

A photograph of a park with large trees and a green field. The trees are in the foreground and middle ground, with their leaves showing some autumnal colors. The field is a vibrant green. In the background, there are some park benches and a fence.

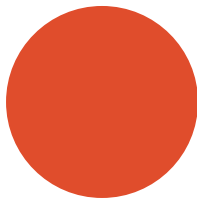
# biodiver**CITIES**:

*A Handbook for Municipal  
Biodiversity Planning and  
Management*

•I.C•L•E•I  
Local  
Governments  
for Sustainability

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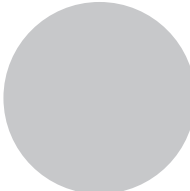
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# Foreword

There is nothing better than being surrounded by life in the middle of an urban centre! Maybe it is on your walk to work, under a canopy of blooming Sakura cherry trees as a gentle breeze rains rose-pink petals onto the sidewalk below. Maybe it is spotting a bright red northern-cardinal against a fresh dusting of snow out of the window of a hectic office building. Or, maybe it is a busy pollinator buzzing from flower to flower down a garden-lined boulevard while cars zoom past. These signs of life add such joy to urban living.

Whether we live in a major metropolis or rural town, each and every one of us depend on healthy natural systems to supply the necessities of life. In *biodiverCITIES: A Primer on Nature in Cities*, we explored why biodiversity should be the business of everyone committed to building more sustainable cities. Now, with *biodiverCITIES: A Handbook for Municipal Biodiversity Planning and Management*, we are providing the practical tools to help operationalize this notion. This Handbook is a tool to help local government staff and urban practitioners build communities abundant in biodiversity.

I encourage you to bring this handbook to life! Use it, modify it, and tailor it to your needs. And by all means, share your feedback and experiences with ICLEI and your peers across the country so we can all learn and create a network of *biodiverCITIES* across the country.



Megan Meaney  
Director, ICLEI Canada

 @meganmeaney









# Introduction

## CONTEXT

Urban biodiversity represents the variety and richness of living organisms. This means that community residents are in a position to positively contribute to the health and vibrancy of biodiversity in their city. Increasingly, biodiversity is receiving recognition for providing local populations with numerous ecosystem services, which are “the benefits people obtain from ecosystems.”<sup>1</sup> Ecosystems are a dynamic collection of microorganisms, plants, animals, and the non-living environment interacting as a functional unit.<sup>2</sup> Healthy ecosystems provide a variety of functions that indirectly benefit communities, such as regulating storm water flow and the urban heat island effect.<sup>3</sup> Furthermore, ecosystems directly contribute to improvements in air, water, and land quality and function- strongly contributing to food production, human culture, settlement, and recreation. Ecosystem health, vibrancy, and quality is enhanced when the diversity of species quality and quantity is high, facilitating relationships and interactions within species populations and among the variety of species. A healthy ecosystem contains predatory, opportunistic, or mutualistic relationships, which are intertwined into a complex hierarchy that is resilient to natural disturbances.

## PURPOSE OF THE GUIDEBOOK

The purpose of this Handbook is to take the foundational knowledge developed in [biodiverCITIES: A Primer on Nature in Cities](#) and add to the concepts with a milestone framework for Canadian municipalities to develop and implement a *Biodiversity Action Plan (BAP)*.

BAPs are valuable planning documents that identify opportunities to improve community biodiversity, sustainability, and resilience.

The process for developing a BAP does not differ dramatically from many existing conservation planning approaches. Both require a definition of scope and purpose of the planning efforts, such as an assessment of the condition, threats, and conservation challenges of the natural areas of interest. Furthermore, the identification of planning and management options, implementation and management strategies and actions, along with a monitoring framework to assess management performance and results, are components of successful plans.

Developing a BAP can take many different forms and serve a different purpose to each community. An *Umbrella BAP* combines existing biodiversity-related objectives and brings them together under one strategy. This approach is effective for municipalities that already have systems in place to protect nature, but are looking for a way to enhance their biodiversity protection efforts. Whereas a *stand-alone BAP* includes new actions not previously considered. This may require extensive ecological assessments in order to determine the species and habitats that need protecting. Through the stand alone approach, biodiversity considerations are integrated into existing departments such as public health, community engagement, green infrastructure planning, and so forth. With this approach, biodiversity becomes a factor in the work a municipality is already undertaking, and in doing helps to mainstream the issue into different aspects of local operations and services.



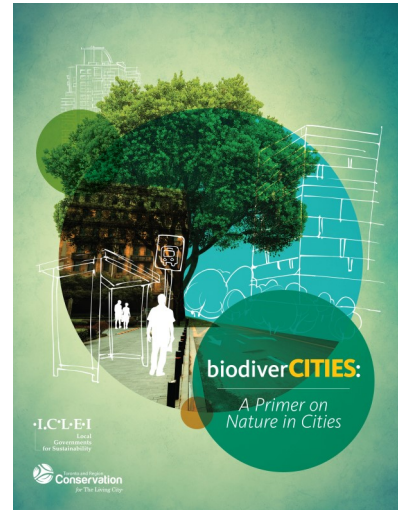
## BIODIVERCITIES SUMMARY

Over 80% of Canadians live in cities. Urban development and growth are increasing in some areas. This growth will increase demand for limited natural resources to support: infrastructure, housing, food, and recreation. Biodiversity is a key component of urban economies and community health, as it drives successful long-term growth. Biodiversity is everywhere. It comprises all living organisms on Earth, such as plants, animals, humans, and microbes. It represents the genetic diversity of life on Earth.

The Convention on Biological Diversity defines biodiversity as:

“the variability among living organisms from all sources, including, among other things, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part. This includes diversity within species, between species and of ecosystems.”<sup>4</sup>

Biodiversity plays a critical role in regulating air, water, and land, which in turn provide us with clean water, fresh air, and healthy communities. Plants and animals require safe places to grow and interact, creating healthy ecosystems and providing natural resources. Healthy ecosystem are resilient to extreme weather events aiding in the reduction of damage to critical infrastructure. They act as a buffers and absorbers of wind, rain, and heat protecting people, their homes, and leisure sites. Healthy ecosystems are self-regulating, which is important to nutrient cycling, nutrient breakdown, biological control, and pollination-all critical to nourishing soil and spreading seeds, which in turn provide crops and food for humankind.



## What Can Cities and Communities Do?

Local governments play an important role as leaders on biodiversity in their community. Through partnerships, education, and policy, local governments can develop programs or measures that result in outputs which target actions for biodiversity management. Local government actions can change attitudes through policy, and facilitate dialogue between decision-makers, the community, and researchers. Exhibit 1 highlights areas where local governments and decision-makers can target actions.

Biodiversity management is beneficial to many aspects of community function and health. Despite the benefits of biodiversity, challenges and barriers to biodiversity integration must be recognized and addressed. Four major barriers identified in *biodiverCITIES: A Primer on Nature in Cities* were: misconceptions about biodiversity; disconnect between science and policy; public awareness and engagement; and funding (see Exhibit 2).

Exhibit 1: Local Action Mechanisms for Biodiversity Planning Management

Local Action Mechanism	Explanation
Urban planning and design	Local governments can manage urban spaces to reflect the community’s needs and shared vision. Municipalities should integrate green infrastructure into designs and site plans.
Regulation	Local governments can implement and enforce biodiversity management and protection policies using several tools, examples include bylaws, planning approvals, surcharges, and rebates
Leadership and awareness	Local governments can connect with community organizations, businesses, residents, and other stakeholders. These connections can be used to develop a shared understanding and encourage community-wide responses to biodiversity loss.
Community engagement and service delivery	Local governments must engage their community in the biodiversity programs, partnerships, projects, and services which are intended to protect health, safety, and well-being of residents.
Operations and workforce	As responsible corporate citizens, local governments can act as leaders in environmental protection by ensuring sustainable business practices are integrated into the services they deliver, the management of public spaces and buildings, and workforce development programs through training and educational campaigns.

Biodiversity planning and management should bring together various stakeholders to share experiences, information, and goals, in order to collectively work together to achieve outcomes that benefit all.

The diversity of nature itself means that biodiversity conservation, planning, and management must be unique to each community and will require a significant commitment of time and resources to ensure the best results. Moreover, political will and political recognition of the opportunities and benefits biodiversity will bring must be expressed to your community.

Together the Primer and this Handbook will help to focus your biodiversity goals and objectives to achieve their desired outcomes.

How to use this guide

A BAP can take many different forms depending on each municipality’s needs and restrictions. This handbook offers a milestone framework that guides the planning, development and implementation of a BAP. The handbook can also serve as an inventory of leading practices, tools, actions, and examples on biodiversity planning and management.



## Exhibit 2: Barriers to Biodiversity Integration

	Explanation	Solution
Misconceptions about biodiversity	Biodiversity is not widely understood outside of biological conservation communities. The message can be confusing, unclear, or seem unimportant to your municipality's stakeholders.	Clearly identify the connections between biodiversity and community well-being. Demonstrate the benefits your community extracts from biodiversity.
Disconnect between science and policy	Policy goals may not be conducive to current scientific information. Or, current policy goals may fail to recognize opportunities for biodiversity action.	Science and policy must find a middle ground to create positive change. Research must be trans-disciplinary to connect themes of economics, community well-being, mental health etc., to scientific information. Researchers and politicians must engage in dialogue and inform the public of new information.
Lack of public awareness and engagement	An inability to connect people to nature creates missed opportunities for your community to learn about biodiversity, share experiences, and shape community biodiversity goals.	Support human to nature interaction with open green spaces, and identify educational and experiential learning activities. When appropriate, attempt to include the public in biodiversity planning.
Funding	Traditional funding sources may not have, or, may be unwilling to provide financial assistance.	Identify alternative funding sources and partners. Furthermore, develop mechanisms which provide opportunity for biodiversity protection and development on private lands.

This Handbook walks readers through a five-milestone framework for biodiversity management (see Exhibit 3) and offers practical and action-orientated steps municipalities can follow as they develop, implement, and monitor a biodiversity action plan. Each Milestone includes detailed activities to help meet the objectives of the Milestone, as well as case studies that detail how certain activities can be achieved.

Collectively, the Milestone approach covers a range of biodiversity actions based on different levels of engagement and expertise in order to capture the interdisciplinary nature of

biodiversity planning and management. Each of the Milestones are dynamic and allow users to customize the use of this resource to fit their specific needs. This is done by highlighting different planning and management options that meet different levels of engagement based on whether a municipality is starting out, on the path, or advanced. Whether a municipality is new to biodiversity planning or is already implementing activities, this Handbook offers tools and options that suit various levels of expertise. Exhibit 3 highlights the key objectives and expected outputs for each Milestone in more detail.

## Exhibit 3: Milestone Objectives and Outputs

1

### Key Objective

Milestone One - Initiate: Start the process of biodiversity planning by researching current actions, networks, and key internal and external stakeholders.

### Milestone Outputs

- Identify potential stakeholders
- Build a biodiversity planning team
- Identify existing actions, policies, networks and resources

2

Milestone Two - Assess: Determine the current state of biodiversity within your community and projected changes that may impact local biodiversity.

- Identify key assessment attributes to inform biodiversity planning
- Plan inventory and gap analysis
- Develop statements on biodiversity changes and impacts to community

3

Milestone Three - Plan: Plan for the successful integration of biodiversity goals, objectives, and actions into new and/or existing program areas.

- Identifying planning scope
- Establish guiding principles
- Establishing biodiversity goals and objectives
- Setting biodiversity indicators, and targets
- Identifying, prioritize, and select actions

4

Milestone Four - Implement: Act on the goals of the biodiversity plan and consider your messaging and outreach efforts throughout the implementation phase.

- Tailor communication to audience
- Develop a message that is personal, local and timely

5

Milestone Five - Monitor and Review: Establish protocols to collect and analyze biodiversity information and determine how to improve BAP actions.

- Collect data to measure performance/uptake
- Circle back and upgrade key elements from the assessment and planning Milestones
- Reporting to partners, stakeholders and Council



## THE ECONOMIC VALUE OF BIODIVERSITY

Biodiversity provides us with numerous goods and services that sustain our environmental, social, and economic systems. Historically, the services provided to us by biodiversity have been poorly or inaccurately reflected in market pricing or economic valuations. The goods and raw natural resources produced by nature such as energy, food, and fibre are exchanged on national and global markets and have a value or price. Although goods have a market value, numerous short-comings such as dumping, harmful extraction processes and alterations to ecosystems are not fully priced, thus devaluing the long-term value of nature. Furthermore, services provided to us by biodiversity, such as pollination, nutrient cycling, and chemical absorption and processing are not factored into

market prices. Non-market valuations price nature in the range of millions to billions of dollars. For example, the Peace River Watershed in British Columbia is estimated to provide over \$6 billion/year of carbon absorption and storage services.<sup>6</sup> In Ontario, the Greenbelt is estimated to be worth over \$2 billion/year for all ecosystem services, while the urban Rouge National Park is estimated to provide over \$100 million/year in ecosystem services.<sup>7</sup> Valuation and accounting is a challenging but valuable processes. At this point, it is not important to conduct your own valuation, but recognize the broad economic contribution biodiversity brings to your community. A growing body of literature from global, national, and regional bodies continually builds our understanding of the economic value of biodiversity.

### Exhibit 4: List of Documents Addressing Economic Benefits of Biodiversity

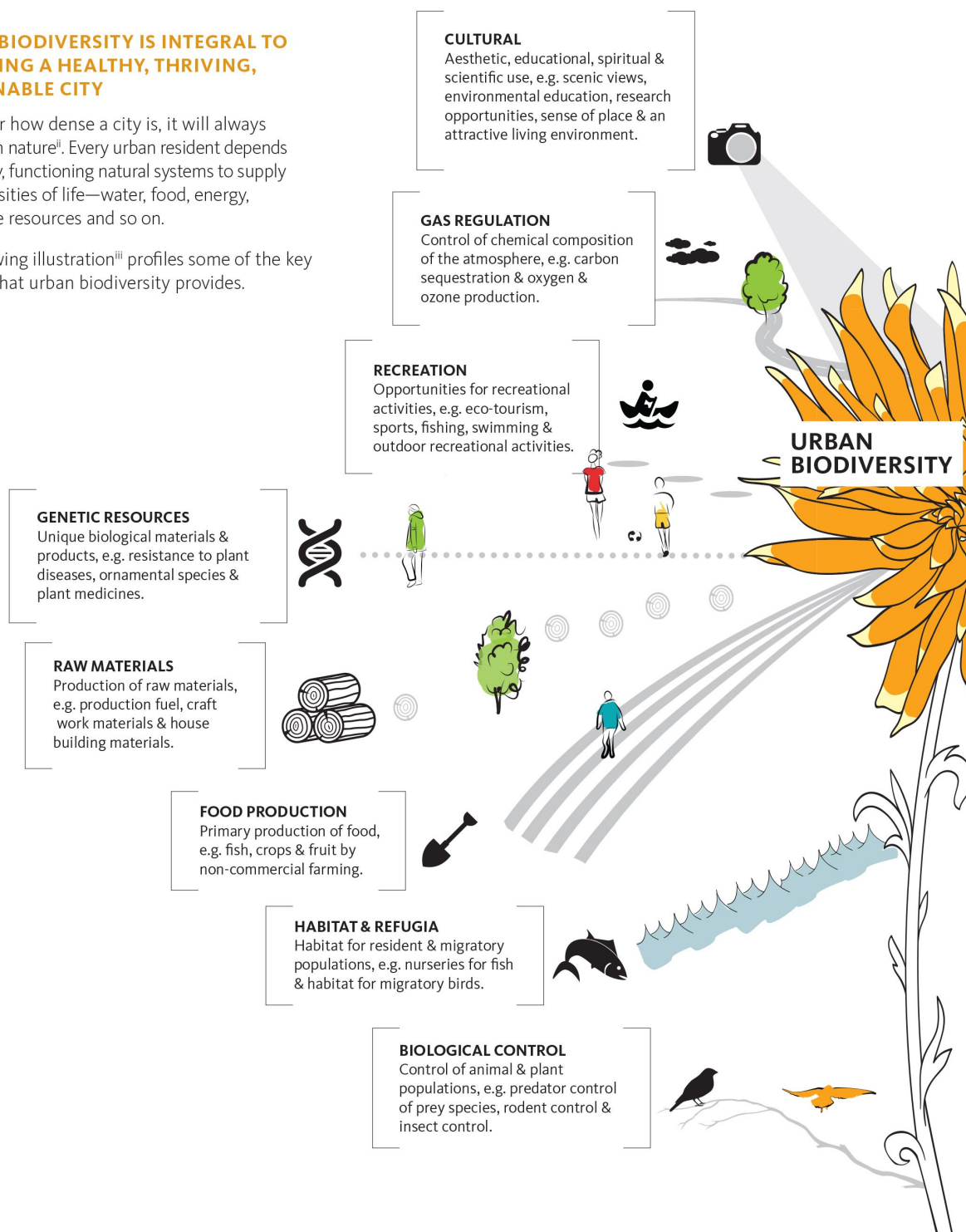
Author	Document
<b>Secretariat of the Convention on Biological Diversity</b>	An Exploration of Tools and Methodologies for Valuation of Biodiversity and Biodiversity Resources and Functions (2007)
<b>Millennium Ecosystem Assessment</b>	Ecosystems and Human Well-Being: a Framework for Assessment (2005)
<b>The Economics of Ecosystems &amp; Biodiversity</b>	TEEB for Local and Regional Policy Makers (2010)
<b>United Nations Environment Programme</b>	Green Economy Briefing Papers: Valuing Nature (2012)
<b>Organization for Economic and Cooperative Development</b>	Handbook of Biodiversity Valuation: a Guide for Policy Makers (2002)
<b>Statistics Canada</b>	Human Activity and the Environment: Measuring Ecosystem Goods and Services in Canada (2013)
<b>Miller, E., and Lloyd-Smith, P. prepared for Ontario Ministry of Natural Resources</b>	The Economics of Ecosystem Services and Biodiversity in Ontario: Assessing the Knowledge and Gaps (2012)
<b>Government of Alberta</b>	Manual for Wetland Ecosystem Services Protocol for Southern Alberta (WESPAB) (2013)
<b>Canadian Business and Biodiversity Program</b>	Canadian Business and Biodiversity Case Studies Compendium, Vol 1, (2010)

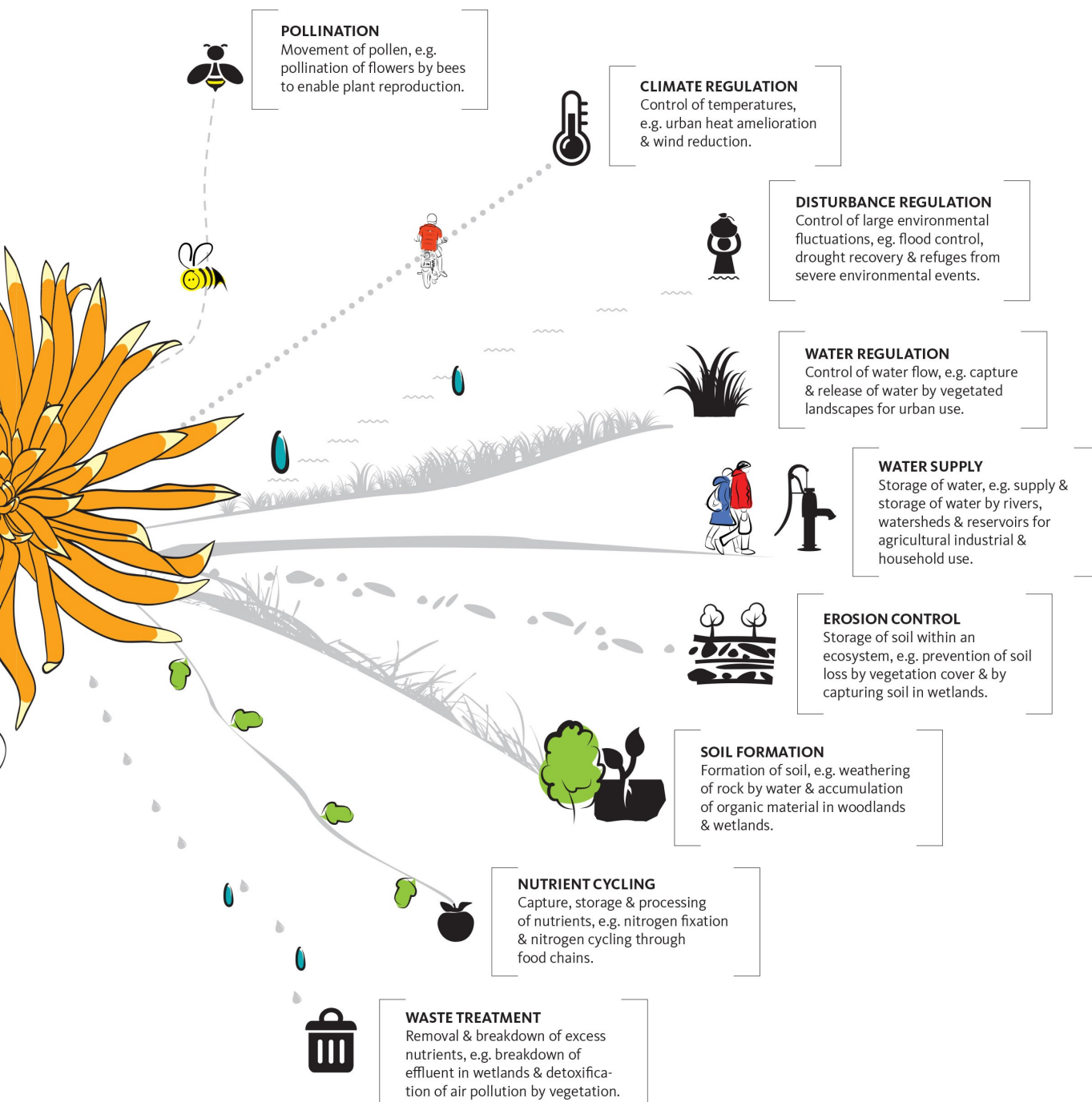
## Exhibit 5: Key Benefits of Urban Biodiversity

### URBAN BIODIVERSITY IS INTEGRAL TO ACHIEVING A HEALTHY, THRIVING, SUSTAINABLE CITY

No matter how dense a city is, it will always depend on nature<sup>i</sup>. Every urban resident depends on healthy, functioning natural systems to supply the necessities of life—water, food, energy, renewable resources and so on.

The following illustration<sup>iii</sup> profiles some of the key benefits that urban biodiversity provides.







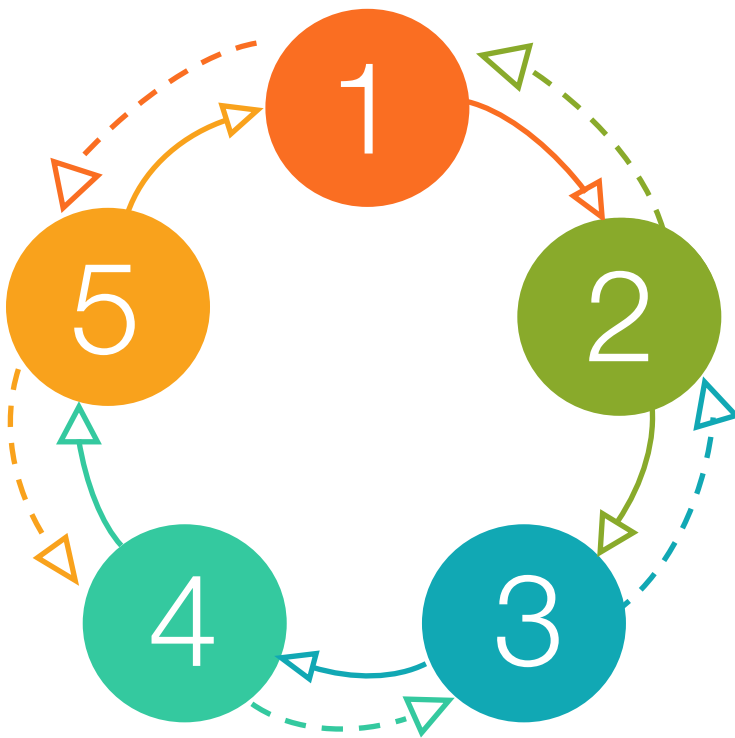
## READY. SET. PLAN!

Biodiversity planning and management is a long-term process which will require patience both through the planning process, and later when actions are being implemented. As your community begins this process and moves towards the completion of a BAP, it is important to remember that each Milestone is part of a

larger framework aimed at managing, promoting, and conserving local biodiversity.







### MILESTONE ONE - INITIATE

The first Milestone starts with building a biodiversity team that will be responsible for outreach and research. The team will identify internal and external stakeholders to include in BAP development, and conduct research of current and past biodiversity actions, policies, and resources.

### MILESTONE TWO - ASSESS

In the second Milestone you will determine the current state of biodiversity in your community through the development of a biodiversity assessment. The biodiversity assessment will identify assets in your community, as well as biodiversity conservation opportunities.

### MILESTONE THREE - PLAN

The third Milestone draws upon the biodiversity assessment developed in the previous Milestone by addressing your biodiversity problems. This Milestone will confront biodiversity issues through the development a BAP to promote biodiversity management and conservation goals and actions.

### MILESTONE FOUR - IMPLEMENT

The fourth Milestone will have your team communicate with staff and council, and external stakeholders to get actions implemented. Your team will tailor communication to broad and specific audiences, and develop a message that is personal, local, and timely.

### MILESTONE FIVE - MONITOR/REVIEW

The final Milestone requires the biodiversity team to verify the implementation of actions, validate outcomes of actions, update the BAP by identifying current scientific, political, and community information, and report success to stakeholders and council.

## ENDNOTES

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# CONNECTING BIODIVERSITY TO CLIMATE

Biodiversity is connected to multiple municipal departments and management issues. Climate change adaptation and mitigation are two municipal management areas where biodiversity can be integrated seamlessly to achieve multiple benefits.

Climate change is the long-term change in the Earth's climate systems caused by a combination of natural and human-induced factors. Overall, our climate system is warming, which will bring many negative impacts to global, regional, and local communities through the alteration of weather patterns. It is generally recognized that warming temperatures will result in the introduction of invasive plant and animal species, increased frequency and magnitude of extreme weather events, and sea level rise. These impacts will adversely impact Canada's economic, ecological, and sociocultural assets if no action is taken to confront the sources and drivers of climate change.

Climate change mitigation is intended to reduce carbon emissions into the atmosphere using a combination of technological, ecological, and political tools. From a biodiversity perspective, healthy ecosystems and vegetation can act as carbon sinks.<sup>5</sup> The concentration of carbon dioxide emissions is expected to continue rising due to the burning of fossil fuels (coal, oil and natural gas),

urban development, and land change (i.e. agriculture, de-forestation). Protecting and enhancing ecosystems and biological and biophysical processes is an important mitigation and biodiversity conservation strategy. For example, terrestrial ecosystems, such as forests, are excellent carbon sinks, meaning that the trees and soil are able to absorb and store carbon.

Although mitigation strategies are well established and underway, it is inevitable that negative climate impacts will be felt. Therefore, climate change adaptation is used to anticipate, attenuate, and avoid negative impacts, but at the same time capitalize on any opportunities that may arise.

Adapting to climate change refers to any undertaking to reduce impacts on built, natural, and social systems. Similar to mitigation, adaptation employs technological, ecological, and political tools, as well as sociocultural strategies to motivate action and change. An example of a biodiversity focused action with an adaptation benefit is stream-naturalization. During extreme flood events, municipal water systems can be overwhelmed by the increased inflow, and streams can be inundated. This increases stream bank runoff and inorganic nutrient loading which can then potentially harm aquatic life.





# CONSIDER THIS

## CHANGE ADAPTATION AND MITIGATION

Stream naturalization (e.g. planting trees, shrubs and other vegetation in and around the stream) acts to reduce the velocity of water flow during flooding. Vegetation can decrease water velocity and act as a natural water filter, thereby reducing the rate of water inflow and reducing stress on treatment plants. From a biodiversity perspective, stream naturalization increases the quality ecosystems by increasing available biodiversity of terrestrial sites and protects aquatic habitats by reducing pollutant loading. Pollutant loading is decreased in two ways: first, a reduction in water speed will reduce erosion of stream banks, and secondly, vegetative root systems increase the binding capabilities of soil particles, making it less likely for the soil to runoff during extreme perception events. In addition to vegetation reducing erosion and runoff, plants provide organic nutrients for important primary aquatic species.

Biodiversity management is not a single endeavour aimed at improving ecosystems and species for aesthetics. Biodiversity is a valuable source that protects and enhances community well-being, but can also be integrated into other environmental planning regimes to produce multiple outcomes. Identifying the interconnection between biodiversity and adaptation and/or mitigation is an efficient method of allocating limited resources, and receiving maximum returns in ecological, social and economic factors of environmental planning and municipal management.







MILESTONE ONE

---

**INITIATE**



## MILESTONE ONE: INITIATE

Milestone One gets the process of developing a biodiversity plan moving by building early interest in the biodiversity planning process. This Milestone will help you understand the role people play in beginning the process and formulate basic biodiversity information. More specifically, the initial phase includes tips for building a Biodiversity Team, considerations for identifying a Biodiversity Champion and Team Chair, and ways to take a cursory glance at existing actions, policies, networks and resources that support the biodiversity planning process.

Though you may be tempted to skip the initiate phase and jump straight to Milestone Two, laying the groundwork early on in the process will have many benefits for the municipality later on. For example, if biodiversity is still a new area of work for the municipality, this step is crucial to getting stakeholders on side. Early engagement can help get the process off to a smooth start to help address any challenges later on. It helps build interest and momentum, and raises awareness of the biodiversity planning process so interested groups have the opportunity to identify themselves and connect with the project team. Milestone One also offers the opportunity to get your bearings, gauge the state of biodiversity planning, and identify what gaps a plan will help to fill. Together, these factors will benefit you at later stages in the Milestone process. In addition, consider these benefits of early engagement and how they might help you in your planning and implementation efforts:

- Resolve conflicts among different sets of values and goals, and reduce the likelihood of future conflicts or derailment
- Gain support from a variety of stakeholders as it can lead to support from key decision makers and funders

- Connect with the key players within your community to build community support for the planning process.

### BUILDING A BIODIVERSITY TEAM

Mainstreaming biodiversity and integrating it into local government services, programs and operations requires an interdisciplinary effort. Building a Biodiversity Team of key stakeholders to take primary responsibility for the development of the Biodiversity Action Plan (BAP) will help ensure the success of the plan. The team constitutes the foundation of expertise which will be used throughout your community's biodiversity planning effort and will be responsible for maintaining momentum throughout each of the Milestones. The team's creation also represents the first step towards initiating the process and internal capacity to integrate biodiversity into municipal services.

A comprehensive team will be comprised of representatives from within the municipal structure (internal) and relevant community groups and stakeholders (external). Before narrowing down potential members (based on the stakeholders identified), think about what factors have led to past successes. For example, has effective implementation come



### PURPOSE

Initiate the biodiversity planning process by establishing networks and partners

### OUTPUTS

- ✓ Build municipal Biodiversity Team
- ✓ Build external committee
- ✓ List of stakeholders
- ✓ Initial list of biodiversity management actions
- ✓ Legislation and policy scan
- ✓ Biodiversity scan

from the partnerships between external and internal stakeholders? Or a balance of decision-makers and coordinators? Or from a team comprised on predominately municipal staff?

Try to diversify your team's expertise and consider including staff with technical knowledge in spatial analysis, conservation and conservation planning, economics, facilitation and engagement, and social issues. The Biodiversity Team should have:

- Team Chair
- Staff from various departments and divisions
- Senior decision-maker(s)
- Local Biodiversity champion
- Member of conservation community (stewardship group, conservation authority, etc.)

### Invite External Team Members

Building partnerships that will help protect biodiversity is essential to complete this process, especially when bringing together groups that have shared mandates and conservation goals. Consider bringing in organizations or agencies that have the potential to influence other stakeholders.

To build an effective team it is important that the group is diverse and represents different sectors and community interests. Begin by identifying key players within the community and the network and resources they would bring to the team. In order to select these players, think about the gaps that exist internally and how external partners can bring specific expertise that are needed.

### Potential External Teams Members:

- |  |                                |  |
|--|--------------------------------|--|
| • Businesses                                       | • Conservation Authorities     | • Environmental education coordinators     |
| • NGOs   | • Wildlife protection agencies | • Teachers and/or members of school boards |
| • Youth/students                                   | • Landscape architects         | • Post-secondary institutions              |
| • Residents  | • Ecologists                   |  |
| • Media outlets                                    | • Park superintendent/rangers  |  |
| • Federal and/or provincial Government departments | • Board members                |  |
| • Local restoration organizations                  | • Facilitators                 |  |
|  | • Stewards                     |  |



In order to identify these stakeholders, look to organizations that have previously worked with the municipality, members of taskforces, and/or organizations that have developed resources relevant to your community and the goals of this initiative. Consider the network and resources they will bring to the group.

In addition, when considering external stakeholders, think about critical sectors in your community that are intimately tied to resource use (e.g. aggregate extraction, mining, agriculture, etc.). Make these key economic sectors a priority to engage, and consider adding them to the external committee. Similar to the internal sub-committee, you may also want to develop an external sub-committee comprised of key economic interests and valuable science and research organizations.

Maintaining momentum and engagement during the planning process is important as it ensures that interest in the planning process continues throughout. The group should collectively decide on the following:

- What are the key deliverables the team is responsible for?
- What expertise does each member bring to the table?
- What are each members' time commitments towards the team?

- What resources are available for the team to accomplish its work?
- What authority does the team have?
- What additional training or information sessions for team members would be helpful at the start of the initiative?

### Identify a Team Chair

After the Biodiversity Team is established, the next step is to designate a Team Chair. This person will be responsible for motivating the team and leading its efforts. Since the team will be coming from different departments, it is important that the Chair have an understanding of the municipality and can communicate well with colleagues.

The Team Chair will champion this initiative internally by leading the planning process and ensuring that key tasks are being delivered. Ideally, this position will be filled by a member of staff with time allocated to this initiative who can help ensure the success of the biodiversity plan. The difficulty will be in identifying the ideal person for the job. Should the Team Chair be at a senior level, management level, coordinator level or junior level? It is important to discuss which candidate can ensure the plan does not lose momentum or support.



## Exhibit 6: Additional Considerations when Building a Team

## Do we need a community champion?

Communicating with a diverse audience is a skill. A valuable partner in this process is a local champion; someone that is a leader in the region, and is able to communicate effectively with a range of audiences. They strongly and passionately understand the importance of this process, and can convey the message from a range of perspectives (as outreach will play a major role in building and maintaining support). Consider reaching out to the list of potential stakeholders as they may have a member of staff or know of a community member that could serve as a representative of this initiative.

Potential Champions could include: current and former elected officials, key business leaders, planners, or other respected members of the community. Where staff resources allow, your Champion and Team Leader should be two different individuals.

## Establish a senior decision-making committee

Having a sub-committee of senior decision-makers can help to facilitate the incorporation of biodiversity activities across different departments and divisions. The team leader will be responsible for managing and briefing this committee.

## Hiring a coordinator or intern

Hiring a biodiversity coordinator means that resources can be dedicated to coordinating activities. Students or recent graduates can help play a coordinating role at a low cost.

## IDENTIFYING POTENTIAL STAKEHOLDERS

The primary goal of this entire Handbook process is to motivate the implementation of biodiversity actions and mainstream biodiversity within the municipality, it is important to create opportunities for interaction between groups that may not normally come together.

A key component of Milestone One is to understand the current status of biodiversity processes within your community. Part of that is identifying other active groups and how their mandates can be used to help develop and implement the BAP. This exercise will inform the building of your Biodiversity Team and create a list of individuals, groups, businesses, organizations that may be needed later on in the process. Because biodiversity issues are unique to each community, there is no limit to the types of stakeholders that can be included in your list.

## Desktop Research and Interviews

Making a list of potential stakeholders starts with identifying existing relationships and networks (both internal and external). Gathering a small team of colleagues to determine potential stakeholders is a good way to ensure that you are drawing from a broad range of resources. Early engagement of stakeholders will help build momentum and interest in the BAP. Consider these tips that may lead to successful early engagement:

- Determine what groups should be engaging more on biodiversity issues (e.g. managers, scientists, community leaders, councillors, etc.)
- Review the stakeholders identified once clear goals are set for the purpose of the BAP
- From the list of stakeholders, evaluate what they have to contribute to the BAP and decide when and how they should be engaged in the planning process.





### Working with an Existing Team

A group or organization may already exist that consists of key stakeholders (i.e. conservation association, non-profit, environmental coalition, etc.). Consider working with that group to identify stakeholders, and include them in the planning process as they may have expertise on which organizations have already done work on biodiversity, have data, or research capabilities.

### DISCUSS PLAN FRAMEWORK

Each municipality will create a BAP unique to their community. BAPs can take many different forms and serve a different purpose for each community. As the team begins to think about the type of plan to create, look at what has already been done and how it all fits together.

Plans, projects, and policies may currently exist in your community that address biodiversity but may not be explicitly labelled as biodiversity (e.g. a parks and open space master plan may

identify ecologically significant areas within the community or planning area). Use these resources to help determine where biodiversity planning and management has been previously successful, and areas where biodiversity has potential for further integration.

By conducting a preliminary scoping exercise of existing biodiversity actions, projects, programs it will help you determine the framework for the BAP in Milestone Three. Think about the different options for the biodiversity plan. For example, an Umbrella Plan collates existing biodiversity related objectives and brings them together under one strategy. This approach is effective for municipalities that already have systems in place to protect nature, but are looking for a way to enhance their biodiversity protection efforts. Another common approach is to create a stand-alone BAP that includes new actions that have not been previously considered.

## Exhibit 7: Description and Outputs of Biodiversity Plan Options

Plan Options	Description	Outputs
<b>Umbrella Plan</b>	This plan will require your team to conduct research into existing biodiversity actions currently underway in your community. The team will scan local documents, plans, programs, projects, and policies that address biodiversity management.	<ul style="list-style-type: none"><li>✓ Summary report of the process, and current actions</li><li>✓ Monitor and review strategies</li></ul>
<b>Biodiversity Action Plan (BAP)</b>	The BAP will act as a standalone document. The team will perform the same task in the umbrella method, but will also develop new actions. The new actions will attempt to identify actions across the municipality (sectors, neighbourhoods, departments, etc.).	<ul style="list-style-type: none"><li>✓ Biodiversity Action Plan (BAP)</li><li>✓ Biodiversity assessment report</li><li>✓ Implementation schedule</li><li>✓ Monitor and review strategies</li></ul>

Use Exhibit 8 to help organize areas to focus your attention by identifying the departments most connected to biodiversity. In the example outlined, four departments are provided but more departments can be added. Then proceed to identify the relevant documents, actions, and stakeholders connected to your community's biodiversity past and present. The flow chart below is a start, more linkages can be added to extend the process of identifying relevant policies, stakeholders, and biodiversity matters.

### Policy Scan

Performing a policy and legislation scan is an important step to help your team identify limitations and opportunities to act. Understand jurisdictional constraints and opportunities to work with higher levels of government. This is an opportunity to utilize external contacts in provincial and federal levels of government to identify valuable biodiversity related documents such as provincial policy statements, natural heritage documents, provincial and territorial biodiversity strategies and plans, and other land use, environmental, and sustainability plans and policies. Additionally, widen the scope of your policy scan and use valuable documents such as municipal official plans and Environmental Assessments (EAs). EAs provide information regarding significant policy, biodiversity, and environmental conditions of the land surrounding a project.

### Biodiversity Scan

Conduct a scan of all the relevant local and regional biodiversity issues and trends. Describe how the land use has changed and

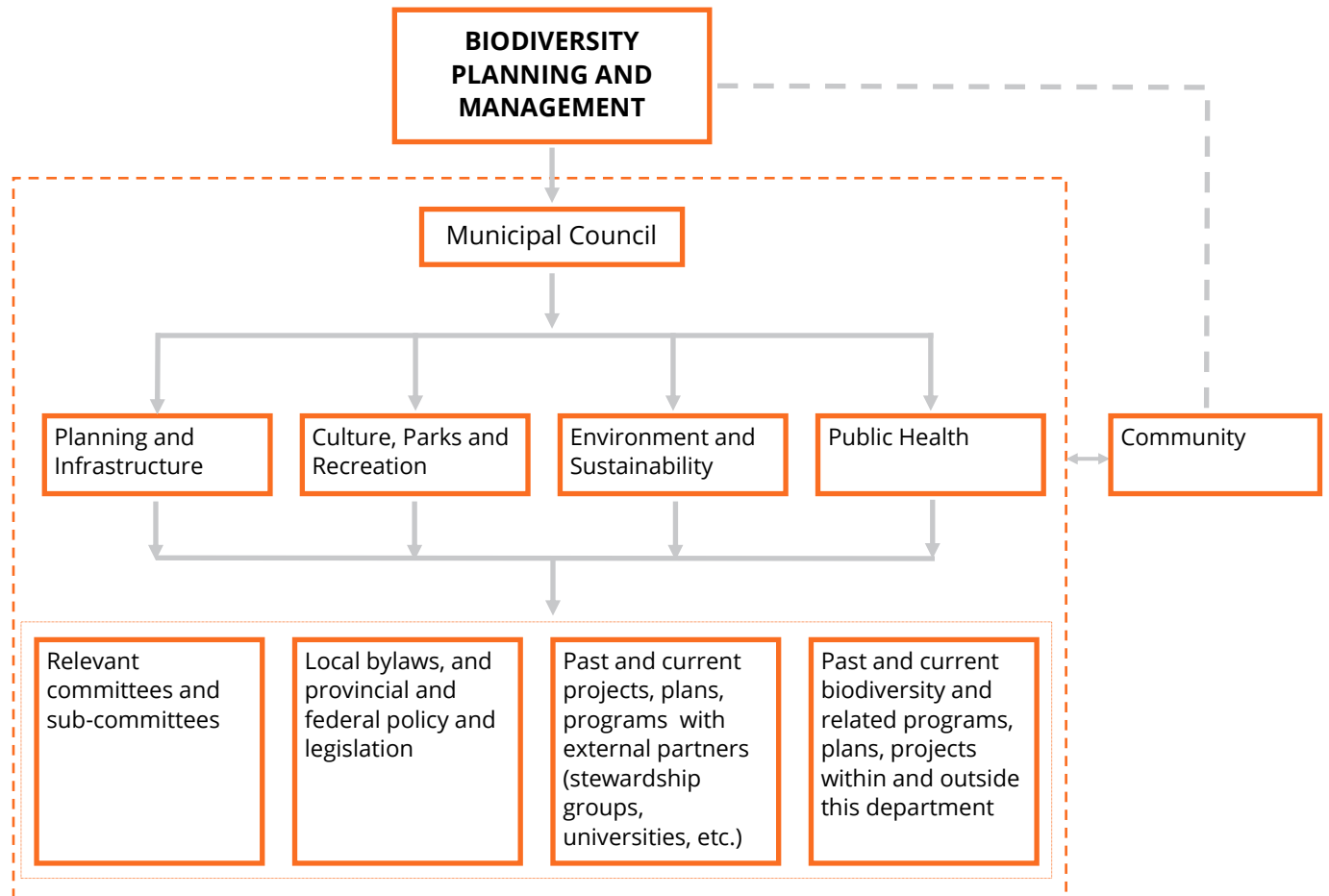
use this document to inform future planning discussions. This step will be required in Milestone Two when your team performs a biodiversity assessment. A preliminary scan will allow your team to collectively understand what information exists and how planning may proceed. Documents that will help build an understanding of biodiversity conservation are: provincial state of biodiversity reports, state of the environment reports, conservation blueprints developed by the Nature Conservancy of Canada and other partners, and the *Canadian Biodiversity Strategy*. Furthermore, you can revisit documents used in the policy scan, such as land-use planning reports, biodiversity strategies. Consider also using biodiversity related documents which have a broader geographic context beyond your community to provide insights on major biodiversity issues, both national and internationally. For example, consider reports produced by think tanks and institutes, and documents from non-governmental organizations (NGOs).

### WHERE SHOULD YOU BE NOW?

The completion of this Milestone has contributed to the development of your Biodiversity Team, identification of external stakeholders, and biodiversity and policy scan. It has provided the human capital necessary to carry out the remaining Milestones, and develop your BAP. Your team should now be familiar with your community's past biodiversity related initiatives.



Exhibit 8: Policy and Biodiversity Scan











# SPECIES AND ECOSYSTEM LOSS

Biodiversity planning and management can include a variety of broad considerations to identify issues and solutions. One way to narrow the scope of your community's work is to consider native species and ecosystems loss.

Three major processes that are altering native species population and local ecosystems in communities across Canada are land development, invasive alien species, and climate change.

Land development (e.g. urbanization, agriculture, etc.) is the most impactful process contributing to habitat destruction, habitat fragmentation, and native species loss. Degraded habitats negatively impact the opportunities for native species to grow and expand. Urbanization and agricultural development intensify species and habitat loss through chemical use and dumping, increased conflict between humans and vulnerable species, and increased demand for natural resources. Agricultural application of pesticides can negatively impact pollinator species,<sup>1</sup> soil microbes, surrounding terrestrial plants and animals, and aquatic systems.<sup>2</sup> The reduction of healthy habitats because of land development reduces buffers between human and natural areas, which increases

potential human-nature conflict. Stressed habitats struggle to support species due to decreased operational ability to supply nutrients, process waste, and absorb shocks.

Another factor contributing to biodiversity loss is invasive alien species. Invasive alien species are a threat to: at risk species, native species, ecosystems, and community well-being.<sup>3,4</sup> Invasive alien species are different, they are able to survive, thrive, and outcompete native species for already limited habitat. Invasive alien species are also known to thrive in disturbed ecosystems.<sup>5</sup> In urban ecosystems, where lands are disturbed by development and other activities, a favourable environment is created for invasive species growth.<sup>6</sup> If an invasive alien is able to outcompete a native keystone species, the entire ecosystem can be affected, which can impact the economic systems.

Climate change is another factor placing greater stress on species and ecosystems. It is projected that climate change will become the leading cause of species and ecosystems loss by the end of this century.<sup>7</sup> Climate change will alter ecosystem regimes as a result of increasing temperatures, which trigger intense storms, floods, wind events, and droughts.



# CONSIDER THIS

Increased temperatures, and the increased frequency and intensity of extreme events will challenge the productivity of ecosystems and create favourable conditions for alien invasive species. The relationship between land development, invasive species, and climate change will act in synergy and create feedbacks to rapidly alter native species population and ecosystem composition.<sup>8,9</sup>

However, biodiversity can be used to mitigate the impacts of climate change, thereby protecting communities, species and ecosystems at risk.

## WHAT SPECIES AND ECOSYSTEMS ARE AT RISK?

The term 'species and ecosystems at risk' is used to describe those species at risk of dying or disappearing.<sup>10</sup> The federal Species at Risk Act (SARA) recognizes the importance of protecting species from destruction, loss, and extinction. A limitation of SARA's applicability is that it is only

concerned with federal lands. However, provinces have their own committees, lists, and acts which further aid in species and habitat risk identification and protection.

Since 1992, British Columbia (BC) has used the Red and Blue Lists as a means of classifying species at risk.<sup>11</sup> The lists are developed and updated annually by the BC Ministry of Environment. The Red List represents species, sub-species, and communities that are extirpated, endangered or threatened. The Blue List represents species, sub-species, and communities that are of "special concern." Special concern represents a species that is sensitive to human activity or natural events, but is not currently extirpated, endangered or threatened.

### Native Species:

are recognized historically to belong to the ecosystems they reside in.

### Alien Species:

are species of plants, animals (including fish), and micro-organisms introduced by human action outside their natural past or present distribution.<sup>12</sup> Some alien species can be beneficial to ecosystems.<sup>13</sup>

### Invasive Alien Species:

are those harmful alien species whose introduction or spread threatens the environment, the economy, or society, including human health<sup>14</sup>





### CONSIDERING SPECIES AT RISK, INVASIVE SPECIES AND ECOSYSTEMS

Considering species and ecosystems at risk in this Milestone will help categorize some of your biodiversity assets. Identifying species and ecosystems at risk will also assist in plan development as you consider the impacts particular species have on the community, environment, and economy. This will contribute to goal and objective development, and potential actions to remedy issues where

appropriate. Furthermore, connecting the problems to climate change and land development will provide your assessment and BAP with solutions that address multiple community planning areas and help integrate biodiversity conservation into municipal planning.

## CASE STUDY

### NOVEL ECOSYSTEMS IN INVASIVE SPECIES MANAGEMENT, DISTRICT OF SAANICH, BC

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The District of Saanich, BC considers novel ecosystems in their Invasive Species Management Strategy, as a tool to better manage and promote species and habitats. Novel ecosystems “occur when new combinations of species appear within a particular biome due to human activity, environmental change, or impacts of introduced species.”<sup>14</sup> This means that the area is now composed of alien species traditionally not present in a particular ecosystem. Although novel systems have been altered, this does not mean they are damaged. Instead, an opportunity exists to identify opportunities in the system. Invasive species management requires the commitment of significant resources and time to eradicate problem species. Thus, managers recognize novel systems as a “new normal” and attempt to promote and manipulate the system to meet beneficial ecological conditions.



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MILESTONE TWO

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**ASSESS**



## MILESTONE TWO: ASSESS

Milestone Two will assess the current state of biodiversity within your municipality. The Milestone will outline the major ways to conduct studies, and go into the importance and role of biodiversity data and how it can be used in the preparing the plan. The research and assessment outcomes will be used for planning rather than scientific purposes. These findings will feed into the goals and objectives of the BAP

In Milestone One, you built your Biodiversity Team, advisory committee, identified internal and external stakeholders, and began to think about the possible direction for your Biodiversity Action Plan. At the end of Milestone One, you should have conducted a policy and biodiversity scan to familiarize your Team with your community's biodiversity and biodiversity-related planning structure. Before you begin drafting your BAP, it is important to understand the state of biodiversity in your community.

Each municipality may approach the assessment phase differently; some may come into the process with a clear idea of information needs, while others need to conduct a series of assessments and consultations in order to determine the key issues that require attention. This section profiles different assessment options, each with their own capacity and funding requirements.

### BIODIVERSITY ASSESSMENT TECHNIQUES

At the core of Milestone Two is the completion of a biodiversity assessment to collect and analyze biodiversity data, and identify key issues that affect local biodiversity. Assessments can be a very complex undertaking depending on the availability of data and the level of detail required. At this stage of the planning process, it is necessary to define the approach that will be used to complete a biodiversity assessment.

Three common approaches to conduct biodiversity assessments are: science-based, community-based and collaborative-based approaches. All three have their own pros and cons, and the outputs can be very different depending on the information you are trying to obtain. These approaches are not mutually exclusive, using multiple approaches can add to the richness and comprehensiveness of the outputs. Consider the financial restrictions, staff time, and additional expertise and resources that will be required when deciding which approach to take.



**PURPOSE**

Conduct a biodiversity assessment to determine biodiversity assets and challenges

**OUTPUTS**

- ✓ Biodiversity assessment
- ✓ Inventory of data
- ✓ Biodiversity report or alternative method to communicate findings
- ✓ List of biodiversity assets and challenges

Exhibit 9: Examples of Table of Contents from Science Based Biodiversity Assessments

A Terrestrial Biodiversity Assessment for the Northwest Territories (2013)	Phase 1 of the Natural Heritage Network Study for the City of Vaughan (2012)	City of Windsor: Update to the Candidate Natural Heritage Site Inventory (2008)
1.0 Plain Language Summary	1.0 Introduction	I. Introduction
2.0 Introduction	1.1 Purpose of Vaughan NHN Phase 1 Study	II. Study Methodology Results
3.0 Biodiversity and Biodiversity Assessment	1.2 General Description of Natural Heritage Network Planning	III. Site Reports
3.1 Scale of Biodiversity Assessment	2.0 TASK 1 - Assembling the Digital GIS Database	IV. Reference
3.2 Ecological Factors Affecting Biodiversity Trends	2.1 Digital Data Layers in City of Vaughan GIS database	V. List of Figure
3.2.1 Island Biogeography Theory	3.0 TASK 2 – Develop NHN Targets	VI. List of Tables
3.2.2 Area and Species Richness	3.1 Review of Background Reports	VII. Appendices
3.2.3 Edge Effects	3.2 NHN Targets based on Policy and Regulation	
3.2.4 Polar versus Equatorial Regions	3.3 NHN Targets based on a Systems Approach	
3.2.5 Elevation Gradients	3.3.1 Ecological Considerations of the Landscape Matrix	
3.2.6 Habitat Complexity	4.0 Task 3 - Gap Analysis of NHN targets	
3.2.7 Ecosystem Productivity	4.1 Forest Habitat	
3.2.8 Climate Change	4.2 Wetland Habitat	
4.0 Methodology	4.3 Riparian Habitat	
5.0 Results	5.0 Task 4 - Review of the Environmental Management Guideline	
6.0 Discussion and Conclusion	6.0 Task 5 - Priorities for Field Work	
7.0 Recommendations.	6.1 Headwater Drainage Features	
8.0 References	6.2 Significant Wildlife Habitat	
	7.0 Next Phases in the NHN study	
	8.0 References	



### Science-Based Approach

There is a strong case for science-based approaches, as they can produce replicable and consistent results. However, the quality of collection, analysis, and interpretation of information is critical to maintaining high scientific standards as it can facilitate the accessibility and usefulness of the findings. The challenge is knowing what information is needed for the biodiversity planning process, as large data sets may be required for an assessment of ecosystem services. Another challenge to consider is the resources required to pursue a science-based approach. Human and capital resources, along with time and external partnerships, are all critical to successfully use this approach.

### Collaborative-Based Approach

A collaborative-based approach combines traditional scientific methods with community capabilities to bridge the gap between knowledge produced through research and community experiences. Where internal staff capacity or funding are barriers to moving

forward with biodiversity approaches, using the broader community can be an effective way to move forward in collecting biodiversity data. Citizen science, for example, can be used to carry out research as to the state of biodiversity in a given park, neighbourhood, city or region. Staff can participate as appropriate in gathering data, however, carrying out the assessment is done directly by community stakeholders (possibly overseen by a local institution - NGO, university, etc.)

### Community-Based Approach

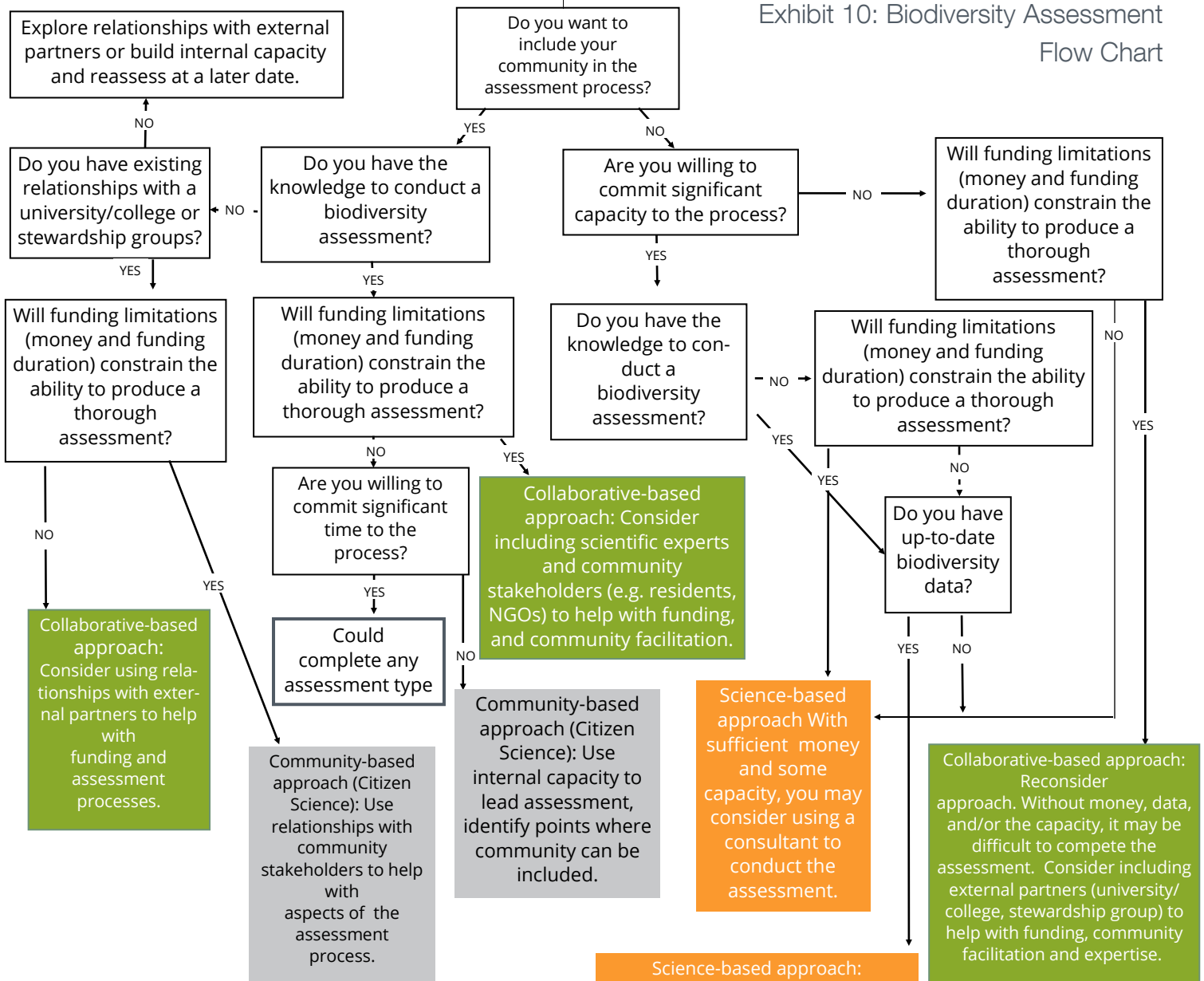
A community-based approach can enhance community participation, awareness and engagement. This approach utilizes techniques which can be applied during any phase of assessment, planning, implementation, or monitoring. Working with the community and other public stakeholders utilizes localized knowledge to help focus the direction of the project and allows a community to shape policy goals.<sup>1</sup>





## START

Exhibit 10: Biodiversity Assessment Flow Chart



Funding and time are significant factors which determine your stream. However, limitations with either should not deter you from conducting an assessment. Limitations simply require creativity in attracting diverse partners to assist with the process. Some partners will assist with funding, while others provide hands-on experience.



## SCIENCE-BASED APPROACHES

To pursue this approach, up-to-date data, descriptions, and mapping of local ecosystem types are required. Methods such as conducting inventories, modeling, and scenario-building all provide the means for a comprehensive analysis and reporting of local biodiversity.

To get a sense of what information already exists and what areas will require further investigation and resources, consider these essential steps:

- Look into whether any flora, fauna, vegetation or any other ecological studies or maps have already been done. Sources include: universities, data from local conservation groups, online databases for your region, Canada's conservation data centres (e.g. NatureServe Canada), etc. Be aware that information can belong to local organizations or institutions which may require permissions for use.
- Find information on the biological history of the region. This will help assess the changes that have occurred to the landscape and species distribution. You may need to undertake desktop research, complete a literature review, and/or consult local community groups.
- Try to identify any data gaps in the available studies or maps.

- Identify any additional resource needs, such as a Geographic Information System (GIS) expert, consultants to analyze and produce resources like maps, or field technicians to produce ground-truth data.
- Conduct land condition assessments such as mapping of specific habitat types, and an assessment of any changes at the species level.
- Public perceptions and understanding of nature and biodiversity can provide anecdotal evidence on perceived changes to the landscape over time, the meaning of biodiversity to resident areas the public believe is worth conserving, and the use of ecosystem services.

## Mapping

Maps are a key tool for displaying and analyzing biodiversity information. They present spatial variability of biodiversity and identify land uses. They are critical to any biodiversity strategy and environmental planning process as they appropriately summarize information and allow for future predictions and scenario building. Maps also identify constraints based on the physical landscape and allow for the discovery of conservation opportunities.

The accuracy of maps depends on updated and accurate data. For example, maps that show vegetative cover may have been extracted from a larger scale, and site-specific data may be needed to increase accuracy. Effective, detailed, and accurate mapping often requires significant resources, and this can be a major hurdle for many municipalities.

Where scientific data is used to support a map, consider including a basic interpretation of what the map means and how it should be used. Provide guidelines and context so it can be understood by a wider audience.

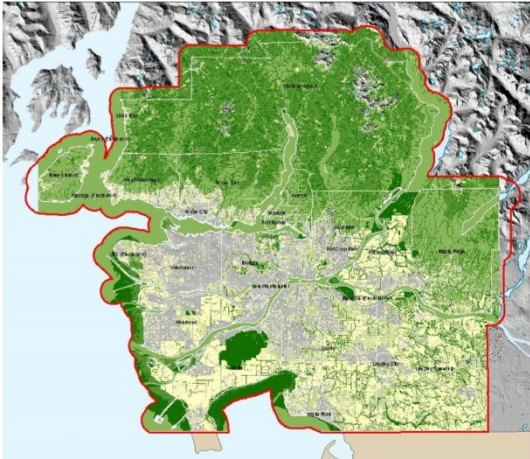


### Ground-truth

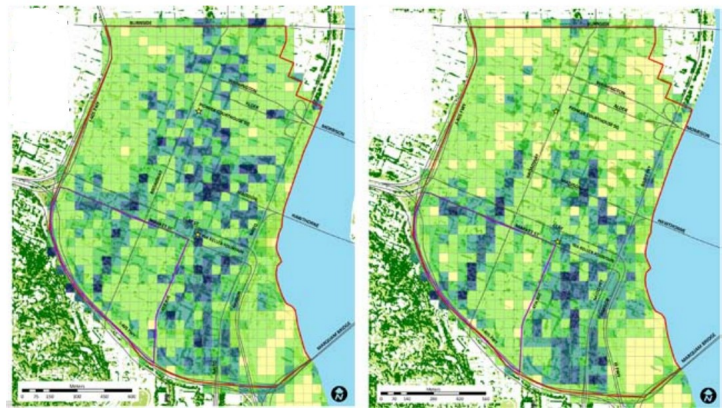
Information that is collected on location to produce more accurate data related to features and materials on the ground. By supplementing existing maps, aerial photographs, and satellite images with ground-truth data, this will recalibrate regional maps to be much more localized and mitigate planning errors that may arise later on.



## Exhibit 11: Examples of Map Types



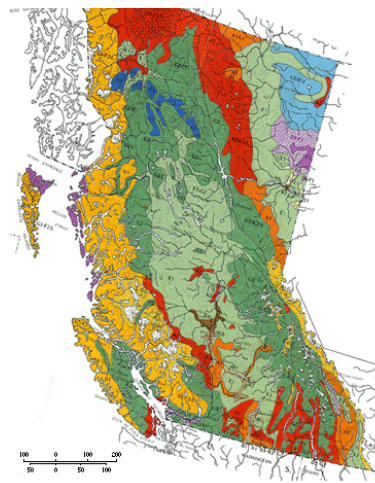
The map above is a relative biodiversity map from Metro Vancouver. Relative biodiversity is a quality rating of habitat that combines quantitative and qualitative variables, rates the quality of habitat and assumes biodiversity levels.<sup>24</sup> In the map above, dark green areas represent high quality habitat and therefore high biodiversity; while light green, yellow and gray indicate poor habitat quality.



The map to the left shows the urban canopy cover in Portland, OR, USA.<sup>5</sup> The darker cells represent more canopy cover, while lighter cells represent less canopy cover. The map to the right shows fragmentation of vegetation, with darker cells representing a higher proportion of vegetative fragmentation.



The image above is an example of overlaying specific features onto an aerial photo or orthophoto.<sup>6</sup> Orthophotos are scaled aerial maps, which can provide detail regarding land change over time with a series of photos over time; and can also help provide information to proposed land changes.



The image above is an example of a soil survey map.<sup>7</sup> The map shows the variety of soil types in BC. Soil maps are often difficult to produce, and require significant time and resources to accurately collect and analyze samples.



## Geographic Information Systems

GIS offers a platform to develop digital databases from existing biodiversity data to analyze, measure, locate, and plan for biodiversity management. GIS has been applied to numerous biodiversity conservation practices, such as modeling habitat suitability, conducting gap analyses, population variability analysis, dynamic ecosystem modeling, and projecting the ecological impacts of land conversion and global climate change.<sup>2</sup>

The potential outputs of GIS will be a key feature of a biodiversity assessment that takes a science-based approach. The following map types will be useful for aspects of the BAP and later monitoring activities in particular.<sup>3</sup>

- Maps of vegetation communities (past and present)
- Geological maps
- Maps showing topography, slopes and catchments
- Soil landscape maps
- Land system maps
- Maps showing land degradation
- Maps showing tree cover
- Maps showing location of species records
- Aerial photographs, orthophoto maps and satellite images
- Property maps

To avoid wasting time and financial resources, take the time to determine the intended use of the maps. A map that is prepared for a specific objective, such as identifying areas to enhance connectivity between habitats is more likely to be useful.

## Surveys

Information on the location and scale of species and habitats, and what factors have changed over time, will provide the local and regional context for the BAP and future biodiversity management practices. There are different surveying methods and scales depending on the information that is required. In general, biodiversity surveys are best suited to regional and site levels.<sup>8</sup> At the regional level, local information is used to provide context, whereas site-specific data is used for site level surveys that support localized management and development decisions. In terms of biodiversity planning, regional surveying can help identify the extent of a species community, while site surveys provide insights into the condition and density of species.<sup>9</sup>

### *Selecting a Survey Method*

Surveys for biodiversity planning should be comprehensive enough to establish the importance of certain areas in both a regional context and at the site level. For example, species specific surveys provide information needed to identify key habitats and urgent conservation needs, however, it may not show the connectivity between habitats. This is why it is important to know what the goals of the survey are and how they will impact the development of the BAP.

Multiple survey techniques can be carried out simultaneously. However, be sure to consider how the results can be meaningfully integrated into the planning process. Field surveys are one of the most common methods used for generating biodiversity data. The variability can come in the way data is collected, the quantity and quality of research, time, resources available, the type of area being surveyed, and the scale of data needed.



To organize the survey methods to be used in different ecosystems, answer the questions in Exhibit 12 to get a better idea of what further research may be needed for different landscape types. For example, you may want to focus your attention on open spaces within transitional and urban areas, which would require a catalog of areas that are protected, assigned for future development, unmanaged, managed for recreation, etc. That level of detail can be useful in mapping open spaces and identifying areas where the municipality can influence protection.

### Data Management

Surveys and maps provide systematic, scientifically grounded datasets that produce replicable results. The results can then be used across a broad range of environmental services and projects, such as strategic conservation planning initiatives or formulating recovery plans for endangered species and landscapes.

Gathering scientific data to survey and map species and landscapes will provide the scientific basis needed to produce a BAP. It is important to keep in mind how the data

collected will contribute to the planning process. The following are the different outputs produced from surveying and the information they will likely provide:<sup>11</sup>

**Databases** are an inventory or list of species records describing features or characteristics. Databases help organize the species identified, categorize them by species type, location, habitat, number of occurrences, etc. This will help you describe them in the BAP.

**Ecological profiles** are descriptions of the characteristics of distinct vegetation, ecosystems, or habitats. These can be created by completing land assessments, species composition, and landscape connectivity studies.

**Species profiles** are descriptions of the characteristics of individual species, including threatened species, invasive species, indicator (keystone) species, and migratory species. These should be developed based on taxonomic group (mammals, birds, plants, insects, etc.).

### Science-based Approach: Measurements and Outputs

#### Features to measure for habitat

- Communities
- Richness or diversity
- Presence of keystone and indicator species
- Density
- Cover
- Inter-habitat
- Intra-habitat
- Cycle change

#### Features to measure for species

- Presence/absence
- Range
- Population size
- Frequency
- Cover
- Mortality
- Emigration
- Immigration
- Age
- Sex ratio
- Fragmentation or isolation
- Genetic diversity

#### Potential outputs of scientific assessment approach

- Identification of landscape context and areas for connectivity
- Locations of ecosystem habitat diversity
- Proportion of planning area in different land classes (forests, wetlands, lakes/ rivers/creeks, agriculture, parks and open spaces)
- Range of species including native and invasive species
- Aerial photos and images for internal database
- Definition of regional ecosystems that are threatened or at risk
- Identification of essential habitats for species at risk or importance to the community



## Exhibit 12: Principle Survey Approaches for Biodiversity Planning<sup>10</sup>

Survey type	Purpose	Survey and mapping scale	Method and survey effort	Issues and applications
<b>Regional survey</b>	For regional scale resource inventory, including ecological relationships between soils, landscape and vegetation. Normally used to compile baseline data	Usually 1:100,000 to 250,000 scale	Detailed survey is required, including reconnaissance and field checking	Identification of native vegetation, biodiversity surveys and soil landscapes
<b>Desktop research</b>	Useful for initial strategic planning, rapid assessments, and understanding site context	Variable, depending on existing information	Literature review, consultation with experts and local residents familiar with natural history	Data gaps, inaccurate information, review and identification of data
<b>Field survey</b>	For obtaining more detailed surveys, species occurrence, and verifying desktop survey results	1:10,000 to 25,000 scale in coastal areas; 1:100,000 scale in inland areas; and from 1:2,000 to 25,000 scale for site specific data	Air photo interpretations and field observations	Consider regionally important species and communities, their conservation status, and the overall regional structure
<b>Site design survey</b>	For determining development feasibility and design constraints (especially in urban areas). Appropriate for environmental study for local environmental plans. Also useful for site-specific management plans	Variable, depending on the development area. Likely to range from 1:1,000 for buildings to 1:25,000 for broader activities like agricultural	Field survey of vegetation and habitat	Useful for an inventory of biodiversity data, review of site ecological processes, identification of threatened species, levels of risk and uncertainty. Provides baseline information for plans and site-specific plan guidelines
<b>Monitoring survey</b>	For evaluating environmental change over time and checking compliance with regulatory requirements. May be helpful for “state of the environment” reporting	Variable, depending on monitoring requirements	Depends on monitoring objective and requirements	Assists with the assessment of water quality, adequacy of rehabilitation efforts, presence of invasive species, and species population and habitat changes over time



*Biodiversity indicators* are measures that assess biodiversity changes over time, such as the annual rate of land clearing and annual change in species populations.

All of these outputs support conservation efforts as they can be used to identify key species, habitats, and corridors, narrow down risks to high-priority habitats and species, locate buffers, and identify vulnerable habitats.

### Using Alternative Resources

As mentioned at the end of Milestone One, environmental assessments (EAs) are a valuable source of biodiversity information which may provide a quick look at specific biodiversity assets in a region. They can also be used to inform the development of the biodiversity assessment in this Milestone. Other documents that may be useful for biodiversity assessments include federal and provincial protocols, guides, policies, and planning documents.

### COLLABORATIVE-BASED APPROACH

Using a collaborative-based approach means working with a variety of community partners and groups. A collaborative-based approach can be a highly valuable way to engage the community in the planning process. By bringing those who can affect the way biodiversity is protected in the community, there is a better opportunity for social change.

When done well, this approach can strengthen relationships between key players such as scientists, policy-makers, local stewards,

#### Questions to consider while conducting the assessment<sup>20</sup>

- What biodiversity occurs on the land?
- How accurate does biodiversity data need to be?
- Is it feasible to protect important biodiversity on the site and if so how?
- What is important about the land from a biodiversity point of view? For example, how will this improve connectivity?
- Where important biodiversity can be protected, what planning and management measures need to be applied?
- Is the biodiversity important that it should be protected?
- How much weight should be given to biodiversity issues in the development process?
- Is it feasible to protect important biodiversity on the site and if so, how?
- Which legal requirements is the data expected to meet?

researchers, residents, and city staff. It can assist in developing a culture of decision-making that emphasizes participation in an open forum where participants learn from one another based on personal experiences and ideas and are receptive to different viewpoints. Time and careful attention can ensure that the community will have ownership over the plan.

It is important to note that a collaborative-based approach does not ignore the role of science in the process. Instead it places community stakeholders in a position to ask questions, provide input on what lands or species are of concern, and why these are important to them.

As such, the community can aid in formulating research questions and the desired direction of the biodiversity assessment. A collaborative-based approach also allows the community to monitor and collect data. The community has “specialized” experts (i.e. their specialization is their local community) who should be encouraged to contribute.



If using this approach, the research team will have to develop a set of questions that maximizes opportunities for information exchange.

### Working With the Community and Not Just For the Community

There can be many barriers to collaboration and community participation when gathering data for the assessment phase of the process.

Consider these options for removing common barriers:<sup>12</sup>

- Offer opportunities to share educational experiences through workshops in order to connect researchers and communities. This can help increase awareness of shared concerns, identify and mitigate tensions, and identify skills and resources that exist between the participants.
- Integrate cultural values and biodiversity, which may include messaging - be it spiritual, religious, or ethnographic - the meaning and location of ecological features to residents in your community.
- Make sure there is some structure to the process, and consider holding group meetings or interviews on specific issues.
- Hire a coordinator to manage the group of active community members.
- Take the time to document key findings and make written plans detailing types of expertise that are required for each stage and where expertise can be found.

### Public Consultation, Workshops, and Information Sessions

Hosting public sessions is an effective way to gather public input and promote initiatives at the same time. They offer a platform for community stakeholders to work with municipal staff and

decision-makers in a co-learning environment that exchanges expertise, and leads to the mutual ownership of outputs. Additionally, understanding what the community wants through their experiences places them as the primary experts to formulate biodiversity goals. Finally, citizen science is a unique method that bridges community participation and science based approaches to gather data and create interest in local biodiversity.

There are several opportunities to facilitate public and targeted consultations throughout the development of the BAP. Consider the overall goal of the outreach effort. Is it to consult with stakeholders or is it to create a space for participation? Consider these consultation goals and how the approaches to each might differ:

- Ensure that the public is taken into account and reflected in the final product
- Supplement knowledge gaps by obtaining input from a wider source of public experiences and views
- Secure an understanding of public perception of the acceptability and relevance of the initiative or project
- Improve the wording and promotion of the initiative or project
- Help to identify whether the initiative or project is relevant and accepted by specific or underrepresented groups
- Establishing support for the final product early on to help with uptake and dissemination in the future

Public sessions are an effective way to gather public input and promote initiatives at the same time. Think about profiling the benefits of biodiversity to participants so they understand its importance to community health and well-being and advocate for its protection.



Because consultation significantly adds to the resources requirements of plan and program development it should be factored in at the outset of the planning process. In most consultation processes public consultation can occur simultaneously with professional consultation.

If internal capacity is limited to conducting an event, consider utilizing volunteer organizations, charities and NGOs to reach relevant community stakeholders.

Finally, use consultation, workshops, and public events as an opportunity to communicate the benefits your community receives from improved biodiversity conservation. These benefits include:

- Ecosystem services of economic value, such as flood control, erosion control, water quality control, insect control, carbon absorption, and climate stability
- Enhanced resilience as a result of larger and more connected natural areas
- Increased capacity to withstand extreme weather events and climatic uncertainties

## CASE STUDY

# SURREY'S SCIENTIFIC APPROACH FOR IDENTIFYING THEIR GREEN INFRASTRUCTURE NETWORK

The City of Surrey used a science-based approach to identify their Green Infrastructure Network (GIN), which is tied to a greater community-wide effort to implement their sustainability charter. One component of the charter was to strategically manage ecosystems throughout the city, and apply the results of their scientific studies to inform the official plan and biodiversity conservation strategy (BCS).

The City commissioned the completion of an Ecosystems Management Study (completed in 2011) to serve as their basis for future conservation work, and identify key area features of their GIN. To do this, they broke the process down into four distinct phases:

1. Collection and review of existing GIS data
2. Mapping of vegetation
3. Identification of the Green Infrastructure Network
4. Evaluating and reviewing the impact and ecological significance of the hubs and corridors

The City used GIS and the principles of landscape ecology and conservation biology to identify a

connected network of natural and semi-natural areas throughout the city. A combination of existing GIS data and maps on physical and biological features (i.e. watersheds, wetlands, nesting locations, land use zoning and road classification) and vegetation mapping (to identify hubs and sites) was used as the basis of the inventory.

The delineation of the GIN required GIS-based analysis techniques to identify hubs and corridors. To evaluate the components of the GIN, the study developed a scoring system that measured the ecological significance of alternative hubs (i.e. large natural areas over 10ha) and potential corridors. The City used a score out of 100, along with 12 different metrics to characterize the function and integrity of each hub and corridor.

Together, these assessments informed Surrey's biodiversity conservation strategy and helped showcase how a city can depend on ecosystems and a wider green network.

# PUBLIC CONSULTATIONS AND BIODIVERSITY PLANNING, CITY OF CALGARY

## CASE STUDY

The City of Calgary has built a solid reputation for engaging their residents in their sustainability planning processes. Most notably, in 2007, the City finished imagineCALGARY, a 12-month consultation effort that engaged more than 18,000 Calgarians in a conversation about the future of the city - the largest visioning process ever undertaken by a municipality. The result was Calgary's Plan for Long Range Urban Sustainability a 100-year vision.<sup>14</sup> The project brought together over 300 community partners, experts and stakeholders, in a direct approach that helped to identify key players within the community and what they saw as the future of the City.<sup>15</sup>

Currently, the City is developing a biodiversity strategy that will serve as an umbrella strategy - one that connects multiple facets of their environmental protection and management work. As part of this work, this City is developing a unique engagement tool in partnership with the University of Calgary, called the Oral History Project. The project will collect stories of Calgarians' perceptions of changes in their parks, urban landscapes and overall environment. The Project will gather anecdotes on local perceptions of urban nature in the hopes of elevating the meaning and importance of local biodiversity.<sup>16</sup>

The Oral History Project and its findings will be used to frame and develop their biodiversity strategy. The project will highlight the following themes:

- Changes in experiences with wildlife (their numbers and patterns)
- Changes in perception of Calgary's parks (their use, size, composition, etc.)
- Changes in Calgary's rivers and wetlands
- Changes in neighbourhood environments (community gardens, street trees, food production, front- and back-yard activities, etc.)

To The project will explore how environmental change has impacted people's lives, their



aspirations for the city, concerns regarding biodiversity, and generally, gathered anecdotal data for future projects. Ultimately, the human experience will become a key component of Calgary's biodiversity plan.



# CASE STUDY

## INNOVATIVE AND CREATIVE COMMUNICATION AND OUTREACH, CITY OF LETHBRIDGE

In 2009, the City of Lethbridge worked with a consulting company to conduct a Regional Park Needs Assessment, Public Engagement Study and Site Recommendation Consulting Services. At the root of their large-scale engagement effort was a multi-faceted, multimedia strategy that used creative, technical, and innovative communications skills.

Strategies such as Storefront Studio designs, interactive workshops, branding, advertising, website creation, lunch box tours, and cross generational engagement tools including web based surveys and social networking facilitated a variety of opportunities for the public to get involved.

### Branding and logo design

The success of their branding relied on a design that spoke to the process and the community. '*I*design: Connecting People, Parks and Places' was created to establish a forward looking brand, with the letter "I" to encourage engagement at the individual level. The brand was used broadly and consistently throughout the project and was placed on all promotion and communications materials.



### Community outreach

A comprehensive website and Facebook page was used to keep the community up-to-date on the consultation process, and provide platforms for people to voice their opinion. The Facebook page facilitated discussions among community members on key issues such as parks planning, outdoor stages, and botanical gardens.

Advertising and promotion strategies were also developed and implemented to broaden the scope of outreach efforts.

Examples include an E-Newsletter which provided regular updates, poster and advertisement campaigns, mail drops to 2,600 homes, theatre trailers, city transit bus banners, window and sandwich board signage, giveaway's, branded water bottles, and static displays. There was also on-site surveys at high traffic locations, a two-day drop-in store front design studio, design classes, participatory open houses, and a lunch box bus tour.<sup>13</sup>

Altogether, the process produced a significant portfolio of ideas that served as the core of Lethbridge's needs assessment. The assessment focused on community-wide needs, attitudes, opinions and behaviours of residents to guide the parks planning process.

This scale of engagement is what made the consultation process unique. The City placed great emphasis on including the community in the planning process, and they employed an advertising and promotion strategy that offered opportunities for meaningful interactions.



- 540 residents participated in the web surveys
- Storefront Studio engaged 176 participants
- 5200+ website visits



## COMMUNITY-BASED APPROACH

Citizen science is a community engagement, and data collection and monitoring activity, which provides scientific experts with valuable information. Diverse groups get together to solve problems, and contribute to conservation and monitoring projects. It creates opportunities for volunteers to partner with scientists to answer questions that apply to their community. The community acts as a network of eager volunteer “scientists” directed by professional scientists and research experts to carry out specific tasks over a large spatial scale. It is crucial that the expert team clearly design the project materials to ensure correct sampling or monitoring techniques are followed by volunteers, to guarantee excellent data quality. The time to organize the process and validate the data may be significant, but citizen science is more cost-effective and feasible than hiring experts to conduct data acquisition over large spatial scales.<sup>17</sup>

The following is a suggested model for developing a citizen science project:<sup>21</sup>

1. Choose a scientific question
2. Form a scientist/educator/technologist/evaluator team
3. Develop, test, and refine protocols, data forms, and educational support materials
4. Recruit participants
5. Train participants
6. Accept, edit, and display data
7. Analyze and interpret data
8. Disseminate results
9. Measure outcomes

The use of volunteers to track, monitor and identify species in the community becomes easier with experience. The use of mobile devices and technology can also make this easier. For example, Ontario’s Invading Species Awareness Program helps people identify invasive species with videos and guides and allows users to upload information and pictures using their mobile device. Another example is



NatureWatch, a partnership between two Ontario universities and two Canadian non-profit organizations, which gives a platform for citizen scientists to provide biodiversity information related to frogs, worms, plants, and ice, using their mobile devices. Participants use the Global Positioning System on their device to identify where they are, and NatureWatch allows for the entry to be processed on their mobile application.

“Bioblitz” campaigns are another form of citizen science aimed at mobilizing a large volunteer base. The campaign has volunteers conduct data acquisition, but over shorter time periods (e.g. one or two days of data collection).<sup>18</sup> Since 2012, Ontario BioBlitz has conducted yearly campaigns in the watersheds of the Greater Toronto Area (GTA). The organization gathered volunteers comprised of expert naturalists, ecologist, biologists, and enthusiastic non-experts or “bioblitzers” to participate in two-day events. The goal of these events was to gather samples of flora and fauna, and have a group of experts identify the collected samples. This led to the development of an inventory of data for two of the three major watersheds in the GTA.

These examples demonstrate that the use of volunteers to gather information is a viable option if information and guidance is provided. It is important for program developers to ensure the reduction or elimination of complexity in identification and reporting. Well-designed identification guides ensure accuracy and usefulness of information collected from citizen science activities.<sup>19</sup>

### UTILIZING ASSESSMENT FINDINGS

Conducting an assessment is a rigorous process that establishes the context for future biodiversity planning and management work. It is important to consider how to document the outcomes of the biodiversity assessment as there are many ways to approach this step. The level of detail and information needed to communicate findings from the biodiversity assessment will depend on your audience, mandate, political will, community desire, and the local culture of environmental protection.

While the objective of this Handbook is to produce a BAP and implement biodiversity action, this may not be possible for all municipalities. Some may use the findings from the assessment to make the case for biodiversity, and could consider producing a biodiversity report or promotional resources to build the case and draw attention to biodiversity issues. The following are options for profiling and presenting the findings of the biodiversity assessment.

#### Tips!

- Ask people to bring their own images if they have any.
- Prepare maps that people can mark on.
- Have a clear goal for the volunteers/ participants and discuss the information gap they are helping to address.







## Biodiversity Report

To take the assessment phase one step further, consider producing a biodiversity report that profiles past, current, and future biodiversity work. See Exhibit 13 for details on features to include in the report.

The objective of the report is to sum up the work completed to date, present findings from the biodiversity assessment(s), and document other relevant information. The biodiversity report can serve as a profile of internal and external engagement on biodiversity and can be used as the jumping-off point for future biodiversity work.

## Resources and Promotional Materials

Promoting the biodiversity assessment from the preliminary stages is an important part of keeping your community and municipal staff informed. The use of social media, community events, and print materials are ways to share your intentions and accomplishments. Social media is an inexpensive alternative to traditional print materials and advertisements and has a broad reach. Using a variety of communication formats will ensure your message reaches as many community members as possible. Refer to Exhibit 42 (p. 120) in Milestone Five for examples of communications strategies.

### Exhibit 13: Features of a Biodiversity Report

Section	Topics
<b>Background information</b>	<ul style="list-style-type: none"><li>• Physical descriptions – location, size, regional climate, physical features, landmarks, etc</li><li>• Summary of biodiversity features and characteristics (e.g. types of ecosystems, local ecology, species list, locally/regionally/provincially significant species)</li><li>• Significant biodiversity and ecosystem services</li><li>• Explain the benefits of biodiversity conservation in your community</li></ul>
<b>Natural heritage</b>	<ul style="list-style-type: none"><li>• Populations of key biodiversity indicator species</li><li>• Description of regional biodiversity and ecosystems</li><li>• Changes in ecological features</li></ul>
<b>Status of biodiversity</b>	<ul style="list-style-type: none"><li>• Presence , condition, and threats to species and habitats at risk</li><li>• The expected ecosystem changes due to climate change</li></ul>
<b>Governance, integration and outreach</b>	<ul style="list-style-type: none"><li>• History of biodiversity planning and management</li><li>• Analysis of performance to date</li><li>• Assessment of areas that need improvement</li><li>• Conservation successes and lessons learned</li><li>• Green infrastructure investments</li><li>• Plans, strategies and policies that address biodiversity</li></ul>
<b>Additional features</b>	<ul style="list-style-type: none"><li>• Interesting facts and figures</li><li>• Public opinion on biodiversity and nature</li></ul>

In order to effectively communicate with internal stakeholders, it is highly recommended that a clear and concise document is produced which demonstrates the significance of the assessment process, any relevant findings, and the importance of biodiversity in the community.

### Biodiversity Action Plan Preparation

When developing a biodiversity plan, there should be clear connections between the findings of the assessment and the plan's goals and objectives. Milestone Three will guide you through the process of developing a BAP. Consider the list of actions below, which may help prepare the data gathered in this Milestone.

### WHERE SHOULD YOU BE NOW?

At the completion of Milestone Two you should have completed a biodiversity assessment. The assessment should provide information on your community's biodiversity assets, opportunities, and challenges. The data collected may have been organized into a biodiversity report, or into simpler communication materials to describe what has been found and potential future actions. The data collected and analyzed will be used to prepare the BAP in the next Milestone.

## Exhibit 14: Items to Prepare for Biodiversity Action Plan Development

- ✓ Use the information to establish a baseline ("current-state-of") from the key finding and observations that will be used as the starting point for the biodiversity plan
- ✓ Compile a list of biodiversity findings that may be used to set targets and objectives
- ✓ Develop statements on the community's biodiversity needs and wishes. This may require additional consultations if the scientific-approach was used
- ✓ Identify the primary pressures on biodiversity and collect information to support the findings
- ✓ Map the natural areas (hubs, core, corridors, sites) within the community and how they can expanded
- ✓ Research case studies of biodiversity planning and management options that may be replicated in your community
- ✓ Identify priority areas that require careful attention and planning considerations (e.g. natural areas sensitive to human disturbance)
- ✓ Brainstorm biodiversity planning concepts that may be incorporated into the BAP. For example, connectivity, health and well-being, conservation, green infrastructure network, and resiliency are all concepts that can be used to frame the BAP
- ✓ Seek out anecdotal evidence from assessment areas that may require local contexts and experiences
- ✓ Not all findings will be good news, and it is important to acknowledge that the plan is looking into how to mitigate further impacts







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MILESTONE THREE

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**PLAN**



## MILESTONE THREE: PLAN

Milestone Three will guide you through the process of developing the components of the biodiversity action plan (BAP). Establishing a vision, goals, and objectives will provide your plan with a clear direction that addresses the values of your community and the biodiversity challenges and opportunities you face. Following that, you will develop short and long-term actions. In addition to identifying challenges, opportunities, and actions, this Milestone will aid in scoping drivers and constraints for implementing actions and developing biodiversity indicators. Further, this Milestone will require your Team to consider the administrative and financial factors necessary to ensure the successful delivery of your plan. With these components developed, you will then draft and finalize your BAP.

In Milestone One your Team identified existing plans, policies, and programs that addressed biodiversity, and, if possible, compiled a list of existing biodiversity actions, goals, objectives, etc. In Milestone Two, you completed a comprehensive biodiversity assessment by collecting data and identifying and analyzing issues impacting local biodiversity. As you go through Milestone Three, try to connect your community's existing biodiversity actions, strategies, objectives, and goals to the planning concepts presented.

The other Milestones in this Handbook were descriptive, offering multiple paths or suggestions to achieve an outcome. Milestone Three on the other hand is prescriptive, and in most cases requires the completion of each section to produce a comprehensive BAP. Although biodiversity planning and management are unique to each community, municipal plans generally follow a standard set of components, and this Milestone highlights specific components to develop a BAP.

### Exhibit 16a: Biodiversity Planning Principles

Surrey, BC	<ul style="list-style-type: none"><li>✓ Protect critical habitat and features</li><li>✓ Enhance habitat connectivity</li><li>✓ Maximize the size of core natural areas</li><li>✓ Improve habitat quality</li><li>✓ Education and public awareness</li><li>✓ Research</li><li>✓ Regulations</li><li>✓ Community action</li><li>✓ Ecosystems services</li></ul>	Biodiversity BC	<ul style="list-style-type: none"><li>✓ Adaptive management</li><li>✓ Precaution</li><li>✓ System connectivity</li><li>✓ Complexity</li><li>✓ Diversity</li><li>✓ Native-invasive</li><li>✓ Ecological network</li><li>✓ Ecosystem approach</li><li>✓ Levels or hierarchy</li><li>✓ Disturbances-resilience</li><li>✓ Risk</li></ul>
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## PURPOSE

Establish short and long-term actions and finalize Biodiversity Action Plan

## OUTPUTS

- ✓ Vision and guiding principles
- ✓ Goals and objectives
- ✓ Actions and indicators
- ✓ Budget estimate
- ✓ Action prioritization
- ✓ Implementation schedule
- ✓ Biodiversity Action Plan

## PRINCIPLES OF BIODIVERSITY PLANNING

In urban environments, habitat fragmentation, habitat degradation, and species loss are exacerbated by urban pressures. The principles presented in Exhibit 16a and 16b can serve as a reference throughout the development of a BAP. These exhibits can be particularly useful

at the stages of developing guiding principles, goals, and objectives.

While the City of Surrey identifies issues unique to urban areas, and Biodiversity BC provides science-based biodiversity principles, it is clear that the CBD believes in an ecosystem management approach to biodiversity.

### Exhibit 16b: Biodiversity Planning Principles

#### Convention on Biological Diversity

- ✓ The objectives of management of land, water and living resources are a matter of societal choices
- ✓ Management should be decentralized to the lowest appropriate level
- ✓ Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems
- ✓ Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context
- ✓ Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach
- ✓ Ecosystems must be managed within the limits of their functioning
- ✓ The ecosystem approach should be undertaken at the appropriate spatial and temporal scales
- ✓ Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term
- ✓ Management must recognize the change is inevitable
- ✓ The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity
- ✓ The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices
- ✓ The ecosystem approach should involve all relevant sectors of society and scientific disciplines



## BIODIVERSITY PLANNING APPROACHES

Consider the following three biodiversity approaches that can be used to guide the development of the BAP.

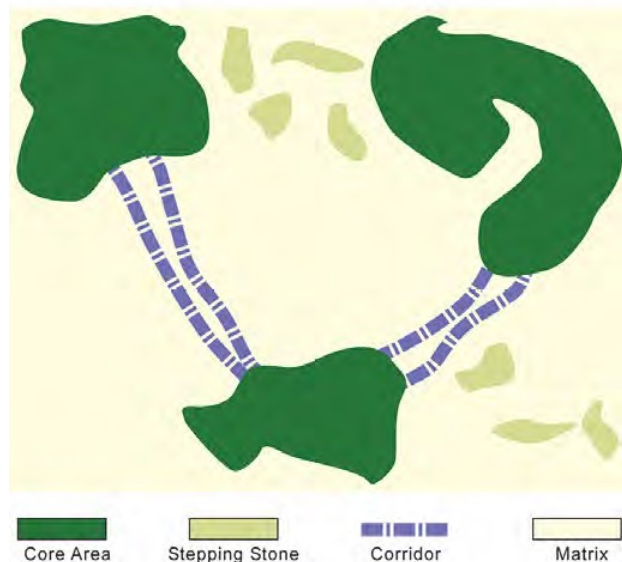
These three approaches may be used individually or collectively to guide the development of the plan, as you may come across a situation where one objective targets expanding ecological networks, while another objective targets naturalization of bike corridors (social and ecological network).

### Ecological Networks

Improved connectivity is a concept central to biodiversity planning and management. Poor connectivity between areas of significant biodiversity value, combined with an inability or restriction of movement, creates habitat fragmentation, habitat loss, and species homogeneity. Ecological networks emerge as a valuable biodiversity planning approach to improve species movement, habitat quality, and land connectivity. ICLEI's Local Action for Biodiversity (LAB) Program considers three concepts when developing a biodiversity network: connectivity, integration, and social interaction.

Creating an ecological network involves the intentional planning and development of a variety of lands and natural areas. It links smaller patches of land to larger core areas rich

Exhibit 17: Ecological Networks<sup>3</sup>



in biodiversity through the use of corridors for movement. This creates a system that is more resilient, connected, and complex as a result of the variety of species, the interlinkages between different plant and animal species, and the inclusion of more lands.

An ecological network should have core areas high in biodiversity and free from urban disturbances. Although humans and related development are threats to biodiversity conservation, simply isolating urban areas from natural areas alone will not improve biodiversity.<sup>4</sup> Exhibit 17 illustrates the components of an ecological network. Areas reserved for human



#### An ecological network...

"...is a coherent system of natural and/or semi-natural landscape elements that are configured and managed with the objective of maintaining or restoring ecological functions as a means to conserve biodiversity while also providing appropriate opportunities for the sustainable use of natural resources."<sup>1</sup>

"...enables animals, plants and ecological processes to persist on a landscape scale by facilitating critical processes such as nutrient flow, genetic exchange, and movement for resources."<sup>2</sup>



activities are represented by the matrix, within which there are core areas that are reserved from development, corridors that connect them, and patches of more isolated habitat that act as stepping stones to facilitate movement between core areas.

### Ecosystem Management

The second concept that is valuable for plan development is integration, which is the complete examination of your municipality at the ecosystem level. Integrated analysis allows for a

large spatial scope across species, assets, and function. This analysis should also consider human use and consumption of ecosystems and their services. Consequently, a necessary component of this process is the inclusion of a range of stakeholders to help identify land-use and consumption patterns.<sup>7</sup> It is critical to include stakeholders early to identify key issues, focus the area of concern, and ensure knowledge sharing between experts and community stakeholders. In the face of increased population growth, developmental pressures, and the need for sustainability, ecosystem management is a tool to identify, organize, and modify how various processes interact within a system and across spatial scales.

### Ecosystem Services

Ecosystem services is a term used to describe the processes provided by nature that significantly contribute to the function and quality of air, land, and water. Moreover, ecosystem services provide economic, social, and cultural value to communities, thereby contributing to the function and quality of urban life. Ecosystem services occur at micro and macro scales. Some are easily identifiable, such as trees that provide cooling shade on hot summer days, while others may be more difficult to see, such as microscopic organisms contributing to soil health for food production.<sup>8</sup>

#### Did you know?

In a provincial study of wetlands, the Government of Alberta recognized that cumulative ecosystem services are provided by wetlands, and improved management and consideration of these valuable lands must be a priority in planning and development. Wetlands store carbon, provide wildlife habitat, act as a flood control point, and filter and release water. Despite the recognition, there is growing evidence to show that wetland losses are increasing, placing greater stress on limited lands and resources.<sup>6</sup>



## CASE STUDY

## WILDLIFE MANAGEMENT IN AN URBAN COMMUNITY, TOWN OF OAKVILLE

The [Town of Oakville's Wildlife Management Strategy](#) is a comprehensive document that addresses the potential challenges wildlife may encounter in a growing community, and how to protect it. The Strategy identifies existing provincial legislation and locates where the community can contribute to the protection of wildlife, while continuing to urbanize. Issues addressed include: humane removal of animals from private property, strategies to discourage direct human-animal

contact, providing safe passage for animal movement, public and private land development best management practices, inventory of species at risk, valuable ecosystems, and recommendations for future action.

# CONSIDERATIONS FOR AN URBAN ECOLOGICAL NETWORK, CITY OF EDMONTON

## CASE STUDY

The City of Edmonton used an ecological network approach to develop their Biodiversity Action Plan. The process was rooted in conservation science and attempted to “connect the diversity of natural lands.” The City emphasized four concepts that were important to the success of their urban ecological network design. These included matrix quality, buffers, semi-natural landscapes, and restoration.

The first concept refers to matrix quality which is vital to system connectivity. The matrix must be permeable in order to encourage movement. This could be achieved by creating open green spaces, and dampening the impact of barriers, such as roads. The second concept Edmonton presented was semi-natural areas, which are constructed open spaces that are not dominated by vegetation, such as golf course, parks, and urban tree cover. In the context of urban complexity and barriers, semi-natural areas act as stepping stones to encourage and guide the movement and dispersal of wildlife,

thus improving permeability. The third concept was buffers, which are relevant to all ecological networks. In the case of an urban area, they emerge as a priority as they serve to attenuate the urban-natural area conflict by establishing a barrier between urban activities and core area function. Vegetated strips are an example of a buffer that are made up of native vegetation and sit between important ecological and built-up areas.<sup>5</sup> The final concept that was identified by the City of Edmonton was restoration. Restoration attempts to re-naturalize areas that may be degraded or damaged from past development. It can also include the naturalization of streets and roads or regeneration of once degraded industrial areas (e.g. brownfields). Therefore, shaping an urban ecological network should attempt to include these four concepts along with basic principles of design.



Natural area in the City of Edmonton that serves as a buffer in an urban environment



Exhibit 18 shows some of the services provided by ecosystems.<sup>9</sup> For example, evidence shows that investment into watershed protection will result in long-term social and environmental benefits, and the avoidance of future capital costs.<sup>10</sup> From a biodiversity perspective, ecosystem services are an important concept that demonstrates the synergistic relationship between biodiversity management, resource protection, and community sustainability.

### Social and Ecological Networks

The role of people is another critical component in biodiversity planning. Social and ecological networks are areas with opportunities to include human activities into biodiversity networks, and integrate specific biodiversity into urban areas. For example, home gardening, active transport, and recreation are part of every community in some way, and should be included in

biodiversity networks. Through actions and decisions, humans can negatively or positively impact biodiversity and environmental conditions in their communities. As such, humans must be seen as part of ecological systems, and should be recognized as active and primary participants in biodiversity management.

The creation of a social and ecological system, recognizes humans as vital in using, shaping, and positively contributing to ecosystem function.<sup>13</sup> This means that the combination of human values (non-monetary and non-scientific) and experiences should be utilized along with scientific information to maximize biodiversity management outcomes. The ability to integrate humans into the systems they interact with will provide them with a sense of responsibility and stewardship over the land.<sup>14</sup>

## Exhibit 18: Ecosystem Services

### Supporting Services

Supporting services provide the basic ingredients that sustain all other ecosystem services and include:

- Nutrient cycling
- Soil formation
- Primary production
- Hydrologic cycling
- Photosynthesis

### Provisioning Services

Production of food, fibre, energy, genetic resources, pharmaceuticals, fresh water, biochemical, and natural medicines.

### Regulation Services

The regulation of climate, air and water quality, land stability, waste, pests, pollination, disease, and natural hazards.

### Cultural Services

Research, education, spiritual and recreational benefits, aesthetic and religious value.

### Preserving Services

Guarding against uncertainty through the maintenance of biodiversity

## GREEN INFRASTRUCTURE: BUILDING AND BENEFITING FROM BIODIVERSITY

### What is Green Infrastructure?<sup>11</sup>

Green Infrastructure refers to natural lands, such as wetlands, woodlots and forests, or engineered lands or structures, such as low impact development, storm water ponds, agricultural lands, green roofs, gardens, or parks.<sup>12</sup> Green infrastructure is increasingly referred to as “critical infrastructure,” making up a key part of the urban fabric. This fabric supports a variety of functions and in return, needs to be planned and managed in a sustainable way, while also being given the same level of attention as other services such as waste, energy, transportation, and water management.

### Why is Green Infrastructure Planning Important?

- Supports working lands (farms and forest) and the landscapes for tourism
- Prioritizes limited financial resources wisely
- Helps a community or region visualize its future
- Provides more information to decision makers to improve outcomes
- May help with compliance with regulatory review and requirements
- Provides predictability and a level playing field for both developers and conservationists
- Supports ecosystem services that provide benefits to communities without additional financial investment
- Makes communities more disaster resistant by using the landscape to protect communities from flooding and focusing development in appropriate areas
- Supports biodiversity and facilitates ecotourism
- Supports a high quality of life, attracting businesses and retirees





In urban areas, people will inevitably interact with biodiversity and the environment. Including people into the larger biodiversity network, and providing a space for low impact activities will create inclusiveness and provide a sense of connectivity with the larger environment. The community can also help identify land-uses, resource consumption habits, and methods to alleviate and reduce negative impacts on significant and productive lands. Ideally, social and ecological networks create spaces where humans feel connected to nature and develop a sense of stewardship. Connectedness can be achieved through community participation in planning processes and decision outcomes, and the encouragement of outdoor activity. Thus, in this network, humans use and interact with biodiversity, but are also included in decision outcomes. Moreover, social and

ecological interaction can improve human health and contribute positively to mental health, which can act as a major driver for protecting biodiversity and green spaces, and promote human-nature contact.<sup>15</sup> Therefore, when formulating a BAP, it is important to understand human interactions and perspectives on nature to better develop networks for human relationships with biodiversity.

## CASE STUDY

## THE VALUE OF URBAN FORESTS IN MAJOR CANADIAN CITIES

In 2014 TD Bank published [Urban Forests: The Value of Trees in the City of Toronto](#) and [The Value of Urban Forests in Cities Across Canada](#) highlight the social, environmental, and economic benefits of urban forests in Toronto, greater Halifax, Montréal and Vancouver. In Toronto, urban forests were valued at \$7 billion. In greater Halifax, Montréal and Vancouver trees were valued at \$11.5b, \$4.5b, and \$35b respectively. This is because urban forests provide benefits beyond beautification and contribute to stormwater flows, air quality, and

carbon sequestration. In addition to these environmental benefits, urban forests provide social benefits through improved human health and well-being. Furthermore, the two reports indicated that trees increased property values in all cities.



# NATURAL ENVIRONMENT TRAIL STRATEGY, CITY OF TORONTO

## CASE STUDY

In 2013, the City of Toronto developed the [Natural Environment Trail Strategy \(NETS\)](#), aimed at "...the protection of the City of Toronto's natural areas while offering safe and enjoyable recreational opportunities for all natural environment users by creating a sustainable multi-use trail system." NETS established clear boundaries for human activities

and promoted safe human-nature interactions. NETS is a comprehensive document, which was completed in conjunction with various stakeholder groups and examined the benefits of trails as it related to human and environmental factors.

### COMMUNITY PARTICIPATION

The participation of community stakeholders and inclusion of their knowledge should be seen as important and critical to achieving short and long-term biodiversity planning goals.<sup>17</sup>

Residents should be seen as a valuable partner in plan development and long-term protection of biodiversity are residents. Residents are the people who will interact with biodiversity daily and including them in the planning process will increase knowledge and shape future biodiversity initiatives. It will be a challenge to consider every idea and voice in the decision-making process. Nevertheless, the process of community facilitation strengthens ties between community members and the municipality, which will build relationships for future biodiversity work.

### *How should stakeholder engagement proceed?*

The City of Calgary developed Engage!, a framework of how they believe stakeholder participation should be undertaken to ensure "inclusion, accountability, and transparency."<sup>19</sup> One valuable component in the process was the "spectrum of strategies and promises" regarding the degree of information exchanged between city and community.<sup>20</sup> The range of options from the spectrum are: listen & learn, consult, collaborate, and empower. Empower, gives complete decision-making power to stakeholders, while listen & learn facilitates back and forth dialogue between the city and stakeholders. Similarly, the City of Sydney, Australia developed their *Community Engagement Strategy*, which defined three levels of communication and community participation: informing, consulting, and active participation.<sup>21</sup> Active participation represented the highest level of community engagement, which allowed community groups to collaborate and provide solutions. Informing was the lowest level of participation, and was used when decisions had already been made by the City, but acted as a let the community know about a decision. In both examples, it is clear the municipality has flexibility with the level of engagement to employ which can be used to facilitate participation.



Exhibit 19: Biodiversity Stakeholder Groups<sup>18</sup>

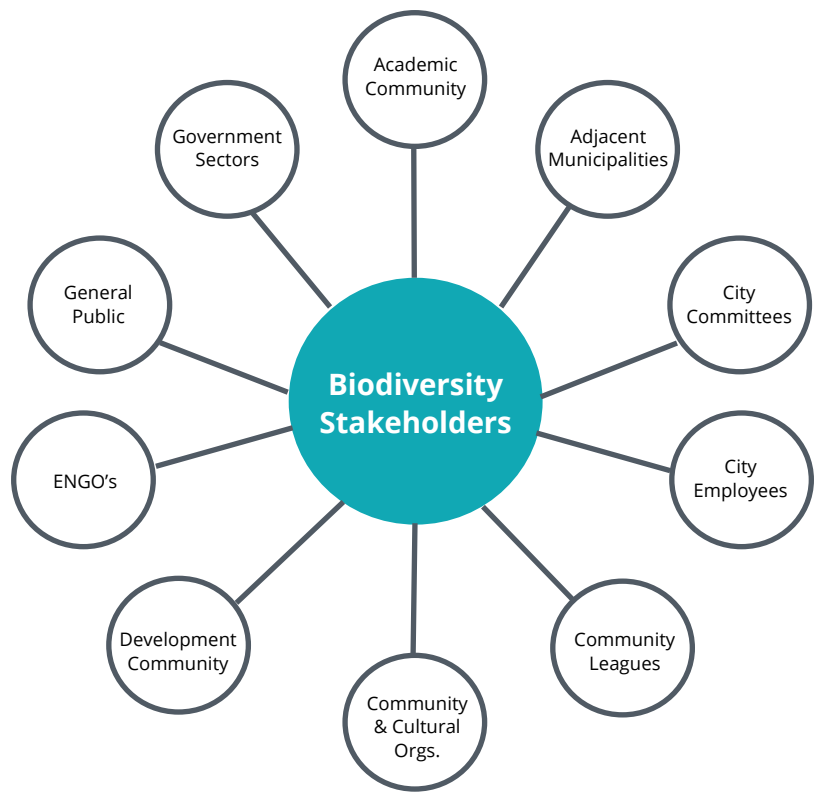


Exhibit 20: City of Calgary - Engage! Spectrum of Strategies

	Listen & Learn	Consult	Collaborate	Empower
Strategy	Stakeholders and the City listen to and learn about each others' views, plans, concerns, and expectations.	Stakeholders' feedback is obtained through consultation to analyze issues and build alternatives, and thereby make contributions to the decision making process. Consulting with stakeholders ensures issues and concerns are understood and considered.	Stakeholders are considered partners in the decision-making process, including collaboration on analyzing issues, building alternatives, identifying preferred solutions and making recommendations.	Aspects of the decision making process are delegated to stakeholders.
Biodiversity Integration	Encourage citizens to deliver opinions on biodiversity and nature. Use multiple communication platform, such as electronic and print surveys; workshops, social media, and in person questionnaires	Include community stakeholders in the planning process by using their expertise, experiences and knowledge of local biodiversity conservation and management issues.	Partner with community stakeholders to utilize community capacity and capabilities to share in action scoping and completion.	Identify opportunities for community groups, and/or citizens to lead, manage and conduct actions to promote or conserve biodiversity.



# CIVIC ECOLOGY USING MULTIPLE PLANNING APPROACHES

## CASE STUDY

The complexity of biodiversity and maintaining fluid connections between natural and human systems present opportunities to integrate multiple planning approaches. Civic ecology is an example of an emerging community driven environmental planning and engagement strategy. Civic ecology strategies are “community-based, environmental stewardship actions taken to enhance green infrastructure, ecosystem services, and human well-being in cities.”<sup>16</sup> They utilize multiple planning approaches and hands-on community actions to improve connection between natural and human systems and planning techniques. One example of civic ecology is community driven planting of native vegetation across a community, which has multiple

benefits connected to all three planning approaches. Firstly, the act of engaging the community, and encouraging hands on planning and planting connects participants to the environmental aspect of their neighbourhood. Secondly, the ecosystem services provide by plants and trees improves local environmental conditions by providing constant pollutant absorption and shade on hot days. Finally, vegetation around a community can be a small component of a larger ecological network. Densely vegetated areas in an urban setting can serve as stepping stones or short-term habitats for some animal species.

## PLAN COMPONENTS

### Biodiversity Vision Statement

The Secretariat of the Convention on Biological Diversity describes a vision as where a local government wants to be with regards to biodiversity and its relation to human well-being. A vision is “a description of the ideal future state of the organization.”<sup>22</sup> A vision is an opportunity to briefly and succinctly articulate an idea on biodiversity and its ability to shape and inspire your community. The form your vision takes can be broad or specific and it can borrow from other municipal programs with themes of

sustainability, resource management, environmental protection, and human health. Exhibit 21 provides examples of vision statements. Note the variety of specificity in some statements (Cape Town), and general themes in others (Canada).



## Exhibit 21: Examples of Vision Statements

Document	Vision
<b>Environment Strategy, Richmond Hill, 2014</b>	"...a community that protects, enhances and restores its natural environment."
<b>Urban Forest Strategic Plan, Peterborough, 2011</b>	"To safeguard the many benefits provided by trees, the City is committed to managing the urban forest by promoting community stewardship and strategic practice to preserve, enhance and renew this essential resource."
<b>Biodiversity Strategy, Cape Town, South Africa, 2003</b>	"To be a City that leads by example in the protection and enhancement of biodiversity. A City within which biodiversity plays an important role, where the right of future generations to healthy, complete and vibrant biodiversity is entrenched, and to be a City that actively protects its biological wealth and prioritises long term responsibility over short-term gains."
<b>A Biodiversity Strategy for the Halton Region Forest, Halton, Region, 2014</b>	"...through its management of the Halton Regional Forests, will be a leader in enhancing, maintaining, and promoting biodiversity in Ontario, set an example of sound environmental stewardship for other landowners in the Region to follow, and contribute to achieving many of the targets identified in Ontario's Biodiversity Strategy."
<b>Ontario's Biodiversity Strategy, 2011</b>	"Our vision is a future where biodiversity loss is halted and recovery is advanced. People value, protect and enhance biodiversity and the ecosystem services essential for human health and well-being."
<b>Canadian Biodiversity Strategy, 1995</b>	"A society that lives and develops as part of nature, values the diversity of life, takes no more than can be replenished and leaves to future generations a nurturing and dynamic world, rich in biodiversity."
<b>Strategic Directions for Biodiversity Conservation, Metro Vancouver, 2008</b>	"A region rich in natural diversity with a network of habitats and healthy ecosystems that are valued and conserved."
<b>Green Infrastructure Strategy, Liverpool, UK, 2010</b>	"Green infrastructure is planned in Liverpool to support a safe, more inclusive, sustainable and enjoyable city; to provide essential life support functions for a world class city, that is adapted to climate change and where healthy living is a natural choice."



## Guiding Principles

Guiding principles establish a common understanding of the direction, boundaries, and consideration the BAP will take. It is a common language or set of parameters that act as a reference to develop goals and objectives. The overall guiding principle in a Biodiversity Plan is “prevention and avoidance of biodiversity loss, through creation of biodiversity and green space targets, namely areas that need protecting.”<sup>23</sup>

In Exhibit 22, below, note the variability for each example. New Brunswick’s broad statements could be adapted to sustainability or environmental planning, while Metro Vancouver produced statements specifically related to an ecological networks and ecosystem services planning. When developing a set of guiding principles try to address common issues of biodiversity conservation planning and management that are unique to your city.

### Exhibit 22: Examples of Guiding Principles

Document	Guiding Principles	
<b>Strategic Directions for Biodiversity Conservation, Metro Vancouver, 2008</b>	<i>Ecological Principles:</i> <ul style="list-style-type: none"> <li>• Consider regional context</li> <li>• Protect core habitats</li> <li>• Maintain diversity of ecosystems, species and genetics</li> <li>• Connect habitat areas</li> <li>• Benefit from nature's services</li> <li>• Protect environmental health</li> </ul>	<i>Process Principles</i> <ul style="list-style-type: none"> <li>• Shared responsibility</li> <li>• Ecosystem-based approach</li> <li>• Adaptive management</li> <li>• Precautionary decision making</li> </ul>
<b>Wildlife Strategy, Oakville, 2012</b>	<ul style="list-style-type: none"> <li>• Adaptive management approach</li> <li>• All species have an intrinsic value within their ecosystems</li> <li>• Policies and procedures will be supported by the best available scientific information and community knowledge</li> </ul>	<ul style="list-style-type: none"> <li>• A landscape and ecologically-based approach is central to biodiversity and natural resources conservation</li> <li>• Policy and procedure approaches will be developed in collaboration with interested public, staff and stakeholders</li> </ul>
<b>Ontario Biodiversity Strategy, 2011</b>	<i>Ecological Principles</i> <ul style="list-style-type: none"> <li>• Maintaining the integrity, dynamics and resiliency of natural systems is critical</li> </ul> <i>Societal Principles</i> <ul style="list-style-type: none"> <li>• We each depend on biodiversity for our health and well-being and have a responsibility to contribute to its stewardship</li> </ul>	<i>Management Principles</i> <ul style="list-style-type: none"> <li>• Adaptive management and long-term monitoring of ecosystem health and function, given the complex and dynamic nature of ecosystems and the uncertainty about climate change</li> </ul>
<b>Urban Forest Master Plan, Halifax, 2012</b>	<ul style="list-style-type: none"> <li>• Adaptive management</li> <li>• Precaution</li> <li>• Public participation</li> <li>• Sustainable development</li> </ul>	
<b>Biodiversity Strategy, New Brunswick, 2009</b>	<ul style="list-style-type: none"> <li>• Multiple values</li> <li>• Stewardship is a shared responsibility</li> <li>• Public participation</li> <li>• Integrated planning</li> <li>• Knowledge and precaution</li> </ul>	

It is important to provide an explanation as to why each guiding principle is valuable to your community. For example, Metro Vancouver provides an explanation of *Protect Core Habitat Areas* as being “large contiguous natural areas, reservoirs and refuges that are essential to species and ecological functions in our region” and *Adaptive Management* as being “a systematic and adaptive process that should be used to continually improve management policies and practices and learn from program outcomes.”

### Identifying Threats and Challenges

Through the biodiversity assessment produced in Milestone Two, the condition of your biodiversity was established. At this point, the biodiversity assessment will help identify the challenges unique to your community.

Biodiversity planning and management must seek to improve species quality and quantity in densely populated areas through the promotion of improved green spaces, especially when facing land fragmentation and degradation from land development.

This stage should be relatively straight forward since community challenges were scoped in Milestone Two. However, take the time if necessary, to revise and add to your challenges and connect them to the biodiversity planning approaches introduced in this Milestone.







If you are having difficulty scoping challenges, refer to Exhibit 24 which provides a list of specific biodiversity threats and themes of biodiversity management. Furthermore, start by asking these questions and generating your own questions to aid in problem identification unique to your community:

- How does my community promote or discourage connectivity of ecological networks?
- Is the matrix (in an ecological network) a source of extreme fragmentation?
- Which species are most valuable to our community?
- How are valuable species lost?
- Are aquatic and terrestrial assets considered together with urban functions?
- What are the ecosystem services in our community?

## Exhibit 23: Threats to Biodiversity

Document	Threats	
<b>Natural Connections Strategic Plan, Edmonton, 2007</b>	<ul style="list-style-type: none"> <li>• Natural areas management</li> <li>• Land development and increase in land value</li> <li>• Limited municipal funds</li> <li>• Restricted legislative authority</li> </ul>	<ul style="list-style-type: none"> <li>• Limited regional collaboration to protect natural systems</li> <li>• Limited public awareness of the value of natural systems</li> </ul>
<b>Biodiversity Conservation Strategy, Surrey, 2014</b>	<ul style="list-style-type: none"> <li>• Habitat loss</li> <li>• Population growth and development pressures</li> <li>• Land prices</li> <li>• Approved land use plans</li> <li>• Agricultural land reserve</li> <li>• Land acquisition</li> </ul>	<ul style="list-style-type: none"> <li>• Planning and development tools</li> <li>• Water courses and riparian areas</li> <li>• Invasive species</li> <li>• Climate change</li> <li>• Public perception</li> <li>• Human disturbance and interaction</li> </ul>
<b>A Biodiversity Strategy for the Halton Region Forest, Halton Region, 2014</b>	<ul style="list-style-type: none"> <li>• Habitat loss and degradation</li> <li>• Invasive species</li> <li>• Population growth</li> <li>• Pollution</li> <li>• Unsustainable use</li> </ul>	<ul style="list-style-type: none"> <li>• Climate change</li> </ul>
<b>Biodiversity Management Plan 2009-2014, Port Adelaide Enfield, Australia, 2009</b>	<ul style="list-style-type: none"> <li>• Environmental weeds</li> <li>• Introduced animals and insects</li> <li>• Isolated native vegetation</li> <li>• Human impacts</li> <li>• Climate change</li> </ul>	<ul style="list-style-type: none"> <li>• Planning of stormwater assets to support biodiversity</li> <li>• Development of vacant areas</li> </ul>

- How can ecosystem services serve multiple purposes?
- What are the sources of ecological degradation?
- How are residents encouraged to use areas of high biodiversity value?
- How are residents encouraged to participate in planning processes?
- What areas can serve to improve human health?
- What climatic changes are we experiencing locally that could impact biodiversity?

## Exhibit 24: Biodiversity Threats and Themes

Threats	<ul style="list-style-type: none"> <li>✓ Clearing of natives</li> <li>✓ Urban Heat Island</li> <li>✓ Introduction of non-native species</li> <li>✓ Low genetic diversity</li> <li>✓ Introduction of non-native animals</li> <li>✓ Use of chemical herbicides and pesticides</li> <li>✓ Plant disease</li> <li>✓ Storm water management</li> <li>✓ Invasive pest incubators</li> <li>✓ Weeds</li> <li>✓ Species loss</li> <li>✓ Diseases and pathogens</li> <li>✓ Destruction and fragmentation of remaining habitat</li> <li>✓ Poor water quality and inappropriate hydrological regime</li> <li>✓ Population growth</li> </ul>	<ul style="list-style-type: none"> <li>✓ Light, noise, traffic, and other disturbances</li> <li>✓ Vandalism</li> <li>✓ Land prices</li> <li>✓ Pollution and waste loading</li> <li>✓ Municipal funding</li> <li>✓ Human awareness</li> <li>✓ Extreme weather</li> <li>✓ Stormwater drainage</li> <li>✓ Government cooperation</li> <li>✓ Soil and road run-off</li> <li>✓ Loss of genetic diversity</li> <li>✓ Limited tool for natural areas securement</li> <li>✓ Erosion</li> <li>✓ Limited habitat availability</li> <li>✓ Regime shift</li> <li>✓ Lack of habitat connectivity</li> <li>✓ Over/irresponsible consumption</li> </ul>
Themes	<ul style="list-style-type: none"> <li>✓ Urbanization</li> <li>✓ Policy, planning, governance, and management</li> <li>✓ Climate change</li> <li>✓ Human interaction and disturbance</li> <li>✓ Education and awareness</li> <li>✓ Exploitation, resources development, resources use</li> <li>✓ Land-use, land-change and development</li> </ul>	<ul style="list-style-type: none"> <li>✓ Extirpation</li> <li>✓ Ecosystems health (land, water)</li> <li>✓ Finance, budget, capital</li> <li>✓ Adaptive capacity</li> <li>✓ Municipal infrastructure</li> </ul>



### Identifying Geographic and Management Focus Areas

The geographic scope of your plan is your community. However, your community contains unique geographic pockets. Disaggregating your community into smaller study areas may help in identifying threats and opportunities specific to those areas. Recognize that intensive threats to species and habitat loss may be difficult to manage across the entire community. Some areas may have biodiversity opportunities more conducive to your plan, while others may be best left to future

endeavours. Exhibit 25 shows a list of communities and their geographic focus areas. The City of Surrey divided their city into five land-use classes: south suburban, north suburban, agricultural, industrial, and urban. Within these, the City further identified fourteen high value biodiversity areas. The City of Joondalup, Australia, identified four study zones for their Biodiversity Action Plan: coastal, wetland, coastal bush, and marine. The City of Sydney, Australia, identified six specific high value biodiversity areas for their Urban Ecology Strategic Action Plan.

Exhibit 25: Geographic Focus Areas

Document		Geographic Focus	
Biodiveristy Conservation Strategy, Surrey, BC, 2014	• North Suburban	• Industrial	
	• South Suburban	• Agricultural	
	• Urban		
Biodiversity Action Plan 2009 – 2019, Joondalup, Australia, 2009	• Wetland zone	• Coastal bush zone	
	• Coastal zone	• Marine zone	
Urban Ecology Strategic Action Plan, Sydney, Australia, 2014	• Sydney Park		
	• Glebe Foreshore Walk East to Orphan School Creek		
	• Pyrmont (sandstone cliffs and outcrops and bush restoration sites)		
	• The Royal Botanic Gardens and Domain (Yurong Precinct)		
	• Garden Island (northern end)		
	• Moore Park (Mt Steel, Moore Park Golf and Lake Kippax)		



Another way to identify focus areas is to look at the municipal management department and connect them to biodiversity management. The City of Port Adelaide Enfield, Australia, and the City of Johannesburg, South Africa, did not divide their jurisdictions into study areas. However, in order to understand biodiversity in their cities, they did generate focus areas or management areas. Exhibit 26 shows the management areas of selected jurisdictions. The City of Edmonton used established governance structures that may have the ability to address biodiversity by focusing on municipal management units. The City of Port Adelaide Enfield, focused their plan on specific natural assets in public and open spaces, such as

street trees. The City of Joondalup used a combination of municipal management areas and broad biodiversity management concepts. It is clear that organizing your city either into geographic or management areas is useful to better understand where biodiversity exists in your city and where to focus your attention. Furthermore, these categories may be used to organize specific actions later in Milestone Three.

Exhibit 26: Examples of Management and Focus Areas

Document	Management and Focus Areas	
Biodiversity Action Plan 2009 – 2019, Joondalup, Australia, 2009	<ul style="list-style-type: none"> <li>• Planning and development</li> <li>• Reserve management</li> <li>• Catchment management</li> <li>• Corridors and connectivity</li> </ul>	<ul style="list-style-type: none"> <li>• Community engagement and partnerships</li> <li>• Community education and awareness</li> </ul>
Natural Connections Strategic Plan, Edmonton, AB, 2007	<ul style="list-style-type: none"> <li>• Parks</li> <li>• Drainage Services</li> <li>• Planning and policy Services</li> <li>• Development compliance</li> <li>• Waste management</li> </ul>	<ul style="list-style-type: none"> <li>• Recreation facilities</li> <li>• Corporate properties</li> <li>• Street engineering</li> <li>• Transportation planning</li> <li>• Office of natural areas</li> </ul>
Biodiversity Strategy and Action Plan 2015, Johannesburg, South Africa, 2009	<ul style="list-style-type: none"> <li>• Urban ecological network</li> <li>• Governance</li> <li>• Education and awareness</li> <li>• Biodiversity features</li> <li>• Social open spaces</li> </ul>	<ul style="list-style-type: none"> <li>• Services and utilities</li> <li>• Invasive alien species</li> </ul>
Biodiversity Management Plan 2009–2014, Port Adelaide Enfield, Australia, 2009	<ul style="list-style-type: none"> <li>• Remnant vegetation</li> <li>• Significant trees</li> <li>• Street trees</li> <li>• Suburban gardens</li> <li>• </li> </ul>	<ul style="list-style-type: none"> <li>• Fauna and flora</li> <li>• Existing areas undergoing revegetation projects</li> </ul>



## GOALS, OBJECTIVES, AND ACTIONS

Goals, objectives, and actions collectively address the biodiversity challenges of your community, layout how you will confront these challenges, and impact what results or outcomes you can anticipate.

### Collecting Existing Biodiversity Actions

In Milestone One your Team determined the plans, programs, policies, and projects along with the goals, objectives, and actions that addressed biodiversity conservation in your community. Biodiversity goals, objectives, and actions should be collected and refined as you go through the remaining sections of this Milestone. Keep a list of current actions as you develop new actions in order to identify connections, and avoid duplication.

## Goals and Objectives

Goals are statements aimed at addressing biodiversity challenges unique to your community. Goal statements can be independent of each other or connected.

Objectives are targeted statements aimed at addressing specific biodiversity issues and describe improvement outcomes connected to your community.

Goals and objectives should be ambitious, realistic and achievable. These specific statements will lead to direct and clear actions, which may in turn be easier to quantify than broad statements. Each community will have to develop statements unique to their biodiversity challenges and desired outcomes - see sample goals and objectives below.

When developing goals and objectives (and later actions), the biodiversity planning concepts of integration, connectivity, and social inclusion may also assist and guide the process.

## Exhibit 27: Sample Goals

Document	Goals
<b>Strategic Directions for Biodiversity Conservation, Metro Vancouver, 2008</b>	<ul style="list-style-type: none"><li>• A connected and biologically diverse network of habitats</li><li>• Healthy, resilient ecosystems and ecosystem services across the region</li><li>• Communities actively involved in caring for and conserving biodiversity</li></ul>
<b>Sustainable Strategic Plan, Town of Stratford, 2010</b>	<ul style="list-style-type: none"><li>• Protecting natural biodiversity in the town</li><li>• Preserving trees and forest areas in the town</li><li>• Protects and maintains existing natural beauty, wildlife habitats, and “green corridors”</li><li>• Protect and maintain the natural landscape, including natural paths, streams, beaches and shorelines, viewsapes and diversified topography in Stratford</li></ul>
<b>Ontario Biodiversity Strategy, Ontario Biodiversity Council, 2011</b>	<ul style="list-style-type: none"><li>• Mainstream biodiversity by incorporating biodiversity considerations into decision making across the province, in different sectors, homes, workplaces, and schools</li><li>• Protect, restore, and recover Ontario’s genetic, species, and ecosystem diversity and related ecosystem functions and processes</li><li>• Use Ontario’s biological assets sustainably</li></ul>

## Exhibit 28: Sample Objectives

Document	Objectives
<b>The Policy on the Protection and Enhancement of Natural Habitats, Montréal, 2014</b>	<ul style="list-style-type: none"> <li>• Maximize biodiversity and increase aggregate hectares of protected natural habitats in Montréal</li> <li>• Ensure the sustainability of natural habitats in existing city parks, and promote the consolidation and viability of park ecosystems</li> <li>• Foster enhanced integration of ecosystems and natural landscapes in built-up areas</li> </ul>
<b>Natural Heritage and Urban Forest Strategy Mississauga, 2014</b>	<ul style="list-style-type: none"> <li>• Build on existing, and develop new, public and private sector partnerships to help pursue and implement the vision and targets for the Natural Heritage System and Urban Forest</li> <li>• Enhance and restore the Natural Heritage System and Urban Forest on private lands by promoting stewardship, naturalization, restoration, tree planting and proactive tree care with creative outreach and incentives</li> <li>• Protect the Natural Heritage System and Urban Forest on public lands through proactive management, enforcement of applicable regulations, and education</li> </ul>

When scanning documents, it is important to thoroughly read the headings along with the statements to correctly categorize “goals” and “objectives” to the definitions in this Handbook because in some instances different terms are used (i.e. outcomes, strategic objective, etc.).

### Biodiversity Action Streams

In order to advance biodiversity objectives and goals, actions need to be identified. Types of actions may be related to activities to engage community participation, new policies and plans, installation of new infrastructure, restoring native species to parks and natural areas, and specific processes to alter community parks. When developing actions, refer to your objectives for guidance.

Biodiversity actions will include a range of approaches and activities, and will likely involve some combination of the following action option streams:

- *Public education and awareness, community participation, and engagement:* public involvement in planning processes or inclusion into the biodiversity decision network is critical because residents are major contributors to biodiversity protection. Community participation and awareness

raising will aid in fulfillment of objectives and actions, as social inclusion has been shown to motivate stewardship and commitment.

- *Integration, modification or development of bylaws, plans, and programs:* Current by-laws, plans, and programs may need to be altered in order to address biodiversity in the future.
- *Promoting conservation and protection of biodiversity:* Expanding natural areas and semi-natural areas through development and planning. This will require actions to apply and follow through on development, design, and maintenance of existing ecological assets, and identification of new opportunities.
- *Develop, enhance and expand green infrastructure:* Green infrastructure is tied to the overall function of ecosystems and ecosystem services, which are valuable components of biodiversity management and municipal operations.





## Alternative Action Options

The action streams already mentioned operate within traditional municipal planning and management. Innovative actions developed from past ideas and market-based approaches have also emerged, and may be of interest to your community. Two specific actions that are gaining attention to promote biodiversity conservation and allow for urban development and growth are: urban green tourism and biodiversity offsetting.

### Urban Green Tourism

Tourism is valuable to Canada's economy, providing over 500,000 jobs, and accounting for 2% of gross domestic product (GDP).<sup>24</sup> Sustainability obligations in urban planning allow for the inclusion of social and environmental factors to be considered along with economic factors to measure the success of tourist activities. Tourism can be a highly consumptive and resource intensive process. If environmental and social factors are not considered, certain activities will leave negative impacts on the local community.<sup>25</sup> Ecotourism is a strategy used to attract visitors to areas of high biodiversity, ecological, and cultural value around the world.<sup>26</sup> Integral to this strategy is maintaining and preserving areas of significant value, as well as conducting tours and other activities in an ecologically sensitive manner.<sup>27</sup> Ecotourism is traditionally carried out in areas far from major urban areas such as protected parks.<sup>28</sup> However, urban areas are also sites of significant culture and valuable environmental and biodiversity assets. Thus, "urban green tourism" can provide an opportunity to revitalize and improve cities in order to attract visitors. Urban green tourism is meant to "encourage travel and exploration in and around a city that would help support natural and cultural aspects, while also encouraging conservation of urban resources and cultural diversity."<sup>29</sup> Moreover, urban green tourism should encourage environmental protection and conservation, promote local economic opportunities, local

cultural diversity, and meaningful experiential opportunities.<sup>30</sup> Urban green tourism is an opportunity for local lands to be restored, local people to profit from tourism, and provide experiential learning opportunities for locals and tourists.

Cities and regions across Canada offer innovative opportunities for people to enjoy the sites and experience nature. People can tour different parts of a city using different modes of transportation. Bike tours in densely populated areas allow people to see the cultural and urban nature strategies employed by a city. Guided walking tours outside the city can show people the flora and fauna located close to the city. Kayaking and canoeing tours provide people with a perspective of the city from afar. It is always critical to remember that urban green tourism encourages environmental protection.

### Biodiversity Offsets

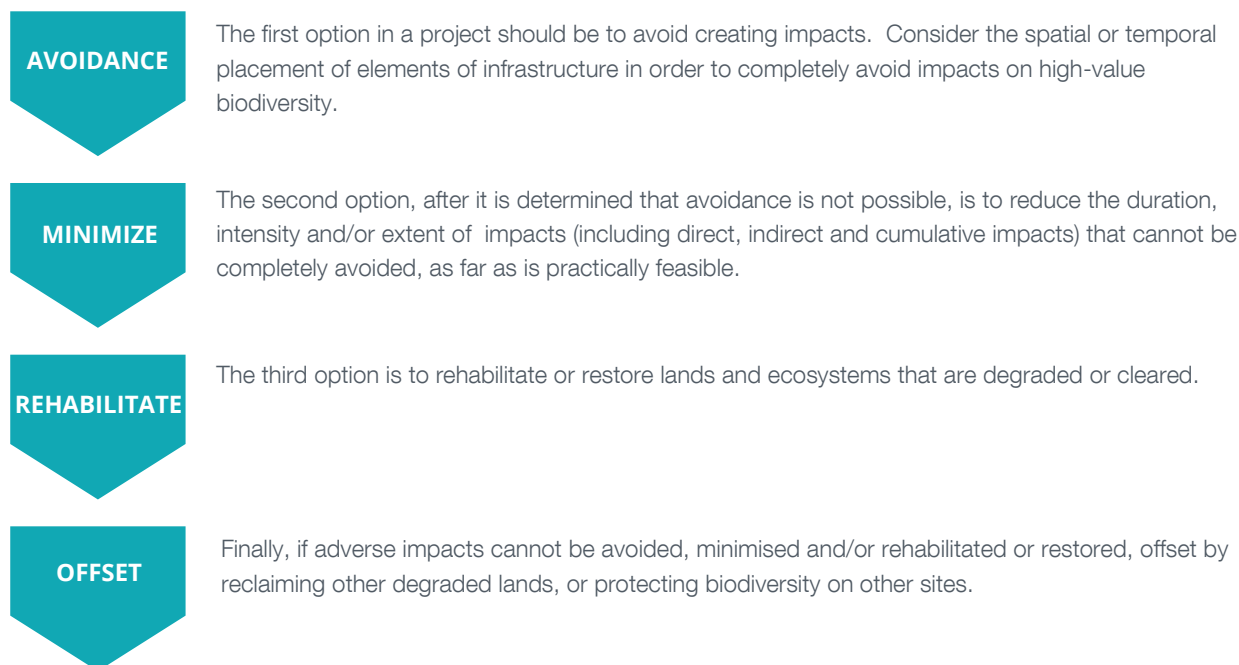
Biodiversity offsetting is an emerging planning strategy that is used to satisfy development needs and biodiversity growth. However, uncertainty exists concerning the efficacy of offsetting to truly conserve and expand biodiversity.<sup>31,32</sup> Biodiversity offsetting is used when development is needed in an area of current biodiversity value.<sup>33</sup> In order to remedy damage to an area, project proponents will try to restore biodiversity in an area close to disturbed lands. It is important to note, biodiversity offsetting is the last option selected in a mitigation hierarchy intended to guide project planning (see Exhibit 29).<sup>34</sup> Three other options - avoidance, minimization, and rehabilitation - should be considered before selecting offsetting.

The Business and Biodiversity Offsets Programme (BBOP) is a collaboration of global organizations and governments, operated by two non-governmental organizations (NGOs) - Forest Trends and Wildlife Conservation Society (WCS).

The BBOP is comprised of: NGOs, government agencies, financial institutions, and private firms engaged in the research and improved understanding of the benefits and applicability of biodiversity offsets. The Programme has developed guides and manuals to assist developers through the biodiversity offset planning and management process. The goals of the BBOP are to: provide a forum for global experiences to be disseminated; assist developers in designing and implementing mitigation measures; support the development of institutional and regulatory frameworks; and improve biodiversity offset concepts.

Many issues continue to surround biodiversity offsetting, particularly land valuation and biodiversity thresholds. Valuing the land and assessing financial value for biodiversity is difficult because of its synergistic and long-term regulating processes. Assigning biodiversity thresholds is contentious, because a set of values or standard values does not currently exist that will ensure an overall net gain in biodiversity.<sup>37</sup> Biodiversity is unique to each community, to each problem, and to each set of goals. Therefore, careful consideration, research, and assessment must be considered before selecting biodiversity offsetting schemes.

## Exhibit 29: Mitigation Hierarchy





## Formulating Actions

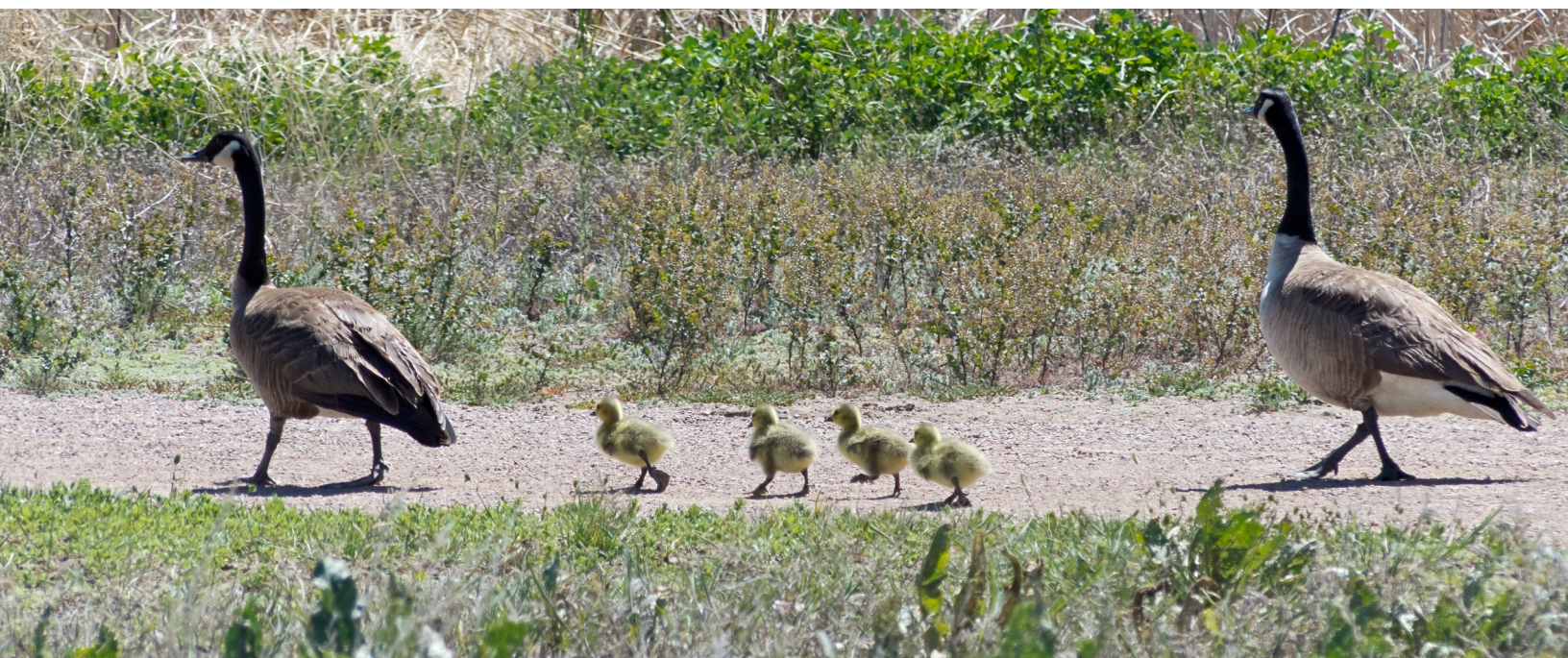
Exhibit 30 provides examples of actions in relation to the specific goals and objectives. It also identifies which biodiversity planning approach the actions correspond to. Having explored geographic and management focus areas earlier, you may want to connect actions to these. When developing actions, it is possible to apply them to multiple geographic areas. A valuable step at this point is to formulate

measurable targets or tangible outputs for as many actions as possible. Measurable outputs provide quantifiable values that are validated against a baseline or defined criteria. Tangible outputs produce materials and items that may be intended to educate and alter behaviour. For example, the production of a pamphlet informing residents of the role they play in conserving biodiversity is a tangible output. It is possible to have actions that are both measurable and tangible, such as increasing community involvement in biodiversity initiatives (e.g. tree planting, awareness raising activities, citizen science activities).



### Consider This

The number of attendees can be measured against previous years, and may also be seen as an attempt to alter attitudes towards biodiversity. It may be difficult to measure attitude change in the short-term. However, over the long term change may be reflected in the improvements in biodiversity conditions in the community.





## Exhibit 30: Selected Goals, Objectives, and Actions

Document	Goals	Objectives	Actions	Planning Approach
<b>Natural Connections Strategic Plan, Edmonton, 2007</b>	Expand Edmonton's ecological network through securement and restoration	Expand Edmonton's ecological network by securing and restoring natural systems, and by supporting and partnering with others in this work in the areas where it is appropriate	<ul style="list-style-type: none"> <li>• Coordinate the processes of key internal branches – namely Parks, Drainage Services, Land and Buildings, Planning and Energy, Environment and Natural Areas – to identify natural areas for acquisition</li> <li>• Encourage the understanding of the many benefits natural areas provide Edmontonians, including ecological services and quality of life enhancements</li> <li>• Establish processes and tools to capture, store and make accessible the local ecological knowledge of Edmontonians</li> </ul>	Ecological network
<b>Earthcare Sustainability Plan 2014-2020, Thunder Bay</b>	Protect, maintain and improve the biodiversity, ecosystems and the well-being of green infrastructure	By 2020, Thunder Bay's natural areas and urban forests are comprised of a healthy and diverse mixture of flora and fauna that are resilient to the effects of climate change	Actions for corporation: <ul style="list-style-type: none"> <li>• Keep abreast of and plant a variety of locally appropriate plant species</li> </ul> Actions for community: <ul style="list-style-type: none"> <li>• Work with local providers to increase appropriate 'living green infrastructure' species availability</li> </ul>	Ecosystem management
<b>A Biodiversity Strategy for the Halton Region Forest, Halton Region, 2014</b>	Focus on readily implementable activities contributing directly to biodiversity maintenance and enhancement in the Halton Regional Forests and/ or furthers our knowledge of BMPs	Engage the public in enjoying, characterizing and enhancing biodiversity resources in the Regional Forest tracts	<ul style="list-style-type: none"> <li>• Work with our Conservation Authority partners to undertake a "BioBlitz" event(s) within Regional Forest Tracts</li> </ul>	Social and ecological network

## Exhibit 31: Sample Actions and Action Streams

### Public education and awareness, community participation, and engagement

A specific example from the City of Joondalup, Australia's Biodiversity Action Plan 2009-2019, demonstrated an attempt to include local knowledge into the process of biodiversity planning, protection and information gathering. The process was bottom-up, as a local indigenous community shared their understanding of the historic composition of native vegetation in an area of significant natural heritage. Furthermore, the indigenous community expressed concern regarding areas of protection and land quality promotion.

Public participation in biodiversity planning is a valuable strategy to generate support for stewardship. However, encouraging your community to 'get outside' and experience nature can serve to improve the human-nature interaction. The Town of Oakville, ON, provided its residents with opportunities to experience and interact with nature with walking trails. The trails are located throughout their urban forest, watercourses and parks. Information about the trails and locations is available to users on their website.

The Town of Stratford, PEI, in their sustainability plan Imagine Stratford Towards a Vision for 2028 recognized the importance of an engaged and eager community to build support for action follow through. In order to engage the community, the Town used an Earth Hour event to introduce the community to environmental related issues, and create public participation. As a result, the community expressed a desire to have more than one Earth Hour type event each year.

### Integration, modification or development of bylaws, plans, and programs

The City of Hamilton, ON, used incentives for the redevelopment and rehabilitation of once degraded lands. Brownfields are lands that are degraded from contamination, and brownfield redevelop is an attempt to revitalize the land for recreation, living or work. The City's Environmental Remediation and Site Enhancement Community Improvement Plan (EARSE CIP) attempts to incentivize brownfield redevelopment for developers. The City offers developers tax breaks, grants, loans and investment partnerships.

The City of Surrey, BC's Biodiversity Conservation Strategy addressed biodiversity policy by building upon two existing local documents the Official Community Plan and the Sustainability Charter. The City of Surrey divided their policy concerns and recommendations into four focus areas: planning and development, agriculture, climate change, and community education and awareness.

The City of Toronto, ON, Green Roof Bylaw is an example of utilizing multiple action streams for biodiversity management. The bylaw is connected to the promotion of conservation because the city requires certain new buildings (residential, commercial, industrial) to develop green roofs. In densely populated areas, green roofs provide an alternative green space form, that plants, insects, and birds can all utilize to feed and grow.

**Promoting  
conservation and  
protection of  
biodiversity**

The City of Calgary, AB's Naturalization Initiative will attempt to increase the amount of native vegetation in parks and open spaces, and decrease invasive plant species. The program will target non-recreation areas, areas located near waterbodies, and designated natural areas. The program will also attempt to use alternative plant techniques which will decrease fertilization, pesticide application and irrigation.

The City of Hamilton, ON's Street Tree Planting Program planted trees along streets in neighbourhoods and along major roads, while also allowing residents to request plantings in their neighbourhood. The initiative recognized the benefits trees provide for the community, and in the process increased the diversity of trees, and habitats for urban wildlife.

The City of Ottawa, ON's Emerald Ash Borer (EAB) Strategy is being utilized to prevent the spread of EAB, a harmful invasive causing significant damage to native trees. The strategy will eliminate the species, remove damaged trees, and replant healthy native trees.

**Develop, enhance  
and expand green  
infrastructure**

The City of Toronto, ON's Livegreen program offers resident grants, incentives and information to encourage environmentally friendly practices. The program offers residents an opportunity to install their own green roof and request tree plantings in their neighbourhood.

The City of Victoria, BC, is finalizing the details and delivery of their Stormwater Utility and Incentive Program, aimed at reducing a property's impact on the stormwater system. All property types will be taxed based on the amount of impervious pavement on their property. Each property will have an opportunity to install runoff abatement tools to decrease their impact on the stormwater system. Initially, the mechanisms that will be used to encourage property participation are: one-time rebates for single family homes, on-going rebates for larger buildings, and a decrease of the utility tax on property bills.

Liverpool City Council, UK, used a green infrastructure assessment and included biodiversity protection and expansion, as one of the priority areas green infrastructure (GI) should contribute to. Similarly, the City of Surrey used green infrastructure network (GIN) as a major component to assess the biodiversity of the community, with the belief that improved GI will improve biodiversity.



## Drivers and Constraints

Drivers are factors allowing for the implementation of actions. Actions should therefore strive to take advantage of any drivers that may exist. Constraints are variables that may prevent the implementation of actions. Constraints can be related to: knowledge gaps, land deficits, financial limits, social willingness, and operational capacity.

Revise your actions to see if drivers and constraints will impact the implementation of each action. Examine your actions to avoid constraining factors, such as conflicts with other policies or missed partnership opportunities. If constraints are identified, revise actions and consider any possible drivers. For example, can an action be revised to include co-benefits, or opportunities for collaboration?

Consider these questions when scoping drivers and constraints:

- Do you have the financial support?
- Does this action involve multiple departments? Will resources be shared between departments?

- What resources currently exist to implement this action?
- Does your municipality have the authority to make biodiversity planning and management decisions?
- Which political leaders and community groups are supportive of biodiversity planning and management?
- How much time will you need to develop and implement each action?
- How will the action impact existing sustainability or environmental policies?
- What are the co-benefits achieved through this action?
- How are long-term biodiversity and economic benefits achieved?
- How will each action improve biodiversity conservation in the community?
- Can this action be part of other municipal programs or plans (i.e. environment, sustainability, climate change, etc.)?

## Exhibit 32: Drivers and Constraints to Implementation

Drivers	Constraints
✓ Funding	✗ Cost
✓ Staff capacity	✗ Staff capacity
✓ Impactful event	✗ Political willingness
✓ Available resources	✗ Time limits
✓ Timeframe of benefits	✗ Internal disagreements
✓ Time considerations	✗ Land availability
✓ Consequences of inaction	✗ Capital restrictions
✓ Policy integration	✗ Conflict with current sustainability and environmental policies
✓ Provincial or territorial policy	✗ Lack of partnership building
✓ Political leadership	✗ Further data and information needs
✓ Internal and external collaboration	

## BASELINE DATA AND INDICATORS

### Baseline Data

With your actions refined and clearly established, the next step is to gather baseline data. Baseline data represents the current information of your biodiversity assets and variables of concern. This data will be assessed against action outputs. The outputs be measureable and quantitative or tangible and qualitative. The objectives and actions will guide the scope of information and variables of interest to formulate your baseline data. Before organizing your baseline data, consider the indicators that will be required to review the BAP and actions in Milestone Five.

### Indicators

How will you know if your programs, plans or actions are contributing to improvements to biodiversity conservation? Indicators are quantitative and qualitative statements, designed to assist in measuring the progress of an action when compared against a baseline value. Quantitative indicators will generally apply to clear numeric values, while qualitative indicators will apply to descriptive and non-numeric data.

Actions may contain a target output that is quantitative or qualitative. The target is not an indicator because it represents the desired or ideally achievable output. For example, a target can be to 'achieve a 40% increase in area of urban greenspace' or 'complete one community event per month annually.' An indicator on the other hand, is a statement which specifically guides the information to identify, and then allows the resulting value to be measured against a baseline. For example, 'percentage (%) of urban greenspace' or 'number (#) of community events hosted.' In the examples provided above, all three are quantitative measures. An example of a qualitative indicator could be 'attendee satisfaction with biodiversity event' or 'community support of municipal biodiversity goals.' In both instances, the qualitative indicators will require the development of open ended questionnaires, or rating surveys to determine 'satisfaction' or 'perception.'

#### **Quantitative Indicators:**

Rely on numerical data or official statistics. Examples of quantitative indicators include amount of protected natural area; or area of pervious surfaces.

#### **Qualitative Indicators:**

Are used in the absence of numerical data and instead, rely upon constructed scales (i.e. high, medium, low, 1 through 10, level of satisfaction etc.). The data can be gathered through surveys, or structured interviews with experts. For example, you can assess the adequacy of a community event based on a survey of attendees.

It is valuable to formulate indicators early, to better assess the financial needs and urgency of the actions.

Indictors and baseline formulation should occur together, as the indicators selected will inform what baseline data must be collected. Furthermore, if data is unavailable for an indicator, it may have to be revised to fit available, or soon to be available, data. In some cases, if an indicator has been developed but baseline data is unavailable, it will be possible to keep the indicator while noting future data needs.

Consider these questions when selecting an indicator:

- What do I need to measure?
- How will measuring this help achieve my objective?
- How frequently will I need to report on the progress of an action?
- How much will it cost to measure this?
- Is this something that is already being measured?
- To whom will I be reporting this information?

Exhibit 33: City of Surrey Performance Indicators

	Low	Moderate	Good	Optimal
<b>Implementation and enforcement of policy and bylaws</b>	No Biodiversity Strategy	Biodiversity Strategy Developed	Biodiversity Strategy reviewed and updated semi regularly to reflect conditions, goals and BMPs	Biodiversity Strategy regularly reviewed and updated to reflect conditions, goals and BMPs
<b>Proportion of GIN protected</b>	<30% of GIN is protected	30-60% of GIN is protected	60-90% of GIN is protected	>90% of GIN is protected



# CASE STUDY

## CITY BIODIVERSITY INDEX

The City Biodiversity Index (CBI) (or Singapore Index) was developed in 2008 by the government of Singapore to evaluate biological diversity, ecosystems services, and the management structures in cities. Throughout 2009, the CBI was revised and finalized through a workshop, and meetings with global experts and global biodiversity organizations. The end result was the User's Manual for City Biodiversity Index, which provides a list of indicators, a scoring system for indicators,

performance measurement, variables required, calculation procedures, and a rationale for why the indicators are valuable. In 2014, the User's Manual went through a fourth revision to keep up with information and trends in biodiversity management and evaluation.

To find out more about the City Biodiversity Index, visit: <https://www.cbd.int/authorities/gettinginvolved/cbi.shtml>

### INDICATOR: RECREATIONAL SERVICES

RATIONALE FOR SELECTION OF INDICATOR	HOW TO CALCULATE INDICATOR	BASIS OF SCORING
Biodiversity provides invaluable recreational, spiritual, cultural, and educational services. It is essential for physical and psychological health	<p>Area of parks with natural areas and protected or secured natural areas /1000 persons</p> <p>Note: some cities refer to this as accessible green spaces</p>	<p>0 point : &lt; 0.1 ha/ 1000 persons</p> <p>1 point : 0.1 – 0.3 ha/ 1000 persons</p> <p>2 points : 0.4 – 0.6 ha/ 1000 persons</p> <p>3 points : 0.7 – 0.9 ha/ 1000 persons</p> <p>4 points : &gt; 0.9 ha/ 1000 persons</p>



#### Consider This...

##### *Process Indicators:*

Are used for a plan element or action to measure, assess or gauge the level of completion or the degree to which the action is meeting its objective. This is useful as it provides an opportunity to correct or adjust an action or plan component if needed.

##### *Outcome Indicators:*

Are used to measure or evaluate the success or achievement of an action or program upon completion.



## ORGANIZATION AND DELIVERY

### Drafting the Plan

By this point, you have developed actions and considered drivers and constraints. Your actions may also include measureable targets and tangible outputs to achieve. This final section addresses important topics to move from action planning to action implementation.

### Costing and Funding

Estimating the cost of each action is a challenge, but should be undertaken to develop a thorough plan. It may be difficult to have each department(s) responsible for implementing individual actions identify the critical factors impacting the commitment of funds. Factors contributing to the cost of each action may

include: assessing staff capability, training staff, hiring experts, producing materials, hosting events, acquiring new land, and obtaining new technology. This assessment should attempt to examine both long and short-term variables contributing to total cost. At this stage a cost estimate can be allocated on a scale ranging from high-medium-low. Remember, this is an estimate. As you move to the next Milestone, the cost may change and you can adjust accordingly.

Addressing financing is critical to implementing and monitoring actions. Determining the funding commitment will allow for detailed allocation of financial and human resources. The process of identifying funding within the

## Exhibit 34: Considerations for Each Action

Consideration	Task
<b>Lead department</b>	Identify the primary department that will implement the action
<b>Other departments</b>	List and briefly explain which other departments may be useful in implementing actions. As well, identify if other departments can provide assistance in another capacity.
<b>Timeline</b>	Establish a timeline. It can be specific (by the end of 2016) or general (short, medium, long-term)
<b>Costs</b>	Identify costs. Be specific with an expected range (\$1000-1200/year) or general (high, medium, low)
<b>Funding</b>	Identify funding sources, existing budget allocations, and external funding opportunities
<b>Indicator</b>	List the indicator associated with this action
<b>baseline data</b>	List baseline data for this action
<b>Target</b>	List the measurable outcome or tangible output for this action
<b>Benefits</b>	Explain the benefits of this action as it relates to biodiversity and community health
<b>External partners</b>	List any external partners that may provide support (capital, information)
<b>Pre-cursors</b>	List and describe steps that need to be taken to enable the implementation of action (i.e. research studies, partnership development)
<b>Other factors</b>	List any other factors that may be important to consider for this action

municipality will require consultation with senior staff. If funding is unavailable internally, look for funding externally from community partners or higher levels of government. Environment Canada and Infrastructure Canada have previously provided funding to municipal governments (and other groups) for projects addressing green infrastructure, habitat protection, and aquatic and terrestrial systems improvement. The role of community groups or NGOs can be valuable not only as an engagement opportunity, but also as a strategy to share responsibility and funding. When attempting to understand your financial situation, consider the following questions:

- Is funding available internally?
- Do higher levels of government have programs, grants, or funding opportunities?
- What external partners have funding or in-kind service to contribute?
- Can actions be integrated into existing programs, policies, plans or projects?
- What is the projected cost of the action relative to the timeframe? Can the financial estimate be reduced, without impacting the quality of the action?
- Which other departments can be included to increase funding?

Working through these questions, and formulating a budget will aid in improving the potential for implementing actions, measuring and evaluating targets and indicators, and a providing an overall direction for the program. Furthermore, understanding the capital resources and funding sources available should make the process of prioritizing actions easier. The City of Sydney, Australia was able to identify a combination of one-time needs for plan implementation, and sustained annual funding for program review.<sup>36</sup> Furthermore, the City was able to identify sources of existing funding in budgets, thereby providing insight into potential future funding needs for each action.

## CASE STUDY

## PRIVATE INVESTMENT FOR PROGRAM SUPPORT, CITY OF GREATER SUDBURY

Greater Sudbury received funding from Vale and Sudbury Integrated Nickel Operations (INO), two private companies with an active presence in the local mining sector. As part of Sudbury's Regreening Initiative, aimed at land reclamation and restoration, the two companies collectively provided

\$2.25million over 5-years. This partnership demonstrates the role important industries can play towards the development of local biodiversity conservation and management programs for local communities.





# USING COMMUNITY FUNDING SOURCES TO DEVELOP URBAN FORESTS, CITY OF CALGARY



“Commemorate a birthday, wedding, anniversary or any other special day by planting a tree.”

The City of Calgary offers its residents the opportunity to have a native tree planted to celebrate a personal occasion. Residents pay the

city to plant “symbolic trees” and the city’s urban forest is expanded contributing to the development of habitat, expansion of native tree biodiversity, and other environmental and social benefits derived from urban trees.

## Action Prioritization

At this point in Milestone Three, actions can be ranked based on the biodiversity action team’s judgement. The ranking exercise will identify actions of high priority based on single or multiple variables. Variables of interest may include: urgency, ease of implementation, or public acceptability. It is possible that variables, such as funding sources, benefits, and lead agency/responsibilities, may also be used as prioritization criteria. Prioritization based on criteria selected by the Biodiversity Team is a valuable exercise to internally assess which actions council may be more inclined to act upon.

Exhibit 35 and 36 show example matrices used to rank actions. Exhibit 35 addresses important criteria for decision making for Liverpool based on a small number of categories, while a prioritization matrix such as Exhibit 36 could help rank many actions based on a scoring system (i.e. the higher the total score for each action, the higher the priority for implementation). If you decide to use either exhibit to assign a priority score for each action, attempt to group actions based on their score. In general, select the highest scoring group of actions as the list of actions most desirable for approval.

Exhibit 35: Prioritization Criteria for Liverpool, UK’s Green Infrastructure Strategy

Criterion	Description	Scoring
Action Achievability	An assessment of the technical feasibility or policy support or barriers.	Based on a scoring system from 1-6, with 6 representing “most achievable”
Impact	What difference would the action make?	Based on a scoring system from 1-6, with 6 representing “the highest”
Funding	What funds may be available as a result of planning requirements, to support the implementation of the action?	Based on a scoring system from 1-6, with 6 representing “highest availability of funding”

Exhibit 36: Action Prioritization Matrix<sup>37</sup>

	1 (Low)	2 (Medium)	3 (High)
<b>Implementation Cost</b>	Cost is high relative to inaction	Cost is moderate relative to inaction	Cost is low relative to inaction
<b>Operating and Maintenance Cost</b>	High cost	Moderate cost	Low cost
<b>Urgency</b>	Risks are likely to occur in the longer term	Impacts are beginning to occur or are likely to occur in the near to mid-terms	Impacts are already occurring
<b>Ancillary Benefits</b>	Measure will contribute little or not at all to other community goals	Measure will contribute somewhat to other community goals	Measure will contribute significantly to other community plans
<b>Window of Opportunity</b>	There is no window of opportunity currently	A window of opportunity could be created	A window of opportunity exists to implement
<b>Public Acceptability</b>	Likely to face public opposition	Not likely to receive much public attention	Likely to receive public support
<b>Funding Source</b>	External funding is required but has not been identified	External funding is required and likely to be secured	External funding is available
<b>Capacity</b>	Current capacity is insufficient and gaps not easily addressed	Gaps exist but could be addressed	Current capacity is sufficient



### *Implementation Schedule*

The process of developing a comprehensive implementation strategy is addressed in Milestone Four. However, being proactive and formulating an implementation schedule in this Milestone will show a thoroughness and completeness in the Plan.

Earlier in Milestone Three, timelines for each action were considered. At this stage, those timelines should be finalized and used to prepare the implementation schedule. Consider time required to begin the action, and any pre-consultation, and preliminary work needed. Also consider potential obstacles that may slow down the process. In the implementation schedule, include the estimated time to measure and evaluate the performance of each action. This phase may include time to gather and refine data, and time to review and improve the plan. It is always possible to redefine timelines to make them more realistic.

With the timeframe of actions established, it may now be valuable to determine the duration of the BAP. Ask yourself how long will the BAP serve to guide your municipality's biodiversity management program? Whether or not you include a set duration for the BAP to remain active, a time period for re-evaluation should be considered. This should be longer than one year, as monitor and review (Milestone Five) will serve to address short-term issues, it should occur within a five to ten year frame. According to ICLEI's Local Action for Biodiversity Guidebook, a BAP should cover a ten-year timeframe, with at least one review of occurring in the fifth year to assess the success and strengthen program delivery.

### *Finalize Plan*

Thorough and detailed identification of goals and objectives, categorizing actions, assigning responsibilities, and projecting funding sources and costs should aid in compiling the final plan. At this point, it is also important to consider who will lead the writing process. This Milestone was completed as a team, however, the written process may best left to an individual or a very small writing team. The draft document should be circulated to the broader Biodiversity Team, and others who may have the ability to provide input and valuable advice.

Biodiversity is connected to critical aspects of community operations and functions. Connecting your biodiversity plan to other municipal plans (transportation, sustainability, water management, etc.) will demonstrate the relationship of biodiversity to other municipal programs. Furthermore, integrating your plan into other municipal plans, programs and policies will take your BAP from a standalone document to a dynamic plan well connected to the diversity of municipal and local issues.

### **WHERE SHOULD YOU BE NOW?**

At the completion of Milestone Three, you should have a finalized BAP, which includes an outline of adaptation actions, budgeting, responsibilities, implementation timeline and a foundation for measures and evaluation. The Plan should now be ready for approval by Council. Remember, this process is iterative. You can and should return to this Milestone to revise and update it as you move onto other Milestones.



## Exhibit 37: Sections to Include in Table of Contents

	Description
<b>Acknowledgements</b>	Thank you to stakeholders, biodiversity team, Mayor, council etc.
<b>Mayors/Council Commitment</b>	A brief explanation written by the Mayor, members of council, or both, describing the desire for the municipality to follow through on the Plan
<b>Executive Summary</b>	Provide a snapshot of the overall Plan, highlight major points and sections
<b>Background and Context</b>	What is biodiversity? What is urban biodiversity? Why does it matter? How is this valuable to your municipality?
<b>Issues and Challenges</b>	What are the factors impacting urban biodiversity? What are the risks of urban biodiversity loss?
<b>Vision Statement and Guiding Principles</b>	A call to action for your community. Describe the future state of your communities biodiversity and the values which will guide the process
<b>Goals and Objectives</b>	What will your plan achieve?
<b>Actions</b>	What specific actions will be used to achieve objectives? What targets are scoped?
<b>Implementation Schedule</b>	Action timeline with dates and responsible departments
<b>Glossary</b>	Key terms for reference

## ENDNOTES

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MILESTONE FOUR

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**IMPLEMENT**



## MILESTONE FOUR: IMPLEMENT

Milestone Four, Implement, will guide you through the process of developing appropriate implementation strategies, and obtaining the support of Council, municipal staff, and the community to carry out your biodiversity action plan (BAP).

Milestone Three provided an implementation schedule and a list of considerations for actions. In addition, it provided a budget which estimated the cost for implementing actions. All of this will be used in developing your implementation portfolio and strategy.

Plan implementation, is a process undertaken by the BAP Team, with cooperation and support from municipal council and other stakeholders. Implementation is an opportunity to put the plan into action. Some BAP actions will take longer to implement than others because they may require significant behavioural changes, time, or capital. Others actions may already be in progress, or may simply require integration into an existing program. Plan implementation will require influencing municipal governments and administrative structures to allow the BAP to be fully realized. Implementation strategies will comprise delivery and support strategies to ensure actions are approved and applied.<sup>1</sup> Delivery strategies convince decision-makers, staff, and departments to approve the BAP and actions. Support strategies target training, technical assistance, and community participation. Remember, biodiversity conservation planning and management is a not

a “one-size fits all” approach. Formulating implementation strategies is necessary to understand how to best operate within prescribed bureaucratic arrangements.

### IMPLEMENTATION STRATEGY

#### Delivery Strategies

In order for actions and the BAP to “start-moving”, approval must be given from your municipal council. The intentions of the BAP may not seem as clear to decision-makers as it is to the Biodiversity Team, therefore, communication is critical for implementation.

#### *What Should Be Communicated, and to Whom?*

The target audience may be small, such as Council, department managers, and expert staff. All three groups are critical to connect with, as each may play a role in approving, or acting as the authoritative voice to get approval. The list of actions developed in Milestone Three assigned departmental responsibilities. In Milestone One, stakeholders from various departments and senior decision-makers were identified. These departments and stakeholders may be valuable to aid in BAP approval from council.



## PURPOSE

Implement actions identified in the biodiversity action plan and secure support of Council and the community.

## OUTPUTS

- ✓ Delivery strategies
- ✓ Support strategies
- ✓ Support and approval from Council
- ✓ Community engagement and partnerships

### *Internal Communication*

Internal communication requires interaction with a variety of ‘active’ and ‘passive’ municipal staff, who may be involved in various municipal functions. Active municipal staff are those most crucial in helping to approve, and implement the BAP. Examples of active stakeholders may include councillors, relevant departments, and internal experts. Passive staff on the other hand, are not directly related to biodiversity operations or functions (e.g. administrative staff). However, they are part of the municipality and effort should be made to educate and inform them of the plan.

When communicating with active staff utilize your internal committee (e.g. senior decision-makers, department staff or Biodiversity Champion) as they are thoroughly familiar with biodiversity or related concepts, such as sustainability and environmental protection. Moreover, the internal experts should be well-known and have a history of positively motivating council or connecting with relevant departments to promote actions and change. If

other internal members exist who you believe are valuable at this stage, but were unable to be part of the internal committee, consider re-connecting with them now. It is the responsibility of the Team to lead communication with council and departments, as any additional internal members act to validate and support the Team’s position. Internal committee and non-committee experts will be assets moving forward on implementation with Council members who are non-experts. A non-expert may require an introduction to biodiversity conservation planning and management. This can be facilitated with the development of a document (e.g. briefing note, pamphlet, report, etc.), short meetings, or events. When communicating with non-experts, do not overwhelm them with advanced and complex information.<sup>2</sup> Instead demonstrate the benefits of biodiversity as they relate to city assets, functions, and livelihood. Provide diagrams, stories and easy to follow models to reduce complexity (see Exhibit 38 for examples).<sup>3</sup>



## Exhibit 38: Communicating the Benefits of Biodiversity



Biodiversity can be integrated into municipal operations. For example, creating bio-retention areas in flood or runoff prone locations helps improve stormwater management. Thereby decreasing damage to lands, and improving water quality in receiving waterways, while also serving to beautify a community and increase biodiversity.



Integrate biodiversity into urban infrastructure to increase and promote community health and recreation opportunities. Trees provide shade on sidewalks and bike paths on hot summer days. Also, street vegetation can serve to beautify a city and separate bikers from vehicles.



Local communities are increasingly recognizing opportunities for neighbourhood gardens to feed, educate and raise awareness of environmental and sustainability issues.



Core areas and ecosystems support and protect a variety of land and species. Healthy core areas will promote biodiversity conservation, which in turn will improve air and water quality to the surrounding matrix.

### Support Strategies

Support strategies will take the approved BAP and follow through on its actions. They will require the Team to develop content and communicate with a range of stakeholders. Support strategies, unlike delivery strategies, will have a variety of outcomes (education, information, motivation). Although, the underlying outcome of support strategies is to get the BAP and actions 'moving,' other implementation activities such as training, and education will help facilitate implementation.

### Training

Training staff is a significant task for implementation, monitoring, and long-term integration of the BAP. Cost and time required to train staff should have been considered and scoped as part of the actions developed in Milestone Three. If not, ensure that you consider them now in order to update the implementation schedule. Assessing staff capacity could also be a cost to factor into training and staff development. Additionally,

new hires and external consultants should be included into budgetary assessments.

The purpose of training is to educate and introduce employees to new practices and municipal goals. The information delivered will vary based on the group and their role in fulfilling an objective and completing an action.<sup>4</sup> In addition to tailoring training to fit specific employee functions, attempt to foster employee and management collaboration along with participatory training methods in order to maximize the uptake of information.<sup>5</sup> Furthermore, the training tools (training software, presentations, videos, written documents, etc.) you use to deliver information, may impact the effectiveness of training and information retention.<sup>6</sup> A core set of information should be delivered to each group, such as the benefits of biodiversity conservation and impacts to the municipality. Other unique items to deliver to specific groups may range from new operating procedures and practices, new technologies, etc.

## CASE STUDY

## RAIN BARREL PILOT PROGRAM IN NORTH HURON

The Insurance Bureau of Canada piloted a study to determine the effectiveness of downspout disconnection and rain barrel harvesting in order to conserve water, reduce pollution and most importantly, decrease water inflow to water treatment plants during extreme precipitation events. The pilot was conducted in the community of Wingham, ON, located in the municipality of North Huron. Wingham was an ideal location because the municipality Wingham was not going to upgrade existing stormwater infrastructure, thus downspout disconnection was the only measure used to alleviate stress.







# TORONTO AND REGION CONSERVATION AUTHORITY (TRCA) - HIGHLAND CREEK WATERSHED NEIGHBOURHOOD GREENING PROJECT

## CASE STUDY

From 2010 to 2012, TRCA, in partnership with the City of Toronto and local community organizations, coordinated the Highland Creek Watershed Neighbourhood Greening Project. This project focused on identifying opportunities to improve water quality, biodiversity and sustainability within three neighbourhoods in close proximity to parks in the watershed. A series of workshops were led to

gather input from watershed residents on ways to green their neighbourhoods and the Highland Creek Watershed Neighbourhood Greening Plans were produced. These plans now provide direction for the projects and events undertaken by TRCA staff and the Highland Creek Green Team.

In addition, the training delivery mechanisms should be tailored based on the group of interest (e.g. gardening technician vs. waste operations manager).

### *Pilot Studies*

One strategy for implementation is using small scale test sites or programs before deploying the action on a larger scale.<sup>7</sup> The goal of a pilot study is to assess the potential success of the program and to provide cost estimates for large scale delivery. Pilot studies provide information that should be analyzed to adjust and improve plan actions and delivery. Pilot studies are an opportunity to engage in projects when limited knowledge or experience exists.

### *External Communication*

Connecting with community stakeholders is important when developing both a needs assessment and a BAP. Depending on the type of plan, public stakeholders are important for adopting and sustaining participation in a plan or program.<sup>8</sup> Thus, engaging stakeholders in

the implementation stage will educate and prepare them for the biodiversity path that their community is embarking on. Public stakeholders will require an introduction to biodiversity conservation planning and management, along with an explanation as to how it impacts their community, the potential benefits, and the current path the municipality is taking. Similar to communicating with internal non-experts, presentations should not overwhelm community stakeholders. Effective communication contributes to the dissemination of the BAP and other future biodiversity goals. Furthermore, communicating with community stakeholders may contribute to the development of a volunteer network, which may be valuable for future biodiversity endeavours or monitoring activities. Community participation is not a means to an end to simply satisfy objectives,<sup>9</sup> it serves to facilitate opportunity, learning, and discussion necessary for long-term success. Consider utilizing your network of external stakeholders scoped in Milestone One.

These groups or organizations can be valuable partners that may share their resources to promote, educate, and motivate the community on biodiversity.

### Marketing

Appealing to the public for buy-in and behavioural changes will have to go beyond community engagement. It may require creative marketing strategies to sell them on benefits and opportunities available. Social marketing uses traditional marketing techniques to persuade the public to engage in an activity for the benefit of health, well-being, and environmental protection.<sup>10</sup> Unlike traditional marketing, social marketing does not sell a tangible product instead, social marketing focuses on “non-tangible products-ideas, attitudes, and lifestyle change.”<sup>11</sup> Motivating lifestyle or attitude change through information alone is not effective, because it does not identify barriers to act.<sup>12</sup> For example, community-based social marketing (CBSM)

attempts to identify barriers that prevent the adoption of an idea, then motivates change through communication, practices and incentives. The topics relevant to biodiversity marketing campaigns will target specific community outcomes (e.g. downspout disconnection to reduce water pollution). It is always critical to communicate the benefits obtained by the public (e.g. reduced water pollution provides cleaner water for recreation). Connecting ideas to practical applications around the home or business may require creative awareness raising, whether it is through the development of pamphlets, videos providing directions (e.g. building a small home garden), etc. Consider using social media as another medium to market ideas and best practices to your community.

## CASE STUDY

## ENGAGING EXTERNAL PARTNERS FOR ACTION IMPLEMENTATION

The 2005 Ontario Biodiversity Strategy created the Ontario Biodiversity Council to guide the implementation of Ontario's biodiversity goals and actions and report to the public on its progress. Utilizing a network of partners to fulfill various biodiversity actions, the partners collectively assist to improve knowledge, connect with the community and facilitate education and awareness.



CONSIDER THIS

# MAKING BIODIVERSITY FUN WITH GAMIFICATION

A growing trend within the gaming industry has been the emergence of “serious games” that address real world problems.<sup>13</sup> ‘Gamification’ is the concept of taking the ideas behind good game design and games mechanics and applying them to non-gaming environments or the real world. The concept is being used for training, education and behavioral change in order to engage people, motivate action, promote learning, solve problems, and elicit tangible outcomes.

Gamification can be a powerful tool for sustainability, and this approach can be used as a catalyst or foundation through which complicated environmental issues can be communicated. In light of the issues faced by municipalities in engaging communities on biodiversity (i.e. limited understanding, low-uptake, limited sense of need, low sense of urgency), gamification can be used to leverage an individuals or community involvement.

Many biodiversity conservation goals seek to change attitudes and behaviours towards nature and ecosystem services. During consultation, games can be used to draw-in participants and as a tool to present the information in an engaging way.


Example: *Downspouts and Ladders*

This game is a modification of the widely known board game, Snakes and Ladders™.

It was developed by ICLEI Canada (sponsored by The Co-operators) as an ice-breaker at workshops or other events in order to tap into local knowledge. Although related to resilience and adaptation the game gets participants to interact with one another while at the same time exposing them to information on the topic being introduced and discussed.







## CASE STUDY

# HOME LANDSCAPING AND GARDENING - REGION OF PEEL AND CITY OF BRANTFORD

The Region of Peel, City of Brantford, and Halton Region provide residents with tips on a variety of gardening methods to save water, while also beautifying properties. In order to encourage resident participation, the Region of Peel provides free home consultations and public workshops, along with decision support tools, to help design a garden and develop cost estimates. The City of

Brantford similarly provides several gardening seminars in the spring, along with a demonstration garden to educate participants. Further, Brantford offers participants an opportunity to receive recognition and a cash reward for well-designed gardens.

The mechanism to market the plan will have time commitments and costs, therefore, it may be wise to incorporate marketing strategies into previously planned actions where funding has already been allocated. For example, use community events to fulfill education and awareness objectives, but also attempt to integrate marketing campaigns at the events. For example, an event may be targeted at developing home gardens, but may also serve as an opportunity to introduce rain barrels to the community.

## WHERE SHOULD YOU BE NOW?

At this point your community is prepared to implement the BAP and the associated actions. In this Milestone you were guided through developing an implementation portfolio, which should include internal and external communications strategies, and other strategies to deploy actions. The portfolio should be diverse, and should provide your Team with confidence to approach council. The process needed to arrive at this point may have taken several months. Successful implementation will require time, persistence, and patience.





## ENDNOTES

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— MILESTONE FIVE

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# MONITOR AND REVIEW







## MILESTONE FIVE: MONITOR AND REVIEW

The final Milestone serves to review implemented actions and determine whether the previously identified goals and objectives are being achieved. This Milestone will identify problems related to implementation and follow through on actions while providing an opportunity to develop solutions to barriers. The achievements realized so far should be celebrated and communicated within and outside the municipality to demonstrate how the community has positively contributed to biodiversity management.

In Milestone Four, you finalized your actions, ranked them, and identified relevant implementation tools to communicate with council, city staff, and your community. So, has the Plan, along with its implementation led to the desired outcomes?

Monitoring and review are separate processes that should be completed together as they provide the Team with an opportunity to assess the fulfillment of goals, objectives, and actions. Celebrating successes is important, but identifying failures and missed opportunities will truly demonstrate a commitment to integrating

biodiversity into the community. Monitoring and review are an effective tool for demonstrating accountability and transparency in the biodiversity planning and management process. The Team and community have spent significant money and time developing the BAP. Therefore, it is in your best interest to monitor actions and review the BAP to identify points for future actions.

### *How Often Should You Monitor and Review?*

Biodiversity is comprised of different processes and activities, making it difficult to prescribe a period for re-assessment. Furthermore, the process of monitor and review can be seen as on-going, as the time to monitor, analyze data, review the BAP, examine actions, identify new information, and integrate new information into the program are all connected to each other, with each stage dependent upon the previous stage. Exhibit 39 presents the steps for monitoring and reviewing the BAP and actions.



**Monitor:** the ongoing process by which stakeholders obtain regular feedback on the progress being made towards achieving their goals and objectives.<sup>1</sup>

**Review:** is periodic or ad hoc, often light assessments of the performance of an initiative and often conducted by those internal to the subject or the commissioning organization.<sup>2</sup>



### PURPOSE

To determine the success in achieving goals, and objectives, as well as progress in completing actions, scoped in Milestone Three.

### OUTPUTS

- ✓ Identify new information
- ✓ Assess progress on implementation
- ✓ Determine effectiveness of actions
- ✓ Update action plan
- ✓ Communicate achievements

## Exhibit 39: Monitoring and Review Cycle

[ MONITOR ]	Phase	Activity
	Collect	<ul style="list-style-type: none"> <li>Collect data related to actions and indicators. Include actions (in a separate list) which were not implemented previously.</li> </ul>
[ REVIEW ]	Assess	<ul style="list-style-type: none"> <li>Verify data and measure against baseline data.</li> <li>Determine if targets have been achieved.</li> <li>Determine actions that achieved biodiversity conservation improvements.</li> <li>Determine actions that provided marginal biodiversity conservation gains.</li> <li>Determine actions which have NOT provided biodiversity conservation gains.</li> </ul>
	Analyze	<ul style="list-style-type: none"> <li>Review the BAP, and analyze new data and actions for success and failure. How can actions be improved to meet objectives? Has biodiversity improved? Did we meet our goals and objectives?</li> </ul>
	Research	<ul style="list-style-type: none"> <li>Research new scientific, political, social, and economic information. Consider actions which are currently implemented, and also think of actions which were not implemented previously.</li> </ul>
	Update	<ul style="list-style-type: none"> <li>New information should be integrated into the BAP and your program to improve actions, implementation and program delivery.</li> </ul>
	Deliver	<ul style="list-style-type: none"> <li>Deliver your monitor and review report, as well as other materials to highlight progress, new information, and future objectives.</li> </ul>



## MONITOR AND REVIEW

Monitoring is a process of gathering data to determine if the BAP objectives and goals are being met through the implementation or completion of actions. The required data is determined by the indicators developed in Milestone Three. The indicators can provide feedback on the action, and when compared against baseline data, a determination can be made of positive or negative outcomes. Depending on the action, issues such as the timeframe to monitor, the stakeholders to include, the timeframe to completion, etc., can be assessed and adjusted in the review phase.

Monitoring, like many activities presented in this Handbook can be done internally. However, your Team can identify opportunities to include the community and other stakeholders in the process. In Milestone Two, strategies to include your community in the assessment process were introduced. One of the methods was Citizen Science (and BioBlitz), which engages non-experts to perform monitoring activities like an expert. The monitor and review phase presents a valuable opportunity to use external stakeholders as potential advisors for long and short-term data collection.

Reviewing, on the other hand, examines the BAP (and to some extent all the Milestones of this Handbook) and attempts to adjust the BAP, improve actions, and solve short-term problems. Since monitoring provided the necessary information to compare against your baseline data, and a determination was made as to whether you are meeting your objectives and goals, you should review ways to improve weak actions, or to build stronger actions. Review will include: identifying short-comings of the BAP and planning process, providing new scientific and non-scientific information, and filling data gaps.

Together, monitor and review are useful tools to assess, measure, and track progress and success. Both activities can be completed in-house, as clear direction and indicators were developed in earlier Milestones. Now, it is simply a matter of determining whether you are headed in the right direction in terms of meeting goals and objectives. Furthermore, review should provide direction to improve actions, develop new actions where appropriate, and improve program delivery. Both activities can be done separately, but are truly beneficial when completed together. It may be possible to review current scientific information, but the breadth of information to scan without adequate knowledge of the relevant information to gather would result in your Team scanning a variety of documents aimlessly. Thus, monitoring, collecting and organizing data, will allow you to focus your review activities to maximize time and knowledge acquisition. On the other hand, simply monitoring and building a database without analysis will not yield meaningful or digestible information for future decision making. Monitoring while providing sufficient datasets should be followed by a period of data analysis and BAP improvement.

## Tracking Progress

Tracking progress is necessary to ensure that work is proceeding as set out in the BAP. The previously developed goals and objectives represent the improvements your community needed to make, and the actions were the tools to achieve or satisfy the goals and objectives. Indicators, and in some cases targets, were developed to measure against a baseline to determine the change in variables or achievement of an objective. The indicators (and targets) will be the primary tool in understanding where your community currently stands with regard to your biodiversity vision, goals, objectives, and actions.

In addition to tracking progress made on actions (i.e. how actions have achieved their intended outcomes) it is also important to assess the progress on the implementation of actions (i.e. are actions in place as intended in the implementation schedule?). As mentioned earlier, some actions may have long-term timelines for monitoring and some actions may have been assigned for future implementation. Review these actions to determine if their timeframes have changed or if other factors have made certain actions more favourable for

implementation (i.e. have political, economic, or social conditions made this action more attractive for implementation?). Exhibit 40 provides some examples of questions you can ask for tracking implementation and progress. When using Exhibit 40, be aware that this is not an exhaustive list, and some questions may be applicable in both columns.

## Exhibit 40: Questions for Tracking Implementation and Action Progress

Process of Implementation: are actions being implemented according to the BAP implementation schedule?	Progress on Outcomes: are actions (collectively and individually) meeting their intended results?
<ul style="list-style-type: none"> <li>• How many actions have not been implemented?</li> <li>• Which departments have implemented the most/fewest actions?</li> <li>• How many departments and staff have been involved in implementing actions?</li> <li>• How have you engaged all stakeholders in the development and implementation of the BAP?</li> <li>• What role has the community played in decision-making and planning?</li> <li>• How much support exists from your council, community and other stakeholders for continued biodiversity action?</li> <li>• How have drivers and constraints changed? Are new opportunities available which may aid implementation of previously omitted actions?</li> </ul>	<ul style="list-style-type: none"> <li>• Based on your indicators, targets and baselines, how have conditions in your community changed?</li> <li>• How effective have the actions been in achieving the vision, goals and objectives established in your BAP?</li> <li>• Is biodiversity management part of larger planning decisions?</li> <li>• Which departments currently include biodiversity as part of their planning decisions?</li> <li>• Has awareness about biodiversity and its role in providing direct and indirect benefits to your community increased?</li> <li>• How has internal capacity and capability of biodiversity planning improved?</li> <li>• Is biodiversity information being considered in new planning decisions?</li> <li>• To what extent has internal knowledge increased concerning biodiversity and its connectivity to other departments?</li> <li>• How has biodiversity improved in your community?</li> </ul>





## Assessing New Information

Natural systems are complex and dynamic, and new information is frequently developed that furthers our knowledge on conserving biodiversity. In addition, your community is constantly changing as a result of internal and external socio-economic influences. These changes should prompt an examination of how your BAP can be improved to capitalize on new information. For example, changes in community perception may provide an opportunity to implement new actions or changes in political goals at different levels of government may impact the delivery of your BAP. When assessing new information consider biodiversity and non-biodiversity related issues. Use these questions as a starting point to guide your thinking about information to collect:

- Has political leadership changed or have political shifts occurred since the implementation of the BAP?
- Has there been a shift in public opinion that may contribute to a shift in priorities?
- How have local and provincial economic conditions changed (i.e. budgetary cuts, increase/decrease of third-party funding, etc.)?
- What socio-economic factors have changed (i.e. unemployment, increase/decrease in environmental concern, etc.)?
- Have your geographic or management focus areas changed?
- Has new scientific information emerged that is of value to your BAP actions and action implementation?

Assessing new information will allow you to look at specific components of the BAP such as: geographic area, management area, biodiversity planning and management approach (social and ecological network, ecological network, and ecosystem services), action streams, etc. However, you should not spend a great deal of

time making long-term decisions to alter these components. Instead, you should attempt to address short-term issues that are urgent and require immediate attention to remedy. For example, if you have recognized a change in political attitudes and a reluctance to develop new biodiversity policy, you should move actions that focus on policy development down the list of priority actions (do not eliminate them), and focus on actions favourable for implementation. The following questions will aid in determining how to improve actions and the BAP:

- **What non-biodiversity (economic, political or societal) related concerns were important in the development of the BAP? Have any changes to these considerations occurred that may affect the successful implementation of BAP actions? What are other communities doing that may be replicated in your community?** Consider changes in internal and external funding, political support, and public perception. How will these changes, impact the continued delivery and advancement of the BAP, and how can you take advantage of opportunities in the short-term?
- **Has new scientific information emerged to alter the understanding of your community's biodiversity opportunities?**<sup>3</sup> Biodiversity and scientific information is constantly being revised and updated. You must keep up with the information and case studies, as they will help your biodiversity program. Keeping the BAP and related actions updated is a challenge. This may be an opportunity to engage university stakeholders to act as partners in this activity.
- **Are vision, goals, and objectives still relevant to the information and data collected in this Milestone?**<sup>4</sup> **How should they change?** New information and data may alter the path you are taking. The

vision, goals, and objectives developed in Milestone Three may have to be adjusted to fit with current information.

- **Have you collected enough information about the progress on actions?**<sup>5</sup> The program you have undertaken may reveal that your actions are having the intended consequences. Other actions may work so well that further funding or additional measures must be implemented to ensure continued success. On the other hand programs may fail to achieve any meaningful results, and they may have to be removed or revised.

### Updating the Plan

Having tracked progress and assessed new information, it is time to update your BAP. In the previous sections of this Milestone, the Team scoped drivers and constraints to maintain movement, and identified new opportunities. Updating your BAP and related actions act to re-calibrate your municipality's

biodiversity focus. Moreover, it is a process that will keep the BAP relevant, as it relates to biodiversity information and your community's non-biodiversity considerations.

Updating your plan does not mean you are creating a new BAP. The BAP will continue to serve the original timeframe originally developed in Milestone Three. Updating your BAP may require slight adjustments to actions, such as timeframe, completion year, or increase/decrease in staff oversight. It may include altering a goal or objective to be more realistic to current non-biodiversity related factors. It may also require adjusting components such as management focus areas, or identifying new partners and funding opportunities. As well, updating the BAP may require a revised implementation list to be presented to council. In addition to updating your BAP, take time to review and update components from other Milestones. However, Milestones One, Two and Four, will not require the same rigorous of review as Milestone Three.

### Exhibit 40: Sample Milestone Updates

Milestone	Areas of Update
One	<ul style="list-style-type: none"> <li>• Biodiversity Team members</li> <li>• External committee</li> <li>• Biodiversity champion</li> </ul>
Two	<ul style="list-style-type: none"> <li>• Monitoring approach</li> <li>• Data collection techniques</li> <li>• Community utilization</li> </ul>
Three	All sections
Four	<ul style="list-style-type: none"> <li>• New implementation opportunities</li> <li>• Implementation tools</li> </ul>
Five	<ul style="list-style-type: none"> <li>• Tracking progress</li> <li>• Communication strategies</li> </ul>

When updating your BAP and reviewing other Milestones, remember to address issues or concerns relevant to the short-term decision-making of your municipality. This means that updates or adjustments must conform to the budgetary and political realities of your municipality. Furthermore, with new information obtained, attempt not only to update your BAP and Milestones, but also to integrate this information into other policies and plans which may be missing biodiversity management opportunities.

### Communicating Results

The fulfillment of actions, achievement of objectives, and success of implementation are accomplishments your Biodiversity Team should communicate both internally to council and staff, and externally to stakeholders, community, members, and other municipalities.



Communicating accomplishments is an important strategy maintaining momentum for future implementation, and for gaining support for the BAP and your biodiversity program.

Keep in mind that your communication strategy is intended to reach a wide audience and many may be unfamiliar with biodiversity conservation. Similar to your implementation strategy in Milestone Four, employ creative communications techniques that demonstrate the benefits of successful actions or achievements. Use a combination of strategies to deliver the message, including traditional communication strategies such as community event, press release, issue briefs and non-traditional social media platforms, street art, etc.

When communicating the success of the BAP, actions, and other achievements some communication strategies are more beneficial than others. Consider the following questions which pertain to what you may want to communicate:

- What specific information from the BAP

needs to be communicated to a particular audience?

- What was the objective of the BAP?
- What groups would be interested in the information? How would this information benefit them?
- What communication tools from Milestone Four can be utilized for this communications strategy?
- What is your timeframe for communications delivery?
- What financial and human resources do you have available?

### WHERE SHOULD YOU BE NOW?

At this point you have completed the final Milestone of the Handbook process and your community has improved its biodiversity. However, biodiversity planning is a process of constant revision, and should be used to keep your BAP and biodiversity program current and relevant to your community's needs.

## Exhibit 42: Examples of Communication Strategies

	Example	Pros	Cons
<b>Community event</b>	<ul style="list-style-type: none"><li>• Launch event</li><li>• Biodiversity week</li></ul>	<ul style="list-style-type: none"><li>• High profile</li><li>• Provides opportunity for community involvement</li></ul>	<ul style="list-style-type: none"><li>• Costly</li><li>• Time consuming</li><li>• May not reach large number of people</li></ul>
<b>Press release</b>	<ul style="list-style-type: none"><li>• Website press release</li><li>• Announcement in local newspaper</li><li>• Newsletter</li></ul>	<ul style="list-style-type: none"><li>• Wide reach</li><li>• Low cost for online release</li><li>• Quick to produce</li></ul>	<ul style="list-style-type: none"><li>• May not be read</li><li>• Low profile</li><li>• Lacks significant detail</li></ul>
<b>Issue brief</b>	<ul style="list-style-type: none"><li>• Internal memo</li><li>• Policy brief</li></ul>	<ul style="list-style-type: none"><li>• Low cost</li><li>• Reaches all departments</li><li>• Could create new partnerships</li></ul>	<ul style="list-style-type: none"><li>• Reaches small audience</li><li>• May not convey scope and breadth of BAP success</li></ul>
<b>Reporting</b>	<ul style="list-style-type: none"><li>• Progress Reports</li></ul>	<ul style="list-style-type: none"><li>• Minimal cost</li><li>• Demonstrates progress and accountability</li></ul>	<ul style="list-style-type: none"><li>• Reaches small audience</li><li>• May only appeal to experts</li></ul>
<b>Social media</b>	<ul style="list-style-type: none"><li>• Twitter</li><li>• Facebook</li></ul>	<ul style="list-style-type: none"><li>• May connect with different demographics</li><li>• Low cost</li></ul>	<ul style="list-style-type: none"><li>• Inability to fully communicate success</li><li>• Unconventional</li></ul>



# CASE STUDY

## INFORMATION DELIVERY - CITY OF SURREY'S SUSTAINABILITY DASHBOARD

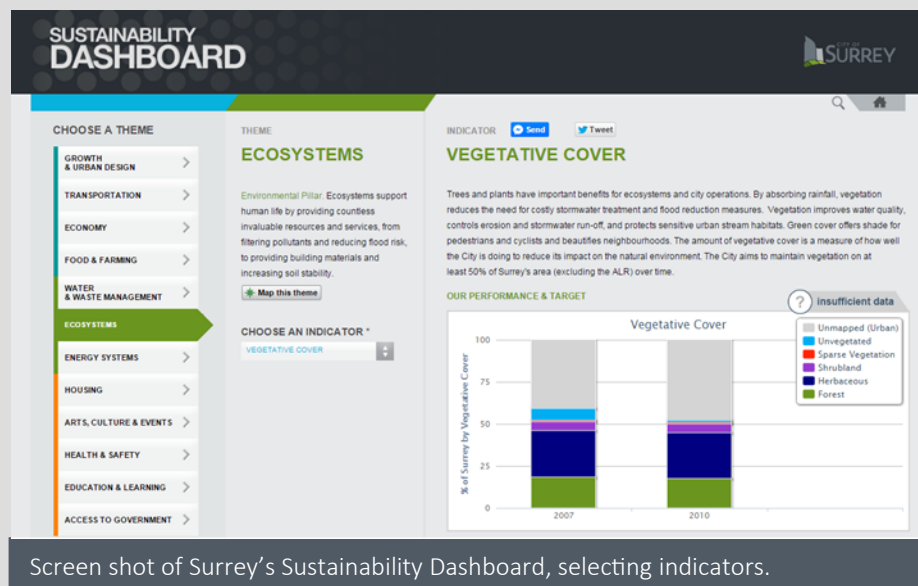
The City of Surrey is proactive and innovative with regard to community sustainability. The City uses creative methods to inform its community of its sustainability progress, and this provides other communities, with an opportunity to borrow and re-shape ideas to fit their sustainability and biodiversity programs.

In 2008, Surrey developed its *Sustainability Charter*, which continues as their long-term plan to improve economic, environmental, and socio-cultural conditions. *The Charter* addresses basic principles of sustainability, community perceptions of sustainability and issues, connecting sustainability considerations to Surrey, finalizing goals, and forming an implementation strategy.

Beyond the traditional reporting on the achievement of indicators in their *Annual Sustainability Charter Report*, the City developed an online *Sustainability Dashboard*. Visitors to the *Dashboard's* website, are able to view charts, graphs, and maps of sustainability progress with specific indicators. The indicators address municipal issues, such as transportation, health & safety, growth & urban

systems, and ecosystems to name a few. The image below is a screen capture of the *Dashboard*. On the left hand of the screen, users can select a "theme." The theme selected in Exhibit 43 is "Ecosystems," and the indicator selected in the "Choose an Indicator" drop down menu is "Vegetative Cover."

In addition to the *Dashboard* Surrey keeps residents updated to the latest sustainability news, by offering residents an opportunity to register for their E-newsletter, found on their sustainability website. The newsletter provides information about the City's sustainability efforts and community news. These efforts clearly demonstrates the collective action Surrey has taken to confront sustainability issues, and produce a long-term and comprehensive plan. Moreover, the methods used to monitor progress and disseminate findings using different online platforms demonstrate Surrey's creativity in maintaining information flow outward to the community.









### ENDNOTES

1. United Nations Development Programme. (2009). Handbook on planning, monitoring and evaluating for development results. p. 8. Retrieved: 2015-03-03. <http://web.undp.org/evaluation/handbook/documents/english/pme-handbook.pdf>
2. Ibid, 9
3. Snover, A.K., et al. (2007). Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments. In association with and published by ICLEI – Local Governments for Sustainability, Oakland, CA. p. 117. Retrieved: 2015-03-20. <http://www.icleiusa.org/action-center/planning/adaptation-guidebook>
4. Ibid, p. 118.
5. Ibid





## Conclusion

Biodiversity is an integral part of ecological, economic, and social resilience and sustainability. The variety of living organisms in a community provide services such as flood management, pollutant absorption, heat mitigation, and food production. Identification, management, and promotion of biodiversity assets will enhance municipal operations, community livability, and economic development. Missed opportunities to protect, promote and enhance biodiversity will decrease community resilience and increase societal risk by increasing vulnerabilities to human health, the environment, and economy.

It is clear that biodiversity contributes to community functionality and livability by providing the resources necessary for economic growth and social well-being. Biodiversity faces challenges to thrive in Canadian communities, and as a result, biodiversity conservation must be integrated into routine municipal planning, and management operations for the maximum realization of benefits. Furthermore, municipalities, through planning and management, must identify the variables of biodiversity loss, reduce impacts of those variables, and promote biodiversity to maximize sustainable use of natural resources.

This Handbook is a valuable tool to initiate biodiversity planning and management for all Canadian municipalities. Biodiversity conservation is unique to each community and requires planning and management tools specific to a community by the multiple voices and perspectives of that community. This Handbook process must be downscaled to fit the issues of concern to those in the community. Ideally, integrating current biodiversity projects, plans, programs, and policies into other departments is part of a comprehensive approach that focuses your BAP to the unique characteristics of your municipality.

This Handbook provided a framework for communities to develop a biodiversity action plan (BAP). The process was aimed at internal municipal staff, yet, throughout the process, the team was required to ask external stakeholders to contribute their knowledge and experiences. The purpose of stakeholder participation is to create a truly community based plan that benefits those who will interact with biodiversity regularly. The Biodiversity Team (and stakeholders) worked through five Milestones, which systematically acquired, applied, and refined information with the goal of improving community biodiversity.





This Handbook has provided your community with many tangible benefits which complement the development of the BAP. Firstly, the Handbook process developed a Team of biodiversity experts and enthusiasts who have laid the groundwork for your community's biodiversity legacy, and contributed to sustainability and resilience planning. Secondly, the development of the biodiversity assessment has provided an inventory of your biodiversity assets, which will serve short-term planning activities. Thirdly, the BAP is your long-term guide for biodiversity management in the community. It is a reference in the near-term and long-term to understand what your community wanted to achieve, the tools to achieve goals and objectives, and the intended results. Fourth, the implementation of your BAP and actions has made decision-makers committed and responsible to long-term biodiversity conservation efforts. Finally, this process has introduced a level of transparency and accountability through monitoring and review. Monitoring and review required your Team to determine the accomplishments and failures of the BAP. Further, the BAP was reviewed and improved to fit current political, social, economic, and scientific conditions and information. In addition, your Team communicated the successes, failures, and future opportunities to show your community that long-term biodiversity management is important to municipal council.

The BAP and actions implemented through it have increased community biodiversity conservation through improved planning and management strategies; thereby, increasing sustainability, resiliency and accessibility. The process, however, is not complete as there are opportunities to further enhance, promote, and integrate biodiversity into your community's political, social, and economic activities. Biodiversity considerations must become part of all municipality operations and departments to ensure commitment to biodiversity conservation and environmental protection.

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## ADVISORY COMMITTEE

Sue Arndt, Evergreen

Lynn Campbell, British Columbia

Todd Cashin, City of Kelowna

Meaghan Eastwood, Toronto and Region  
Conservation Authority

Stephen Godwin, City of Surrey

Tony Iacobelli, City of Vaughan

Pierre Jutras, McGill University

Markus Kischnick, City of Surrey

Joëlle Roy LeFrançois, Ville de Montréal

Shela Patrickson, ICLEI Cities Biodiversity Center

Grant Pearsell, City of Edmonton

Rebecca Zeran, Ontario Ministry of Natural Resources  
and Forestry

## AUTHORS

Aravind Kundurpi, ICLEI Canada

Nicole Marzok, ICLEI Canada

## EDITORS

Leya Barry, ICLEI Canada

Michael Dean, ICLEI Canada

Ewa Jackson, ICLEI Canada

Hana Lapp, ICLEI Canada

Megan Meaney, ICLEI Canada

## DESIGN AND LAYOUT

Leya Barry, ICLEI Canada



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**ICLEI Canada**

204 — 401 Richmond Street West  
Toronto, Ontario M5V 3A8

T: 647.728.4308

F: 416.642.0954

E: [iclei-canada@iclei.org](mailto:iclei-canada@iclei.org)

[www.iclei.org/canada](http://www.iclei.org/canada)