the context of the site being treated.

MONITOR ENVIRONMENTAL IMPACTS

☑ Develop monitoring programs to ensure designed terrestrial habitat protection measures are functioning as expected and implement changes where needed.

☑ Discourage activities that will damage natural ecosystems, such as throwing garden waste into ravines (which can destabilise slopes and cause slumping).

☑ Control recreational access to natural grassland areas, as even walking can damage both vegetation and thin soils. For further information on recreational activities on grasslands see *Best Management Practices for Recreational Activities on Grasslands*.

4.4.6 Restoration and Enhancement of Degraded Habitats

Some development sites have degraded habitats with the potential for restoration. The following best management practices provide guidance on restoration efforts.

Mature trees add to property value.
PHOTO: MARLENE CASKEY.

RESTORE AND ENHANCE DEGRADED HABITATS

☑ Work with an appropriately qualified professional to develop a site restoration plan for the specific site(s) being restored. This will include determining the appropriate state to restore the ecosystem to—for example, in a rural area the goal may be to re-create the natural ecosystem, whereas in a highly urbanised area the goal may be less ambitious.

☑ Allow natural succession to proceed with minimal intervention or disturbance unless active management is needed to enhance or maintain habitat value or to control trees or brush that pose fire or safety hazards.

☑ Avoid and minimise the use and spread of alien vegetation, especially invasive plant species

☑ Discourage the occurrence and spread of invasive species. Active control methods include hand clearing, pruning, mowing, digging, and planting of appropriate native species to replace or shade out invasive species. Ongoing maintenance may be required.

4.4.7 Stormwater Management

Below are some of the principal best management practices for stormwater management at the site level. For detailed information on stormwater planning and management, refer to the guidelines from *Stormwater Planning: A Guidebook for British Columbia* (especially Chapter 7), *Standards and Best Practices for Instream Works* and the Water Balance Model.

Lost Streams: Studies in the Lower Fraser Valley show that of the original 779 streams, 117 no longer exist, and that "most of the remaining 662 streams are under significant stress due to landscape alterations in watersheds, riparian zone degradation, and pollution, and are classified as threatened or endangered." (*Fraser River Action Plan 1997*)

PUT WATER BACK IN THE GROUND

☑ Establish performance targets for stormwater that are consistent with *Stormwater Planning: A Guide for British Columbia*.

☑ Retain natural water flows. Changes in surface drainage and groundwater flow patterns may adversely impact aquatic and riparian ecosystems and destabilise the banks. Changes in flow can also impact previously dry gullies by introducing seasonal flows.

☑ Minimise the amount of impervious surfaces by installing alternatives to asphalt for laneways, driveways, walkways, patios, etc. and building narrower roads.

☑ Encourage groundwater recharge through the use of vegetated swales, infiltration basins and the use of absorbent vegetation, and by disconnecting downspouts (where the terrain permits).

PRESERVE OR IMPROVE WATER QUALITY

☑ Create engineered wetlands to filter pollutants before they can enter streams or creeks.

☑ Provide vegetated waterways (swales) or other measures to prevent the movement of road salts and other contaminants into sensitive habitats.

☑ Ensure that pollutants such as oil and other hydrocarbons are removed by oil/water separators before they enter the groundwater or streams.

☑ Minimise, or better yet avoid, the use of pesticides and fertilisers.

HOLD BACK WATER THROUGH RATE CONTROL OR DETENTION

☑ Use the Water Balance Model to assess stormwater volumes and identify appropriate source controls.

4.4.8 Erosion and Sediment Control

Erosion and sediment control can be a significant issue on construction sites, as loss of materials from exposed soils can lead to charges under the *Fisheries Act* as well as creating problems with drainage systems.

Effective erosion and sediment control requires the use of a variety of techniques. For more information consult the Water Quality Municipal Best Management Practices for Construction Design website and/or hire an appropriately qualified professional.

DEVELOP AN EROSION AND SEDIMENT CONTROL PLAN

☑ Develop a plan for erosion and sediment control **before** construction begins. The plan should include:

- Best management practices for source control and removal of contaminants from site runoff;
- Detailed direction to contractors to ensure that no erosion or sediment movement will occur and that no silt will be released to watercourses during the construction and post construction phase; and

- The planting appropriate of native plant species of a size that will quickly re-establish riparian cover.

☑ In the construction and post-construction sediment and erosion control plan, recommend that an environmental consultant or other responsible party:

- Provide monitoring to ensure the sediment and erosion control plan is properly implemented during the course of clearing and construction;
- Ensure construction will proceed smoothly without harmful alteration of habitat; and
- Provide long-term monitoring for disturbed sites until green-up is established and the soils at the site are stable.

☑ If sensitive habitats may be at risk during the construction and development stage, hire an appropriately qualified professional to assist in planning and monitoring. Environmental consultants and monitors should be given the authority to halt all work if in their opinion on-site conditions will result in impacts to sensitive habitats.

The Greater Vancouver Regional District's Stormwater Best Management Practices Guide includes many recommendations for erosion and sediment control. http://www.gvrd.bc.ca/sewerage/management_guide.htm

CONTROL EROSION AND SEDIMENT DURING CONSTRUCTION

☑ Construct and stabilise runoff management systems at the beginning of site disturbance and construction activities.

☑ Minimise disturbed areas and stripping of vegetation and soils, particularly on steep slopes, and stabilise denuded soils as soon as possible. Re-vegetate promptly once foundation work is complete

☒ Do not open up sites when the weather is likely to be rainy or during snowmelt. Retain as much of the natural vegetation cover as possible.

☑ Consider additional stormwater runoff requirements for projects constructed during the rainy season.

☑ Require stabilised site entrances with provisions to prevent tracking of mud and debris off site.

☑ Roughen and/or terrace slopes to prevent erosion.

☑ Ensure proper containment and disposal of concrete wash water.

☑ Use temporary coverings (plastic sheets) for soil stockpiles and bare slopes, and surface mulches, including leaves and straw, to provide erosion control from raindrop erosion. Control of sheet, rill and gully erosion requires management of surface flows.

☒ Avoid the collection, conveyance and concentration of surface water by encouraging it to seep into the soil.

☑ Inspect the construction site regularly to determine compliance with requirements.

4.4.9 Wildfire Considerations

Wildfires are a natural process of B.C.'s forests and grasslands. For detailed information on reducing risk from wildfires, see *FireSmart: Protecting Your Community from Wildfire*.

Reduce risk from wildfires

- ☑ Install sprinkler systems in new homes that are close to areas of wildfire hazard.
- ☑ Support the restoration of natural disturbance regimes in local forests so that fuel loadings and the risk of crown fires are reduced.
- ☑ Minimise the build up of fuels (wood piles, deserted out buildings, etc.) in and around home sites.
- ☑ Rake up litter close to homes as an additional fire prevention/restoration tool.
- ☑ With an appropriately qualified professional, investigate options for prescribed burning. **Note: Burns close to homes can be hazardous and, improperly managed, can do more harm than good. They should only be conducted with professional advice.**

4.4.10 Wildlife Human Conflicts

When we build communities, we do so in places that are the homes of many different species of wildlife. Native plants and trees are replaced by roads, building and lawns, and many of the reclusive animals die out or move elsewhere. Some 'pest' species remain, or move in to the area, to benefit from the human activities. 'Garbage bears' and opportunistic wildlife such as racoons can become a problem.

Site developments to avoid wildlife conflicts.
PHOTO: MINISTRY OF WATER, LAND AND AIR PROTECTION

Site developments to avoid conflicts

- ☒ Do not build on or near wildlife corridors and other well-frequented wildlife habitats (especially those used by large predators such as bear and cougar, and other potentially dangerous species such as rattlesnakes).
- ☑ Recognise that old orchards can attract bears and other wildlife and locate developments accordingly.
- ☑ Consider possible wildlife conflicts when siting trails around or near developments.

Remove or reduce wildlife attractants

- ☑ Minimise human-wildlife conflicts, for example by harvesting orchards that may attract problem bears. For more information on ways that communities have dealt with problem bears, see *Get Bear Aware*.
- ☑ Build covered areas for garbage that are designed to keep out problem species such as bear, skunk and rats. Spilled garbage attracts crows and raccoons, which prey on sensitive wildlife such as reptiles, amphibians and songbirds. Recent amendments to the *Wildlife Act* make it illegal to improperly manage garbage.

4.4.11 Pollution Prevention

For best management practices on pollution prevention see Section 8: Pollution Prevention.

4.5 Useful Sources

For complete references and a more extensive reading list, see the Bibliography.

Legislation:

For a full listing of **provincial government legislation**, see http://www.qp.gov.bc.ca/statreg/list_statreg_l.htm

B.C. *Wildlife Act*: http://www.qp.gov.bc.ca/statreg/stat/W/96488_01.htm

B.C. *Fish Protection Act*: http://www.qp.gov.bc.ca/statreg/stat/F/97021_01.htm

Streamside Protection Regulations: http://www.qp.gov.bc.ca/statreg/reg/F/FishProtect/10_2001.htm

For a full listing of **federal government legislation**, see: http://laws.justice.gc.ca/en/

Canada *Species at Risk Act*: http://www.sararegistry.gc.ca/the_act/default_e.cfm

Canada *Fisheries Act*: http://laws.justice.gc.ca/en/F-14/

Canada *Wildlife Act*: http://laws.justice.gc.ca/en/W-9/

Canada *Migratory Birds Convention Act*: http://laws.justice.gc.ca/en/M-7.01/

Inventory and Mapping:

Conservation Data Centre http://srmwww.gov.bc.ca/cdc/index.html

Conservation Data Centre known occurrences: http://srmwww.gov.bc.ca/cdc/access.html

Conservation Data Centre data requests: http://srmwww.gov.bc.ca/cdc/request.html

Conservation Data Centre report of findings: http://srmwww.gov.bc.ca/cdc/contribute.html

Sensitive Ecosystems Inventories (http://srmwww.gov.bc.ca/sei/index.html) are currently available for East Vancouver Island and Gulf Islands; Sunshine Coast; Bowen and Gambier Islands; Central Okanagan; and Bella Vista Goose Lake (North Okanagan).

Sensitive Habitat Inventory and Mapping (part of the Community Mapping Network): http://www.shim.bc.ca/maps2.html

Resource Information Standards Committee http://srmwww.gov.bc.ca/risc/standards.htm

Terrain stability mapping: http://srmwww.gov.bc.ca/terrain/inventory/stability/index.html

Floodplain mapping: http://srmwww.gov.bc.ca/aib/fpm/

For area-specific inventories see Appendix B: Sources for Environmental Mapping and Inventory.

Best Management Practices

These Best Management Practices documents will be posted on the Ministry of Water, Land and Air Protection website (http://wlapwww.gov.bc.ca/wld/BMP/bmpintro.html) in the near future. Some drafts are available for review on other websites, or from Ministry offices, as noted below. Comments on these drafts can be sent to Marlene Caskey (Marlene.Caskey@gems7.gov.bc.ca) or Dr. Grant Bracher (Grant.Bracher@gems2.gov.bc.ca).

Best Management Practices for Recreational Activities on Grasslands

Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia: http://www3.telus.net/public/leahmalk/BMP.pdf

Standards and Best Practices for Instream Works: http://wlapwww.gov.bc.ca/sry/iswstdsbpsmarch2004.pdf

Best Management Practices Guidebook for Raptors in British Columbia: Guidelines for integrating raptor conservation with urban and rural developments

Best Management Practices for Hazard Tree and Non-Hazard Tree Limbing, Topping or Removal. Ministry of Water, Land and Air Protection, Okanagan Region. Penticton, B.C. For a copy contact Susan Latimer, Susan.Latimer@gems1.gov.bc.ca

To contact regional Ministry of Water, Land and Air Protection offices see http://wlapwww.gov.bc.ca/main/prgs/regions.htm

STEWARDSHIP PUBLICATIONS:

All of the publications in the Stewardship Series are available at http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp. These include:

Access Near Aquatic Areas: A Guide to Sensitive Design, Planning and Management
Coastal Shore Stewardship: A Guide for Planners, Builders and Developers
Green Legacies: A Donor's Guide for B.C.
Naturescape: British Columbia: Caring for Wildlife Habitat at Home
Stewardship Options for Private Land Owners in British Columbia

TOOLS FOR NATURAL AREA PROTECTION

Habitat Acquisition Trust. 2004. The *HAT Manual: Protecting Areas in the Capital Region*. Habitat Acquisition Trust, Victoria, B.C. http://www.hat.bc.ca/projects/planning.htm

Environment Canada Eco-gifting website: http://www.cws-scf.ec.gc.ca/ecogifts/intro_e.cfm

Hillyer, A. and J. Atkins. 2000. *Giving It Away: A Guide to Best Practices for Conservation Covenants*. West Coast Environmental Law Research Foundation, Vancouver, B.C. http://www.wcel.org/resources/publications/default.cfm

SMART GROWTH

Curran, D. and M. Leung. 2000. *Smart Growth: A Primer*. Smart Growth British Columbia and University of Victoria Eco-Research Chair of Environmental Law and Policy, Victoria B.C. http://www.smartgrowth.bc.ca

Smart Growth B.C. 2001. The *Smart Growth Toolkit: Helping to create more livable communities in British Columbia*. For this and other Smart Growth B.C. publications, see http://www.smartgrowth.bc.ca

Invasive and Alien Species

Alien species in British Columbia: http://wlapwww.gov.bc.ca/wld/aliensp/index.html

Fraser Basin Council. 2004. *Invasive Plant Strategy for British Columbia.* Fraser Basin Council, http://www.fraserbasin.bc.ca

Stormwater Management:

Stormwater Planning: A Guidebook for British Columbia
http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html

Water Balance Model: http://www.waterbalance.ca

Wildfire

FireSmart: Protecting Your Community from Wildfire:
http://www.partnersinprotection.ab.ca/downloads/

Wildlife

Get Bear Aware: http://wlapwww.gov.bc.ca/eeeb/info/bearaware/home/index.htm

Green Buildings

Green Buildings B.C. program: http://www.greenbuildingsbc.com/

LEED (Leadership in Energy and Environmental Design) Green Building Rating System™:
http://www.usgbc.org/LEED/LEED_main.asp

Erosion and Sediment Control

Atkins, R.J., M.R. Leslie, D.F. Polster, M.P. Wise and R.H. Wong. 2000. "Best Management Practices Handbook: Hillslope Restoration in British Columbia." Watershed Restoration Technical Circular No. 3 (Revised). B.C. Ministry of Forests. Victoria, B.C.
http://www.for.gov.bc.ca/hfd/pubs/Docs/Mr/Mr096.htm

Coulter, T. S. and D. R. Halladay. 1997. "Control of Erosion and Shallow Slope Movement Manual." Unpublished report prepared by Thurber Environmental Consultants Ltd. for B.C. Ministry of Transportation and Highways, Victoria, B.C.

Greater Vancouver Regional District. 1999. Stormwater Best Management Practices Guide.
http://www.gvrd.bc.ca/sewerage/management_guide.htm

United States Department of Agriculture. 1994. Planning and Design Manual for the Control of Erosion, Sediment and Stormwater. http://www.abe.msstate.edu/csd/p-dm/index.html

Water Quality Municipal Best Management Practices website:
http://wlapwww.gov.bc.ca/wat/wq/nps/BMP_Compendium/Municipal/Municipal_Home.htm

APPENDIX 4-1: DEFINITIONS

See also Glossary

Alien species: Plants, animals and micro-organisms from one part of the world that are transported beyond their natural range and become established in a new area. They are sometimes also called "exotic," "introduced," "non-native," or "non-indigenous" species. Some alien species are also **invasive species**.

Appropriately qualified professional: A scientist or technologist specialising in a relevant applied science or technology including, but not necessarily limited to, agrology, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture, and who is registered in British Columbia with their appropriate professional organisation, and acting under that association's Code of Ethics and subject to disciplinary action by that association, and who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise.

Bio-inventory: A detailed site assessment that documents plant communities, aquatic and wildlife habitat values, aquatic and wildlife species presence (or likelihood of presence), sensitive ecosystems, rare ecosystems, rare species, adjacent land uses and threats, site stability and flood issues, other factors affecting lot layout, and where appropriate, potential habitat enhancement/protection opportunities. Terms of reference for a bio-inventory are included in Appendix C: Terms of Reference for a Bio-Inventory.

Buffer: An area of land that surrounds and protects a sensitive feature from the adverse effects of activities on, or encroachments from, adjacent land.

Edge habitat: The point at which dissimilar plant communities (different vegetation types, successional stages or vegetative conditions) meet. Many species have adapted to the interface between the two habitats.

Ecosystem features: The physical components of the ecosystem (such as snags and large woody debris) that help maintain the diversity and processes associated with a healthy ecosystem.

Ecosystem functions: The physical, chemical and biological processes that keep an ecosystem operating. Examples include infiltration of surface water, evapo-transpiration and nutrient cycling.

Environmentally sensitive area: A term often used loosely to mean a site or area that has environmental attributes worthy of retention or special care. A more exacting definition is: any parcel of land that already has, or with remedial action could achieve, desirable environmental attributes. These attributes contribute to the retention and/or creation of wildlife habitat, soil stability, water retention or recharge, vegetative cover and similar vital ecological functions. Environmentally sensitive areas range in size from small patches to extensive landscape features. They can include rare or common habitats, plants and animals. Areas requiring special management attention to protect fish and wildlife resources, other natural systems or processes, and/or historical, cultural or scenic values. Environmentally sensitive areas also include hazard lands.

Fragmentation: A process whereby large contiguous ecosystems are transformed into one or more smaller patches surrounded by disturbed areas.

Groundwater recharge: The movement of rainwater down through the soil and into the groundwater and aquifers beneath.

Habitat reservoir: A large area of relatively natural habitat that has sufficient size and ecological integrity to support a range of native species, including species that need interior habitats. The size of habitat reservoir depends on the species being managed for. Habitat reservoirs are often hotspots of biodiversity in or near disturbed urban and rural landscapes.

Hazard lands: Lands that may be subjected to terrain hazards (flooding, landslides, debris flows, avalanches, etc.)

Hydrology: The science of water, its properties and movement (water cycle) over and under land surfaces.

Impervious surface: Hard surfaces that do not permit water to flow through to the ground beneath.

Interior habitat: A point where edge effects no longer influence environmental conditions within an ecosystem. The effects usually involve light intensity, temperature, wind, relative humidity and snow accumulation and melt. In a forest ecosystem, edge habitat is often considered to extend at least 200 m and for some species up to 400 m from the edge of the forest, so very large patches are needed before 'interior habitat' is present.

Invasive species: Plants, animals and micro-organisms that colonise and take over the habitats of native species. Most invasive species are also alien (non-native) to the area, and can become predominant because the natural controls (predators, disease, etc.) that kept their populations in check in their native environment are not found in their new location.

LEED™: The LEED (Leadership in Energy and Environmental Design) Green Building Rating System™ is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.

Naturescape: A way of restoring, preserving and enhancing wildlife habitat in urban and rural landscapes by providing wildlife habitat in our homes and gardens. See the Naturescape website for details.

Soil morphology: The form and structure of the soil, including its mineral and biological (dead organic matter) content.

Species at risk: A species that has been defined as 'at risk' by either the federal or provincial government.

- Federally listed: The federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC) maintains a list of species listed as extirpated, endangered, threatened or of special concern. These species are protected under the *Species at Risk Act.*
- Provincially ranked: The British Columbia government maintains a ranking of species considered to be "red-listed" and "blue-listed" in this province.

Wildlife corridor: A travel corridor for wildlife. This ranges from very wide, natural corridors for large mammals, to 'sky corridors' that offer a safe flight path between feeding and resting places for birds, to smaller man-made corridors (such as urban trails) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.

Wildlife trees: A standing live or dead tree with special characteristics that provide valuable habitat for the conservation or enhancement of wildlife. Characteristics include large diameter and height for the site, current use by wildlife, declining or dead condition, value as a species, valuable location and relative scarcity.