

Environmental Best Management Practices for Urban and Rural Land Development



3

June 2004

Section Three

ENVIRONMENTAL PLANNING AT THE COMMUNITY LEVEL

Summary	ii
3.1 Benefits of Environmental Planning at the Community Level	3-1
3.2 Objectives	3-2
3.3 Legislation	3-3
3.4 Best Management Practices	3-3
3.4.1 Community and Landscape-level Plans	3-3
3.4.2 Inventory and Mapping	3-5
3.4.3 Appropriate Development	3-7
3.4.4 Ecosystem and Species Protection	3-9
3.4.5 Ecosystem and Species Restoration and Enhancement	3-13
3.4.6 Flood and Terrain Hazard Management	3-14
3.4.7 Erosion and Sediment Control	3-15
3.4.8 Wildfire Considerations	3-16
3.4.9 Wildlife-Human Conflicts	3-16
3.4.10 Pollution Prevention	3-17
3.4.11 Stormwater Management	3-17
3.4.12 Lead by Example	3-18
3.5 Local Government Responsibility for Environmental Planning at the Site Level	3-19
3.5.1 Working with Landowners and Developers	3-20
3.6 Useful Sources	3-21
Appendix 3-1: Definitions	3-25
Appendix 3-2: Idealised Neighbourhood Plan	3-28



Summary

Best management practices for environmental planning at the community level should set the framework for good environmental decisions at the site level. Best management practices for environmental planning include:

COMMUNITY AND LANDSCAPE PLANS

- Select an appropriate scale for environmental planning
- Consider all aspects of the environment in community plans
- Identify areas of environmental value in community plans

INVENTORY AND MAPPING

- Identify known environmentally sensitive areas and species at risk
- Conduct additional inventories to identify other important wildlife and habitat values
- Identify hazard lands

APPROPRIATE DEVELOPMENT

- Locate development appropriately
- Avoid rural sprawl

ECOSYSTEM AND SPECIES PROTECTION

- Retain large habitat reservoirs
- Retain habitat refuges
- Identify and set aside wildlife corridors
- Set buffers around sensitive areas
- Create incentives for natural habitat protection
- Enact bylaws to control pets

ECOSYSTEM AND SPECIES RESTORATION AND ENHANCEMENT

- Develop restoration plans
- Take advantage of restoration opportunities offered by re-development
- Manage invasive species

FLOOD AND TERRAIN HAZARD MANAGEMENT

- Assess and mitigate flood risk
- Identify and assess terrain hazards

EROSION AND SEDIMENT CONTROL

- Control erosion and sediment

WILDFIRE CONSIDERATIONS

- Address the possibilities of wildfire before permitting satellite developments
- Develop a plan to balance fire management and wildlife considerations

WILDLIFE HUMAN CONFLICTS

- Consider wildlife-human conflicts when planning new developments

STORMWATER MANAGEMENT

- Establish bylaws to encourage stormwater management

LEAD BY EXAMPLE

- Demonstrate good environmental practices

WORKING WITH LANDOWNERS AND DEVELOPERS

- Create a regulatory framework that promotes environmental protection and stewardship
- Ensure developments meet environmental standards
- Provide incentives for environmental protection and stewardship
- Promote the use of native species in landscaping
- Draw on local knowledge and expertise in the design of developments
- Educate landowners and developers about the benefits of environmental protection

Environmental Planning at the Community Level

"Wildlife" includes all wild plants AND animals.

This section of *Environmental Best Management Practices for Urban and Rural Land Developments* is intended primarily for the benefit of **local governments**—regional districts and municipalities—and others (including First Nations) that are responsible for ‘big picture’ planning at a community-wide scale. Decisions made at the local government level are critical for the protection of **wildlife**¹ and **ecosystems**.

Community-level plans include plans that cover entire regional districts (e.g. regional growth strategies, regional **greenways** or regional parks plans), plans for all or part of a community (e.g. official community plans, local area plans and liquid waste management strategies), and plans for large sites (e.g. a comprehensive development plan for a major brownfield re-development). It also includes plans developed at a *landscape-level*—such as watershed-based plans, often developed by multi-partnered groups representing a variety of community interests.

This section addresses all of these ‘big picture’ plans that encompass an area much broader than the site-specific level, and which set the stage for effective environmental planning at the site level.

Environmental planning and development at the site level is discussed in [Section 4: Environmental Planning and Development at the Site Level](#); [Section 5: Environmentally Sensitive Lands](#); [Section 6: Special Wildlife and Species at Risk](#); and [Section 7: Aquatic and Riparian Ecosystems](#).

3.1 BENEFITS OF ENVIRONMENTAL PLANNING AT THE COMMUNITY LEVEL

Good environmental planning at the community level benefits people as well as the environment and wildlife.

- Developers benefit from greater certainty, cost savings and faster approvals.
- Residents benefit from a well planned community with clean air, clean water and a diversity of greenspace.
- Local governments benefit from greater community support, higher tax revenues, lower servicing costs and free ecosystem services

To learn more, see [Appendix A: Benefits of Environmental Protection](#).

THE IMPORTANCE OF LOCAL GOVERNMENT DECISIONS

“The factors causing ecosystem decline, such as rapid urban development and habitat fragmentation, occur at the local level and are generated by local land use decisions (*Noss and Scott 1987*).

The vast majority of these decisions affecting large ecosystems will be made at a smaller scale, where they will make the largest impact on the natural environment (*Endter-Wada et al 1998, McGinnis et al 1999*).

As a result, many of the decisions that may threaten or protect natural habitat are in the hands of county commissioners, city councils, town boards, local planning staff, and the participating public. Thoughtful policies and actions at the local level can often protect critical habitats more effectively and less expensively than the best intentioned state or federal protection schemes (*Duerksen et al 1997*”.

From Brody et al 2003.

¹**Definitions** are provided in Appendix 3-1 and in the Glossary

COMMUNITIES BENEFIT FROM ENVIRONMENTAL PLANNING

- **Good for business:** “Land use planning strategies adopted initially for environmental concerns have been found not only to improve the local environment and living conditions, but also to attract business and increase economic value on the area” (*Quayle and Hamilton 1999*).
- **Lower costs:** “It can cost 70% more to provide infrastructure and services to low density suburbs than it does to re-develop an existing neighbourhood or to build on unused land” (*Curran and Leung 2000*). For local governments, the additional infrastructure would also add to the future maintenance costs.
- **Stormwater and flood management:** Retaining the natural stormwater balance of watersheds by protecting streams and wetlands and preserving natural riparian vegetation can avoid the need for expensive storm sewer infrastructure while reducing the risk of flooding and associated costs (*Sandborn 1996*)
- **Better air and water quality:** Trees and greenspaces improve air quality by removing pollutants and greenhouse gases (*Center for Urban Forest Research 2003*). Wetlands and riparian areas remove many pollutants before they reach streams (*McPhee et al 2000*).

For more information, see [Appendix A: Benefits of Environmental Protection](#)

“Conservation is an urban issue. More attention needs to be directed at urban municipalities with regard to land-use planning, transportation, major sources of air and water pollution, greenhouse gas emissions and entry points for invasive species.” *WWF Nature Audit, 2003.*

3.2 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.

Environmental planning at the **community** or **landscape-level** should set the framework for good environmental decisions at the **site** level. Local governments should meet the following environmental objectives during urban and rural land development:

- Develop and implement community plans that promote sound environmental management, for the benefit of present and future residents and the flora and fauna of the community;
- Identify and plan for the long-term conservation and function of broad, landscape-level, ecological values, including:
 - all **environmentally sensitive areas** (terrestrial, aquatic and riparian ecosystems),
 - all known **species at risk** in the community, and
 - **wildlife corridors**;
- Protect and enhance environmentally sensitive areas, **habitat** for native plants and animals and species at risk, and wildlife corridors using bylaws, incentives and other planning tools;
- Identify areas where more sensitive development needs to occur;
- Direct community growth, development and re-development to areas with low environmental sensitivity;
- Protect residents and their property by siting developments away from areas subject to erosion, flooding, wildfires and undesirable human-wildlife encounters;

- Prevent and manage deleterious effects on the air, water and land quality, through pollution prevention, management of stormwater, and waste management; and
- Work with the development community and other community interests to maximise the benefits of good environmental planning at the community and site level.

Official Community Plans can designate development permit areas for a variety of purposes, including “protection of the natural environment, its ecosystems and biological diversity.” (*Local Government Act, s 919.1*)

3.3 LEGISLATION

The [Community Charter](#) and [Local Government Act](#) enable local governments (municipalities and regional districts) to plan for and control development within their jurisdiction.

The Community Charter states that the purposes of a municipality include “providing for stewardship of the public assets of its community,” and “fostering the economic, social and environmental well-being of its community” (*Part 2, Section 7*). A council “may, by bylaw, regulate, prohibit and impose requirements in relation to:

- (c) Trees
- (j) Protection of the natural environment
- (m) The removal of soil and the deposit of soil or other material.”

(*Community Charter, Part 2, Section 8*).

The Community Charter came into force in January 2004, replacing portions of the *Local Government Act* for municipalities, but a transition period allows for individual municipalities to adapt their bylaws.

The Community Charter does not currently apply to Regional Districts, which are governed by similar provisions of the *Local Government Act*.

There are many tools available to local governments to protect and enhance the natural environment. Some of the most frequently used tools are discussed in [Stewardship Bylaws: A Guide for Local Government](#) and include bylaws (tree protection bylaws, soil removal and deposit bylaws, watercourse protection bylaws, etc.), zoning and development permits.

Many other Acts and regulations apply to development at the site level. These are referenced in the later sections of this document.

3.4 BEST MANAGEMENT PRACTICES

Decisions by local governments, such as zoning or servicing decisions, affect the natural environment. The cumulative impact of many seemingly innocuous decisions can have a significant environmental impact, for better or for worse. Good community plans can avoid or minimise environmental issues before they occur.

3.4.1 Community and Landscape-level Plans

Local governments may prepare a variety of plans including regional growth strategies, official community plans, park plans, greenways plans, integrated stormwater management plans, local area plans and other community-wide planning documents. These are usually based on political boundaries.

Landscape-level plans are those that address a geographical area with natural boundaries, such as a watershed plan, and the same best management practices will apply. Working on a watershed basis will ensure that impacts from upstream development do not affect lands in the lower part of the watershed (which may be in a different jurisdiction). Where watersheds cross community boundaries, “community scale” planning should include these adjacent areas.

SELECT AN APPROPRIATE SCALE FOR ENVIRONMENTAL PLANNING

- When selecting a scale for planning, consider what scale will best address environmental considerations. This may be a community-wide or landscape scale, a watershed scale (that may involve more than one jurisdiction), or a smaller scale such as a sub-watershed, neighbourhood or local area plan.

CONSIDER ALL ASPECTS OF THE ENVIRONMENT IN COMMUNITY PLANS

- Ensure that community plans address a range of environmental aspects, including:
 - Identification, protection and potential for restoration of important wildlife habitats;
 - Location of development away from environmentally sensitive areas;
 - Prevention of **fragmentation** of environmentally sensitive areas or other important habitats;
 - Minimisation of crossings of watercourses and riparian areas;
 - Maintenance, and potential for restoration, of wildlife corridors;
 - Mimicking of natural stormwater drainage and infiltration processes;
 - Energy conservation (e.g. through ‘green’ buildings, encouragement of walking, bicycling and transit use);
 - Water conservation (e.g. through **xeriscaping** and water-efficient devices);
 - Waste reduction and encouragement of recycling;
 - Naturalisation of public spaces (e.g. treed boulevards, planting of native shrub and herb species);
 - Retention of habitat values on adjacent resource lands (agricultural, forest and mining);
 - Reduction of sprawl and retention of greenspaces; and
 - Management of **invasive species**.
- Set targets for environmental protection and management. For example, “protect xx% (as needed to preserve viable habitats) of the land within the urban containment boundary in a relatively natural state” and “decrease volume of solid waste by yy% in the next five years.”
- Ensure that the Official Community Plan is worded to permit and encourage the development of supporting environmental bylaws.

“ECO-TARGETS”

Urban design consultant Michael von Hausen gives these examples of targets for a “balanced ecological planning approach”:

- 1. Green space expansion and mixed uses:** 50-100% increase in green space and associated mixed uses (compensated by clustering of development elsewhere).
- 2. Designed density:** A two- to four-fold increase in density.
- 3. Site water management:** a) 0% runoff and maintain or improve water quality using ‘green infrastructure’ methods; and b) a 20-50% decrease in underground pipes for sewer and water.
- 4. Road transformation:** A 50% decrease in roads and parking and a 50% increase in bicycle and walking paths; use of grass grid and painted lines on grass for traffic overflow.
- 5. Waste efficiency:** 50% decrease in solid waste.
- 6. Energy efficiency:** 30-60% decrease in energy use through building orientation (south facing to catch the sun), tree conservation (for windbreaks and shading) and efficient fixtures (such as compact fluorescent light bulbs).

(von Hausen 2004, p. 16)

Many Regional Districts have developed habitat atlases that combine environmental information from a variety of sources. For example, the Sunshine Coast Habitat Atlas combines data from over 40 sources, providing information that supports the protection, enhancement, and restoration of fish habitat and sensitive ecosystems. For more information see <http://habitat.scrd.bc.ca/>

IDENTIFY AREAS OF ENVIRONMENTAL VALUE IN COMMUNITY PLANS

- Ensure that the Official Community Plan includes maps of hazard lands, environmentally sensitive areas and other environmental values.
- Update the Official Community Plan as required to incorporate new inventory information.
- Identify ‘green connections’ within the community that link natural areas together and are of sufficient width to allow for wildlife movement.
- Develop park plans and greenways plans that protect ecological values in the long term.
- Designate environmentally sensitive areas and appropriate buffers as development permit areas (DPAs). DPAs should include guidelines limiting how or if development can occur. For examples of DPA language, see the Sensitive Ecosystems Inventory Conservation Manual for [East Vancouver Island/Gulf Islands](#) and the Technical Report for [Central Okanagan](#).

For an example of an ‘idealised’ neighbourhood/local area plan, see [Appendix 3-2](#).

3.4.2 Inventory and Mapping

IDENTIFY KNOWN ENVIRONMENTALLY SENSITIVE AREAS AND SPECIES AT RISK

- Identify any existing mapping and inventory information (see [Appendix B: Sources for Environmental Mapping and Inventory](#)) such as the [Sensitive Ecosystems Inventory](#), [Sensitive Habitat Inventory and Mapping](#), [Fish Wizard](#) and environmentally sensitive area mapping. Ensure that data is gathered for all local ecosystem types, including terrestrial, aquatic and riparian ecosystems. Be aware that regional scale mapping may not identify small, but locally important, natural areas—these will need to be identified on the site or neighbourhood level plans. Not all maps and inventories are digitally available—seek out other documented information including unpublished sources.

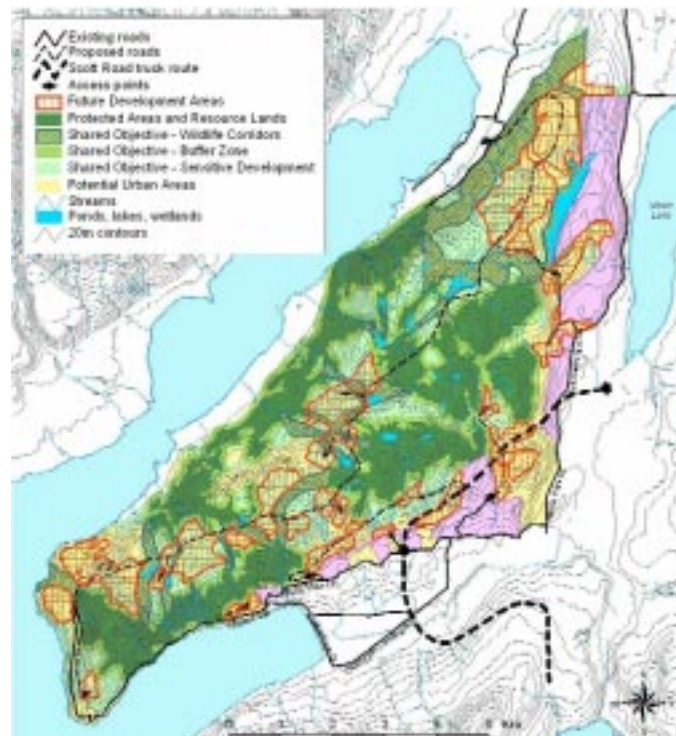
- ☑ Identify known occurrences of species at risk, including **federally-listed** and **provincially-ranked** species. The [Conservation Data Centre](#) maintains information on ‘[element occurrences](#)’—approximate known locations of species at risk.
- ☑ **Do not include information on specific locations of species at risk on community maps without consulting the [Ministry’s regional staff](#)**, as this publicity could further endanger the species. This information may be provided to a potential developer and their consultants for the purpose of preparing a development plan that avoids occurrences of species at risk, or to local conservation organisations for the purposes of protecting the species (with the similar proviso that this information not be published).

CONDUCT ADDITIONAL INVENTORIES TO IDENTIFY OTHER IMPORTANT WILDLIFE AND HABITAT VALUES

- ☑ Identify other habitats that may not be ‘environmentally sensitive’ but are nonetheless important components of the wildlife habitat of the area. Examples include second growth forests, hedges on agricultural lands, scrublands and other modified ecosystems.
- ☑ Work in partnership with other governments, community groups and **appropriately qualified professionals** to conduct additional community-wide inventories of species and ecosystems to address any information gaps. The [Resource Information Standards Committee](#) provides information on standards for conducting ecosystem inventories. This data will add detail to the information from higher-level inventories such as a Sensitive Ecosystems Inventory. Natural history groups, land

The Community Mapping Network is building capacity within communities to compile local knowledge and to access natural resource information, and to promote planning sustainable communities in B.C. For information see www.shim.bc.ca.

The Ministry of Water, Land and Air Protection worked with the Allan Brooks Nature Centre to develop a “balanced growth” scenario for the Bella Vista-Goose Lake Range near Vernon. The project used the Sensitive Ecosystems Inventory and capability mapping for 10 species at risk to develop maps identifying conservation ratings and priorities. This was combined with planning information to define areas of sensitivity, wildlife corridors and the most suitable places for urban development (*Clarke et al 2004*).



trusts and other community interests may have survey information they can share, or may be able to work in partnership with the local government to carry out inventory work.

- ☑ Ensure that mapping and inventory information gathered by developers and their consultants is provided to the local government and added to their inventory database (see [Section 4: Environmental Planning and Development at the Site Level](#)) as well as the provincial database as appropriate.

IDENTIFY HAZARD LANDS

- ☑ Identify areas subject to flooding, erosion, wildfire and other natural hazards in community plans. For more information see [Section 3.4.6 Flood and Terrain Hazard Management](#) and [Section 3.4.8: Wildfire Considerations](#).

3.4.3 Appropriate Development

LOCATE DEVELOPMENT APPROPRIATELY

- ☑ Using the information from the mapping and inventories, develop appropriate zoning and servicing to concentrate growth and development away from environmentally sensitive areas, resource lands (agricultural and forest lands) and hazard areas.
- ☑ Encourage densification of development in areas with low environmental values in exchange for the protection of areas with high environmental values, using tools such as density bonusing and density transfer.
- ☑ Consider the impacts of different development types on adjacent ecosystems. A shopping mall with bright parking lot lights would be detrimental to an adjacent wetland, while a housing development with appropriate buffers may be far less damaging. (The many wetland creatures that use darkness to hide from predators and the plants that flower according to length of daylight would be disrupted by the bright lights.)

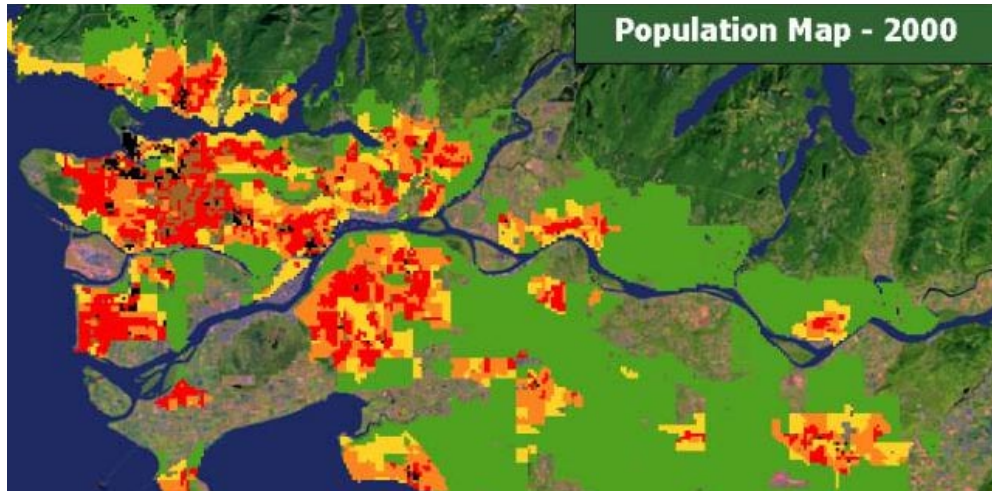
AVOID RURAL SPRAWL

‘Rural sprawl’ is the growth of low density developments into the areas surrounding our town and cities. People move out to be in the country, and are often unpleasantly surprised when other growth and development occurs, threatening the lifestyle they had come for. This sprawling growth also has huge impacts on wildlife, as large areas of habitat are alienated by clearing, buildings, road development and increasing human activity.

- ☑ Establish an urban containment boundary that limits sprawl and concentrates growth in appropriate areas.
- ☑ Discourage ‘satellite’ developments outside of the urban containment boundary. These are more expensive to service, cause habitat fragmentation and displace many wildlife species that are not tolerant of human presence. They are also more prone to public safety risks from wildfire and from ‘problem’ wildlife.

Salt Spring Island is using density transfer to direct development away from sensitive ecosystems and into less environmentally sensitive areas.

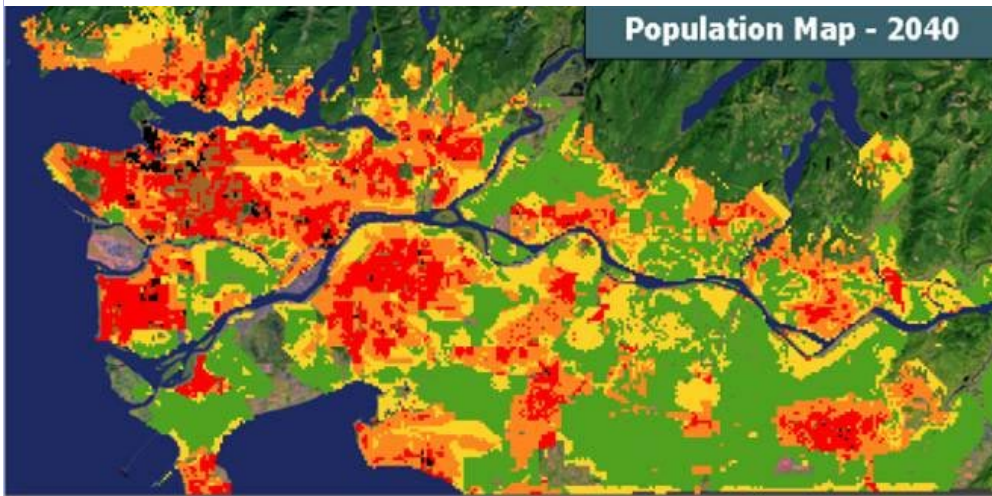
The District of Hope has developed a cluster development zone and performance standards to protect environmentally sensitive areas in the District.



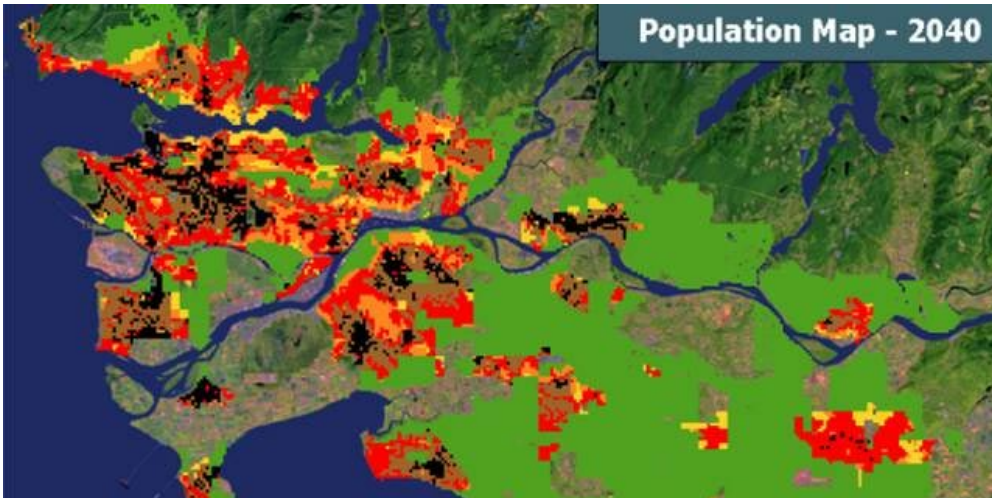
Lower Fraser Valley Population Density, 2000. Black and red areas indicate high density, green indicates open space (including agricultural lands).

There are two projected land use scenarios for 2040, based on a) urban expansion continuing in its present form or b) using a higher density urban form with infill development. Scenario (b) conserves considerably more open space. (Source: *Georgia Basin Action Plan 2004.*)

a



b



- ☒ Avoid large-lot subdivisions. Unless covenants are placed on the land to restrict the ‘footprint’ of the development, these large lots can destroy large amounts of wildlife habitat.
- ☒ Adopt ‘smart growth’ principles to reduce sprawl and minimise the impact of development on the environment. For more information see www.smartgrowth.bc.ca.

TEN SMART GROWTH PRINCIPLES

- Build compact communities that avoid sprawl.
- Create walkable communities.
- Promote development patterns that encourage the use of sustainable transportation.
- Foster distinct, attractive, vibrant communities with a strong sense of place
- Protect and preserve green space and environmentally sensitive areas in urban and suburban areas.
- Ensure the integrity of a secure and productive agricultural land base.
- Provide a range of affordable housing options.
- Promote energy efficient infrastructure and alternative development standards.
- Strengthen and direct development towards existing communities.
- Ensure an early and ongoing role for community engagement in the planning, design and development process.

Smart Growth B.C. www.smartgrowth.bc.ca

Preserve the best
and restore the rest

3.4.4 Ecosystem and Species Protection

Major threats to species and ecosystems include:

- Habitat destruction. As habitats are lost to development, road building and other human activities, the wildlife that once lived there will move away—if there is another suitable habitat nearby—or die out.
- Invasive species: These plants and animals take over the natural habitats of native species, competing for food, water, space and light. Some ‘successful’ invaders such as English ivy can completely replace native vegetation, radically altering the ecosystem.
- Habitat fragmentation. Some species do not tolerate human presence. Roads, trails and ‘satellite’ subdivisions introduce human presence into new areas, making it no longer suitable for these shy species.
- **Islandisation:** In many urban and suburban areas the only remaining natural ecosystems are small remnants—*islands* that are cut off from each other. This limits the amount of genetic mixing that can occur, and leaves the species that live there vulnerable to external influences such as predation by pets.

The best management practices listed below are designed to avoid or minimise these impacts during land development. Other impacts such as human activities (e.g. hunting and fishing) and climate change will also affect wildlife populations, but are not discussed in this document.

The best way to protect ecosystems during development is to preserve the **best and restore the rest**.

ECOLOGICAL NEEDS

Ecological principles that should guide urban and rural land development are:

- **Larger sites provide a greater variety of habitats.** A 40 ha site will tend to support a greater diversity of species and habitats than a 10 ha site. Some animals require a minimum size area in which to live. Also, smaller sites are more prone to the 'edge effect.' In a forest for example, some plants only live in the interior of the forest where there is less light, less wind and higher humidity. There is proportionately more interior space in a large forest than in a small patch of trees.
- **Diversity is better.** Greater ecosystem diversity tends to support greater species diversity. Maintaining a diversity of ecosystems ensures a variety of food sources and cover, and the availability of preferred breeding and rearing areas. Individual species may utilise several different types of habitat. Herons, for example, need tall trees for roosting, that are close to wetlands or shorelines where they can feed. Other species need different habitats at different stages of their life, such as a caterpillar that eats different plants from the adult butterfly. Also, when the diversity of species in an ecosystem is decreased, the ecosystem becomes less productive.
- **Closer is better.** There is a better chance of interbreeding (and thus greater genetic diversity) if two populations are closer together. If two habitats are close together, this increases the ability of species to move from one area to the next. Areas that are ecologically isolated having a greater chance of losing an entire population (local extirpation) because of disease or further habitat loss.
- **Linkages help.** There is a better chance of preventing fragmentation effects if individuals or whole populations can safely move from one area to the next with less chance of predation or interception. For many species, the chance of surviving catastrophic natural events (such as fire or flood) or impacts from human activities are much greater if their habitats are connected to similar neighbouring or adjacent without large breaks or barriers. In urban areas, riparian corridors, recreational greenways, street boulevards and backyards can provide these types of linkages.
- **Redundancy ensures sustainability.** If there is only one remaining population of a particular species, the chances of extirpation are very high. Having several populations in different locations increases overall survival. In economics, a diverse portfolio is more likely to survive long-term changes in the market. In urban biodiversity, growth pressures require us to think about the need to create population banks or reservoirs that act as backups for potential loss.
- **Small habitats can be critical to a species survival.** In the Greater Vancouver region the collective impact of many small habitats can be as great as a single Stanley Park. These fragmented habitats are critical areas for many urban species. Some of these small areas may contain remnant populations of rare or endangered species. Others may be important because they provide a link between larger habitats, or simply because they support local biodiversity by providing a home for one of the many species that have adapted to living in urban and suburban environments.
- **Buffers help to protect core areas.** Because of the 'edge effect,' the impacts of human activity and other ecosystem stressors such as invasive species tend to be greatest at the edges of ecosystems. A buffer area helps to protect core areas from these impacts. For example, a forest buffer between a mall parking lot and a wetland can filter some of the pollutants from stormwater, reduce the number of shopping carts that are thrown in, shade the edges of the wetland, and reduce the noise and visual impact of the parking lot." (*Cullington 2001*)



Identify and protect habitat reservoirs.

PHOTO: SUSAN LATIMER

RETAIN LARGE HABITAT RESERVOIRS

Habitat reservoirs are large areas that support a range of native plant and animal species, and several ecosystem types.

- ☑ Use the mapping and inventory information to identify habitat reservoirs in your community, such as wetlands. Habitat reservoirs should be as large as possible (recognising that in general their size will be larger in rural areas than in urban areas). An appropriately qualified professional or staff from the Ministry of Water, Land and Air Protection may be able to help you identify habitat reservoirs in your community, and refer you to related documents such as Recovery Plans for species at risk.
- ☑ Delineate these habitat reservoirs in community plans, including effective buffer areas, and establish zoning that will preclude development of these areas. Where it is not possible to preclude development, development permit areas or other tools should be established to require sensitive development that protects natural values. An appropriately qualified professional can assist in defining measures that can protect the natural values.
- ☑ Establish some form of legal protection for the habitat reservoirs, such as designation as a natural park. Work with [local land trust organisations](#) to encourage **conservation covenants** on private lands/waters with high environmental values, or purchase of some of these lands.
- ☑ Work with an appropriately qualified professional to develop management plans for these areas that address long-term protection of ecological values. This may include managing impacts from recreation, edge effects, invasion by non-native species and fire control.

The Greater Vancouver Regional District is developing a Biodiversity Conservation Strategy for the region. This involves identification of habitat reservoirs and refuges, and working with member municipalities and conservation interests for the conservation of biodiversity in this urbanised region. For more information see <http://www.gvrd.bc.ca/growth/pdfs/biodiversity.pdf>

DIVERSE ECOSYSTEMS FOR DIVERSE SPECIES

To protect a diversity of species, we need to protect a diversity of ecosystem types. Plan to protect a full range of different ecosystem types in the community plan (specific ecosystem types will depend on those native to your area). For example:

- Forests and woodlands
- Grasslands, including old field habitat and natural meadows
- Wetlands (vernal pools, marshes, swamps, bog, etc.) and estuaries
- Riparian areas around watercourses, lakes and coastal foreshore
- Open rocky areas and moss-covered rocks
- Cliffs and bluffs (inland and coastal)
- Sparsely vegetated areas, including gravel bars and sand dunes

RETAIN HABITAT REFUGES

Habitat refuges are smaller patches of habitat. They may include small remnants of natural ecosystems and human-modified areas such as agricultural lands, playing fields, and even naturalised backyards. They provide important habitats for species that are more tolerant of people, such as hummingbirds.

- ☑ Identify habitat refuges in your community, and work with the community to protect and enhance their habitat values.

- ☑ Retain different ecosystem types adjacent to each other, such as forested patches next to old fields, pastures or fallow fields. These enhance the habitats accessible to wildlife, as many species prefer having different habitat types close together (referred to as ‘**edge habitat**’).
- ☑ Establish passive use parks with natural areas of forests and/or grasslands next to maintained playing fields. Limit impacts in these areas, for example through well-designed trails and requirements to keep dogs on a leash.

Plants and animals need food, water and shelter to survive. Just as humans need roads and sidewalks to get between home and their shops, animals need a safe route between their nest and dens and foraging areas. Wildlife corridors provide that safe passage.

IDENTIFY AND SET ASIDE WILDLIFE CORRIDORS

The ecological values of habitat reservoirs and refuges increase if these areas are connected together by wildlife corridors. Wildlife corridors provide for the movement of species between larger areas of habitat, and also provide year-round habitat for less mobile species such as plants, invertebrates and small mammals.

- ☑ Identify wildlife corridors—including corridors for large species such as deer, and smaller species such as frogs—and use development permit area or zoning designations to restrict development in these corridors.
- ☑ Develop a community **greenways** plan to identify habitat reservoirs, refuges, and wildlife corridors connecting them. For more information see [Community Greenways: Linking Communities to Country, and People to Nature](#).

SET BUFFERS AROUND SENSITIVE AREAS

Buffers help to maintain the long term values—both environmental and economic—of an environmentally sensitive area. Target buffer widths are provided in [Section 4, Table 4-1](#).

- ☑ Establish buffers around all environmentally sensitive areas. Buffers should not only preclude development, but should also promote the retention of natural vegetation as part of the buffer. Buffers for terrestrial environmentally sensitive areas are described in [Section 5: Environmentally Sensitive Areas](#). Buffers around habitats for special wildlife are described in [Section 6: Special Wildlife and Species at Risk](#), and riparian buffers are described in [Section 7: Aquatic and Riparian Ecosystems](#).
- ☑ 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 non-native 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, and restoration of natural vegetation should be encouraged.
- ☑ Where possible, buffer areas should be on public lands. Another option is to place conservation covenants on the buffer areas that are on private land, but these covenants must be enforced to prevent intrusion into the buffer area. Other options include easements and stewardship agreements. For more information see [Stewardship Options for Private Landowners in British Columbia](#), and [Greening Your Title: A Guide to Best Practices for Conservation Covenants](#).

The Islands Trust has created a Natural Areas Protection Tax Exemption, and can issue 'Tax Exemption Certificates' to property owners who voluntarily give permanent legal protection to specific types of natural areas on their property. For more information see <http://www.islandstrust.bc.ca/stewardshipprograms/naturalareaprotection/naturalareaprotection.htm>

CREATE INCENTIVES FOR NATURAL HABITAT PROTECTION

Consider offering incentives for natural habitat protection:

- Encourage the protection of riparian areas through eligible tax exemptions under the Community Charter ([Section 225](#)).
- Use the federal Eco-gifting program to encourage donations of environmentally sensitive lands/waters. For more information see the [Eco-gifting](#) website or [Green Legacies: A Donor's Guide for B.C.](#)
- Offer tax breaks for the gifting of conservation covenants or other natural area protection mechanisms.
- Provide recognition for individuals within the community that are undertaking voluntary conservation and stewardship of public or private lands.

ENACT BYLAWS TO CONTROL PETS

- Require that dogs be leashed in sensitive habitats (such as beach areas) to prevent them from chasing birds or other wildlife.
- Encourage pet owners to keep cats indoors. Domestic pets, especially cats, can be significant predators on wildlife.
- In urban areas, enact bylaws requiring cats to wear bells to reduce their success at hunting.

3.4.5 Ecosystem and Species Restoration and Enhancement

Some communities have a great deal of damaged habitat with potential for restoration. The following best management practices provide guidance on restoration efforts.

DEVELOP RESTORATION PLANS

- Work with conservation organisations and appropriately qualified professionals to develop landscape-level restoration plans for habitats that have been degraded. The plans should consider the impacts of future developments that may support or limit the success of site-level restoration efforts, and set priorities accordingly.
- 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.
- Support community efforts to restore ecosystems (e.g. programs such as [Streamkeepers](#), [Wetlandkeepers](#) and the [Grasslands Conservation Council](#) projects).

TAKE ADVANTAGE OF RESTORATION OPPORTUNITIES OFFERED BY RE-DEVELOPMENT

- When a degraded site is being re-developed, work with the landowner to rehabilitate

some of the natural values of the area. This can include simple techniques such as naturescaping the property, or more far-reaching projects such as daylighting streams, increasing the amount of pervious surfaces and restoring natural ecosystems on part of the property.

The City of Vancouver has long term plans to daylight and restore parts of Still Creek as part of the Grandview-Boundary Industrial Area re-development.

MANAGE INVASIVE SPECIES

- ☑ Identify problem areas with invasive and **alien** species and work with maintenance staff, weed specialists and community volunteers on invasive species removal. For information on management of alien species, see the [Aliens website](#).
- ☑ Learn more about invasive species in British Columbia. An Invasive Plant Council of British Columbia is being established to minimise the effect of invasive plants on human health, the economy and the environment. For more information, see the [Invasive Plant Strategy for British Columbia](#).

INVASIVE SPECIES ENDANGER PUBLIC HEALTH AND SAFETY

Invasive species:

- Increase allergies and hay fever, and are potentially toxic to humans, pets, livestock and wildlife.
- Clog waterways used for swimming and boating, and reduce visibility on transportation corridors.
- Increase costs for maintaining resources and public utilities.
- Displace native species and destroy natural habitat for birds, butterflies and other wildlife, domestic animals, and fish and other aquatic organisms.” *Fraser Basin Council 2004*.
http://www.fraserbasin.bc.ca/news/documents/invasive_plant_strategy04.pdf



Assess flood risk.
PHOTO: MARGARET HENIGMAN

3.4.6 Flood and Terrain Hazard Management

Flood and terrain hazard management is important for the safety of residents and their property.

ASSESS AND MITIGATE FLOOD RISK

- ☑ Identify areas subject to flooding. For information on floodplain mapping, see the [Canada - British Columbia Floodplain Mapping Program](#).
- ☑ Assess flooding and erosion risk effects to aquatic habitat and to downstream water users from stormwater runoff. Proposed developments that would increase existing levels of risk (or create new high-risk effects) to aquatic habitat, downstream water users, or downstream floodplains should either not be permitted to proceed or should be required mitigate those impacts.
- ☑ In areas subject to tsunami effects, consider the potential hazard of a tsunami wave when determining flood damage reduction measures. Elevations may be established using recorded events in the area plus a suitable allowance for freeboard.
- ☑ **Restrictive covenants** must be placed on areas subject to flooding hazard, pursuant to [Section 82](#) of the *Land Title Act*, and Section 3(3) of the [Bare Land Strata Regulations](#), in order to minimise claims on public funds, minimise damage to

property and to warn future property owners of a flooding hazard. These covenants contain flood-proofing conditions and a waiver of liability to the province and local authority, and are registered under [Section 219](#) of the *Land Title Act* on the title of land subject to flooding at the time of subdivision or on the sale or grant of Crown land. Similar conditions and waivers *must* be included in leases or other dispositions of Crown land under Part 2 of the *Land Act* on land subject to flooding.

- Enact floodplain management bylaws to control development within lands subject to flooding.

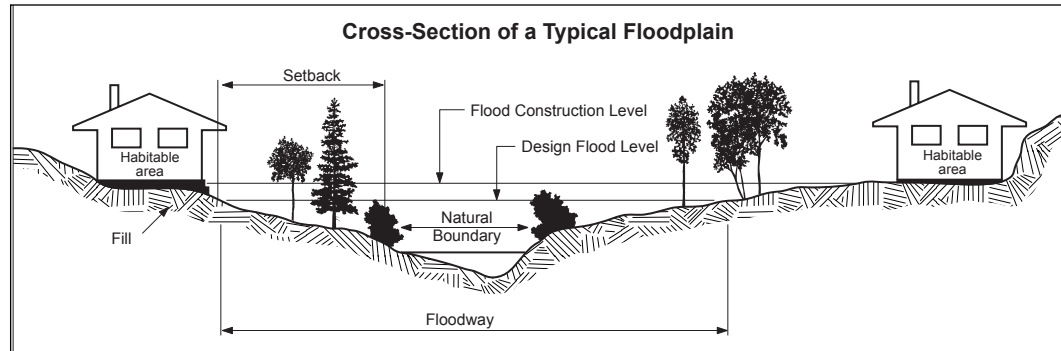


Figure 1: Cross-section of a Typical Floodplain

IDENTIFY AND ASSESS TERRAIN HAZARDS

- Consult available [regional terrain inventory mapping](#) to determine the terrain suitability for various purposes. Do not permit development in unsuitable areas.
- Ensure sites that may possess geotechnical hazards (unstable slopes, poor foundation conditions, debris flow hazards, earthquake prone soils, high water tables, etc.) are assessed by an appropriately qualified professional before development proceeds.
- Identify and avoid areas where avalanches may occur. Consider the impacts of upslope activities that might result in increased avalanche risk (e.g. land clearing).

See [Section 4: Environmental Planning and Development at the Site Level](#) for site-specific considerations for flood and terrain hazard management.

3.4.7 Erosion and Sediment Control

Community level practices can influence the ability to control erosion and sediment generation at the site level (see [Section 4: Environmental Planning and Development at the Site Level](#)). The following best management practices address erosion and sediment control at the community level.

CONTROL EROSION AND SEDIMENT

- Identify areas of high risk of sediment movement within the watershed. Erosion and sediment control should be considered on a watershed-wide basis to ensure that development in one part of the watershed does not impact instream features downstream.

- ☑ Develop policies on how site development should be carried out in high risk areas to minimise sediment generation.
- ☑ Establish timing restrictions that prevent clearing of sites at times when work or the conditions of the soils could result in substantial erosion and sediment generation (e.g. during high rainfall periods or snowmelt).

B.C.'s forests and grasslands burn from time to time. The extensive damage to homes in the Kelowna and Kamloops areas during the summer of 2003 demonstrated the need to carefully consider where to build new communities.

3.4.8 Wildfire Considerations

Wildfire is a natural process, and many natural ecosystems in British Columbia thrive on occasional or even frequent burns. Failure to plan for wildfire may leave a local government vulnerable to liability claims for damage. For more information on building “FireSmart” communities, see [*FireSmart: Protecting Your Community from Wildfire*](#), developed in Alberta.

ADDRESS THE POSSIBILITIES OF WILDFIRE BEFORE PERMITTING ‘SATELLITE’ DEVELOPMENTS

- ☑ Consider wildfire possibilities in the Official Community Plan.
- ☑ Densify existing communities rather than building new subdivisions in areas prone to wildfires. Avoid ‘satellite’ subdivisions.
- ☑ Develop a fire plan prior to permitting development. This will include considerations such as water supply, road access and fire breaks.
- ☑ Identify high risk wildfire areas before approving new subdivisions. Locating development in areas subject to wildfire can affect forest management strategies, as when fire occurs, the emphasis shifts from protecting forests to protecting homes. Also, some homeowners may not accept fire-proofing techniques (such as controlled burns) in their neighbourhood, because of safety concerns and loss of viewsapes.

The District of Langford required sprinkler systems to be installed in one subdivision close to a forested area. This was done as an alternative to clearing the trees away from the subdivision, as originally requested by the fire department.

DEVELOP A PLAN TO BALANCE FIRE MANAGEMENT AND WILDLIFE CONSIDERATIONS

- ☑ Work with local fire and emergency experts to “fire-proof” existing developments. The fire-proofing should be completed with wildlife in mind, so that important ecological features (such as brush buffers) are not destroyed by the fire-proofing techniques.

3.4.9 Wildlife-Human Conflicts

When we build communities, we do so in places that are the homes of many different species of plants and animals. Native plants and trees are replaced by roads, building and lawns, and many of the native animals die out or move elsewhere. Some of the more adaptable species remain or move into the area, to benefit from the human activities and become pests. ‘Garbage bears’ and other wildlife can become a problem.



Rattlesnake.
PHOTO: DAVE POLSTER

Rattlesnakes hibernate in communal dens and may travel long distances from their dens to summer sites. Den locations and travel paths should be avoided when planning developments. See [Best Management Practices for Amphibians and Reptiles](#).

There are many ways to reduce impervious surfaces that can be used in small- or large-scale developments, such as reducing road width and using roadside swales rather than a piped system. See [Stormwater Planning: A Guidebook for British Columbia](#).

CONSIDER WILDLIFE-HUMAN CONFLICTS WHEN PLANNING NEW DEVELOPMENTS

- ☑ Avoid development in or adjacent to habitat reservoirs and refuges, wildlife corridors and their buffer areas. Consider the needs of large mammals (bears, moose, deer, cougars) as well as smaller species (amphibians, snakes, birds).
- ☑ Be aware of potential wildlife conflicts for airport and solid waste management facilities. For more information on airport siting see the Transport Canada publication [Sharing the Skies](#).
- ☑ Refer to the [Beaver Management Guidelines](#) and the [Beaver and Beaver Dam Management](#) sections of the Best Management Practices for Instream Works when dealing with beaver issues.
- ☑ Refer to the [Best Management Practices for Amphibians and Reptiles](#) and *Best Management Practices Guidebook for Raptors in British Columbia: Guidelines for Integrating Raptor Conservation with Urban and Rural Land Developments* when dealing with these species.

3.4.10 Pollution Prevention

For best management practices on pollution prevention see [Section 8: Pollution Prevention](#).

3.4.11 Stormwater Management

Best management practices for urban stormwater management are provided in [Stormwater Planning: A Guidebook for British Columbia](#). Stormwater management techniques are designed to put water back into the ground, preserve or improve the water quality and hold back the water through rate control/detention.

The federal and provincial governments and other partners have developed a Water Balance Model that can be used to assess stormwater volumes due to urban development, and the types of source controls that can be used to reduce the volume of overland runoff. This model also allows users to evaluate the effectiveness of various types of source control. For more information see the [Water Balance Model for British Columbia](#) website.

ESTABLISH BYLAWS TO ENCOURAGE GOOD STORMWATER MANAGEMENT

- ☑ Enact bylaws or establish development permit areas that require the maintenance of stormwater characteristics that emulate the pre-development natural watershed, including that stormwater volumes reaching lowlands are the same after development as they were before. This will discourage large scale clearing and creation of **impervious surfaces**, reduce servicing costs (storm sewers), and help to recharge aquifers and maintain stream flows during low flow periods. For more information see [Stormwater Planning: A Guidebook for British Columbia](#).

- ☑ Review existing bylaws, policies, designs and standards (such as road and curb and gutter standards) for opportunities to improve stormwater management (retention/detention/imperviousness) in future developments and re-developments.

3.4.12 Lead by Example

Local governments have the ability to demonstrate good environmental practices in action. For example:

NATURESCAPING

- ☑ Use native plantings and ‘**naturescape**’ principles on public lands to demonstrate to residents the benefits of native plantings for maintenance and as wildlife habitat. These benefits include lower watering needs and reduced maintenance costs, if appropriate native species are selected.
- ☑ Consider planting more trees in boulevards, municipal properties and parks. The urban forest provides benefits for people and wildlife.

STORMWATER MANAGEMENT

- ☑ Create zero-discharge stormwater systems for municipal facilities.
- ☑ Provide pervious paving in municipal parking areas.
- ☑ Use porous paving in crosswalks, parking stalls and other such sites to drain road surfaces.
- ☑ Reduce overland runoff through the use of infiltration basins, green roofs and absorbent vegetation.

GREEN TRANSPORTATION OPTIONS

- ☑ Encourage the use of bicycles and walking by providing employee showers and change facilities.
- ☑ Provide safe bicycle storage areas for employees and visitors.

GREEN BUILDINGS AND FACILITIES

- ☑ 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 BC](#) program. For information on LEED™, see the [LEED \(Leadership in Energy and Environmental Design\) Green Building Rating System™](#).
- ☑ Improve the energy efficiency of municipal buildings and facilities like swimming pools, water systems, and sewage treatment plants.
- ☑ Install low-flush toilets and other water-saving devices.
- ☑ Use xeriscape landscaping to reduce water use.

WASTE MANAGEMENT

- ☑ Capture methane gas from landfills. Methane has 21 times the heat-trapping effect of CO₂. This gas can also be used for heating or producing electricity.
- ☑ Promote the reduction of all forms of waste, and re-use or recycle as much as possible.

3.5 LOCAL GOVERNMENT RESPONSIBILITY FOR ENVIRONMENTAL PLANNING AT THE SITE LEVEL

Local governments have the final say in land use and development patterns, and are one of the primary contacts with the development community. They have a responsibility to ensure that development benefits the community—socially, economically and environmentally.

Responsible environmental planning at the site level benefits the development community as well as the local government and residents. For example:

- Developments that incorporate greenspace and retain trees are generally more desirable for prospective buyers. This leads to higher property prices and faster sales.
- Developments that are supported by the community—and those that promote environmental values frequently are—move faster through the planning and approval process, with time and cost savings for the developer.
- Where developments are densified to protect greenspace, the footprint of the development is reduced. This may mean cost savings for land clearing, road development and servicing costs.

For more information, see [Appendix A: Benefits of Environmental Protection](#).

GOVERNMENTS LEAD BY EXAMPLE

- The Capital Regional District has recently constructed a new office building that meets the LEED™ silver standard, and is constructing a second building that will meet the gold standard.
- The Greater Vancouver Regional District is developing a regional Biodiversity Conservation Strategy that will identify habitat reservoirs and refuges, as well as important greenspace connections between these areas.
- The Regional District of Comox Strathcona have designated Bald Eagle and Great Blue Heron development permit areas that restrict land clearing and prevent other activities during nesting periods.
- The City of Vancouver RS-1 residential zone limits the amount of impermeable surface in property development/redevelopment to reduce stormwater runoff, increase groundwater recharge and reduce flooding.
- The Maplewood Community Eco-industrial Project is a partnership between the District of North Vancouver and 30 other partners that combine sustainable community planning and eco-industrial networking (<http://www.maplewoodproject.org>).

Is your local government doing something worth bragging about? Fill out the feedback form in [Appendix 1-1](#) and let us know.

3.5.1 Working with Landowners and Developers

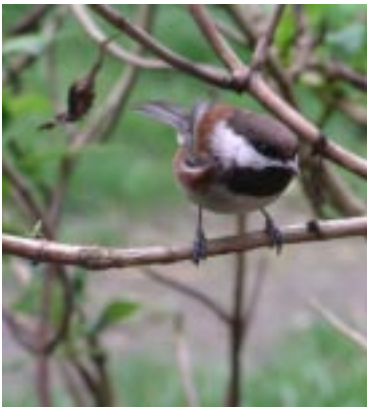
- ☑ Be open to novel approaches to environmental problems as some new technologies can provide significant benefits at minimal or reduced cost. Ensure that bylaws and regulations allow for innovative approaches.

CREATE A REGULATORY FRAMEWORK THAT PROMOTES ENVIRONMENTAL PROTECTION AND STEWARDSHIP

- ☑ Enact bylaws that promote environmental protection and stewardship, such as soil protection bylaws. For a list of possible bylaws, see [Stewardship Bylaws: A Guide for Local Government](#).
- ☑ Establish Development Permit Areas for sensitive sites, and ensure that the guidelines for development address ways to protect ecosystem values, for example by restricting timing of construction so that it does not compromise nesting or spawning (check timeframes with an appropriately qualified professional).

PROVIDE INCENTIVES FOR ENVIRONMENTAL PROTECTION AND STEWARDSHIP

- ☑ Make landowners and developers aware of the benefits of incentive programs such as [Eco-gifting](#) or tax breaks for natural area protection (see Section 3.4.4: Ecosystem and Species Protection).
- ☑ Consider incentives for good developments, such as awards for ‘green’ developments or fast-tracking of approvals that provide large amounts of Greenspace and protect environmentally sensitive areas.



Chickadee.

PHOTO: MARLENE CASKEY

PROMOTE THE USE OF NATIVE SPECIES IN LANDSCAPING

- ☑ Use native tree species for boulevard plantings, and native shrubs and herbs for landscaping work. Native species are adapted to the local climate, and require less maintenance and watering than many imported species.
- ☑ Restore natural tree cover that will promote shading and discourage the growth of some invasive plant species, such as Himalayan blackberries in riparian areas.

DRAW ON LOCAL KNOWLEDGE AND EXPERTISE IN THE DESIGN OF DEVELOPMENTS

- ☑ Encourage local naturalist clubs, stewardship groups and similar organisations to provide input into development decisions. These groups often have knowledge of local flora and fauna as well as movement corridors and important habitats that can contribute to environmentally effective design of developments. Property values are enhanced by a sensitive treatment of local natural values.

EDUCATE LANDOWNERS AND DEVELOPERS ABOUT THE BENEFITS OF ENVIRONMENTAL PROTECTION

- ☑ Provide information on the benefits of environmental protection (see [Appendix A](#)).

3.6 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_1.htm

B.C. Community Charter (Bill 14) http://www.legis.gov.bc.ca/37th4th/3rd_read/gov14-3-toc.htm

B.C. *Land Act*: http://www.qp.gov.bc.ca/statreg/stat/L/96245_01.htm

B.C. *Land Title Act*: http://www.qp.gov.bc.ca/statreg/stat/L/96250_00.htm

B.C. *Local Government Act*: http://www.qp.gov.bc.ca/statreg/stat/L/96323_00.htm

B.C. *Strata Property Act*, Bare Land Strata Regulations:

http://www.qp.gov.bc.ca/statreg/reg/S/StrataProperty/75_78.htm

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

OTHER BEST MANAGEMENT PRACTICES DOCUMENTS:

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. To obtain a copy for review or to comment on these drafts, contact Marlene Caskey (Marlene.Caskey@gems7.gov.bc.ca) or Dr. Grant Bracher (Grant.Bracher@gems2.gov.bc.ca) unless otherwise noted.

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 Land Developments

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:

Coastal Shore Stewardship: A Guide for Planners, Builders and Developers

Community Greenways: Linking Communities to Country, and People to Nature

Green Legacies: A Donor's Guide for B.C.

Naturescape: British Columbia: Caring for Wildlife Habitat at Home

Stewardship Bylaws: A Guide for Local Government.

Stewardship Options for Private Land Owners in British Columbia

Stream Stewardship: A Guide for Planners and Developers

COMMUNITY DESIGN AND APPROPRIATE DEVELOPMENT

Brody, S., V. Carrasco and W. Highfield. 2003. "Evaluating Ecosystem Management Capabilities at the Local Level in Florida: Identifying Policy Gaps Using Geographic Information Systems." In *Environmental Management*, Vol. 32, No. 6, pp 661-681.

Clarke, D., L.Knuever, K. Iverson, M. Sarell and A. Hamer. 2004. "Balanced Growth for the Bella Vista–Goose Lake Range: A Demonstration of Landscape Planning for Ecosystems and Urban Growth in the North Okanagan." Paper prepared for the Allan Brooks Nature Centre, March 2004.

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.

Nolan, L., C. Rolfe and K. Grant. 2001. *The Smart Growth Guide to Local Government Law and Advocacy*. For this and other Smart Growth B.C. publications, see <http://www.smartgrowth.bc.ca>

von Hausen, Michael. 2004. *Eco-Plan: Community Ecological Planning and Design*. MVH Urban Planning & Design Inc., Surrey, B.C. <http://www.mvhinc.com>

INVENTORY INFORMATION:

Conservation Data Centre: <http://srmwww.gov.bc.ca/cdc/>

Conservation Data Centre rare element occurrences: <http://srmwww.gov.bc.ca/cdc/products.htm>

Fish Wizard: <http://www.fishwizard.com/>

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 Range (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 Inventory Mapping: <http://srmwww.gov.bc.ca/terrain/inventory/index.html>

For other area-specific inventories see **Appendix B: Sources for environmental mapping and inventory.**

ECOSYSTEM AND SPECIES PROTECTION:

Cullington, J. 2001. "Goals and Objectives for the Protection and Restoration of Biodiversity: The Biodiversity Conservation Framework for the Greater Vancouver Regional District: A Discussion Paper."

Land Trust Organisations: For a listing of land trust organisations in British Columbia, contact the Land Trust Alliance of B.C., <http://www.landtrustalliance.bc.ca/>

Species and Ecosystems at Risk website: <http://wlapwww.gov.bc.ca/wld/serisk.htm>

Sensitive Ecosystems Inventory (East Vancouver Island and Gulf Islands) Conservation Manual. http://srmwww.gov.bc.ca/sei/van_gulf/doc/SEICMfinal.pdf

Sensitive Ecosystems Inventory (Central Okanagan) Technical Report: ftp://ftp.env.gov.bc.ca/dist/wis/tem/warehouse/region_3/central_okanagan/reports/cok_rpt.pdf

INCENTIVES AND BENEFITS:

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

Green Legacies: A Donor's Guide for B.C.:

http://www.stewardshipcentre.bc.ca/sc_bc/stew_series/bc_stewseries.asp

Hillyer, A. and J. Atkins. 2000. *Greening Your Title: A Guide to Best Practices for Conservation Covenants.*

This and other publications by West Coast Environmental Law can be found at

<http://www.wcel.org/resources/publications/default.cfm>

Quayle, M. and S. Hamilton. 1999. *Corridors of Green and Gold: Impacts of Riparian Suburban Greenways on Property Values.* Fisheries and Oceans Canada, Fraser River Action Plan, Vancouver, B.C.

Habitat Acquisition Trust. 2004. *The HAT Manual: Protecting Natural Areas in the Capital Region.*

Habitat Acquisition Trust, Victoria, B.C. <http://www.hat.bc.ca>

Sandborn, Calvin. 1996. *Green Space and Growth: Conserving Natural Areas in B.C. Communities.* B.C.

Commission on Resources and Environment, Victoria, B.C.

RESTORATION AND ENHANCEMENT:

Fraser Basin Council. 2004. *Invasive Plant Strategy for British Columbia.* Fraser Basin Council,

<http://www.fraserbasin.bc.ca>

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

Pacific Streamkeepers Federation: <http://www.pskf.ca/>

Wetlandkeepers: http://www.naturalists.bc.ca/fbcn_bn/bn9910-7.htm

Grasslands Conservation Council: <http://www.bcgrasslands.org/>

Naturescape British Columbia: <http://wlapwww.gov.bc.ca/hctf/naturescape/about.htm>

Evergreen Canada has a variety of publications on green space and naturalising urban areas on its

Common Ground website: <http://www.evergreen.ca/en/cg/cg-toolshed.html>

FLOOD AND TERRAIN HAZARD MANAGEMENT:

Floodplain Mapping Program: <http://srmwww.gov.bc.ca/aib/fpm/>

Central Kootenay Regional District Floodplains, Alluvial Fans and Geotechnical Hazards:

<http://www.rdck.bc.ca/build/Floodplain.pdf>

WILDFIRE:

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

PROBLEM WILDLIFE:

Transport Canada. Sharing the Skies: An Aviation Industry Guide to the Management of Wildlife Hazards.

2001. <http://www.tc.gc.ca/CivilAviation/Aerodrome/WildlifeControl/tp13549/menu.htm>

Ministry of Water, Land and Air Protection. *Beaver Management Guidelines*.

<http://wlapwww.gov.bc.ca/vir/pa/Beaver-Guide.pdf>

Ministry of Water, Land and Air Protection. *Best Management Practices for Instream Works*. Specific Standards and Best Practices: Beaver and Beaver Dam Management:

<http://wlapwww.gov.bc.ca/wld/BMP/beaver.html>

STORMWATER MANAGEMENT:

Stormwater Planning: A Guidebook for British Columbia

(<http://wlapwww.gov.bc.ca/epd/epdpa/mpp/stormwater/stormwater.html>).

Water Balance Model for British Columbia: <http://www.waterbalance.ca/sql/home/index.asp>

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

APPENDIX 3-1: DEFINITIONS

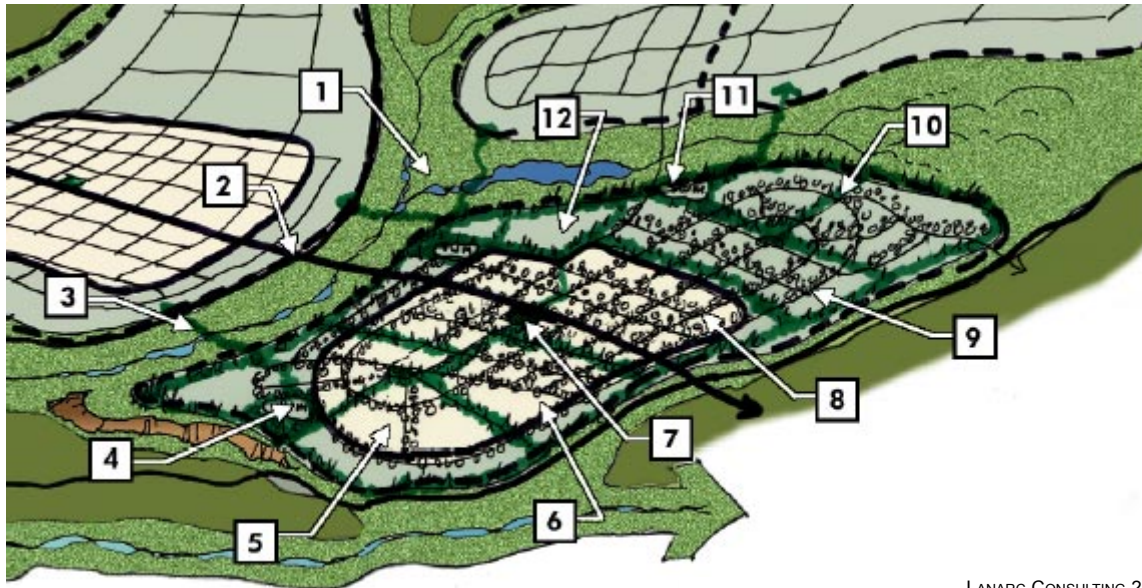
See also Glossary

- 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.
- Buffer:** An area of land that surrounds and protects a sensitive feature from the adverse effects of activities on, or encroachments from, adjacent land.
- Conservation covenant:** A voluntary, written legal agreement in which a landowner promises to protect their land in specified ways. The covenant is attached to the title of land and binds future landowners to the terms of the covenant. The presence of the covenant may lower taxes by changing the assessed value of the land.
- Ecosystem:** The dynamic and interrelated complex of plant and animal communities and their non-living environment. All parts of an ecosystem, including physical, chemical and biological components are interconnected: that is, they affect and are affected by all other parts.
- 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.
- 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.
- Erosion:** A natural process of sediment movement as a consequence of water currents, rainfall runoff, or wind, which may be considered beneficial or detrimental, depending upon the associated environmental concerns.

- Fragmentation:** A process whereby large contiguous ecosystems are transformed into one or more smaller patches surrounded by disturbed areas.
- Greenways:** Networks of linked greenspace that provide wildlife habitat and recreational opportunities. They include trails in some areas and no public access in others. Greenways are created as part of an integrated approach to land planning, balancing the needs of human communities and natural systems.
- Habitat:** The natural home of a plant or animal within an ecosystem, which provides food and shelter and other elements critical to an organism's health and survival.
- Habitat refuge:** A small patch of habitat that provides food, shelter and/or other needs for wildlife. It may include human-modified ecosystems. They are not generally large enough to maintain the genetic diversity of a population.
- 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** and those that are less tolerant of human presence. The size of the habitat reservoir depends on the species being managed for. Habitat reservoirs are often hotspots of biodiversity in or near disturbed urban and rural landscapes.
- Impervious surfaces:** Surfaces that prevent water from going into the ground, such as roofs, roads, parking lots and compact soils.
- 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 populations in check in their native environment are not found in their new location.
- Islandisation:** The process by which disturbance results in an ecosystem becoming isolated from surrounding ecosystems. The remnant ecosystem becomes an 'island' in a sea of development.
- 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.
- Restrictive covenant:** A covenant between the landowner and the Province of British Columbia (and/or local government) which restricts certain activities that may occur on that land. The covenant is registered against the property title under section 219 of the Land Title Act.
- Sediment:** material carried in suspension by a flowing body of water which will ultimately settle to the bottom as water velocity decreases.

- 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:** Any wild organism including wild mammals, birds, reptiles, amphibians, fishes, invertebrates, plants, fungi, algae and bacteria.
- Wildlife corridor:** A travel corridor for wildlife. These range 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 or culverts under roads) that provide safe passage for smaller creatures. These corridors also provide year-round habitat for less mobile species.
- Xeriscaping:** A landscaping approach using plant species that are tolerant of drought conditions.

APPENDIX 3-2: IDEALISED NEIGHBOURHOOD PLAN



LANARC CONSULTING 2003

1. Riparian areas and other buffers are maintained in their natural state, with management programs to mitigate for human, dog and invasive species impacts.
2. Road, trail and utility crossings of watercourse and riparian areas are kept to a minimum and crossing points are chosen for low impact, in particular to avoid critical habitats of sensitive species.
3. Pedestrian/cycle and road crossings of watercourses have a low impact design; i.e., boardwalk or bridge.
4. Constructed stormwater wetlands are integrated with community parks and schools, but constructed outside of riparian or other environmentally sensitive areas.
5. Private development and institutions incorporate naturescape principles and source controls for stormwater management, erosion control and spill management.
6. Light industrial and commercial areas include work/living space to minimise car use, and green roofs and other best management practices to mitigate stormwater runoff.
7. The town square is a best management practices showpiece and transit hub. It and adjacent high density buildings have pervious paving and absorbent landscape over parking structures.
8. An interconnected grid street system encourages walking, cycling and transit use.
9. Local streets are tree and boulevard lined, and designed to absorb stormwater runoff into the ground.
10. A system of walk/bike trails and greenways outside the protected areas links neighbourhoods to amenities, and provides corridors of native vegetation that are routes for surface flows of stormwater.
11. An Urban Containment Boundary and related zoning avoids development pressure on environmentally sensitive areas and resource lands.
12. At the elementary school, the adjacent environmentally sensitive areas provide a natural backdrop and outdoor classroom, but the school's naturescape garden, playing fields, and trail connections are separated from the environmentally sensitive areas by a carefully designed barrier.