



Metro Vancouver's
**Ecological Health
Action Plan**

OCTOBER 2011





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OBJECTIVES OF METRO VANCOUVER'S ECOLOGICAL HEALTH ACTION PLAN

Ensuring ecological health is one of the priorities identified in Metro Vancouver's Sustainability Framework. In the Framework, Metro Vancouver commits to "protect and restore an interconnected network of habitat and green space, account for ecosystem services, and enhance the connection between people and nature."

The Ecological Health Action Plan (EHAP) has two objectives:

- To summarize how maintaining and enhancing the region's ecological health is incorporated into Metro Vancouver's plans and operations.
- To propose 12 projects, within Metro Vancouver's mandate, that can be implemented in the next two to five years. These projects will expand our efforts to maintain and enhance the ecosystem services in the region and help to realize the commitments articulated in the Sustainability Framework.

The EHAP is a pragmatic step – it is based on short-term actions clearly within Metro Vancouver's mandate that will contribute to the ecological health of the region. These are introductory projects that will complement the broad and on-going efforts by many organizations and individuals to improve the region's ecological health.



WHAT IS ECOLOGICAL HEALTH?

The concept of ecological health captures the connection between healthy functioning ecosystems, the valuable services they provide, and human health and well-being. Maintaining and enhancing the integrity of ecosystems and other natural features is essential for ensuring that residents of the region continue to benefit from the stream of ecosystem services that contributes to our collective well-being and economic prosperity.

The base of economic activity and human well-being is a healthy, functioning ecosystem. Our regional economy was built using the wealth of natural resources; the forests that produce timber and other products, marine and freshwater systems that support salmon, shellfish and other delicacies, and the rich soils that support a diverse agricultural sector. Though the relative importance of fishing and forestry industries has declined, the continued prosperity of the region is still linked to the natural beauty of the region and the ability of local ecosystems to provide clean water and other essential services. These services coupled with parks that provide spaces for relaxation, recreation and rejuvenation all contribute to the well-being of the region's residents.

The natural environment is also an important influence on human health. A commitment to ensuring the health of natural systems would generally assist in achieving healthier populations. For example, actions that improve air quality will lead to a decrease in respiratory problems, improved personal health for affected individuals, and reduced stress on our healthcare system. There is also a growing body of evidence suggesting a person's proximity to, and time spent in nature, helps reinforce self esteem, reduces stress, creates tighter-knit communities, and supports a healthier and more active lifestyle.

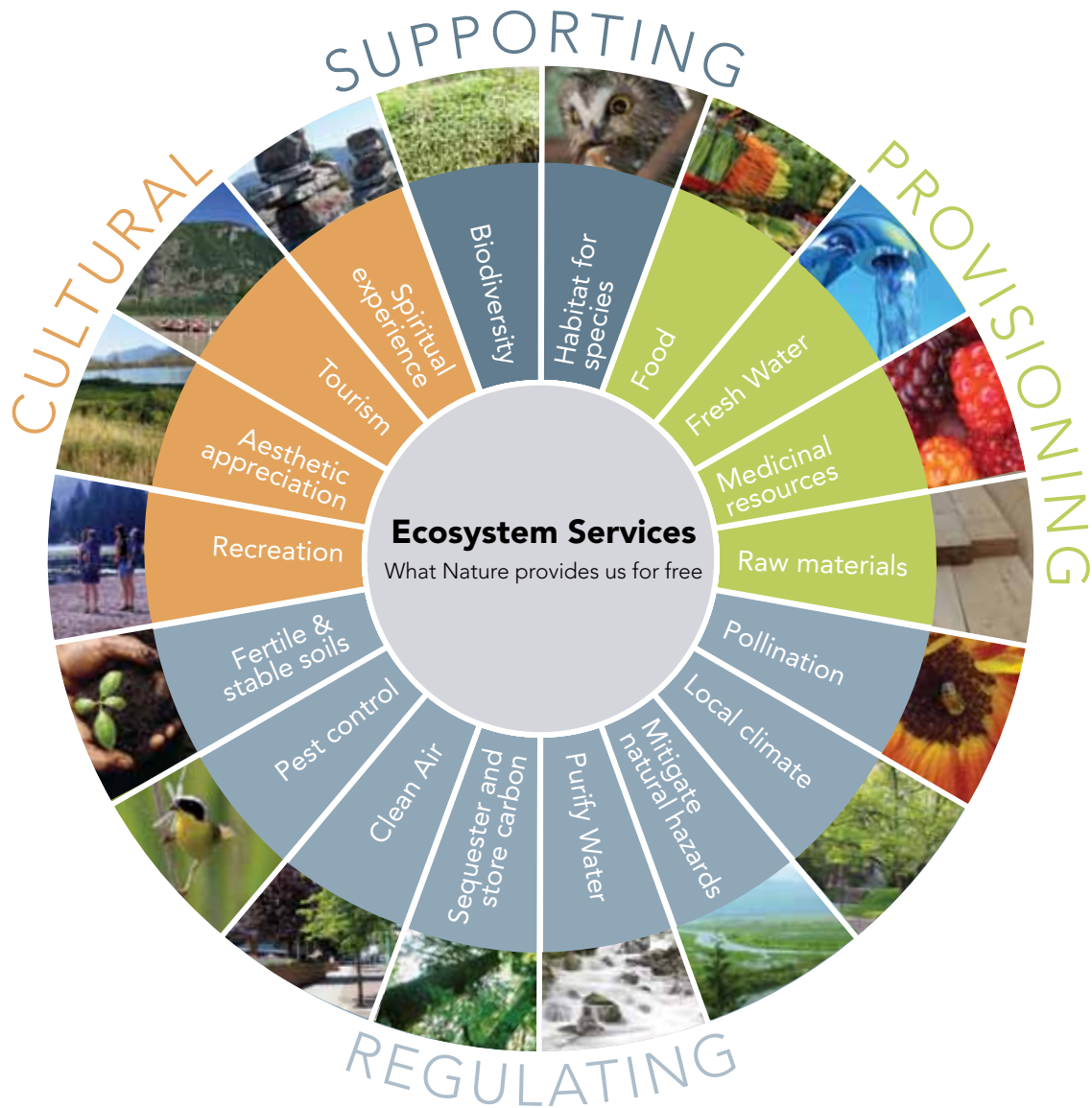
Ecosystem Services

Ecosystem services are the vast range of benefits nature provides that support and enhance our quality of life (see Figure 1). The wide range of these services can be grouped into four types:

- **Provisioning** services describe material and energy outputs from ecosystems, including food, fresh water, and raw materials used for construction and energy like wood.
- **Regulating** services refer to the services provided by ecosystems in processing and assimilating pollution, stabilizing water flows and soil erosion, controlling local climates, and storing or sequestering carbon.
- **Cultural** services are the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, recreation, and aesthetic enjoyment.
- **Supporting** services underpin all other ecosystem services. Ecosystems provide living spaces or habitats for all plants and animals while depending on a diversity of species to maintain their own functions.



Figure 1: Diagram of Ecosystem Services



Ecosystems provide a range of services. For instance, forests provide timber and fuel directly for human use but they also contribute to water purification, reduce erosion problems, store carbon and regulate local air quality and climates. The forests are also home to a wide range of plants and animals in addition to providing opportunities for education, recreation, solace and wonder.

In 2005, the United Nations Millennium Ecosystem Assessment (MEA) published a broad-based scientific assessment on the state of the world's ecosystems and their services, and concluded that, "human activity is putting such strain on the natural functions of the Earth that the ability of the planet's ecosystems to sustain future generations can no longer be taken for granted." The growing demand for food, fresh water, fibre, and energy have compromised and destroyed ecosystems that provide supporting services for humans and essential habitat for a wide range of species. In addition, the continual build up of nitrogen and phosphorus in lakes, estuaries, and enclosed seas as well as carbon in the atmosphere will likely lead to changes in environmental conditions that could have devastating impacts on human communities.

The MEA concludes that urgent and transformative changes needed to reverse the current trend towards decreasing ecological health can be achieved if the economic value of ecosystem services is better incorporated into decision-making at all levels. It may appear that ecosystem services are "free" because we do not pay for them, but the costs of degraded ecosystems may be borne by distant communities or by future generations.

Managing Ecological Health in a Metropolitan Region

Fortunately, for local governments, there are financial benefits to maintaining and improving ecological health. As a provider of key infrastructure, local governments can effectively and efficiently use natural processes to reduce operating costs and improve service delivery. The costs of restoring degraded ecosystems or replacing services once provided by nature for free with an engineered solution are very high. For example, conventional stormwater management involves a significant investment in pipes and other infrastructure to reduce the potential of flooding in urbanized areas and associated property loss. The engineered drainage system changes the intensity and level of water flows in urban streams and unless stormwater is treated prior to disposal, the water quality in receiving water bodies degrades. Better urban design, including more absorptive landscapes, is less expensive and will result in better environmental outcomes, including improvements in the hydrology of urban watersheds and reduced pollution loadings associated with urban run-off. This can be accomplished by working with natural systems to better manage rainwater: planting more trees as well as installing bio-swales, rain gardens, permeable surfaces and green roofs. These kinds of investments have the additional benefits of making urban areas more attractive and comfortable.

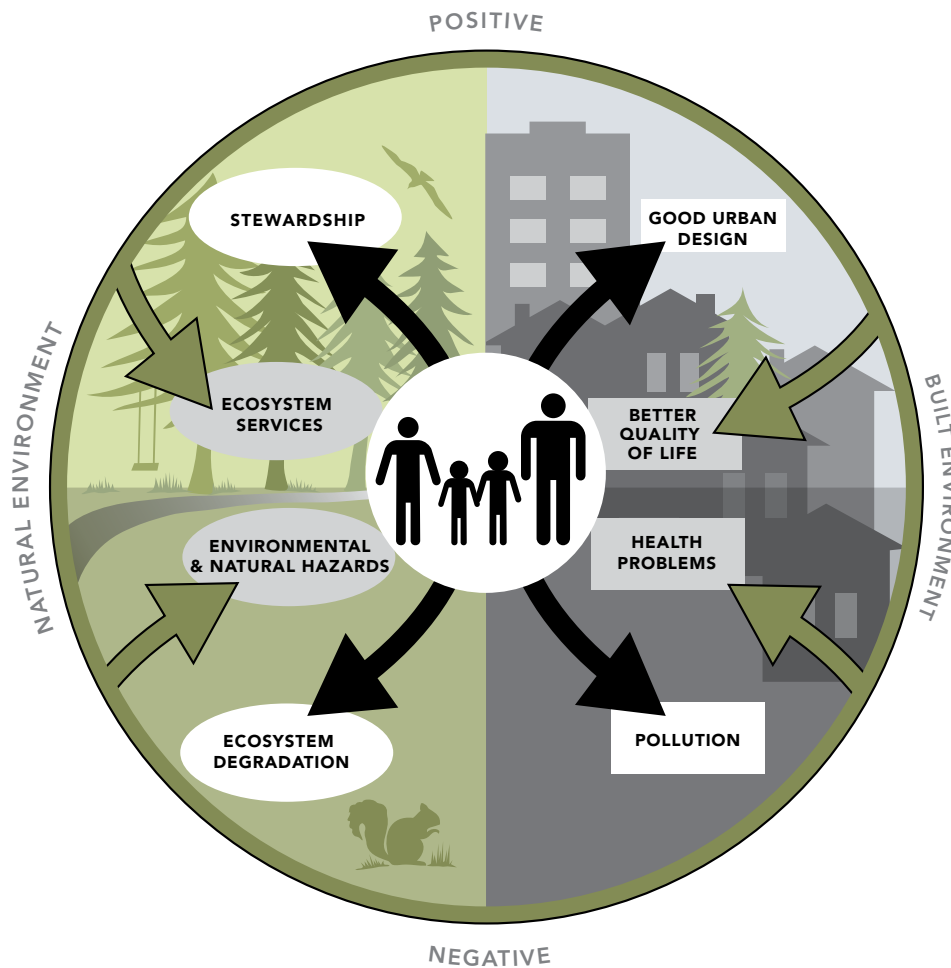
Managing the ecological health of a metropolitan region is a dynamic process. Our knowledge of how ecosystems, natural processes and human activities interact and affect each other is constantly evolving and so policies and plans must be adaptive. Other factors, like the effects of continued population growth and climate change, will require an on-going assessment of how best to maintain ecological health.



In addition, there are numerous examples of well-intentioned efforts to implement engineered solutions that have resulted in unintended disastrous ecological consequences. For instance, while the introduction of a new species to an ecosystem may provide short-term benefits from a human perspective, this kind of solution may result in a significant disruption in the complex relationships within an ecosystem.

Figure 2 illustrates the importance of maintaining ecological health in the built environment as well as in the natural environment of a metropolitan region.

Figure 2: Dynamics of Ecological Health in a Metropolitan Region



Regional Context

Despite being an urbanized area with a population of over 2.3 million, the Metro Vancouver region is characterized by diverse land cover. Only about a third of the land base is developed and devoted to residential, commercial and industrial uses, with remnant natural areas interspersed within this urban landscape. The remaining two-thirds of the region is a diverse network of forests, alpine areas, riparian areas, streams and rivers, wetlands, intertidal marshes, estuaries and agricultural lands. Figure 3 identifies the natural features and land cover of Metro Vancouver.

Figure 3: Natural Features and Land Cover of the Metro Vancouver Region



These natural features highlight the diverse range of ecosystems that contribute to the natural capital of the region. Natural capital refers to the stock of natural resources, ecosystem services and land in the region. Figure 4 illustrates that natural capital is located throughout the region including urban areas.



Figure 4: Components of Natural Capital in Metro Vancouver



In 2010, the David Suzuki Foundation and the Pacific Parklands Foundation released the report, “Natural Capital in BC’s Lower Mainland: valuing the benefits from nature” that estimated that the annual economic value of the services provided by the forests, wetlands, grasslands, and croplands in BC’s Lower Mainland is \$5.4 billion.

Within the region, many important initiatives are underway to protect and enhance natural ecosystems. Conservation, naturalist and streamkeeper groups have engaged the public in the restoration of habitat and other important actions to protect biodiversity in the region. Some businesses and individuals are also switching to more environmentally friendly technologies and products.

Similarly, Metro Vancouver has made significant efforts to incorporate ecological health into its decision making at all levels: policy, project and operations. This Ecological Health Action Plan summarizes how ecological health is incorporated into Metro Vancouver’s management plans and proposes some pragmatic steps to advance the agenda of ecological health within the mandate and authority of Metro Vancouver.



INTEGRATING ECOLOGICAL HEALTH INTO METRO VANCOUVER'S SUITE OF PLANS

Since 2002, Metro Vancouver has formally put the concept of sustainability at the centre of its operating and planning philosophy and has been one of the leading agencies in promoting a sustainable future for the region. This comprehensive endeavour became known as the Sustainable Region Initiative (SRI). In 2008, Metro Vancouver's Board adopted the Sustainability Framework outlining its vision, mission, values, sustainability imperatives and principles.

Ecological health is one of the strategic priorities identified by the Metro Vancouver Board. The Ecological Health Action Plan is one plan among a suite of interconnected regional management plans and strategies that together comprise a comprehensive and sustainability-driven approach to regional responsibilities and initiatives. The commitment to maintain and improve the region's ecological health has been incorporated into all of the relevant regional plans developed by Metro Vancouver.

The value of ecological health has also been incorporated into Metro Vancouver's operations and affected a range of practices and policies. Conventional solutions are re-examined and cutting edge research, systems thinking and collaboration across disciplines have been incorporated. This section of the Ecological Health Action Plan reviews how ecological health considerations have been woven into the management plans developed by Metro Vancouver and provides examples of specific Metro Vancouver projects that contribute to the region's ecological health.



Integrated Liquid Waste and Resource Management Plan

The Integrated Liquid Waste and Resource Management Plan was adopted by the Metro Vancouver Board and accepted by the provincial Minister of Environment in May 2011. The long term vision for liquid waste management in Metro Vancouver is to recover all energy, nutrients, water or other usable materials in the liquid waste stream that can effectively and efficiently be recovered, while the rest is returned to the environment in a manner that protects public health and the environment. Towards this goal, actions have been initiated that will:

- Reduce pollution through source management at the point of pollution and improving wastewater treatment.
- Release effluent that is safe for marine ecosystems through extensive environmental assessment programs and quality control work on existing infrastructure.
- Reduce the occurrence of sewer system overflows and their environmental impacts.
- Pursue liquid waste resource and energy recovery.

In addition to sanitary sewage, this Plan deals with drainage issues related to storm and rain water. Better stormwater management helps improve the water quality and biological integrity of the streams in the region's more than 100 watersheds that provide habitat for fish and other wildlife as well as recreational opportunities. The development and implementation of Integrated Stormwater Management Plans are municipal requirements in the regional Plan. Metro Vancouver provides an important coordination function through the Stormwater Interagency Liaison Group and the Environmental Monitoring Committee.



Similcoe Mine, Princeton BC. Smelter lake tailings before (2005) and after biosolids application (2006)

Recovering Resources from Liquid Waste: Biosolids

Since 1990, Metro Vancouver has beneficially used over one million tonnes of biosolids through a variety of actions to restore and enhance the environment in British Columbia. Biosolids, a valuable and renewable resource of nutrients and organic matter produced at Lower Mainland wastewater treatment plants, are used in projects such as mine reclamation, landfill rehabilitation and methane mitigation, forest fertilization, and in the creation of high-quality landscaping soils.

Integrated Solid Waste and Resource Management Plan

The Integrated Solid Waste and Resource Management Plan was adopted by the Metro Vancouver Board and accepted by the provincial Minister of Environment in June 2011. The overriding principle of the Plan is to minimize the amount of waste requiring disposal. This will be accomplished through an intensive effort to avoid the creation of waste, and maximize the reuse, recycling and material recovery from the waste that is generated.

Reducing the amount of waste that requires processing is fundamental to improving ecological health because there are environmental implications associated with all waste disposal methods. Actions in the Plan will:

- Reduce or eliminate materials entering the solid waste system that may exacerbate the environmental impacts of the waste that goes to final disposal sites.
- Divert food scraps and other organic materials from disposal. The decomposition of organic materials in the anaerobic conditions of landfills results in the emission of methane gas. Methane gas is a much more potent greenhouse gas than carbon dioxide so expanded composting programs will reduce regional greenhouse gas emissions.
- Continue to improve the environmental performance of the existing waste-to-energy facility with improved technologies and performance monitoring to ensure compliance with environmental objectives and regulations. Any new facilities will be designed to outperform environmental standards.



Safely Disposing of Medications

Metro Vancouver is partnering with the BC Pharmacy Association in a public awareness campaign on the importance of safe disposal of medications. The key message is how easy it is to drop off unused and expired medications, non-prescription drugs, vitamin, mineral and herbal supplements to local pharmacies. While medications constitute a very small part of the region's total waste stream, their potential environmental impact is disproportionately high. Medications and health-care products from a dispensary have been banned from Metro Vancouver landfill sites since 2009. In that year, 20 percent of residents were aware that medications should and could be returned to pharmacies. In 2011, this awareness had grown to 50 percent.

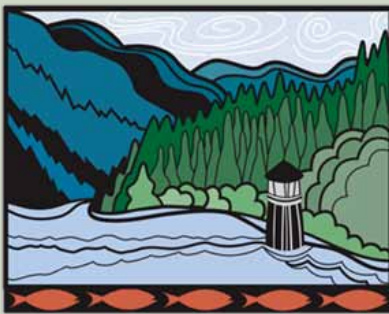


Drinking Water Management Plan

The protected North Shore watersheds are the source of the region's drinking water. The Drinking Water Management Plan was adopted in July 2011 and articulates how Metro Vancouver will continue to provide clean, safe drinking water to the region's residents and businesses while protecting the watersheds. The importance of protecting the ecological services provided by the watersheds is reflected in the Plan by actions that:

- Manage watershed lands and their biological diversity to advance regional sustainability.
- Protect and conserve fish populations while providing clean, safe drinking water.
- Minimize human access and activities in the drinking water watersheds to significantly reduce the risk of microbiological or chemical contamination to drinking water.
- Manage the watersheds with a minimum interventionist approach that protects, restores and enhances the natural capital of the North Shore mountains.

The Drinking Water Management Plan also promotes the sustainable use of drinking water resources through the use of demand management strategies. Through demand management and watershed planning, the objective is to ensure an adequate supply of water for the region, now and in the future, while also managing for fish and other wildlife in the watersheds.



Coquitlam Salmon Restoration Program

Coquitlam Lake supported spawning Sockeye salmon for thousands of years. In the 1890s, the lake was used as a drinking water source while still supporting spawning and rearing habitat for Sockeye. However, the construction of the hydroelectricity dam in the early 1900's blocked salmon from accessing the lake. In 2003, BC Hydro, Kwikwetlem First Nation, Metro Vancouver and environmental organizations began work to examine the feasibility of restoring Sockeye populations in this watershed while protecting drinking water quality and maintaining electricity generation. After an absence of nearly 100 years, an initial Sockeye population was released in the lake for further study. Although we are yet to see a viable population return, this is an example of a collaborative approach of many parties to support salmon populations, restore a culturally and ecologically important fish species while ensuring the lake still provides clean, safe drinking water and electricity to the region.

Integrated Air Quality and Greenhouse Gas Management Plan

Metro Vancouver was the first regional district in Canada to develop and adopt an Air Quality Management Plan. A third iteration, Metro Vancouver's new Integrated Air Quality and Greenhouse Gas Management Plan that is scheduled for adoption in 2011, will broaden the scope to include greenhouse gases.

Although regional air quality in Metro Vancouver is generally good, continual population growth as well as trade and transportation activity has resulted in localized pollution and increasing particulate matter. Both can affect human health. Climate change may also affect our region in many ways, including increasing water temperatures in the Pacific Ocean and rivers, making them less hospitable to salmon and other fish. Drier and hotter summers may create stress on habitats and agricultural production as well as produce heat island effects in built-up urban areas that can pose health threats to vulnerable populations.

Recognizing that clean air is essential to the health of all residents of the region as well as to our local ecosystems, the Integrated Air Quality and Greenhouse Gas Management Plan will:

- Protect public health and the environment by reducing the emissions of particulate matter and the precursors to ozone.
- Improve visual air quality by reducing emissions of particulate matter and other contaminants.
- Minimize the region's contribution to global climate change.

The AirCare program helps to reduce particulate matter and nitrogen oxides, which is a precursor to ozone. Metro Vancouver has also established regulations and a permit system to control emissions from industrial and commercial sources.

Metro Vancouver's air quality monitoring stations provide the data used to generate the regional Air Quality Health Index. The hourly index provides guidance to individuals on how to adjust their exposure and physical activities in relation to local air pollution levels.



Reducing Emissions from Non-Road Diesel Machines

Metro Vancouver, in cooperation with private and public sector stakeholders, is taking a leading role in addressing emissions from non-road diesel machines. Primarily found in construction and industrial equipment, these machines are a leading source of regional diesel particulate matter emissions in the region. These emissions can have a significant impact on human health, and can also settle and accumulate causing long-term harm to specific ecosystems in the region. Metro Vancouver has adopted a non-road diesel bylaw to reduce particulate matter emissions from diesel engines that will come into effect and be enforced in 2012.



Regional Parks Plan

Adopted by the Metro Vancouver Board in 2005, the Regional Parks and Greenways Plan provides strategic direction to the operations of Metro Vancouver's Regional Parks. An updated Regional Parks Plan is scheduled for adoption in 2011. The commitment to protecting and enhancing natural systems is a strong component of both plans and has shaped how regional parks are managed and developed as well as the public education and engagement programs associated with them.

This has been translated into actions to:

- Secure critical and sensitive habitats and ecological corridors.
- Complete and adopt management plans for each park and greenway.
- Restore and enhance critical habitats in regional parks and greenways.
- Implement integrated policies and strategies to manage health, user conflicts and environmental issues.

In addition, the ecological health of the region will benefit from activities in regional parks that:

- Build community capacity to undertake stewardship activities, restoration, and species recovery and biodiversity enhancement projects.
- Promote active living and healthy lifestyles through collaboration with other agencies.



Brae Island Campground Ecological Drainage and Infiltration System

This project involves creating a drainage and retention system that replicates the natural hydrology of Brae Island in a campsite with a capacity of 215 campers. Installation of a network of infiltration cells has enabled on-site water retention in the campground and a small drainage pump and pipes store excess water during the spring thaw. As a result there is no runoff into the Fraser River from the site except during extremely heavy storms. As a result of the success of this project, it is now common practice to retain and infiltrate stormwater on site in the development of facilities in Metro Vancouver's regional parks.

Regional Growth Strategy

The Metro Vancouver Board adopted the Regional Growth Strategy in July 2011. It represents an on-going commitment to building a compact metropolitan area where approximately two-thirds of the land in the region will continue to be designated for agricultural, recreational and conservation uses. The strategy establishes land use designations and the policies that manage the multiple objectives of accommodating population growth, enhancing economic prosperity, and maintaining the environmental qualities that contribute to the livability and sustainability of the region. Specifically the Regional Growth Strategy:

- Creates an urban containment boundary that will focus the majority of new development to areas already designated for development.
- Emphasizes that new growth should be focused on complete communities that are walkable, mixed use, and transit-oriented. This will support regional efforts to reduce the level of pollutants associated with personal travel.
- Protects agricultural, recreational, conservation and rural lands that provide a flow of valuable ecosystem services from urban development.
- Supports a collaborative approach to developing a connected network of ecosystems, natural features, and corridors that enhance recreational connectivity and ecosystem functions.
- Encourages land use and transportation infrastructure that reduces energy consumption and greenhouse gas emissions and improves air quality.
- Encourages decisions related to land use and public infrastructure to improve the capacity of the built environment and natural environment to withstand climate change impacts and natural hazards.



Sensitive Ecosystem Inventory

In 2010, Metro Vancouver initiated a Sensitive Ecosystem Inventory to identify and map at-risk, fragile and ecologically important ecosystems throughout the region and Abbotsford. This ambitious project will provide data required to support sustainable land management practices and conserve ecological diversity. When the inventory is complete, it will be a valuable resource for achieving the goal of protecting endangered wetlands and advancing a regional Green Infrastructure Network. It will also inform further analyses on ecosystem services in the region.



Affordable Housing Strategy

The Affordable Housing Strategy was adopted by the Metro Vancouver Board in 2007 to address some of the critical housing affordability challenges in the region. It does not address the issue of ecological health directly but instead reflects the linkage between housing choices in the region and the broad concept of sustainability.



Landscaping at Metro Vancouver's affordable housing sites

Metro Vancouver Housing Corporation owns and operates 49 affordable rental housing sites across the region and is working to incorporate landscaping that supports natural systems and habitat into its operations. For example, through the introduction of berry bushes at housing sites, the amount of "edible" landscaping will increase, benefitting tenants and local wildlife. About a third of the sites participate in the Corporation's Community Gardens Project and use composters that turn food scraps into compost that will be reused in the garden.

Regional Food System Strategy

The Metro Vancouver Board adopted the Regional Food System Strategy in February 2011. It is a strategy that encourages the collaboration of all levels of government and their agencies, the private sector, public institutions, community groups, and consumers to create a sustainable, resilient and healthy regional food system. Healthy, functioning ecosystems are essential for the production of food from the land and sea. Implementation of the Regional Food System Strategy will support improvements in the region's ecological health through actions that:

- Protect and enhance ecosystem goods and services. This will be achieved by exploring opportunities to develop programs to reward farming practices that contribute to the ecological health of the region.
- Support for efforts that reduce waste at every step in the food system.
- Facilitate the adoption of environmentally sustainable fisheries and agriculture practices.
- Communicate to consumers how their food choices can support environmental sustainability. Empowering consumers with relevant information about how their food choices affect their own health and the health of important ecosystems can encourage food producers to change their practices.

The strategic planning process at Metro Vancouver ensures that the Sustainability Framework guides the development of each of the management plans and this has meant that the concept of ecological health has been integrated into Metro Vancouver's suite of management plans. This summary provides a good sense of how Metro Vancouver plans and operations contributes to maintaining and improving the region's ecological health. While each management plan identifies actions required of Metro Vancouver, they also contain actions required or requested of member municipalities and other regional stakeholders to achieve the long-term goals articulated in the plan.

In addition to the suite of management plans, there are opportunities for Metro Vancouver to make further contributions to the ecological health of the region in the short term. Those opportunities and potential ecological health projects are described in the next section.





OPPORTUNITIES FOR IMPROVING ECOLOGICAL HEALTH

In this part of the plan, Metro Vancouver has adopted a project-based pragmatic approach to developing initiatives that will add value to current initiatives in the region.

Following the comprehensive review of existing ecological health initiatives in Metro Vancouver's regional plans and operations, a gap analysis was conducted to identify areas of opportunity for Metro Vancouver to further contribute to the ecological health of the region. The four areas of opportunity are:

1. Advancing the Regional Green Infrastructure Network
2. Supporting Salmon in the Cities
3. Supplementing Ecosystem Services
4. Reducing Toxics.

The following section describes four areas of opportunity in more detail and proposes 12 projects that Metro Vancouver can initiate within the next one to five years. Together they will support ecological connectivity in the region, incorporate an assessment of ecosystem services, and enhance the connections between people and nature. These proposed projects are an initial set of actions to contribute to the ecological health of the region – they are not in any of Metro Vancouver's management plans but are consistent with the goals of these plans. Implementing these actions will build capacity within Metro Vancouver and will inform subsequent work to scale up efforts to protect the region's ecological health.





Advancing the Regional Green Infrastructure Network

The forested mountains, wetlands, streams, and riparian areas are important in providing key ecosystem services in the region and fortunately some of these lands have been protected from urban development and industrial activity. Due to the collective efforts of many agencies, organizations and dedicated individuals, the region benefits from protected drinking watersheds along with parks, recreational greenways and conservation areas including Burns Bog. The creation of the Agricultural Land Reserve has also been important in maintaining farmlands in the region that contribute ecosystem services. These important building blocks of a Regional Green Infrastructure Network are already in place.

The next step is to improve and enhance the existing network. This will require the same level of collaboration and a focus on restoring and expanding the protected lands while creating linkages between the existing elements of the network. The normal course of urban development leads to a fragmented natural landscape. Therefore, creating a contiguous network of lands that provide ecosystem services is important for ecological succession, seed dispersal, the flow of water and nutrients, and expanding opportunities for migration, foraging and breeding for many species. A connected network of green infrastructure will also mitigate environmental disruptions like climate change.

Given limited resources, it will be important to take a strategic approach to protecting, maintaining and enhancing our Regional Green Infrastructure Network. In a metropolitan region where the price of land is high, opportunities for adding to the Regional Green Infrastructure Network by solely purchasing land is not financially viable. Therefore, a broader approach is needed to expand a Regional Green Infrastructure Network including daylighting streams, and restoring riparian areas, utility corridors, rights-of-way and easements. In order to encourage these changes, the identification and use of innovative policies and tools that can be used by all partners for managing lands and building corridors is important. For critical ecosystem services provided by privately owned lands, like farmlands, compensation or other incentives may be necessary. In urbanized areas, building connections may involve green roofs, backyards and street trees, engaging residents will be important in this effort.

In addition to creating connections, managing the lands in the Regional Green Infrastructure Network to ensure that they continue to provide ecosystem services that we depend on is important. Many of the projects proposed in the Ecological Health Action Plan will demonstrate how Metro Vancouver sites can be used to expand green infrastructure.

Metro Vancouver is currently developing a sensitive ecosystem inventory that will support the identification and expansion of the Regional Green Infrastructure Network. This will be accomplished by delineating and describing the quality of protected areas and other relevant lands in the region. The next step will involve collaboration with regional stakeholders to determine the gaps, both spatially and functionally, in the network and then agree on actions to expand and improve the network. Advancing a Regional Green Infrastructure Network is particularly important as community plans are developed to accommodate projected population growth, regional utility and transportation infrastructure is enhanced and the region begins to experience the effects of climate change and other global environmental trends.



What is needed:

To secure the continued flow of important ecosystem services within a region, the following are critical:

1. Prioritize lands for inclusion in a Regional Green Infrastructure Network:
 - a. Identify and map well established, functioning ecosystems including hubs and corridors.
 - b. Identify important or at risk ecosystem services and opportunities to advance the Regional Green Infrastructure Network.
 - c. Evaluate opportunities to advance the regional network, while considering implications to:
 - i. relationships between the living and non-living environment,
 - ii. evolutionary requirements,
 - iii. spatial and temporal needs,
 - iv. recreational activities, and
 - v. unique opportunities available in newly developing areas.
2. Expand and support ecosystem services within the network. For example:
 - a. Improve riparian vegetation.
 - b. Mitigate physical barriers to biological connectivity.
 - c. Minimize the use of impermeable surfaces.
 - d. Plant more trees and flowering shrubs.
3. Promote and advocate for the use of tools (covenants, easements, tree protection bylaws, property tax relief) that can be used to support the enhancement and expansion of a Regional Green Infrastructure Network.

Project 1: Advancing a Regional Green Infrastructure Network

In collaboration with local and senior levels of government, First Nations and other agencies, Metro Vancouver will lead the identification of a Regional Green Infrastructure Network and begin implementation on Metro Vancouver lands where appropriate.

Objective:

- Enhance and expand a Regional Green Infrastructure Network in collaboration with regional stakeholders.

	Action	Timing	Funding
1.	Metro Vancouver to produce a small scale regional map identifying the existing hubs and corridors of green infrastructure in the region. The Sensitive Ecosystem Inventory will be used in combination with other municipal and regional land use and protected area planning tools to identify existing components of the Regional Green Infrastructure Network and the priorities for improving connectivity.	Short term	Within existing workplans and budgets
2.	Establish a collaborative process involving municipalities, other levels of government, conservation organizations, and private land owners to identify broad objectives and components of the Regional Green Infrastructure Network.	Medium term	Within existing workplans and budgets
3.	Assemble a comprehensive set of tools and policies that can be used to aid in the development of the Regional Green Infrastructure Network.	Medium term	TBD
4.	For identified high priority Metro Vancouver sites, implement appropriate restoration.	Medium term	TBD



Supporting Salmon in the Cities

In this document the term salmon refers to Steelhead and all of the five Pacific Salmon species: Chinook, Chum, Coho, Pink and Sockeye.

Salmon are central to the forest food web. In addition to nourishing their own offspring, returning salmon are food for eagles, heron, otters and many other species. Decomposing fish also leach nutrients back into the stream systems and riparian areas, nourishing some 190 species of plants and animals and fertilizing the trees that provide important shade and cover to the streams. Rebuilding salmon populations now will contribute to the health and functioning of forests and riparian areas in the region now and into the future.

The economic history of Metro Vancouver is tied to salmon. The legendary abundance of salmon supported a vibrant fishing and canning industry that once vied for space along the rivers and inlets with shipping, log booms and mills. Salmon continues to be part of everyday meals and important occasions for residents across the region. The emergence of complex First Nation societies on the coast was supported in part on the abundance of salmon and the importance of salmon is strongly reflected in their oral histories, art, and celebrations. The continuing importance of salmon is reflected by First Nation involvement in policies on fisheries management and conservation.

Salmon continue to be an important cultural icon in the region. This importance is reflected in the efforts of streamkeepers, other conservation groups, and local governments to reclaim salmon streams and implement programs to augment native stocks. Within the region, events are organized to celebrate the return of the spawning salmon and a variety of information events, displays and permanent fixtures in museums, hatcheries, and aquariums are dedicated to the species.

Declines in salmon stocks are attributed to many factors, including poor marine survival, disease, overfishing and loss of habitat. While efforts to address these many challenges continue, regional efforts to protect and enhance critical spawning and rearing habitat are required. The salmon's continued transference of nutrients from the Pacific Ocean to the people, wildlife and landscape of the Coast requires the creation of positive conditions for all elements of the salmon food web – robust habitat, abundant clean water and the thriving web of insect populations that salmon feed on.

In a 1997 study Fisheries and Oceans Canada (DFO) estimated that over 100, or almost a third, of the streams in the Metro Vancouver area had been lost, and of the remaining 238 streams, 97 percent were either threatened or endangered. The status of these streams have been affected by multitude of factors associated with the urban and economic development of the region and restoring and enhancing the remaining streams will require a new process of evaluating the trade-offs in terms of ecological health and other objectives. Towards this end, the detailed proposals for the projects in this section will include an estimate of the value of the ecosystem services derived from the restoration work. This will be useful in assessing each project's relative merits as well as building greater awareness among decision-makers and the public of natural capital.



Photo by Jason Coburn

The restoration of healthy streams and riparian areas is an important contribution in building the Regional Green Infrastructure Network. Recreational and ecological corridors along salmon streams can be useful in building connectivity in this regional network.

What is needed:

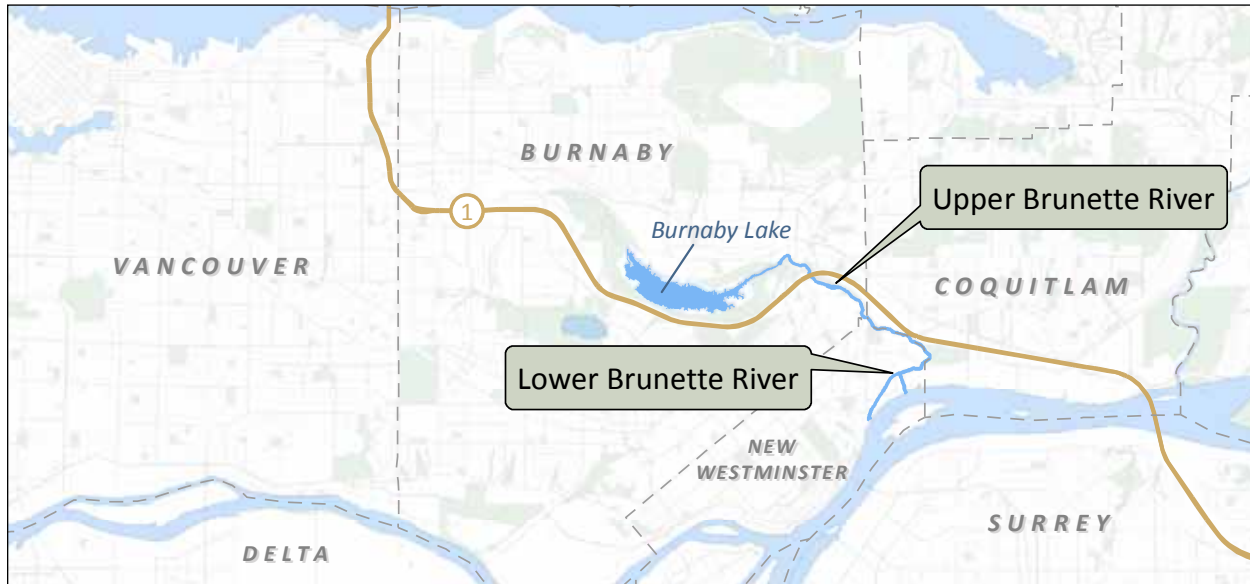
To reverse this trend of stream habitat loss and degradation, coordinated action to protect and enhance critical spawning and rearing habitat is required. Specific strategies to achieve these broad goals include:

1. Improve biological integrity of existing watersheds
2. Protect the integrity of aquifers
3. Ensure adequate in-stream flows
4. Improve quality of surface waters
5. Integrate riparian habitat standards into new developments
6. Restore historic native fish distributions
7. Restore the hydrological regimes of watersheds
8. Restore and enhance habitat and productive capacity for native salmon.

Metro Vancouver has opportunities through its regional parks and sewerage and drainage functions to act in partnership to incrementally improve salmon habitat. While Metro Vancouver has some level of legal authority or responsibility for the streams identified in this plan, it does not have sole jurisdiction so a partnership-based approach will be adopted. Habitat banking opportunities with the Department of Fisheries and Oceans will also be explored.



Project 2: Enhancing the Lower Brunette River



The Brunette River continues to provide important habitat for the Nooksack Dace and rearing and spawning habitat for salmon in the midst of highly urbanized area of the region. Maintaining and improving the capacity of this system to support salmon and other species is important for demonstrating our ability to create, and the value of fish-friendly built environments.

The lower Brunette River Project encompasses the lower reaches of this urban river located between North Road and the stream's historic mouth at the Fraser River near Sapperton Landing in New Westminster. It is a fish bearing stream that has been severely affected by urban development and flood prevention projects, particularly in the lower reaches below Brunette Avenue. A bypass channel constructed to mitigate flooding in the Braid Industrial Area is thought to have significantly compounded habitat degradation in the river. Stream habitat in the project area is limited by poor water quality, low summer base flows, a poor distribution of areas suitable for rearing, as well as relatively poor in-stream cover and habitat diversity.

The *Brunette Basin Watershed Plan* was developed collaboratively by Metro Vancouver and other regional partners in 2001. Metro Vancouver has responsibilities for managing designated drainage facilities in this watershed and has rights-of-way along various reaches of this river. In addition to management responsibilities, Metro Vancouver maintains the Brunette-Fraser Regional Greenway and owns lands along the Lower Brunette for liquid waste and drainage purposes.

Partners to the watershed plan include the Brunette Basin Coordinating Committee with a mandate to coordinate municipal and stewardship activities as well as the Sapperton Fish and Game Club who have been instrumental in returning salmon to this river. In addition to the existing and potentially expanded greenway along the Lower Brunette, outdoor recreationalists suggest that a revitalized Brunette River could support a "blueway" for canoes, kayaks and other paddle vehicles.

Objectives:

- Increase base water flow levels in the historic channel which will improve in-stream rearing and spawning habitat for Coho, Chum, Pink, Steelhead and the Nooksack Dace.
- Improve water flows and remove navigational barriers to enhance use of the Brunette River as a recreational corridor. Other recreational values will be enhanced by efforts to augment the connection of the Brunette-Fraser Regional Greenway between the Braid Station area and Sapperton Landing on the east bank and the development of parkland at Cold Point for recreational use.
- Public education on the value of restoring salmon habitat.

	Action	Timing	Funding
1.	Initial scoping study of options for increased base flow and habitat enhancement in the historic Brunette River channel and estimation of the ecosystem value of such work.	Short term	\$20,000
2.	Develop implementation strategy to increase baseflow and improve riparian habitat in the historic Brunette River channel. Initiate implementation.	Medium term	\$20,000
3.	Continue implementation of stream restoration within historic Brunette River channel. Assess potential benefits of options for improving riparian and fish habitat and recreational access below Brunette Avenue.	Medium term	TBD
4.	Explore opportunities and implement a strategy for improving riparian and fish habitat as well as recreational access on the Brunette River below Brunette Avenue.	Medium term	TBD



Project 3: Enhancing the Upper Brunette River

The salmon habitat in the upper reaches of the Brunette River has also been affected by urbanization, though less than further downstream. A number of restoration projects have been completed or are actively under development in the upper Brunette River. These include a significant upgrade to the fish ladder on the Cariboo Dam and an enhanced weir that will provide improved access to Burnaby Lake and other tributaries for migrating salmon and other species. Additional efforts to expand and improve salmon rearing habitat by Metro Vancouver in this section of the river would supplement these efforts and conform to objectives set in the Brunette Basin Watershed Plan.

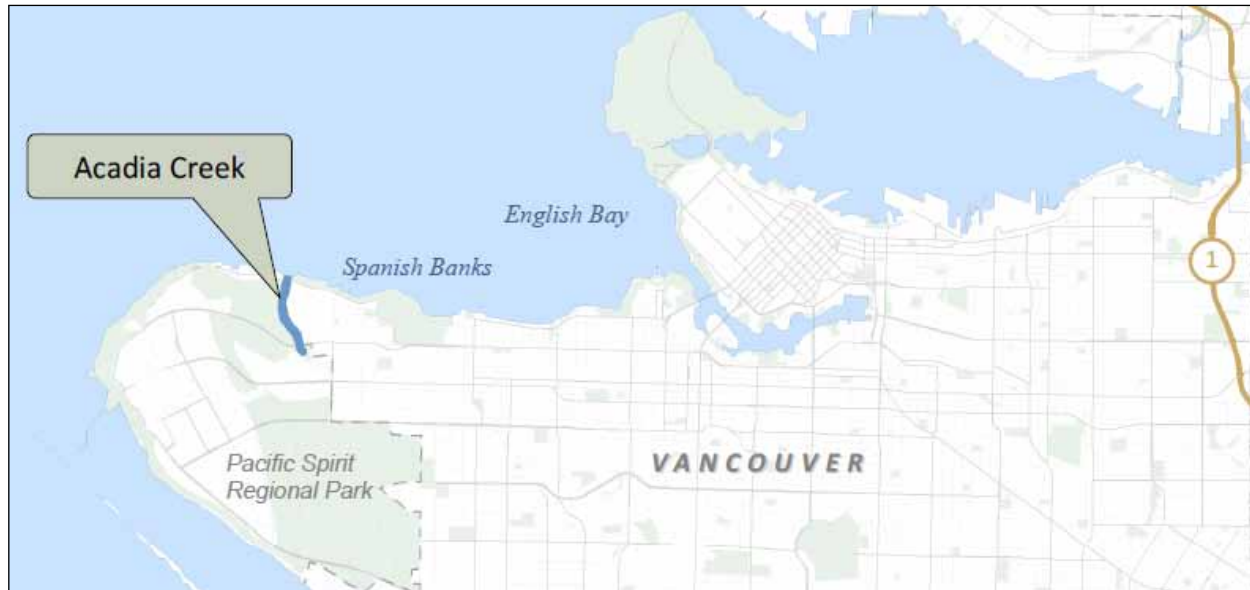
Metro Vancouver has responsibilities for managing designated drainage facilities within the Brunette River watershed and maintains the Brunette-Fraser Regional Greenway. In addition there is a sanitary sewer in this stream corridor.

Objectives:

- Enhance riparian and in stream habitat to benefit Coho, Pink, Chum, Steelhead, Cutthroat trout and Nooksack Dace.
- Public education on the value of restoring salmon habitat.

	Action	Timing	Funding
1.	Initial scoping study of options for riparian and in-stream habitat enhancement in the Upper Brunette River and estimation of the ecosystem value of such work.	Short term	\$20,000
2.	Develop riparian and in-stream habitat enhancement implementation plan for the Upper Brunette River	Medium term	\$20,000
3.	Implement habitat enhancement plan for the Upper Brunette River.	Medium term	TBD

Project 4: Enhancing Acadia Creek



Located in Pacific Spirit Regional Park and flowing in a northerly direction, Acadia Creek discharges into English Bay near Spanish Banks. The headwaters of the stream are located in the vicinity of the University Golf Course and much of the watershed is located within Pacific Spirit Regional Park. The stream is adjacent to University Hills Elementary School.

Just to the east of Acadia Creek is Spanish Creek which was recently enhanced through a daylighting and habitat enhancement project. It now provides spawning and rearing habitat for Chum and Coho salmon. Reports indicate it also provides secondary biodiversity enhancing benefits to a variety of species in the area including heron and otter. Acadia Creek offers an opportunity to create new Coho habitat in a regional park near the popular beach at Spanish Banks.

It appears that the limitations to establishing salmon in Acadia Creek are the diversion of its lower reaches to a pipe, access restrictions at the culvert on Marine Drive, and low summer flows. The creek's habitat was mapped and assessed during the spring and summer of 2011 as a BCIT student project and the results supplied to Metro Vancouver.

The Spanish Banks Streamkeepers are active in the area and may participate in an Acadia Creek enhancement project.



Objectives:

- Enhanced access to high quality natural habitat for Coho.
- Public education on the value of restoring salmon habitat.

	Action	Timing	Funding
1.	Initial study of options for habitat enhancement and improved Coho access in the Acadia Creek system and estimation of ecosystem value of such work.	Short term	\$15,000
2.	Implement priority actions outlined in the study.	Medium term	TBD

Project 5: Enhancing the Lower Seymour River



The Seymour Dam and drinking water reservoir are located 19 kilometres upstream from the mouth of the Seymour River. A number of tributaries feed into the Lower Seymour and a volunteer supported fish hatchery is located just below the dam.

Urban development surrounding the lower reaches of the river cause flows in the main stem to be erratic – high after intense storms and much lower the rest of the time. The mouth of the Seymour River has been dredged and modified resulting in a heavily degraded estuary and an area of high smolt mortality. Polluted storm runoff has been a problem, including low dissolved oxygen levels in Maplewood Creek. The dam also has limited gravel recruitment for spawning habitat.

Metro Vancouver is developing a joint water use plan for the Capilano and Seymour systems involving a number of stakeholders who are interested in restoration and enhancement with a focus on steelhead. In addition to existing stewardship partnerships, greenway corridor planning is enhancing Metro Vancouver's network in this community. The Seymour Salmonid Society is heavily involved in this watershed.



Objectives:

- Mitigate flashiness of the lower main stem river from local urban development.
- Create new rearing habitat for all fish and increase spawning habitat for Pinks.
- Public education on the value of restoring salmon habitat.

	Action	Timing	Funding
1.	Initial study of options for habitat enhancement, flow stabilization, and recreational access in the Lower Seymour River system and estimation of ecosystem value of such work.	Short term	\$20,000
2.	Implement habitat enhancement to enhance salmon rearing habitat in the Lower Seymour River system.	Medium term	TBD
3.	Explore opportunities for creating salt water habitat enhancement at the southern terminus of the Seymour River Regional Greenway at Metro Vancouver’s North Vancouver Beach Yard.	Medium term	TBD
4.	Implement further actions based on outcome of the Joint Water Use Plan for the Seymour and Capilano Watersheds.	Longer term	TBD



Supplementing Ecosystem Services

Ecosystem services also underpin the green infrastructure that can assist, and in some cases replace, conventional engineered solutions or grey infrastructure. Since green infrastructure uses soils, vegetation and trees to help manage rainwater, it is generally less expensive than grey infrastructure to build and operate.

In the Ecological Health Action Plan, expanding ecosystem services in our urban and rural landscapes is focused on expanding pollinator populations and rethinking pest control, increasing tree coverage in urban areas and expanding on-site rainwater infiltration and retention. These are important individual objectives and may also have important synergistic benefits.

In general, these Supplementing Ecosystem Services projects will contribute to improvements in the aesthetics of urban landscapes and some will help to enhance the Regional Green Infrastructure Network. The intent is to learn and build on these initial leadership projects within Metro Vancouver and to share our experiences with land and property managers across the region.

Pollination and Pest Control

Up to 90 percent of all plants and a third of our food supply relies on natural pollination. Natural pollinators in our region include bees, butterflies, and hummingbirds. Declines in the health and populations of pollinators pose a significant threat to our food supply as well as natural food webs. Pollinator populations are under stress from the effects of habitat fragmentation, loss of secure and stable nesting and forage areas, disease, predators, parasites, climate change and most notably pesticide use.

To support pollinator populations, efforts will be focussed on protecting existing species and habitat, enhancing or creating new habitat and adapting current maintenance practices to avoid causing harm to pollinator populations. Pollinators need habitat that includes a rich array of flowering plants that provide food in the form of nectar and pollen. Native shrubs, grasses, flowers and trees are adapted to local conditions and are less susceptible to pests and disease.

Improving habitat for pollinators will also benefit insects that are useful for pest control, like ladybugs, and will create a healthy landscape of robust plants. The coordination of the use of pest biology, environmental information, and adaptable technology may better control pests, diminish risks to people, property and ecosystems, including pollinators.



What is needed:

1. Eliminate the cosmetic application of pesticides and provide greater support to non-toxic methods of pest control.
2. Enhance and protect existing pollinator habitats.
3. Supplement existing habitat with new and enhanced habitat.
4. Support changes in agricultural practices that are pollinator-friendly including integrated pest management, more targeted application of pesticides and the expansion of buffer strips when pesticides are used.
5. Expand the number and range of flowering plants that can provide food for pollinators throughout the year in parks, roadways, field hedgerows, around public buildings and in private gardens.

In order to bring focus while supporting a wide variety of pollinator species, the Western Bumble Bee will be targeted in pollinator habitat restoration and creation efforts. The Western Bumble Bee has been one of the most abundant pollinators in Metro Vancouver but there are indications of a dramatic decline in their populations. Efforts to improve the food and habitat requirements of this species will benefit other pollinators and species which share similar requirements.

Urban Trees & Rainwater Detention

Planting trees can mitigate urban heat island effects, improve air quality by sequestering and storing carbon and reducing airborne pollutants, reduce energy costs for heating and air conditioning, promote physical and mental well-being of people, contribute to the management of rainwater and increase real estate values.

Trees offer essential habitat in built urban environments by providing refuges and habitats for insects, birds and small mammals. Natural vegetation and soils allow the gradual absorption and slow movement of rain and snowmelt. In contrast, paved streets and buildings speed the delivery of both water and pollutants into pipes and out into our waterways. Pollutants from commercial, industrial and residential activities are moved by rain and snowmelt into storm drains that flush into rivers, lakes, or marine waters. Stormwater runoff accounts for 30 percent of the pollution of water bodies across North America and the runoff includes toxic metals, oils, solvents, pesticides, herbicides and leaded paint chips. Even a relatively small proportion of impervious surfaces can radically degrade salmon habitat and the volume of polluted waters can thwart local stream restoration efforts.

Soils in the region have the capacity to store large amounts of moisture during the winter months and release it slowly as temperatures rise. This process is important in recharging aquifers and maintaining stream base flows during the summer. On-site storm water management will protect and expand this function which will be especially important in light of higher levels of precipitation during the winter and hotter summers associated with climate change.

What is needed:

1. Increase urban tree canopy cover.
2. Increase the permeability of urban surfaces to reduce the frequency and likelihood of high, quick flows of stormwater.
3. Use trees, shrubs and other vegetation to reduce the volume and peak load of stormwater/ rainwater entering the drainage system.
4. Expand trees and landscaping to provide on-site capture of contaminants or limit the transportation of pollutants off-site.
5. In new development areas, use trees to provide: soil stability, improved aesthetics and noise buffering.

Planting more trees, protecting and enhancing habitat for pollinators and supporting on-site rainwater management, will reduce the need to expand grey infrastructure in the years ahead, while providing the benefits of a more lush, inviting and healthy region.

The proposed projects represent Metro Vancouver's commitment to manage its lands and facilities in a manner that is consistent with improving the provision of ecological services in the region. These initiatives may, depending on their location, represent an incremental contribution to building a Regional Green Infrastructure Network.

Project 6: Enhancing the Centennial Beach Ecosystem

Centennial Beach, in south Delta, is to be redeveloped to increase access and provide improvements and enhancements to park facilities. The site will be redesigned to include bio-swales to capture run-off, and rain gardens and increased tree cover and plantings to improve the aesthetics, provide shade and habitat for pollinators, with specific focus on the Western Bumble Bee. In the pond, invasive plant species and sediments from the pond area will be removed, a solar aerator installed, and the number of native aquatic and non-aquatic plants increased.

Objectives:

- Develop an ecologically sound parking lot area with extensive tree cover and stormwater being filtered and turned into a resource for a nearby pond.
- Revitalize the existing pond and provide much needed pollinator habitat.
- Create a green infrastructure learning opportunity in a very visible, high traffic area.



	Action	Timing	Funding
1.	Develop a detailed landscape design and cost estimate for enhancing the Centennial Beach ecosystem.	Short term	\$25,000
2.	Construct new landscaping for Centennial Beach.	Medium term	TBD
3.	Maintain new habitat areas at Centennial Beach.	Medium term	TBD

Project 7: Augmenting Habitat at Boundary Bay Regional Park

The objective of this project is to restore old field sites located in the Boundary Bay Regional Park in Delta to benefit local pollinator and raptor populations and nearby agricultural operations while providing important educational opportunities. The project area will be seeded with a mix of grass, clover and native flowering annuals, which will provide long-season, diverse nectar sources for various pollinators.

The project will complement innovative work by the Delta Farmland and Wildlife Trust in conjunction with local farmers to restore and protect habitat on farmlands. The location of the project provides good visibility and public access for educational and awareness initiatives related to ecological health and ecosystem services.

Objectives:

- Manage vegetation in old agricultural fields to enhance biodiversity with a focus on pollinators and raptors.
- Conduct trials of different approaches and species compositions to find the appropriate mix for the site and targeted Western Bumble Bee.
- Provide information and examples to the local agricultural community on old field management.

	Action	Timing	Funding
1.	Prepare a site assessment and preliminary site design for Boundary Bay Regional Park.	Short term	\$10,000
2.	Implement habitat enhancements for Boundary Bay Regional Park.	Medium term	\$20,000

Project 8: Enhancing the Parking Lot at Capilano River Regional Park

Capilano River Regional Park is the site of the Cleveland Dam and Capilano Reservoir in North Vancouver. The parking lot is busy with visitors interested in the numerous recreational and educational opportunities for hikers, biker, kayakers, as well as the fish hatchery, dam and picnicking sites. The park is also frequently used as a location for film and television production. Currently, the site is a large paved area with some small trees and surrounded by limited mature vegetation to the north and south as well as large areas of turf.

This project would redevelop the parking lot to include deep and/or shallow rooting trees and bio-swales. Increased tree coverage would reduce temperatures on site and in combination with bio-swales would maximize absorption of rainwater.

Objectives:

- Improve site aesthetics and shading while reducing the heat island effect of the asphalt surface.
- Reduce water entering the storm drains connected to the site.
- Provide on-site capture of contaminants or limit the transportation of pollutants off-site.

	Action	Timing	Funding
1.	Prepare site assessment for re-landscaping the parking lot at Capilano River Regional Park with consideration of the engineering opportunities and constraints.	Short term	Within existing workplans and budgets
2.	Develop site concept and preliminary cost estimate for parking lot at the Capilano River Regional Park.	Medium term	TBD
3.	Construction of re-landscaped parking lot at the Capilano River Regional Park.	Medium term	TBD



Project 9: Relandscaping Wastewater Treatment Plants

Wastewater treatment plants, such as those in Northwest Langley and on Lulu Island, represent an opportunity to demonstrate how industrial sites can be re-landscaped to contribute to the region’s green infrastructure. This could include planting trees and shrubs, developing rain gardens and constructing bio-swales. A side benefit to constructing habitat conducive to building pollinator populations, like the Western Bumble Bee, would increase the aesthetics of the plants while reducing standing water and habitat for mosquitoes. In addition, the proximity of these wastewater treatment plants to farmlands, increasing pollinator populations would also benefit nearby agricultural operation.

Objectives:

- Revegetate industrial sites to enhance biodiversity by focusing on flowering shrubs for pollinators and trees for rainwater detention.
- Show leadership by investing in green infrastructure in industrial areas.

	Action	Timing	Funding
1.	Work with Metro Vancouver staff at each of the Wastewater Treatment Plants to determine potential sites for redevelopment.	Short term	Within existing workplans and budgets
2.	Develop a short list of potential projects and identify priorities based on opportunities and challenges.	Short term	Within existing workplans and budgets
3.	Develop landscape designs for identified sites.	Medium term	TBD
4.	Implement landscape designs.	Medium term	TBD

Project 10: Expanding Beekeeping at Metro Vancouver Sites

There are many opportunities for expanding beekeeping at Metro Vancouver sites that will benefit agricultural operations in the region. Possible locations include Colony Farm Regional Park, Campbell Valley Regional Park and the numerous Air Quality Monitoring Stations.

Objectives:

- Increase pollinator populations in landscaped urban environments.
- Explore beekeeping as an interpretation opportunity to support our pollinators.

	Action	Timing	Funding
1.	Work with Metro Vancouver staff to determine potential Metro Vancouver sites that would be conducive for beekeeping.	Short term	Within existing workplans and budgets
2.	Develop a short list of possible locations and identify priorities based on opportunities and challenges.	Medium term	Within existing workplans and budgets
3.	Develop sites in collaboration with Metro Vancouver staff and professional beekeepers.	Medium term	TBD



Project 11: Redeveloping Greenspaces at Metro Vancouver Housing Corporation Sites

Metro Vancouver Housing Corporation manages 49 affordable housing sites. This project entails working with Tenant Associations and residents at these sites to redevelop green spaces focusing on new landscaping that supports ecological health objectives while meeting resident needs and desires. This could include removing invasive species, restoring wetland and stream corridors, increasing tree cover and developing pollinator friendly and water-wise gardens.

Objective:

- Redevelop more appealing and ecologically healthy landscapes at Metro Vancouver Housing Corporation sites.

	Action	Timing	Funding
1.	Work with Metro Vancouver staff, Tenant Associations and residents at Metro Vancouver Housing Corporation (MVHC) affordable housing sites to determine potential opportunities for landscape redevelopment.	Short term	Within existing workplans and budgets
2.	Develop a short list of possible MVHC sites and identify priorities based on opportunities and challenges.	Medium term	Within existing workplans and budgets
3.	Develop landscape designs for prioritized MVHC sites.	Medium term	TBD
4.	In conjunction Metro Vancouver staff, MVHC Tenant Associations, and residents to initiate new landscaping.	Medium term	TBD



Reducing Toxics

Contaminants in the air we breathe, the water we drink and play in, and the food we eat may contribute to risks to human health and to the functioning of ecosystems. Particularly concerning are the effects of contaminants that are persistent (breakdown slowly or not all), bio-accumulative (accumulate in the tissues of organisms in a food chain), and are toxic at low levels of exposure. Preventing pollution and harmful exposures to humans and other living organisms will likely prove to be less expensive than clean-ups and managing related health problems in the long-run.

What is needed:

A comprehensive approach to reducing the risk of exposure to toxic substances will require:

1. More rigorous testing of new chemicals before they are approved for use.
2. National and international bans of the most dangerous toxic substances.
3. Expansion of programs that require manufacturers and importers of products containing toxic substances to assume the full costs of proper disposal.
4. Increased monitoring efforts to track changes in environmental health and success of source control programs along with continued research into potential effect of toxics on human and wildlife health.

Although most of these issues lie largely within Federal and Provincial jurisdictions, Metro Vancouver can contribute to efforts to reduce the risks to human and environmental health by taking action to reduce exposure to toxic substances through our responsibilities for managing air quality, liquid and solid waste.



Project 12: Targeting Harmful Toxics

Metro Vancouver possesses a range of tools, including source controls, regulations, bans and public education, which can be employed to reduce the amount of toxic substances used and disposed of in the region. Examples of successful past initiatives to reduce toxics in the region include the reduction of mercury by the adoption of amalgam separators in dental offices and the reduction of surfactants through a public education campaign that involved member municipalities.

Monitoring in the Fraser River indicates that ambient levels of copper are already high and are elevated from the effluent of regional wastewater treatment plants. Copper is toxic to plankton, the base of the aquatic food chain, and it also interferes with a salmon's sense of smell. The copper in the effluent is likely the result of the leaching of copper from pipes in the drinking water system due to the naturally acidic regional waters.

Concentrations of molybdenum in the region's biosolids are high. Chemicals used to control corrosion in the heating and cooling systems of older commercial buildings lead to the increased production of molybdenum, which is then flushed into the sanitary sewage system. High levels of molybdenum can be toxic to animals feeding on the vegetation that consume the nutrients in the biosolids produced by the wastewater treatment plants.

This project targets the concentrations of copper and molybdenum in the liquid waste stream. This project is consistent with the goals of Metro Vancouver's Integrated Liquid Waste and Resource Management Plan.

Objective:

- To develop an effective approach to reducing toxic substances in Metro Vancouver.

	Action	Timing	Funding
1.	Identify the most efficient and effective tools for reducing the release of copper and molybdenum into the liquid waste stream.	Short term	Within existing workplans and budgets
2.	Implement a solution in collaboration with municipal partners and stakeholders.	Medium term	Within existing workplans and budgets

PERFORMANCE MEASURES

Progress in implementing the Ecological Health Action Plan projects will be monitored using the following performance measures.

Building a Regional Green Infrastructure Network

- Creation of a map identifying existing portions of a Regional Green Infrastructure Network, hubs and corridors, as well areas that need to be included.
- Formal agreement to build the Regional Green Infrastructure Network by regional partners and stakeholders.

Supporting Salmon in the Cities

- Kilometres of riparian area restored or rehabilitated by each project.
- Estimated value of ecosystems services restored by each project.

Supplementing Ecosystem Services

- Amount of rainwater diverted from storm sewers from each project. (Impervious surfaces removed in each project.)
- Area of Western Bumble Bee habitat restored or created by each project.
- Number of trees planted in each projects.
- Estimated value of ecosystem services restored by each project.

Reducing Toxics

- Change in copper concentration in the effluent of each wastewater treatment plant.
- Change in molybdenum concentration in biosolids.

The Ecological Health Action Plan represents an important examination of Metro Vancouver's role in improving ecological health and a next step in becoming more focussed and explicit about supporting ecological health for the benefit of all inhabitants of the region. This action plan should be reviewed in three years to allow for assessment of progress within each of these projects and adjustment of objectives in light of experience.



GLOSSARY

Biodiversity: The variety of species and ecosystems for a given geographic area and the ecological processes of which they are a part, including ecosystem, species and genetic diversity components.

Ecology: A branch of science concerned with the interrelationship of organisms and their environment; the study of ecosystems.

Ecological health: The components and connections between healthy functioning ecosystems, the valuable services they provide and human health and well-being. It recognizes that maintaining and enhancing the integrity of ecosystems and other natural features is essential for ensuring that people continue to benefit from the stream of ecosystem services that contributes to our well-being and economic prosperity.

Ecosystem: A dynamic complex of plant, animal and microorganism communities and their non-living environment, all interacting as a functional unit.

Ecosystem services: The aspects of ecosystems utilized, actively or passively, to produce human well-being. They include the provision of clean water and air, pollination of crops, mitigation of environmental hazards, pest and disease control and carbon sequestration.

Environment: The complex of physical, chemical, and biological factors in which a living organism or community exists.

Green infrastructure: The undeveloped natural lands, working landscapes and other open spaces that conserve natural ecosystem values and functions while providing associated benefits to human populations.

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 banking: The planned creation or improvement of fish habitat, in order to provide compensation for a future development project(s).

Habitat Fragmentation: Fragmentation of habitats occur when a continuous habitat has become divided into separate, often isolated small patches interspersed with other habitats or land uses. Fragmentation frequently obstructs species from immigrating between populations and therefore can lead to losses of species diversity in the longer term.

Natural capital: The stock of renewable and non-renewable natural resources, ecosystem services, and land.

Natural environment: The natural environment comprises all living and non-living things that occur naturally on Earth that is not the result of human activity or intervention. The natural environment may be contrasted to the built environment.

Natural features: Landscape features or elements created by natural processes; for example, rivers and mountains.



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OCTOBER 2011



PRINTED IN CANADA ON RECYCLED PAPER