

Riparian Strategy: Sustaining Healthy Rivers and Communities

calgary.ca | contact 311



Protecting what's precious. Land. Air. Water.

Onward/ We are committed to protecting our rivers.



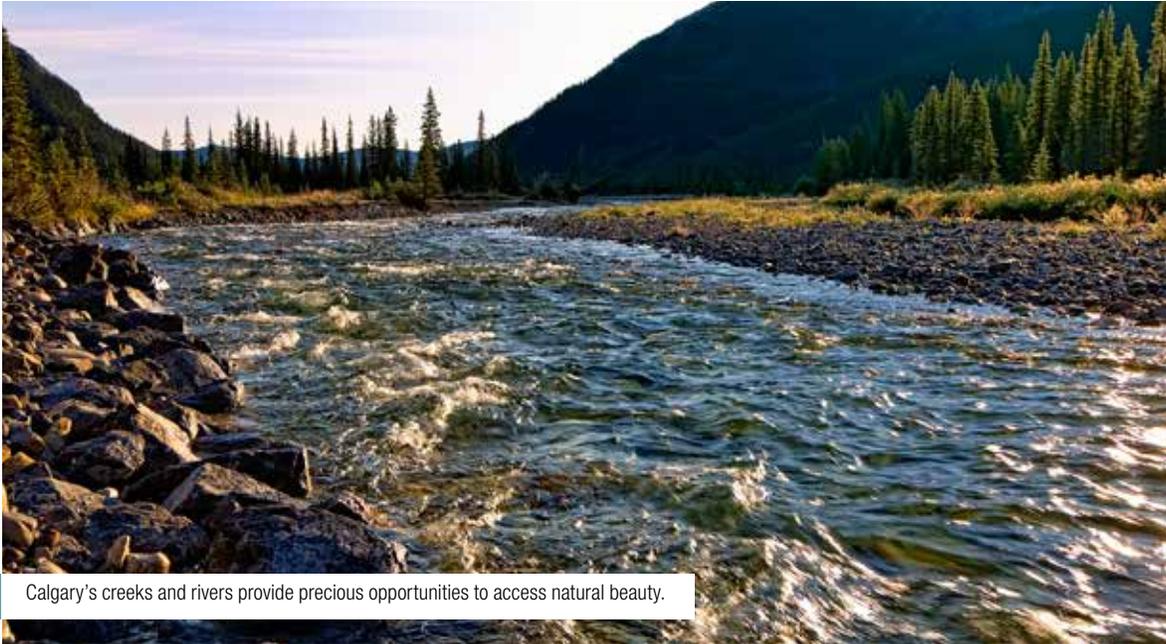
THE CITY OF
CALGARY

TABLE OF CONTENTS

Introduction	1
Valuing what we depend on	1
Building on a strong foundation	2
It takes a community	2
Principles shaping riparian protection	2
Purpose and scope of this strategy	3
Vision, goals and strategies	5
Cornerstone one: Protecting riparian health	7
Cornerstone two: Connecting Calgarians	8
Cornerstone three: Recognizing value	10
Cornerstone four: Aligning activities	11
Monitoring	12
Adaptive management	12
Calgary's riparian areas	13
What are riparian areas?	15
An ecological definition	16
Importance, function and services of riparian ecosystems	17
Riparian health in Calgary	18
Building a plan	19
Overview of activities	19
Existing activities (ongoing)	20
Riparian Framework	21
Collaboration and engagement	23
Overview	23
Stakeholder engagement framework	24
Glossary	26
Appendix One: Legislation, policy and plans pertaining to riparian areas	28
Appendix Two: Riparian health inventory methodology	35
References	37



A healthy river depends on healthy riverbanks.



Calgary's creeks and rivers provide precious opportunities to access natural beauty.

Valuing what we depend on

Calgary's creeks and rivers are a defining feature of our city's character; they provide a sense of place and precious opportunities to access natural beauty within our urban environment. But they do much more than that. The banks and areas beside our rivers are an integral part of a healthy watershed. They provide a variety of benefits for all Calgarians, and it is important to understand and appreciate their values and functions.

The unique nature of riparian ecosystems is largely defined by the complex interactions that happen when land meets water. Higher-than-normal levels of nutrient exchange give rise to rich soils that store water and support a lush diversity of plant and animal life. It is this natural diversity that supports the many ecological, social and economic benefits of riparian areas that we have come to depend on.

While riparian areas naturally change over time, what we do in them and in the surrounding watersheds can speed up many of those changes. Sometimes the speed and degree of change is greater than the natural resiliency and healing rate of riparian areas. Development can cause streams to erode their banks more quickly, flooding may fluctuate more and productive areas may dry up.

The banks and areas beside our rivers are an integral part of a healthy watershed.

Over the past decades, our land-and water-management choices have impaired the critical functions of some riparian areas in the city. Increasingly, municipalities are recognizing the values and benefits of these areas, and are making efforts to incorporate, integrate and restore them within an urban context.





Riparian areas are places where land meets water.

Building on a strong foundation

The ecological boundaries of riparian areas are not the same as our municipal boundaries, and as such, our planning cannot be conducted in isolation. In order to achieve our goals, we must align with other regions so that our actions reinforce each other at various scales on the landscape. With this in mind, the Riparian Strategy has been built from a watershed-planning perspective. It flows from the provincial *Water for Life* strategy and aligns with collective efforts within the region and Bow River Basin. It builds on those existing municipal policy and plans that apply to riparian areas, and identifies focused goals and strategies for greatest impact.

It takes a community

But The City of Calgary cannot do this alone. While a watershed-planning approach helps to achieve a shared vision for riparian management, strategic partnerships within the community will be essential to translating ideas into action and realizing riparian protection and restoration success.

Principles shaping riparian protection

Against this backdrop, the following principles will guide riparian protection in Calgary:

Recognize the value of riparian ecosystems in decision-making.

Riparian areas deliver environmental, social and economic benefits and provide ecosystem services that minimize the need for human interventions, investment and engineered infrastructure over time.

Use an integrated systems approach to management and monitoring.

Integrated watershed management helps retain and enhance natural riparian ecosystem features, while adaptive management enables continual improvement, accountability and transparency and accounts for the dynamic nature of these areas.

Support current riparian work and build capacity where needed.

Aligning our planning and programs throughout the region reinforces actions at various scales on the landscape. This Strategy supports other guiding policies, plans and programs and aims to build capacity where needed.



The Bow supports life in many forms.

Photo credit: S.Ryan/Calgary River Valleys

The Riparian Strategy provides strategic direction to the protection, restoration and management of riparian areas.

Use a high level of collaboration and engagement.

Community, stakeholder and partner engagement results in better transparency, decision-making and programming, while collaboration supports community empowerment and stewardship.

Use knowledge and research to underpin activities and decisions. Improving scientific understanding and filling knowledge gaps will support effective policy and management decisions.

Purpose and scope of this strategy

The Riparian Strategy provides strategic direction to the protection, restoration and management of riparian areas within Calgary's watersheds. It flows from existing mandates and will coordinate ongoing programs and policies while also providing more focus and refinement and creating a platform for broader engagement.

The Riparian Strategy defines a vision, goals and strategies. Future work will involve the development of indicators and targets in consultation with watershed partners and key stakeholders and the development of an implementation plan. While a number of key components have been outlined in this document, the implementation plan will identify specific programs, actions, priorities, timelines and resources needed to implement the Strategy.

All planning has been, and will be, conducted in collaboration with internal and external stakeholders.

Foundation and mandate for riparian protection

Our best bet for achieving our goals is to align our planning with that of other regions so that everyone's actions reinforce each other at various scales on the landscape. With this in mind, the Riparian Strategy has been built from a watershed-planning perspective. Figure 1 demonstrates its alignment with other regions and levels of government.

Provincial strategies, such as *Water for Life*, set out high-level direction for the management and maintenance of healthy aquatic ecosystems and safe drinking water.

Regional and sub-regional plans, such as the South Saskatchewan Regional Plan and Calgary Metropolitan Plan (CMP), direct land use and development within our regional watersheds. To date, The City of Calgary has collaborated to develop and endorse plans for the Bow River, Elbow River and Nose Creek watersheds.

The Municipal Development Plan (MDP) and other City planning documents provide specific goals and objectives for water and land use management within Calgary, and reinforce the actions and planning at various scales on the landscape.

Appendix One contains an overview of federal, provincial, regional and municipal legislation and plans that apply to riparian areas.



Figure 1 Mandates directing City of Calgary watershed planning

The vision for riparian areas has four basic cornerstones which form the goals:

- Protecting riparian health
- Connecting Calgarians
- Recognizing value
- Aligning activities

These cornerstones are the foundation upon which the Strategy's goals have been built. These goals also stem from existing directions that apply to riparian areas, as well as desired results and conditions articulated during stakeholder engagement. Each of these cornerstones, the goals they support, and specific strategies to which the goals in turn give rise, is addressed in more detail in the following sections and in Figure 3 on page 6. Figure 2 outlines the complete Riparian Framework.

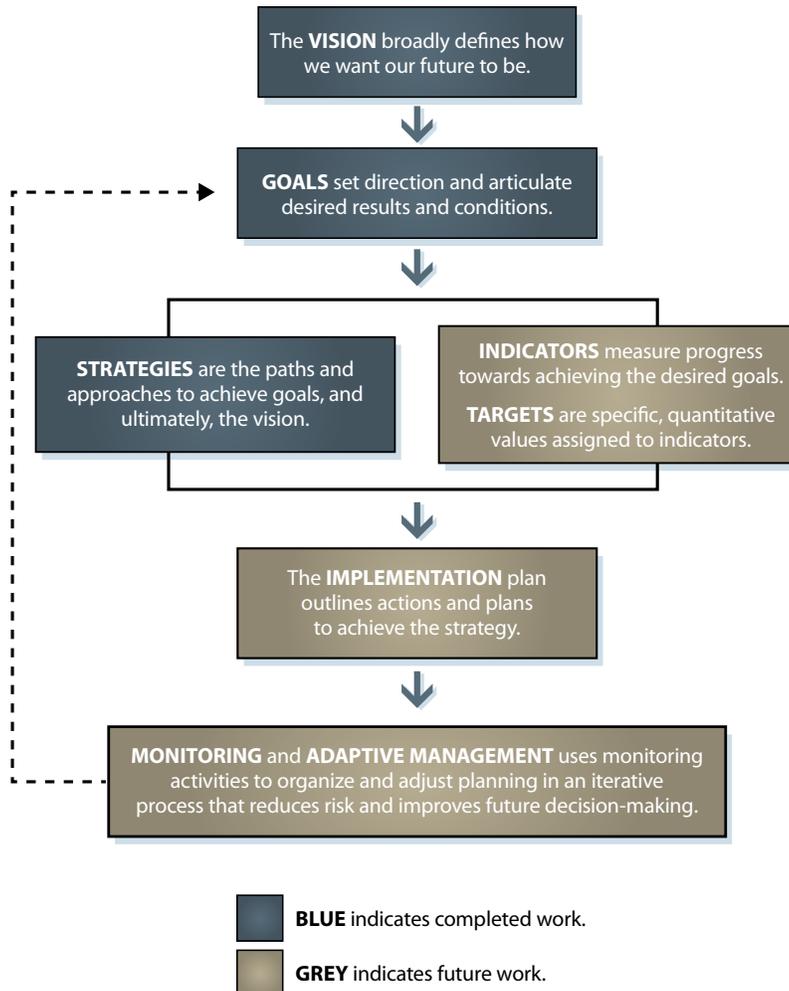


Figure 2 Riparian Framework

Vision

healthy rivers and communities sustained by healthy river valleys

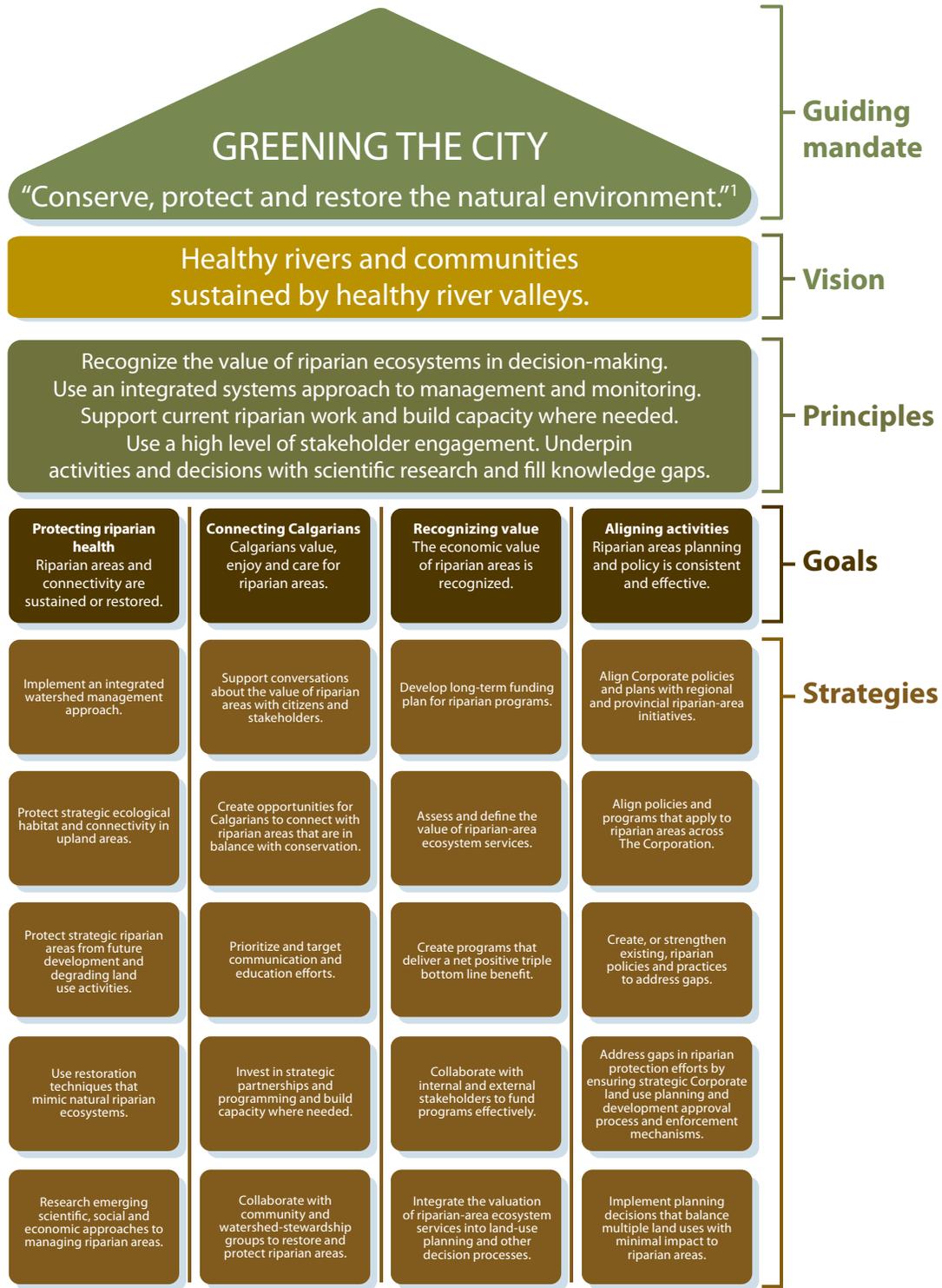


Figure 3 Overview of Riparian Strategy

¹ See Appendix One for an overview of the Municipal Development Plan (MDP) goals, and other policies, guiding the Riparian Strategy.



Riparian areas protect and support water quality and quantity.

Cornerstone one: Protecting riparian health

WHY IS PROTECTING THE HEALTH OF RIPARIAN AREAS IMPORTANT?

Clean, safe water. As lands that border our creeks and rivers, riparian areas provide connection to upland areas and act as natural filtering systems. They improve water quality by trapping and storing sediment, and by filtering contaminants and nutrients from upland areas. These areas also store water and recharge aquifers through slow release. As such, they provide Calgary and downstream communities with fresh, clean drinking water.

Biodiversity. Riparian areas are among the most biologically diverse and productive places on the planet. Ecological networks of natural areas and open space provide plant, fish and animal populations with critical habitat to survive in human-dominated landscapes. Areas along rivers and creeks are important wildlife corridors for yearly migrations.

Climate change and future development. Calgary's population growth and future development is expected to magnify concerns relating to water demand and pollution. Riparian areas naturally moderate climate change impacts such as floods and droughts.

Goal	Strategies
Riparian areas and their connectivity are sustained or restored.	<ol style="list-style-type: none"> 1. Implement an integrated watershed management approach to protect riparian areas. 2. Protect strategic ecological habitat and connectivity in upland areas. 3. Protect strategic riparian areas from future development and degrading land-use activities. 4. Use restoration techniques that mimic natural riparian ecosystems. 5. Research emerging scientific, social and economic approaches to managing riparian areas.
Implementation actions may include:	
<ul style="list-style-type: none"> • Developing a comprehensive riparian health assessment program. • Completing riparian health assessments and prioritizing restoration work. • Evaluating riparian area conservation tools including conservation easements, offset programs, and transfer of development credit schemes specified in the Alberta Land Stewardship Act. 	



Riverbanks provide precious opportunities to access natural beauty in our city.

Photo credit: S.Ryan/Calgary River Valleys

Cornerstone two: Connecting Calgarians

WHY IS CONNECTING CALGARIANS TO RIPARIAN AREAS IMPORTANT?

It's our quality of life. Our river valleys and water landscapes contribute to the quality of our lifestyle. Natural areas and open spaces are a defining feature of Calgary's character, providing a sense of place and opportunities for activities and play, tourism and education, as well as moments of quiet solitude in areas of natural beauty. And because riparian areas improve water quality and reduce flood risk and damage, they also contribute to our public safety.

It takes a community. Successful management of riparian areas is dependent upon bringing communities of people together to work at the landscape level and beyond municipal boundaries towards a common vision. Leveraging the power of our community is key to lasting riparian health. Evidence shows that effective solutions arise from citizens and stakeholders combining technical knowledge and the human and social dimensions of resource management issues.

Fostering involvement. Studies show that if people experience the natural environment within their community they will be more committed to protecting it. Providing opportunities to connect with riparian areas helps citizens build a lasting and meaningful relationship with our watershed.

Goal	Strategies
Calgarians value, enjoy and care for riparian areas.	<ol style="list-style-type: none"> 1. Support conversations about the value of riparian health with citizens and stakeholders. 2. Create opportunities for Calgarians to connect with river landscapes that are in balance with conservation. 3. Prioritize and target communication and education efforts. 4. Invest in strategic partnerships and programming and build capacity where needed. 5. Collaborate with community and watershed-stewardship groups to restore and protect riparian areas.

Implementation actions may include:

- Prioritizing community programming in areas where behaviour degrades riparian areas or where there are significant changes in management.
- Involving community and watershed stewardship groups in the design, implementation, maintenance and monitoring of riparian protection and enhancement programs.
- Developing criteria to balance public access and conservation to meet the objectives of the riparian area.

Land use and river ecology discovery

Beginning at the Elbow River headwaters and ending on Calgary's west boundary, the *Elbow River Watershed Field Study Program* gives Grade 8, 9, and 11 science students first-hand knowledge of the impacts of land use on river ecology.

Students stop at key locations to test for aquatic invertebrates, dissolved oxygen, nitrates, and phosphates, as well as water pH, turbidity, and temperature – key indicators of watershed health.



The Elbow River Watershed Field Study Program gives science students first-hand knowledge of the impacts of land use on river ecology.

Educators challenge students to predict how local land use affects water quality, and support student debate on the relationship between our social values and land use in our watersheds. Students also explore possible management strategies for minimizing human impacts.

More than 6,000 students have participated in this innovative program, which recently expanded to include the Bow River basin. Providing watershed education is vital to achieving the long term goals of the Elbow and Bow River watershed management plans.

Delivered by the Elbow River Watershed Partnership and Alberta Tourism, Parks and Recreation, the program has found a wide variety of supporters since its inception in 2005 and is a showcase example of successful collaboration between multiple sectors.

Art...bringing water into public focus



Providing opportunities to connect with riparian areas helps build a lasting and meaningful relationship with our watershed.

Artist rendering by Brian Stolle Studio

Believed to be the first of its kind in North America, Utilities and Environmental Protection's Public Art Plan (a key component of The City's Public Art Program) merges ecology, artistry, and community to bring our creeks, rivers and watershed landscapes into public focus.

As part of the Memorial Drive – Landscape of Memory project, a new, permanent sculpture by Brian Tolle will bring Calgarians inside the glacial origins of the Bow River. The sculpture, an inverted profile of Mount Peechee in Banff National Park, will create an opportunity to draw a connection between the river, the stormwater outfall below and the community.

Experiences like these enrich our urban life and help to renew our relationship with our watershed.



When natural systems are no longer intact, infrastructure is typically needed to provide these lost services.

Cornerstone three: Recognizing value

WHAT ARE THE ECONOMIC BENEFITS OF RIPARIAN AREAS?

Flood risk management. Riparian areas act as a watershed safety valve to store high volumes of water during floods. They help mitigate the risk of damage due to flooding and reduce the need for costly interventions such as flood and erosion control structures and post-flood repairs to bridges, outfalls or buildings. Riparian buffers respect flood zones and natural changes to watercourses and proactively prevent damage and safety risks. The reduction of flood damage is also an economic benefit for residents.

Mitigation of future costs. Functioning riparian ecosystems reduce the need for intervention and investment in water quality improvement, stormwater management, erosion protection, and other infrastructure over time. If riparian functions degrade, regulatory water quality and quantity targets may be more costly to meet, and reactive repairs or responses – like restoring stream banks and damaged property – may be required.

The economic value of social-ecological benefits. Research shows that riparian areas have social and ecological benefits that have economic value. For example, recreation and educational opportunities contribute to our quality of life, improve our health and typically improve the property values of surrounding communities. Another example would be that healthy riparian areas support healthy fish populations, a definite benefit to our blue-ribbon trout fishery.

Goal	Strategies
The economic value of riparian areas is recognized.	<ol style="list-style-type: none"> 1. Develop a long-term funding plan for riparian programs. 2. Assess and define the value of riparian-area ecosystem services. 3. Create programs that deliver a net positive triple bottom line benefit. 4. Collaborate with internal and external stakeholders to fund programs effectively. 5. Integrate the valuation of riparian-area ecosystem services into land-use planning and other decision processes.
Implementation actions may include:	
<ul style="list-style-type: none"> • Exploring incentive programs to motivate riparian protection and restoration on private lands. • Developing financial tools to value riparian ecosystem services in land-development decision-making. • Developing a framework to identify and manage internal and external funding and resources. 	



Riparian areas sustain our creeks and rivers.

Cornerstone four: Aligning activities

WHY IS ALIGNING RIPARIAN-AREA MANAGEMENT ACTIVITIES IMPORTANT?

Reinforcing everyone's actions. Our best bet for achieving our goals is to align our planning with that of other regions so that everyone's actions reinforce each other at various scales on the landscape.

Effective management. A simplified but specific, consistent and coordinated approach to policy and planning will enable effective management of riparian areas. Some riparian areas are currently at risk due to inconsistent application of processes, and gaps in policy, regulation and legislation.

Goal	Strategies
Riparian-area planning and policy are consistent and effective.	<ol style="list-style-type: none"> 1. Align Corporate policies and plans with regional and provincial riparian-area initiatives. 2. Align Corporate policies and programs that apply to riparian areas. 3. Create, or strengthen existing riparian policies and practices to address gaps. 4. Address gaps in riparian protection efforts by ensuring strategic Corporate land use planning and development approval process and enforcement mechanisms. 5. Implement planning decisions that balance multiple land uses with minimal impact to riparian areas.
Implementation actions may include: <ul style="list-style-type: none"> • Ensuring City of Calgary riparian protection programs align with the recommendations of existing watershed and water management plans. • Identifying opportunities to incorporate riparian area information in City planning and development approval documents. • Advising the Government of Alberta on policy issues affecting riparian areas as required. 	

Monitoring

An important element of the Riparian Strategic Framework (see figure 2 on page 5) is monitoring progress towards achieving our goals. Effective protection of riparian areas is built on a successful monitoring program.

Establishing a monitoring plan for riparian areas will require selecting indicators and targets that allow The City of Calgary to identify trends and relationships related to the health, functionality, value, and economics and overall riparian resources within an urban context. Collecting and monitoring data over time is critical for making informed management decisions and for evaluating whether or not policy objectives are being met.

Adaptive management

Monitoring is both a research and a management tool. Adaptive management is a systematic process for continually improving management policies and practices by learning from the outcomes of operational programs.

This approach assumes that natural-resource policies and management actions should be adjusted as our understanding improves, and involves deliberate experimentation with policies and/or practices based on results.

The adaptive management process follows a six-step cycle (Figure 4): synthesizing existing knowledge, exploring alternative actions, making explicit predictions of their outcomes, selecting one or more actions to implement, monitoring actual outcomes to see if they match those predicted, and then using these results to adjust future management policy and practices.

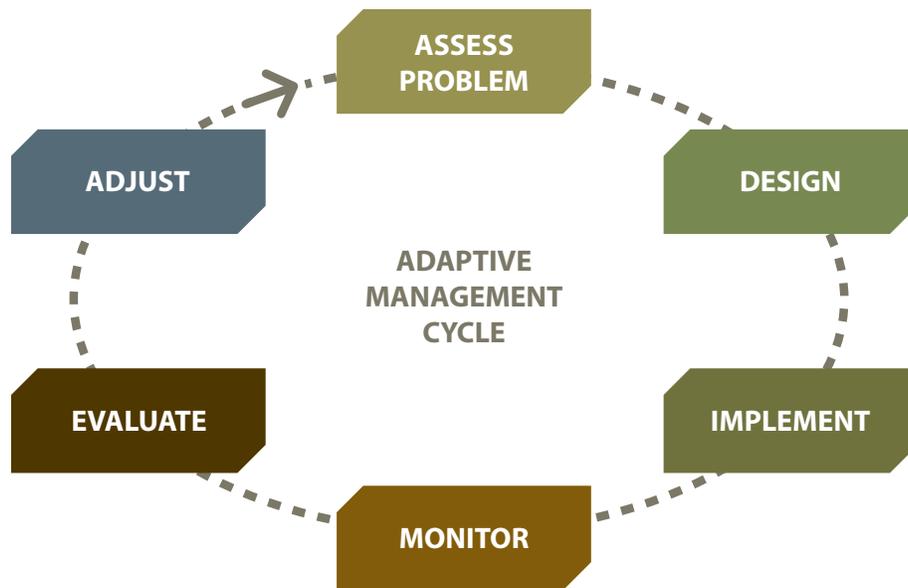


Figure 4 The Riparian Strategy will employ an adaptive management approach



The floodplain provides vital space to hold water during spring melts.

Photo credit: C. Mader

Calgary's roots are at the confluence of two rivers – the Bow and the Elbow. We are extremely fortunate in that both of these waterways have their water source just upstream and are largely fed by runoff from protected parkland and conservation areas. Because the Bow River is one of five major tributaries of the South Saskatchewan River, our influence extends downstream (see Figure 5), impacting many people along the way.



Figure 5 Calgary is the first major urban centre along the Bow River's natural journey

The Latin root of the word “riparian” is *ripa* meaning “bank”.

The Bow and Elbow Rivers are situated within the Bow River Basin. There are six watersheds within the basin and Calgary region (see Figure 6). Riparian areas associated with all of these watersheds are important, although the scope of most studies to date have focused primarily on riparian areas adjacent to major rivers, creeks and streams.

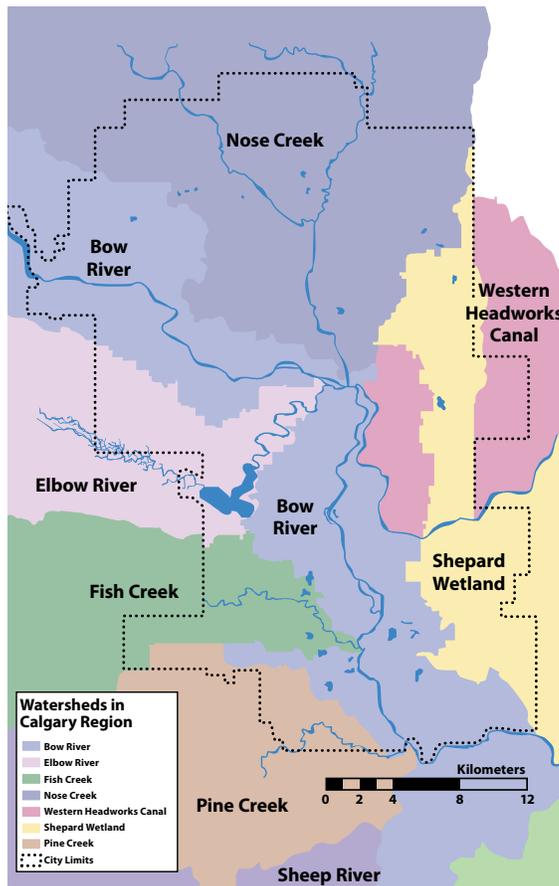


Figure 6 Watersheds within the Calgary region

Understanding floods

Floods occur when excess water flows over the top of the watercourse bank or beyond the basin of a wetland, pond or lake, and onto the floodplain. How high the water will rise, how long the water will stay on the floodplain, and when a similar-sized flood event will occur again can be difficult to predict.

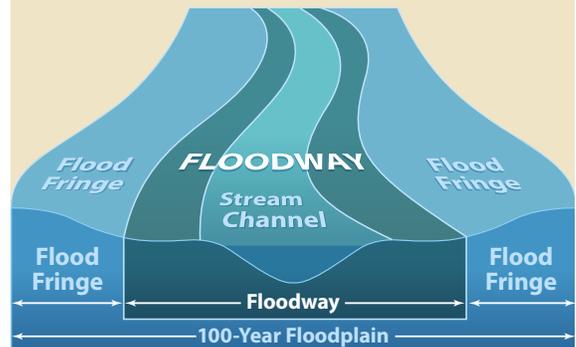


Figure 7 The river floodplain

The things we build on the floodplain – bridges, roads and buildings – can be casualties of flooding. When we try to “fix” the problem by building infrastructure or looking for more developable land, we may actually be increasing the risk of future erosion and floods by impacting natural functions.

Repeated repairs and replacement of infrastructure are costly. (Source: Province of Alberta. 2012. *Stepping Back from the Water.*)

What are riparian areas?

The complex interplay of human and natural processes makes riparian areas dynamic and ever-changing systems, particularly in an urban context. These areas are ribbons of the landscape along edges of rivers, creeks, lakes and wetlands where water and land interact. Riparian areas extend outward across the floodplain, down into the groundwater, and upwards to the plants, trees and surrounding slopes (see Figure 8).

Riparian areas are characterized in many different ways, but most definitions highlight the importance of the following traits:²

- **Hydrological.** Groundwater and surface water are the driving forces behind the physical, chemical and biological processes occurring on these lands.
- **Connective.** Riparian lands facilitate connections that allow the transfer of energy and materials between terrestrial and aquatic ecosystems.
- **Influential.** Of all land-cover types, riparian areas have the greatest influence on aquatic ecosystems. They are also much more biologically productive and diverse than other habitats of comparable size.

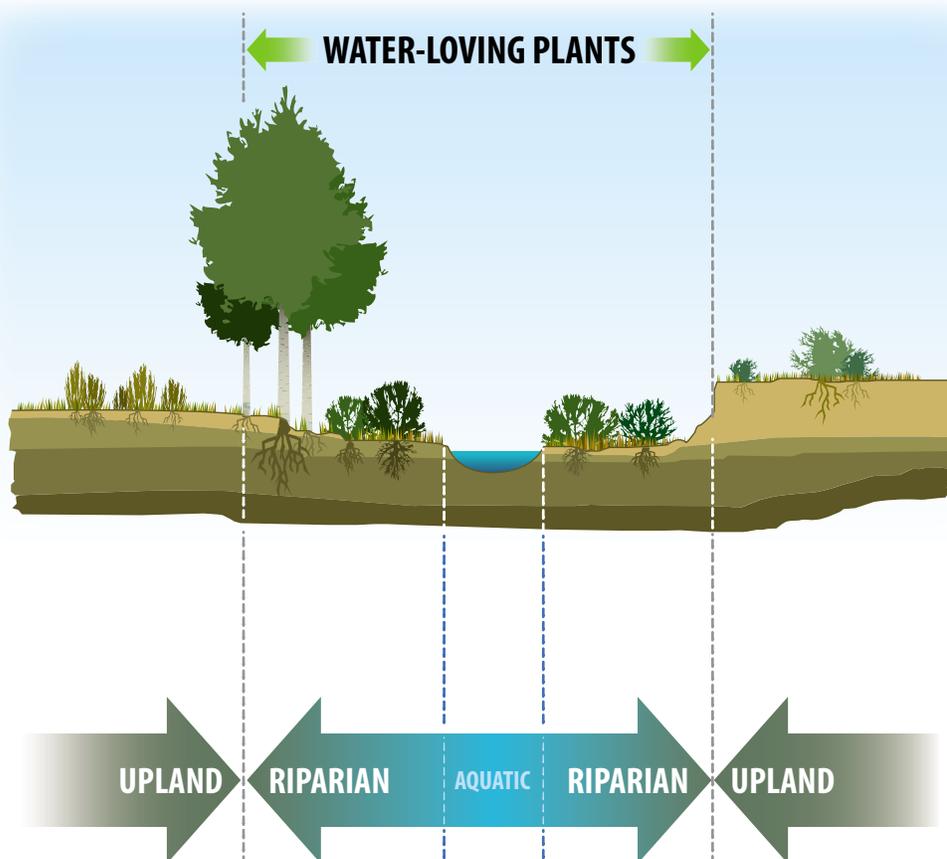


Figure 8 Riparian areas border rivers, creeks and streams (adapted from Fitch *et al*, 2001).

² For more information see page 3-4 of Clare & Sass (2012).



Plants slow water down and their roots grab soil, helping to reduce erosion and stabilize banks.

Photo credit: Cows and Fish

An ecological definition

The following definition³ has been developed by the Alberta Water Council Riparian Land Conservation and Management Project Team. It provides a common science-based ecological characterization of riparian areas for the province of Alberta and our strategy.

Riparian lands are transitional areas between uplandⁱ and aquatic ecosystems. They have variable width and extent above and below ground and perform various functions. These lands are influenced by and exert an influence on associated water bodiesⁱⁱ, including alluvial aquifersⁱⁱⁱ and floodplains. Riparian lands usually have soil, biological, and other physical characteristics that reflect the influence of water and hydrological processes.

- ⁱ For the purpose of this definition, "upland" is considered to be the land that is at a higher elevation than the alluvial plain, stream terrace(s), or similar areas next to still water bodies, which are considered to be "lowlands."
- ⁱⁱ A water body is any location where water flows or is present, whether or not the flow or the presence of water is continuous, intermittent or occurs only during a flood. The designation includes but is not limited to wetlands and aquifers, and generally excludes irrigation works. Source: *Alberta Water Act*.
- ⁱⁱⁱ For the purposes of this definition, alluvial aquifers are defined as areas where groundwater is under the direct influence of surface water.

³ See page 4 of Clare & Sass (2012) for an explanation of how the definition was developed.

The health of riparian areas starts in upland areas



Protecting riparian areas starts long before land meets water.

How we build and manage our urban environment has a big impact on the health of riparian ecosystems. Rain and snowmelt that might typically soak into natural landscapes, travels over the roofs, pavement and compacted soil of built landscapes and ultimately through riparian areas and into creeks and rivers. The sheer water volume, debris and pollutants picked up along the way erode riverbanks and compromise natural riparian functions. Once an area is degraded, a self-reinforcing cycle of vulnerability starts.

By doing things differently in upland areas and across the watershed, we can reduce many of the harmful impacts of polluted stormwater before it reaches riparian areas.

An integrated watershed management approach focuses on retaining or enhancing natural features and hydrologic functions within the landscape. When stormwater is treated further upland, less polluted water and sediment end up in riparian areas.



Plants help reduce the amount of sediment, pollution and nutrients reaching our rivers.

Importance, function and services of riparian ecosystems

The products, services and benefits provided by riparian ecosystems depend on the correct meshing of a complex series of interconnected functions. The benefits provided to humans are often called ecosystem goods and services. Riparian areas

provide distinct goods and services with high environmental, social and economic values when compared to other types of land cover. Clean air and water, flood control and nutrient cycling are some of the services rendered by healthy riparian areas. When natural systems are no longer intact, infrastructure is typically needed to provide these lost services, and unlike natural capital, infrastructure loses value over time.

Some of these ecosystem functions and services are shown in Table 1 below.

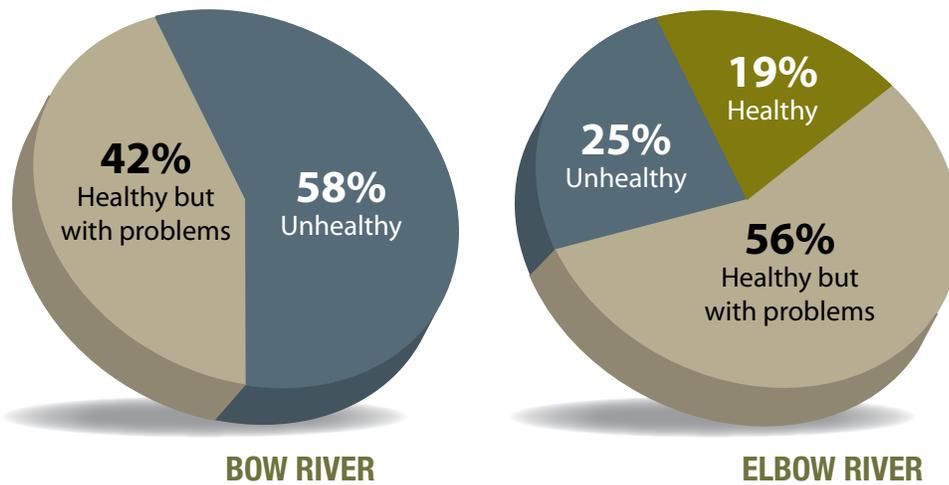
Table 1 Key Ecosystem functions and services

Key Ecological Functions	Services
Trapping and storing sediment	Clean, ample supplies of water
Building and maintaining banks and shorelines	Flood and erosion control
Storing water and recharging aquifers	Reduced water-treatment costs
Filtering and buffering water	Supports fish and wildlife habitat
Reducing and dissipating energy	Pollution reduction
Maintaining biodiversity	Produce highly fertile soil
Enhancing soil development	Tourism and recreation
Capturing and recycling nutrients	Enjoyment and pleasure
	Climate control and drought management

Riparian health in Calgary

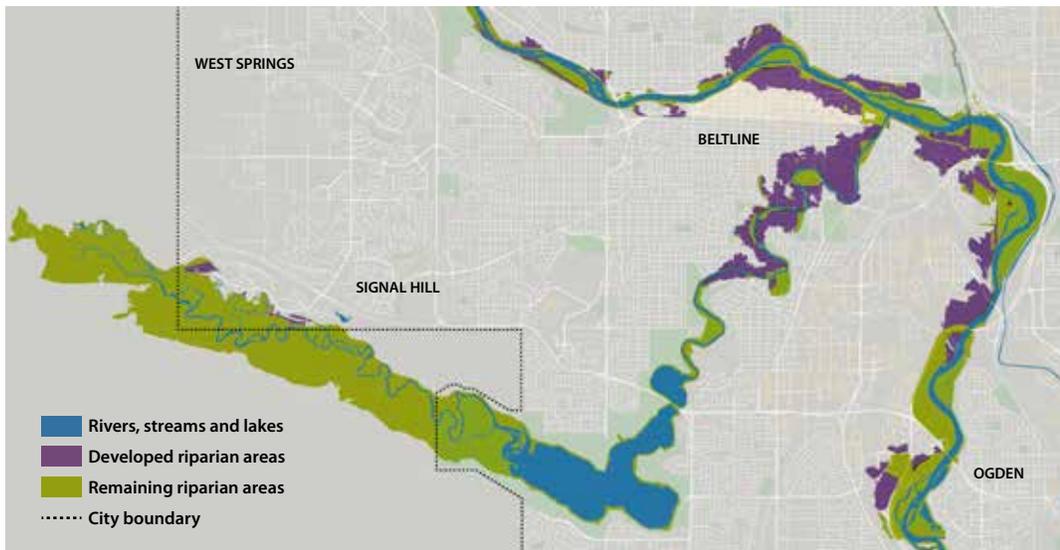
Riparian areas were studied between 2007 and 2010 to gather baseline information on riparian health and bank conditions. One hundred riparian sites on both City-owned and private lands, or approximately 25 per cent of riparian

area along major rivers and creeks in Calgary, were assessed using the Riparian Health Inventory (RHI) methodology developed by Cows and Fish (The Alberta Riparian Habitat Management Society). For more information on assessment methodology, see Appendix Two. Map 1 below represents lost or impacted and remaining riparian areas in inner city areas.



HEALTHY	Little to no impairment to riparian function
HEALTHY WITH PROBLEMS	Some impairment to riparian function due to human or natural causes
UNHEALTHY	Severe impairment to riparian function due to human or natural causes

Figure 9 Riparian health in Calgary (see Appendix Two)



Map 1 Developed inner city riparian areas (prepared by O2 Planning + Design Inc.)

Riparian protection is already an important part of how The City manages water and natural resources. Current projects are underway within the Corporation and at different scales across the region. What this Strategy does is establish a unified direction for riparian management in Calgary. The work that lies ahead is to continue to build on the solid foundation of existing mandates and programs with increased focus, funding and collaboration.

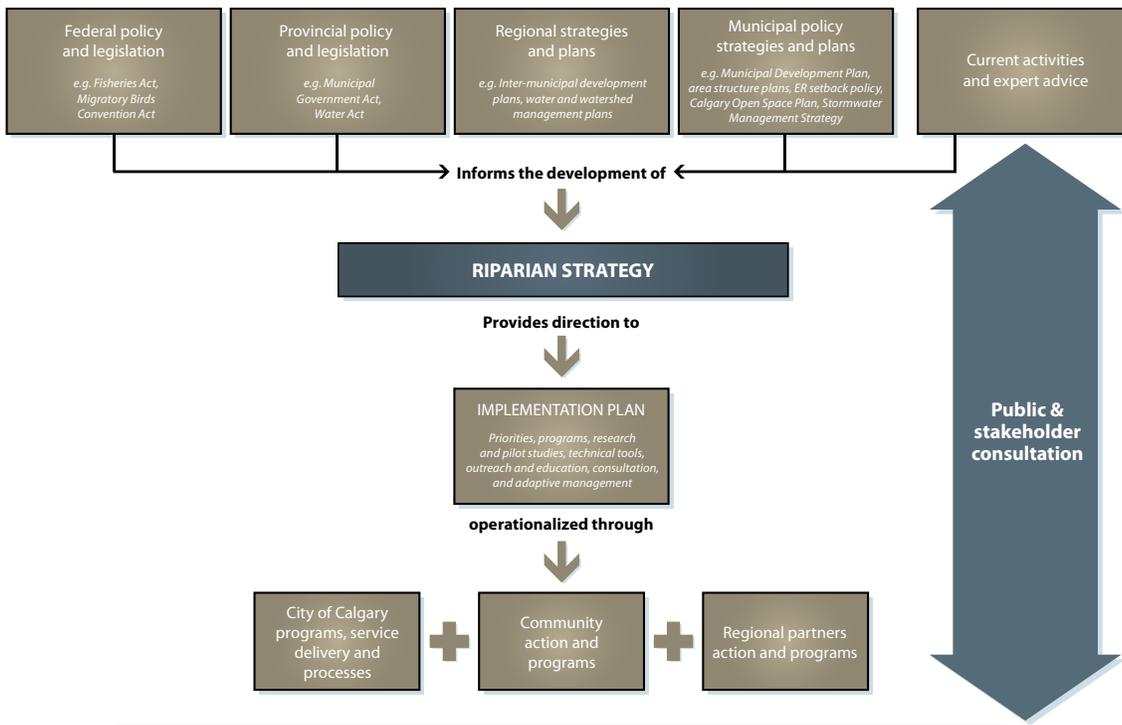


Figure 10 Relationships and influences guiding the development of the Riparian Strategy

The following section briefly discusses the types of activity required to move forward on developing an implementation plan. It provides an overview of steps within the framework and how The City will work with various stakeholders (see Figures 11 and 12).

Overview of activities

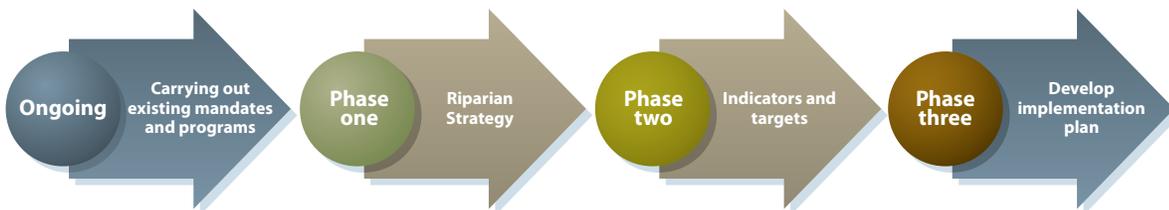


Figure 11 Phases of Riparian Framework

Existing activities (ongoing)

The following activities, programs and plans are ongoing and will inform strategy and implementation planning.

Existing mandates

- Provincial mandates
- Existing plans and policies

Open space system

- Park and open space system

Working with nature

- Bioengineering
- Stormwater management through low impact development (LID)
- Ongoing streambank restoration work

Tools and baseline studies

- GIS and riparian mapping
- Baseline information
- Full-cost accounting and infrastructure investment planning

Engineering with nature



Planting willow along damaged riverbanks is a low-maintenance and self-sustaining solution.

Photo Credit: Cows and Fish

Increasingly, communities are looking to nature for innovative alternatives to riparian-area protection and restoration.

Sandy Beach is one Calgary example that has incorporated natural solutions into modern technology and design. Between 2008 and 2010, The City of Calgary, in partnership with the *Calgary Herald* and Cows and Fish, ran a bioengineering project to restore riverbank areas along Sandy beach, a popular park and dog off-leash area within Calgary's Elbow River corridor.

Crews and volunteers planted shrubs and live sandbar willow (*Salix exigua*) stakes in key areas. Native thorny shrubs were also strategically planted to deter access to the restoration area and allow the new vegetation to establish itself.

The willow stakes and shrubs act as structural and mechanical elements to stabilize and naturally protect slopes. The plant roots help to grab and hold soil, while the plant vegetation helps to slow the flow of water – a twofold approach to preventing further bank erosion.

Bioengineering techniques like these help to mitigate problems associated with conventional bank-protection practices like riprap – the practice of armouring and stabilizing banks with rock. While riprap is an effective immediate answer to erosion, its long-term effects are less than ideal. The hard rock surfaces tend to increase water flow, which reinforces the damaging effects of high flows downstream. The rocks also impact sensitive spawning areas, by heating the water and depriving fish and wildlife of the food and habitat they depend on.

Vegetating degraded areas is a low-maintenance and self-sustaining solution with multiple benefits such as providing critical habitat for fish and wildlife and creating areas of natural beauty in our urban landscape.



From the river to the tap and back, we all have a connection to the watershed.

Riparian Framework

The Riparian Strategy provides strategic direction to the protection, restoration and management of riparian areas within Calgary's watersheds. It flows from existing mandates, but provides focus and more refinement. The Riparian Framework will be addressed over several phases:

PHASE ONE: DEVELOPING THE RIPARIAN STRATEGY

The first phase defines the strategic direction outlined within this document. It was developed in collaboration with internal and external partners, and will be the foundation of future community and stakeholder consultations.

PHASE TWO: SETTING INDICATORS AND TARGETS

The second phase will define indicators and targets in consultation with watershed partners and key stakeholders. Indicators and targets provide critical guidance over the long term and are an integral part of adaptive management.

The development of indicators and targets is an essential next step of the Riparian framework. Factors that will be considered in the development of indicators and targets include:

- Views of key stakeholder groups as determined through consultation.
- The nested hierarchy of scales of municipal, provincial, regional, watershed, etc.
- Indicators and targets previously developed as part of Watershed and Water Management Plans, provincial plans and strategies. The City's plans and strategies, etc. will be reviewed and incorporated.

The draft *Bow Basin Watershed Management Plan Phase 2* includes a number of examples of indicators and targets (see Table 2):

Indicator	Target
Restoration of riparian lands identified as degraded as a result of human activity	A plan in place to address the recovery or restoration of riparian lands identified as degraded.
Condition of riparian land health as indicated using the <i>Cows and Fish Riparian Health Inventory Rating System</i> or alternative methodologies	Riparian land health is one level higher than initial conditions measured using the Cows and Fish Riparian Health Inventory rating system (e.g., Unhealthy > Healthy but with Problems > Healthy)

Table 2 Example indicators and targets

PHASE THREE: DEVELOPING AN IMPLEMENTATION PLAN

While a number of key actions have been provided as examples in this document, the implementation plan will also contain specific programs, timelines and resources. The following section identifies areas of activity that will be crucial to developing the implementation plan.

Research: A broad spectrum of research activities will be needed to fill gaps in knowledge and technical expertise; for example, research into emerging bioengineering practices, assessments of riparian-area health, and ongoing consultations to determine stakeholder priorities.

Tools: A number of tools have been identified within the Strategy that will support future planning. Utilization and development of these tools will be a key component of the implementation plan; for example, an ecosystem-service valuation tool and riparian-area conservation tools.

Priorities: Given the dynamic and long-term nature of riparian work, setting conservation and restoration priorities is critical and will drive other strategic work.

Process and policy: Additional analysis and consultation will be needed to align process and policy across domains; for example, existing gaps in land-use policy, planning and development-approval processes will have to be analyzed.

Planning: To ensure mutually reinforcing actions across domains and disciplines, riparian protection goals must be nested. For example, watershed-management planning and community education planning must be integrated.

Funding: Identifying and securing resources to carry out riparian programming will ground the implementation plan in budgets and workplans. Such resources might include a framework for internal and external funding, and incentive programs to motivate riparian protection and restoration on private lands.

Overview

Best practice shows that high levels of community and stakeholder engagement result in better transparency and decision-making, and will lead to community empowerment and stewardship. Successful management of riparian areas is dependent upon bringing communities of people together to work at the landscape level and, beyond political boundaries, to create a common vision for productive and sustainable riparian conditions.

There is also increasing evidence that effective solutions arise from citizens and stakeholders working together to combine technical knowledge and the human and social dimensions of

resource management issues. Fostering strong relationships and understanding will encourage stakeholders to work together, share knowledge and reinforce and support each other's activities. With this in mind, the Strategy was developed in collaboration with internal and external experts and forms the basis for future community and other stakeholder consultation and engagement. Stakeholder groups have and will continue to be involved in the riparian planning process, at various times and in various ways.

Engagement activities and priorities will be determined by the phases of the planning process and will align with The City's Engage policy. Ultimately, our goal is to foster opportunities for meaningful participation by stakeholders (as identified in Figure 12) and support transparent and sustainable decision-making.

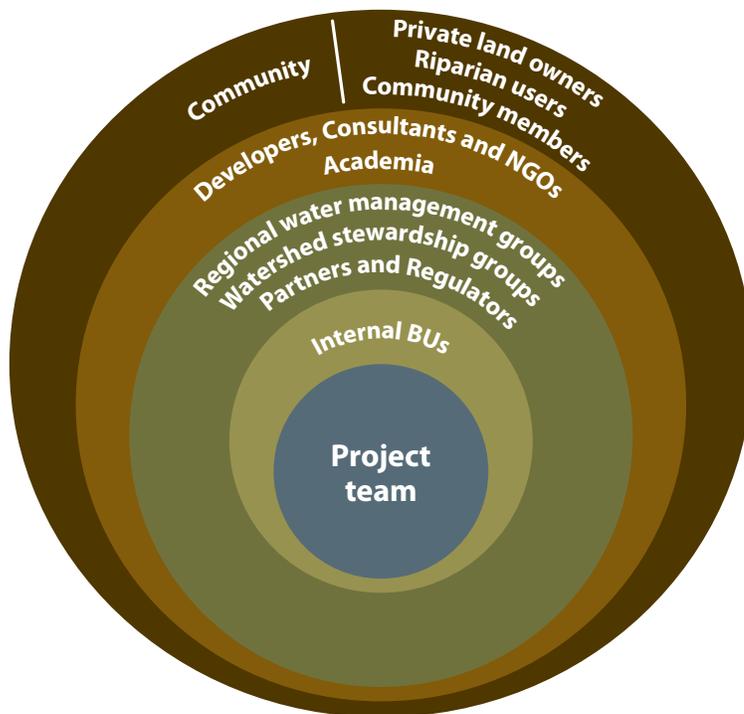


Figure 12 Stakeholder relationships

Stakeholder engagement framework

The framework (see Figure 13 below) provides a high-level overview of engagement activities used to develop strategic direction and proposes engagement activities to develop targets and indicators

and the implementation plan. It is important to note that a robust, detailed engagement plan that includes specific actions will be developed to support the implementation plan as well.

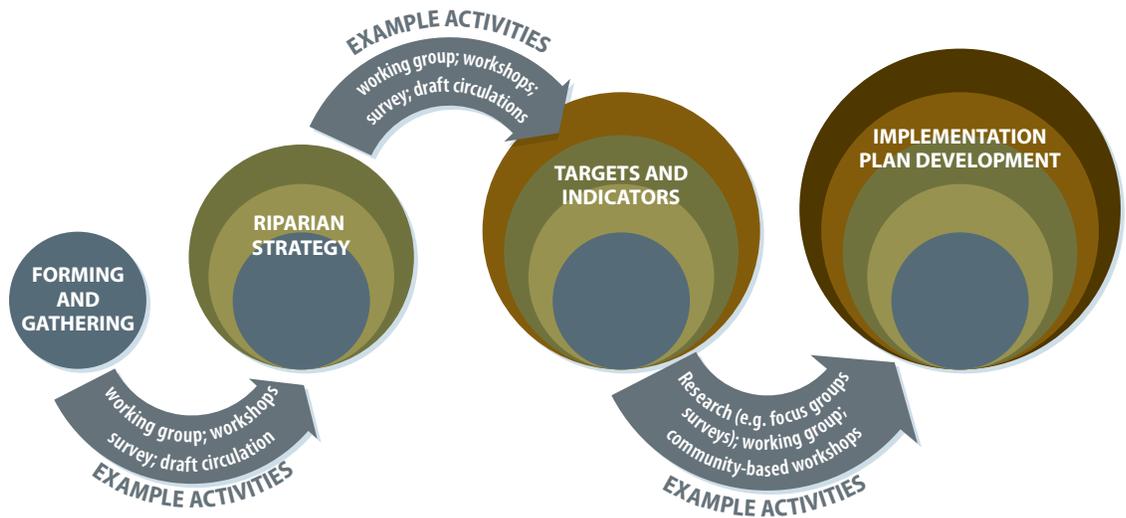


Figure 13 Overview of stakeholder engagement framework

PREVIOUS ACTIVITIES

As part of 2007 and 2010 baseline riparian assessment studies, AMEC Environment and Infrastructure consulted stakeholders on behalf of The City. During a workshop stakeholders reviewed assessment findings, provided feedback on a Triple Bottom Line prioritization tool, and shared their experience with riparian and streambank protection and restoration. Stakeholders included federal and provincial regulators, watershed stewardship groups and not-for-profit groups.

PHASE ONE: DEVELOPING THE RIPARIAN STRATEGY

September 2012 – January 2013: Gathering Insights and Information. A multidisciplinary project team led by Water Resources and including staff from Parks and Land Use Planning & Policy was formed. Building on previous engagement activities, the team consulted and collaborated with key watershed partners and Calgary River Valleys Forum Society to lay the foundation for the strategic direction. Key activities included: circulation of draft materials, stakeholder surveys and a multi-stakeholder workshop.

February 2013: Sharing and validating. Through a workshop co-facilitated by consulting firm O2 Planning and Design Inc. and the Calgary River Valleys Forum Society, the project team continued the conversation with key stakeholders to validate the vision, goals, riparian protection management categories, policy analysis and priorities.

PHASE TWO: SETTING INDICATORS AND TARGETS

Early and frequent involvement has been shown to empower a community to achieve a common vision. It will be important to collaborate and consult with key watershed partners and stakeholder groups during the development of indicators and targets.

PHASE THREE: DEVELOPING THE IMPLEMENTATION PLAN

Stakeholders will play a critical role in defining and implementing plan actions. Engagement techniques include focus groups and surveys, the establishment of representative working groups, and community-based workshops. Priorities and resources will drive specific engagement timelines and techniques.

Glossary⁵

Aquifer: Refers to a sub-surface layer or layers of porous rock which hold water within the spaces between the rocks (interstitial spaces).

Alluvial Aquifer: A non-confined aquifer comprised of groundwater that is under the influence of surface water.

Bed and Shore: The land covered so long by water as to wrest it from vegetation or as to mark a distinct character on the vegetation where it extends into the water or on the soil itself. In Alberta, the province owns most of the beds and shores of all naturally occurring lakes, rivers and streams (*Public Lands Act*, Sec. 3 (1)).

Biodiversity: The degree of variation of life forms within a given species, ecosystem, biome, or planet.

Bioengineering: Refers to the practice of vegetative engineering. The biological parts of plants are used to stop and prevent slope failures and erosion.

Buffers: A buffer is a strip of land placed in the landscape and managed in such a way so as to maintain desired ecological processes and provide economic and societal benefits.

Channelization: The modification of a natural river channel; may include deepening, widening, or straightening.

Corridor: A corridor is a strip of a particular type that differs from the adjacent land on both sides. Corridors have several important functions, including conduit, barrier and habitat.⁶

Development: As defined in Section 616 of the Municipal Government Act:

1. an excavation or stockpile and the creation of either of them,
2. a building or an addition to or replacement or repair of a building and the construction or placing of any of them on, in, over or under land,
3. a change of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the use of the land or building, or
4. a change in the intensity of use of land or a building or an act done in relation to land or a building that results in or is likely to result in a change in the intensity of use of the land or building.

Ecosystem: A community of living organisms (plants, animals and microbes) in conjunction with the nonliving components of their environment (things like air, water, minerals and soil), interacting as a system.

Ecosystem Services: The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth.

Floodplain (Flood Hazard Area): A floodplain consists of the low-lying land next to a watercourse that is subject to periodic inundation. A 1:100-year floodplain, which is the result of a flood having a 1 per cent chance of being equaled or exceeded in any given year, is used for purposes of development. In the absence of information that identifies the 1:100-year floodplain elevation, the best available information must be used to establish the historic high-water level for a water body. The floodplain can be divided into two zones once a flood hazard mapping study has been completed:

⁵ This glossary has been adapted from The Province of Alberta. (2012). *Stepping Back from the Water*. Pp. 54-56.

⁶ City of Calgary. (2010). *City of Calgary Municipal Development Plan*. Pp. 2-47.

1. **Floodway** The area within which the entire design flood can be conveyed while meeting certain water-elevation, water-velocity and water-depth criteria. Typically the floodway includes the river channel and some adjacent overbank areas.
2. **Flood Fringe** The land along the edges of the flood-risk area that has relatively shallow water (less than 1 metre deep) with lower velocities (less than 1 metre/s). In Calgary, maps use the term “floodplain” for the flood-fringe area.

Hydrology: The branch of geology that studies water on the earth and in the atmosphere, its distribution, uses and conservation.

Invertebrates: Animals without backbones.

Low impact development (LID): A term used to describe a land-planning and engineering-design approach to managing stormwater runoff close to its source. LID emphasizes conservation and use of on-site natural features to protect water quality and promote infiltration into the subsurface.

Meander belt: The land area on either side of a watercourse representing the farthest potential limit of channel migration. Areas within the meander belt may someday be occupied by the watercourse; areas outside the meander belt typically will not.

Riparian: Riparian is derived from the Latin word “ripa”, meaning bank or shore, and refers to land adjacent to a water body.

Riparian area: Refers to any land that adjoins or directly influences a water body, including floodplains and land that directly influences alluvial aquifers. Typical examples include the green ribbons of lush vegetation that grow on floodplains and watercourse banks. They usually are distinctly different from surrounding lands because of unique soil and vegetation characteristics that are influenced by the presence of water above the ground and below the surface. Water is present due to a water body or elevated water table such as in a seep or spring.

Riparian vegetation: Vegetation growing on or near the banks of a watercourse or other water body that is more dependent on water than vegetation found further up slope.

Setback: A minimum distance that must be maintained between a land use or development and a water body. The distance is measured from the legal bank of the water body to the boundary line of the adjacent development.

Stream: A natural watercourse of any size containing flowing water, at least part of the year, supporting a community of plants and animals within the stream channel and the riparian vegetative zone.

Upland area: Land that is at a higher elevation than the alluvial plain, stream terrace(s), or similar areas next to still water bodies, which are considered to be “low lands”.

Water body: Any location, natural or man-made, where water flows or is present, whether or not the flow or the presence of water is continuous, intermittent or occurs only during a flood. Water bodies include but are not limited to wetlands and aquifers. The water boundary is defined by its ecological boundary. Water bodies can be natural or man-made:

Watercourse: A flowing water body, such as a river, stream, or creek. This includes watercourses that may be ephemeral, intermittent, temporary or seasonal in nature.

Watershed: An area of land that catches precipitation and drains it to a specific point such as a marsh, lake, stream or river. A watershed can be made up of a number of sub-watersheds that contribute to the overall drainage of the watershed. A watershed is sometimes referred to as a basin, drainage basin or catchment area.

Wetland: A wetland is land that has the water table at, near, or above the land surface, or which is saturated for a long enough period to promote wetland or aquatic processes as indicated by hydric soils, hydrophytic vegetation, and various kinds of biological activity that are adapted to the wet environment. If the rooting zone extends below the water table, the area is a wetland. Wetlands in Alberta’s prairie region (White Area) are commonly classified according to the Stewart and Kantrud classification system.

Appendix One: Legislation, policy and plans pertaining to riparian areas

The following charts list federal, provincial and municipal legislation, policy, plans, strategies and guidelines that apply to riparian areas.

FEDERAL

The responsibility for managing natural resources primarily falls under provincial jurisdiction, and consequently, federal jurisdiction over riparian lands in Alberta is somewhat limited in scope.

Federal Legislation and Regulations	Description
<i>Fisheries Act</i>	Includes provisions for the protection of fish and fish habitat, and requires an authorization for activities that cause harmful alteration, disruption and destruction of fish habitat. In many cases, riparian lands may contribute to, or constitute, fish habitat.
<i>Migratory Birds Convention Act</i>	Prohibits the harming or killing of migratory birds listed under the Act, which includes riparian obligate or dependent bird species.
<i>Species at Risk Act</i>	Protects listed wildlife species and their critical habitats on federal lands, but does not apply to lands held by the Province of Alberta or its private citizens unless “the laws of Alberta do not effectively protect the species or the residences of its individuals”. In this case, the Minister may issue an order in council to protect federally listed species that occur on provincial or private lands.
<i>Navigable Waters Protection Act</i>	Prohibits the placement of any work in, on, over, under, through, or across any navigable water unless the work, the site, and the plans have been approved and the work is built and maintained according to approved plans. This includes construction of structures on the shore of a water body (e.g., docks) that may impact riparian habitat.

PROVINCIAL LEGISLATION, POLICIES AND STRATEGIES

The provincial *Water for Life* strategy sets out high-level direction for the management and maintenance of healthy aquatic ecosystems and safe drinking water. Partnerships form a key part of the Water for Life strategy, which empowers groups to implement the strategy at different geographic scales. The City of Calgary is an active member in all three levels of partnerships including: watershed planning and advisory councils (WPACs), watershed stewardship groups (WSGs) and the Alberta Water Council.

A number of provincial policies and legislation apply to riparian areas. The *Municipal Government Act* (MGA), which governs all municipal planning in Alberta, empowers The City of Calgary to create statutory plans and bylaws to manage and protect environmental reserves and riparian areas.

Provincial Legislation ⁷	Description
<i>Water Act</i>	The stated purpose of this Act is to support and promote water conservation and management. Under the Act, any activity that causes or has the potential to cause an effect on the aquatic environment requires an approval.
<i>Alberta Land Stewardship Act</i>	Creates authority of regional plans and enables the development of conservation and stewardship tools that can be used to manage riparian lands (e.g., conservation easement).
<i>Public Lands Act</i>	Regulates and enforces activities that affect the Crown-owned bed and shore of water bodies, as well as Crown-owned riparian and upland habitats (e.g., forest and grazing leases).
<i>Surveys Act</i>	Definitions for the “legal bank” of a water body, upon which the Crown-owned “bed and shore” is defined.
<i>Environmental Protection & Enhancement Act</i>	Management of contaminated sites, storage tanks, landfill management practices, hazardous waste management practices and enforcement. Provides municipalities with the authority to regulate water on municipal lands, manage private land to control non-point-source pollution, and regulate land-use practices such that they are compatible with the protection of aquatic environment.
<i>Agricultural Operation Practices Act</i>	Regulates and enforces confined livestock-feeding operations, planning for siting, manure handling/storage, and environmental standards.
<i>Soil Conservation Act</i>	Regulates activities that may cause erosion and sedimentation of a water body.
<i>Safety Codes Act</i>	Regulates and enforces septic-system management practices, including installation of septic field and other subsurface disposal systems.
<i>Wildlife Act</i>	Regulates and enforces protection of wildlife species and their habitats, which may include riparian-dependent species.

⁷ Clare, S. and G. Sass. *Riparian lands in Alberta: Current State, Conservation Tools, and Management Approaches*. Report prepared for Riparian Land Conservation & Management Team, Alberta Water Council, Edmonton, Alberta. Fiera Biological Consulting Ltd. Report #1163.

Provincial Legislation ⁸	Description
<i>Forests Act</i>	Provides the legal framework for the management of forests on public land, including rules for tenure, policies and regulations for acceptable logging methods, standards for wood utilization, and the management of non-timber values.
<i>Provincial Parks Act & Wilderness Areas, Ecological Reserve and Natural Areas Act</i>	Both Acts can be used to minimize the harmful effects of land-use activities on water quality and aquatic resources in and adjacent to parks and other protected areas.
<i>Oil and Gas Conservation Act</i>	Section 8.060 and 8.070 stipulate that when a well or facility is located closer than 100 m to the normal high water mark of a water body or permanent stream, the application must be reviewed to assess the risks and minimize direct disturbance to the water body.
Memorandum of Understanding Between the Energy Resources Conservation Board, Alberta Environment, Alberta Sustainable Resource Development, and the Special Areas Board on the Identification and Delineation of Water Bodies (DRAFT)	This <i>draft</i> document provides direction on how to delineate and identify the ecological boundaries of water bodies that may be impacted by oil-and-gas activity. Setback for oil-and-gas developments are based on the ecological boundary of the water body, and depending upon the setback distance, riparian areas may be included in the development setback.
Provincial Policies, Strategies and Guidelines	Description
Water for Life Strategy (renewed 2008)	Provincial strategy with three stated goals: <ul style="list-style-type: none"> • Safe, secure drinking water • Healthy aquatic ecosystems • Reliable, quality water supplies for a sustainable economy <p>The appropriate management of riparian lands is central to achieving desired outcomes of this government water strategy.</p>
Interim Wetland Policy for the Settled Region of the Province	Policy goal is to conserve wetlands in a natural state, mitigate the degradation or loss as close to the site as possible, and enhance, restore, or create wetlands in areas where they have been depleted or degraded.
<i>Stepping Back from the Water: A Beneficial Management Practices Guide for New Developments Near Water Bodies</i>	Released in March 2012, this document provides discretionary guidance to local authorities and watershed management groups to assist with “decision making and watershed management relative to structural development near water bodies” primarily within the White zone.

⁸ Clare, S. and Sass, G. (2012). *Op cit.*

REGIONAL, SUB-REGIONAL AND BASIN-SCALE PLANS

The South Saskatchewan Regional Plan is currently being finalized under the provincial Land-use Framework. It is a regional land-use plan for Southern Alberta that addresses economic development, environmental management and social concerns.

As part of the Province's *Water for Life* strategy, watershed and water management plans address water quantity, water quality and riparian protection. To date, The City of Calgary has collaborated within the region to develop and endorse plans for the Bow River, Elbow River and Nose Creek. While these plans are often voluntary, many of their recommendations can become statutory. The objectives and targets of these plans will be recognized and incorporated into Calgary's Riparian Strategy and management practices.

Regional plans and sub-regional and basin-scale plans	Description
South Saskatchewan Regional Plan (expected 2013)	This plan is currently being finalized under the provincial Land Use Framework. This document contains strategic land use principles and water management objectives.
Calgary Metropolitan Plan	This strategic plan, which was developed by the Calgary Regional Partnership, protects the region's landscape and associated ecological goods and services. The plan guides urban growth based on a forecasted 1.7 million new residents to the region.
Watershed management plans	Non-statutory documents that set the vision and best practices for water resource management in watersheds. Watershed Planning and Advisory Councils (WPACs) are required to develop these plans.
Water management plans	These plans set clear and strategic directions regarding how water should be managed. An approved water management plan under the Water Act must be considered by a Director when making water licence and approval decisions. None of the water management plans in Calgary fall under this category, and as a result, these are discretionary and non-statutory.

CITY OF CALGARY MUNICIPAL PLANNING DOCUMENTS

Municipalities provide specific directions for development in or near riparian areas. The Municipal Development Plan, area structure plans and area redevelopment plans are all statutory planning documents. The tools and mechanisms used to implement planning consist of a variety of approvals and permits established in response to applications from the private sector. In addition to statutory planning documents, municipalities can also enact bylaws to influence the management of riparian lands.

One other important influence for riparian management decisions is the unique service provided by healthy riparian ecosystems to reduce sediment and nutrients entering rivers and creeks. Supporting natural riparian functions accordingly supports stormwater management compliance within The City’s wastewater operating approval.

In addition to statutory instruments for the management of riparian areas, there are a number of municipal government policies and strategies that also provide direction. The City of Calgary has two main policies that influence riparian-area management:

Wetland Conservation Plan. This plan was developed in response to concerns about the rate of wetland loss due to urban growth. The Plan has policies and procedures for the identification of wetlands and their associated environmental significance. It includes a “no net loss” policy and is one of the first municipal wetland policies in Canada.

Environmental Reserve Setback Guidelines. These Council-adopted guidelines stemming from the Municipal Government Act of Alberta established a greater setback from wetlands and water courses to prevent pollution discharge into water bodies, and to further protect riparian areas. The base setback is modified by factoring in land quality and slope. Degraded lands and steeper slopes require a greater setback from water bodies

City of Calgary Municipal Planning Documents	Description
Municipal Development Plan (MDP) ⁹	<p>The MDP was adopted by Council in September, 2009. This document provides specific direction on watershed management and the maintenance and establishment of green infrastructure. The goals and objectives with regards to Greening the city are to:</p> <ul style="list-style-type: none"> • Conserve, protect and restore the natural environment. • Connect green infrastructure throughout the urban fabric. • Protect, conserve and enhance water quality and quantity by creating a land-use and transportation framework that protects the watershed. • Protect and integrate critical ecological areas such as wetlands, floodplains and riparian corridors into development areas. • Maintain biodiversity and landscape diversity, integrating and connecting ecological networks throughout the city.

⁹ O2 Planning & Design, Phase 1 Technical Report, Riparian Areas Map Project for The City of Calgary, 2012.

City of Calgary Municipal Planning Documents	Description
Calgary Transportation Plan (CTP)	This plan provides policy direction on multiple aspects of the city's transportation system.
Area Structure Plans (ASP)	A statutory plan, as defined by the Municipal Government Act, that directs future land-use patterns, transportation and utility networks, and the sequence of development in new communities.
Area Redevelopment Plans (ARP)	A statutory plan, as defined by the Municipal Government Act, which directs the redevelopment, preservations or rehabilitation of existing lands and buildings, generally within existing areas of the city.
Bylaws	Municipalities can influence the management of riparian lands by enacting bylaws. Examples of City bylaws that can potentially relate to riparian areas include: Land Use Bylaw, Drainage Bylaw, Parks and Pathway Bylaw, Street Bylaw, Tree Protection Bylaw, Glenmore Park Bylaw, Public Behaviour Bylaw and Responsible Pet Ownership Bylaw.
Municipal Approvals to Operate: Environmental Protection & Enhancement Act Approval No. 476-02-00 for the water system and <i>Environmental Protection & Enhancement Act</i> Approval No. 17531-01-00 for the wastewater system	The City receives approval from Alberta Environment & Sustainable Resource Development to operate water and wastewater treatment plants based on conformance to the EPEA. The Approvals outline the terms and conditions under conditions extend to which we can operate the plants including sampling, monitoring, record-keeping, certification of operators, performance limits and water-quality requirements. The Wastewater Approval also contains requirements for an Environmental Performance Plan and a Total Loading Management Plan.
Water Efficiency Plan (2005)	In 2005, City Council adopted the 30-in-30 water-efficiency goal as outlined in the Water Efficiency Plan. The City's 30-in-30 goal and Water Efficiency Plan take into account the drivers for current and forecasted water demand, the potential for water savings, and the expected long-term return on investment. Through long-term water-management strategies, The City will service its growing population and customer base over a 30-year time period (2003 – 2033) without exceeding the total annual amount of water that was diverted from the Bow and Elbow Rivers in 2003.
Stormwater Management Strategy (2005)	<p>This strategy was approved by Council in 2005, and its purpose is to protect Calgary's water resources and reduce the impacts of urban drainage on local watersheds. The strategy has identified that an integrated approach to stormwater management is necessary to protect watershed health and ensure sustainability of future growth. The goals of the strategy are to:</p> <ul style="list-style-type: none"> • Reduce pollutants entering Calgary's rivers • Protect watershed function by reducing rate and volume of stormwater runoff • Protect property from flooding and erosion • Develop sustainable stormwater management practices • Ensure that the potential for TSS loading to Bow River remains at or below the 2005 TSS level

City of Calgary Municipal Planning Documents	Description
Calgary Wetland Conservation Plan (2004)	This plan was developed in response to concerns about the rate of wetland loss due to urban growth. The Plan has policies and procedures for the identification of wetlands and their associated environmental significance. It includes a “no net loss” policy and is one of the first municipal-wetland policies in Canada.
Environmental Reserve Setback Guidelines (2007)	These Council-adopted guidelines stemming from the <i>Municipal Government Act</i> of Alberta, established a greater setback from wetlands and water courses to prevent pollution discharge into water bodies, and to further protect riparian areas. There is a base setback that can be modified for factoring land quality and slope. Degraded lands and steeper slopes require a greater setback from water bodies.
Open Space Plan (2003)	This Plan was adopted and amended by City Council in 2003. The objective of the Plan is to maintain biodiversity and integrate and connect ecological networks throughout the city. The components of the Calgary’s ecological network include the river-valley system, natural-environment parks, regional and neighbourhood parks, pathways, school sites and community gardens
Urban Forest Strategic Plan (2007)	The objective of the Plan is to provide a framework for City staff and community partners to make decisions regarding the sustainable management of the urban forest today that will have a positive impact for future generations.
Urban Parks Master Plan (1994)	This Plan was approved by City Council in 1994 and outlines policies for preserving natural landscape features based on the following goal: <i>“the establishment of significant areas of open space to ensure that urban populations have easy access to natural environments, and the development of these areas to enable their sustained and unimpaired use of outdoor recreation”</i> .
Natural Area Management Plan	This Plan established an overall policy direction for the protection, management, acquisition and stewardship of Calgary’s natural heritage. The Plan provides a framework of options for acquiring natural areas, including developer dedication as Environmental Reserve (ER) or Municipal Reserve (MR), donations, land exchange and purchase.
Triple Bottom Line Policy (2005)	This policy was adopted by City Council in 2005. The policy is a decision-making, planning and reporting framework to achieve sustainable development. It addresses social, economic, environmental and smart growth impacts of all City business.
Environmental Policy	This policy states how The City of Calgary will work with the community for a sustainable future. The main goals of the policy are to: Comply with applicable legislation; Conserve resources and prevent pollution; Continually improve our environmental performance.

Appendix Two: Riparian health inventory methodology

The Riparian Health Inventory (RHI) methodology was developed by Cows and Fish (The Alberta Riparian Habitat Management Society) in collaboration with Dr. Paul Hansen and William Thompson (formerly of University of Montana's Riparian and Wetland Research Program¹⁰). A RHI measures key vegetation, soil and hydrology indicators that determine how well a riparian site is performing important ecological functions.

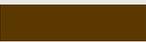
For stream and small river systems, riparian health scores are derived from an evaluation of 11 key vegetation, soil and hydrology health parameters (Table 4). For large rivers, health scores are based on an evaluation of eight of these parameters in addition to seven others mainly related to tree cover and hydrology. Riparian health ratings for streams and rivers are determined by an evaluation of the following parameters:

Riparian Health Parameter Assessed		Streams and small rivers	Large rivers
Vegetation	vegetation cover	✓	
	cottonwood and poplar regeneration		✓
	regeneration of other tree species		✓
	preferred shrub regeneration		✓
	preferred tree/shrub regeneration	✓	
	preferred tree shrub utilisation and other woody vegetation removal buy other than browsing	✓	
	dead/decadent woody material	✓	✓
	total canopy cover of wood plants		✓
	invasive plants	✓	✓
	disturbance plants	✓	✓
Physical	root mass protection	✓	✓
	human-caused alterations to banks	✓	✓
	human-caused bare grounds	✓	✓
	human-caused alterations to rest of site	✓	✓
	floodplain accessibility		✓
	channel incisement	✓	
	removal or addition of water from/to river system		✓
	control of flood peak and timing by upstream dam(s)		✓

Table 3 Riparian Health Parameters

¹⁰ 2007 – 2010 Riparian Evaluation Synthesis and Riparian Restoration Recommendations, Alberta Riparian Habitat Management Society (Cows and Fish), January, 2012.

Riparian health ratings are broken down into three categories:

Health Category		Score Ranges	Description
Healthy		80 – 100%	little to no impairment to any riparian functions
Healthy, but with problems		60 – 79%	some impairment to riparian functions due to human or natural causes
Unhealthy		<60%	severe impairment to riparian functions due to human or natural causes

In order to select RHI sites, the project area is initially stratified based on physical and vegetation features. Using air-photo interpretation, stream systems are delineated into similar sub-reaches based on valley type and slope. The outer boundary of a site is generally determined by the outer edges of the functional riparian zone. Functional riparian areas are characterized by three main features¹¹:

- Seasonal or regular presence of water that is either on the surface or close to the surface (e.g. alluvial aquifers and flood risk areas with the 1:100 yr floodplain)
- Presence of hydrophytic vegetation that responds to, requires and survives in abundant water
- Presence of hydric soils that have been modified by high water tables or by the sediment deposition or lush and productive vegetation associated with abundant water.

¹¹ 2007 – 2010 Riparian Evaluation Synthesis and Riparian Restoration Recommendations, Alberta Riparian Habitat Management Society (Cows and Fish), January, 2012.

References

References

- City of Calgary. (2009). *Calgary Municipal Development Plan*. Retrieved from https://www.calgary.ca/PDA/LUPP/Documents/pdf/municipal_development_plan/municipal-development-plan.pdf?noredirect=1 on April 22, 2013.
- Clare, S. & Sass, G. (2012). *Riparian lands in Alberta: Current state, conservation tools, and management approaches*. Report prepared for Riparian Land Conservation & Management Team, Alberta Water Council, Edmonton, Alberta.
- Fitch, L., Adams, B., & Hale, G. (2001). *Riparian Health Assessment for Streams and Small Rivers – Field Workbook*. Lethbridge, AB: Cows and Fish Program.
- Fitch, L. and Ambrose, N. (2003). *Riparian Areas: A User's Guide to Health*. Lethbridge, Alberta: Cows and Fish Program. ISBN No. 0-7785-2305-5
- Hull, K., Halawell, A., & Stebank, K. (2012). *2007-2010 Riparian Evaluation and Riparian Restoration Recommendations*. Alberta Riparian Habitat Management Society (Cows and Fish). Report No. 40.
- Loë, R.C., Armitage, D., Plummer, R., Davidson, S. and Moraru, L. (2009). *From Government to Governance: A State-of-the-Art Review of Environmental Governance*. Final Report. Prepared for Alberta Environment, Environmental Stewardship, Environmental Relations. Guelph, ON: Rob de Loë Consulting Services.
- O2 Planning + Design Inc. (O2). (March 21, 2013). Technical Memo. Unpublished report prepared for City of Calgary.
- O2 Planning + Design Inc. (O2). (October 2012). Phase One Technical Report. Prepared by O2 Planning + Design Inc. (O2). Unpublished report prepared for City of Calgary.
- Province of Alberta. (2012) *Stepping Back from the Water: A Beneficial Management Practices Guide for New Development Near Water Bodies in Alberta's Settled Region*. Calgary, AB: Alberta Environment and Water.
- Province of Alberta. (2008). *Water for Life: Alberta's Strategy for Sustainability*. Calgary, AB: Alberta Environment and Water. ISBN 978-01-7785-7670-9

Riparian Strategy: Sustaining Healthy Rivers and Communities

2014-1595



THE CITY OF
CALGARY