

RIPARIAN TARGETS IN LAW AND POLICY: A Jurisdictional Review

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IN BRIEF

Riparian area conservation and restoration has become a central pillar for water and ecosystem management and regulation. Implementing conservation restoration programs can be facilitated and driven by the setting of riparian vegetation targets at various scales. These targets will often include buffer widths for restoration of riparian vegetation, but it is also important and useful to consider broader functions beyond localized restoration efforts. This report canvasses various provincial and state-level approaches to setting riparian targets. The objective of this review was to identify these targets as well as the scientific rationale behind the setting of such targets.

The desktop review revealed that most jurisdictions have not established targets for riparian connectivity or riparian extent. Many jurisdictions did not implement any meaningful targets for riparian health, and those that did tended to rely on restoration targets which were based on baseline or reference conditions. These conditions were derived through historical analysis or through modelling and often reflected a target of 100% intactness, whether that target was directly prescribed or merely implied. Targets that focused on specific functions at a higher level (for example catchment or river reach level) were largely absent.

Due to time and resource limitation, the desktop review did not include an in-depth assessment of riparian targets implemented by local authorities. Nevertheless, the review did reveal extensive reliance on local authorities in managing and regulating riparian areas, making a review of local authorities a potential avenue for further research.

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INTRODUCTION

The North Saskatchewan Watershed Alliance (NSWA) has proposed draft riparian targets for certain watersheds as part of its draft **Riparian Conservation and Restoration Strategy**. These targets, focused on the level of intactness of riparian areas within certain NSWA watersheds, will assist in implementing the NSWA Integrated Watershed Management Plan. As part of this Strategy, the NSWA has undertaken significant riparian assessment and has gathered the data to inform next steps in riparian management in the basin. The setting of these riparian targets is being considered to prioritize future work around riparian areas within the North Saskatchewan River Basin.

The Environmental Law Centre (ELC) undertook this report to provide the NSWA with an understanding of how other jurisdictions have (or have not) pursued the setting and use of riparian targets.

From the outset it is important to note that the setting of objectives and targets for riparian areas can be as complicated or simple as decision makers wish to make them. This variability in target setting reflects the large number of riparian functions that may be of interest to managers and decision makers, as well as the research and monitoring needs each function may attract. Targets may also be set in a purely aspirational way, reflecting the understanding that the more “healthy” the riparian area is in a specific basin, sub-basin, reach, or parcel, the more likely there is a commiserate contribution to riparian function.

The ELC has undertaken a desktop review of various jurisdictions to determine whether riparian targets are being used (primarily at a provincial or state level) and how those targets are supported by specific riparian functions. The focus of this review is on target setting in laws, regulation, and policies. The scientific basis for these targets were also of specific interest, to assist decision makers in justifying their chosen targets.

The report is set out in 3 distinct parts. First, the report presents a general background to the nature of riparian area functions, values, and targets. Second, there is a jurisdictional review of various provincial and state jurisdictions to determine the extent to which regulation and policy foster the creation of riparian targets for riparian cover. Third, the ELC provides a summary of the most significant legal tools that municipalities can use to implement and meet riparian health targets.

From an early stage, the ELC observed that many of the relevant targets may exist at a more localized level. While some examples are provided in this report, investigating more localized targets in each jurisdiction was beyond the scope of this report. Future work may include a further detailed review of select jurisdictions and whether local targets have been adopted into local policies, regulations, and planning and development processes.

RIPARIAN AREAS

Riparian areas (or riparian zones) can be defined as “transitional environments occurring at the interface between land and freshwater ecosystems, with distinctive biotic and abiotic characteristics strongly regulated by water presence”.¹ The Alberta Water Council has provided a more detailed definition.²

Riparian lands are transitional areas between upland 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 bodies, including alluvial aquifers and floodplains. Riparian lands usually have soil, biological, and other physical characteristics that reflect the influence of water and hydrological processes.

The delineation of these areas can be more challenging due to various spatial, hydrological, and biophysical considerations.³

The various functions (and therefore the value) of riparian areas have been extensively researched. These functions include a variety of ecosystem functions and services, such as carbon sequestration, shading (and temperature regulation), water quality, flood attenuation, habitat availability, and connectivity.⁴ Due to these multiple functions there is a broad recognition that maintenance, conservation, and restoration of riparian corridors is important for both ecosystems services and ecological reasons.

Riparian Assessment and Setting Targets

Effective riparian and aquatic ecosystem management requires a systematic approach to understanding the state of riparian conditions and assessing and understanding the nature of riparian area pressures. This understanding can then be used to guide decision making regarding allowable activities within a riparian corridor and drive conservation and restoration within a basin. Setting out riparian based targets at various scales will assist in driving restoration planning and effort.

¹ Pedraza, S.; Clerici, N.; Zuluaga Gaviria, J.D.; Sanchez, A. “Global Research on Riparian Zones in the XXI Century: A Bibliometric Analysis”. (2021) *Water* 13, 1836. See also *National Research Council, Riparian Areas: Functions and Strategies for Management* (Washington, DC: The National Academies Press, 2002).

² Alberta Water Council, *Riparian Land Conservation and Management Report and Recommendations* (2013), online: https://www.awchome.ca/_projectdocs/?file=e807bf3e2ed51423.

³ Pedraza et al, *supra* note 1.

⁴ See Tenna Riis, Mary Kelly-Quinn, Francisca C Aguiar, Paraskevi Manolaki, Daniel Bruno, María D Bejarano, Nicola Clerici, María Rosário Fernandes, José C Franco, Neil Pettit, Ana P Portela, Olga Tammeorg, Priit Tammeorg, Patricia M Rodríguez-González, Simon Dufour, “Global Overview of Ecosystem Services Provided by Riparian Vegetation” (2020) *BioScience*, 70:6, 501–514 and Pedraza, S.; Clerici, N.; Zuluaga Gaviria, J.D.; Sanchez, A.

“Global Research on Riparian Zones in the XXI Century: A Bibliometric Analysis”. (2021) *Water* 13, 1836.

When considering the assessment of riparian functions and related values, one should not underestimate the complexity of determining relative riparian “health”.⁵ Characterizing riparian health will depend on the functions that the riparian area provides and on the choices and priorities that managers and decisions makers ascribe to those functions. Assessment processes such as those undertaken by the NSW are an essential first step in understanding the current state of riparian health and what management actions and strategies may be required to maintain or restore prioritized functions.

Riparian corridor assessments have been evolving over the years. In the European Union (EU), for example, a robust system of assessment has evolved as a result of the EU *Water Directive* and the need for member states to undertake ecological and hydromorphological assessments, including the assessment of multiple functions, at various scales.⁶

The setting of targets will be guided by the functions that a decision maker wishes to prioritize. These riparian functions may be singular in nature (e.g., mitigating nitrogen runoff) or may be bundled (e.g., water quality and biodiversity).⁷ In this regard, targets will be focused on providing distinct services and will require the support of different assessments and management. The various factors at play may include buffer width, vegetative cover (species diversity and make up), riparian connectivity, management of flows, and channel geomorphology. This can be characterized as developing a “river identity” that will reflect an overall state of the river and the multiple functions it plays through time and space.⁸

Setting conservation and restoration targets will also be driven by function and the relevant scale of interest. While some functions may be appropriately assessed and managed at a scale of the basin or

⁵ It has been noted that “an attempt to model the different processes and pathways of a freshwater [ecosystem services] by Johnston et al. (2011) highlighted over 7000 variables”. Kris Van Looy, Thierry Tormos, Yves Souchon & David Gilvear, “Analyzing riparian zone ecosystem services bundles to instruct river management” (2017) *International Journal of Biodiversity Science, Ecosystem Services & Management*, 13:1, 330-341, DOI: 10.1080/21513732.2017.1365773 <https://www.tandfonline.com/doi/pdf/10.1080/21513732.2017.1365773>.

⁶ See Massimo Rinaldi (UNIFI), Barbara Belletti (UNIFI), Wouter Van de Bund (JRC), Walter Bertoldi (QMUL), Angela Gurnell (QMUL), Tom Buijse (DELTA RES), Erik Mosselman (DELTA RES), “Review on eco-hydromorphological methods” (2013), online https://www.researchgate.net/profile/Barbara-Belletti-2/publication/285453114_Restoring_rivers_for_effective_catchment_management_D11_Review_on_eco-hydromorphological_methods/links/566a974908ae430ab4f7986c/Restoring-rivers-for-effective-catchment-management-D11-Review-on-eco-hydromorphological-methods.pdf.

⁷ Kris Van Looy, Thierry Tormos, Yves Souchon & David Gilvear, “Analyzing riparian zone ecosystem services bundles to instruct river management” (2017) *International Journal of Biodiversity Science, Ecosystem Services & Management*, 13:1, 330-341, DOI: 10.1080/21513732.2017.1365773.

⁸ See Pedroli, B., De Blust, G., Van Looy, K. & S. van Rooij “Setting targets in strategies for river restoration” (2002) *Landscape Ecology* 17: 5-18, online: https://www.researchgate.net/publication/226280964_Setting_targets_for_river_restoration.

sub-basin, others will be better managed at a parcel or river reach level. These scales and related management actions will be invariably linked and nested.⁹

As noted by Tenna Riis *et al*, the underlying question is: *How much area is needed in order to support and optimize each of the [Ecosystem Services]?*¹⁰

Regulation and Governance

Riparian management, conservation, and restoration takes place within a broad regulatory and policy system. We will refer to this broad suite of policy and regulation as “riparian area governance” as it deals not only with specific regulatory and policy requirements, but also with administrative and decision-making systems and programs that might be used to reach riparian objectives and targets.

The focus of this report is on a discrete aspect of riparian governance, that of target setting. However, it must be kept in mind that riparian governance will play a key role in how one might not only set targets, but also on monitoring, decision making about activities that impact riparian health, and creating the necessary administrative systems, policies, and programs. A comprehensive riparian governance system will allow for the implementation of strategic action to maintain and restore riparian systems.

It should also be kept in mind that, much like the complexity of riparian systems themselves, riparian area governance is a prime example of an area of law and policy complexity. Where land meets water there is a convergence of regulatory jurisdiction (federal, provincial, municipal) and, with it, a tension between private property and publicly owned resources.

In Alberta law, riparian areas are under the jurisdiction of all three levels of government, namely federal, provincial, and municipal. This creates challenges for the management and regulation of these areas. Further, the regulatory tools that are available differ significantly between private and public land. The full suite of regulatory and policy tools will need to be well understood and strategically used if targets are to be met.

⁹ See for example González del Tánago M., V. Martínez-Fernández, D. García de Jalón, P.M. Rodríguez-González, S. Dufour, V. Garófano Gómez (2020). *Knowledge Conversion for Enhancing Management of European Riparian Ecosystem and Services: Guidance to Implement the Protocol for the Status/Pressures Assessment*. Report, COST Action CA16208 CONVERGES, 60 p.

¹⁰ Tenna Riis, Mary Kelly-Quinn, Francisca C Aguiar, Paraskevi Manolaki, Daniel Bruno, María D Bejarano, Nicola Clerici, María Rosário Fernandes, José C Franco, Neil Pettit, Ana P Portela, Olga Tammeorg, Priit Tammeorg, Patricia M Rodríguez-González, Simon Dufour, “Global Overview of Ecosystem Services Provided by Riparian Vegetation”, (2020) *BioScience*, 70:6, 501–514.

JURISDICTIONAL REVIEW

Canada

In Canada, the majority of provinces have introduced measures to protect riparian areas from development. Specifically, most provinces have implemented buffer zones to protect riparian areas, including restrictions on the activities that may be carried out in these buffer zones. Most often, this includes restrictions on forestry practices and land use and development, as well as some agricultural practices. In addition, some provinces have created legal structures to allow municipalities or other lower level authorities to carry out riparian health assessments in order to facilitate development planning and to identify priorities for the restoration of riparian lands. However, no province has implemented binding targets for riparian health, whether at a watershed level or otherwise.

In this section, we will review some of the measures the provinces have implemented to assess and protect riparian health, insofar as these measures may help to inform the project of setting riparian health targets in the North Saskatchewan watershed. We will focus specifically on the measures taken in British Columbia, Saskatchewan, Manitoba, Ontario, and Quebec, with a brief comment on measures taken at the federal level.

British Columbia

In British Columbia, the provincial government has imposed set-backs and buffer zone requirements to protect riparian areas, specifically focussing on land use planning, agriculture, and forestry.

With respect to land use planning, the provincial government has enacted the *Riparian Areas Protection Regulation*¹¹. This regulation requires listed municipalities to enact land use bylaws that restrict development within 30m of any watercourse that provides habitat to protected fish.¹² In particular, the municipalities must enact bylaws that require any development within the riparian buffer zone to undergo an environmental assessment and to follow any measures recommended in the assessment.¹³

With respect to forestry practices, the Government of British Columbia has enacted the *Forest Planning and Practices Regulation*¹⁴. This regulation allows the government to set objectives for water, fish, wildlife, and biodiversity within riparian areas. Anyone who possesses a timber permit or timber agreement must develop a forestry stewardship plan and, as part of that plan, must explain how they will meet the riparian objectives set by the government.¹⁵ In addition, the *Forest Planning and Practices*

¹¹ *Riparian Areas Protection Regulation*, BC Reg 178/2019.

¹² *Ibid*, ss 3, 4, 8.

¹³ *Ibid*, s 5. Note that the methods to be used in the assessment are based on a print document that is only available at the office of the Resource Stewardship Division, Ministry of Forests, Lands and Natural Resource Operations in Victoria (see *ibid*, Schedule).

¹⁴ *Forest Planning and Practices Regulation*, BC Reg 14/2004.

¹⁵ *Ibid*, s 8. To date, there are no objectives specifically dealing with riparian zones: see *Provincial Timber Management Goals, Objectives & Targets* (16 June 2020), online: Government of British Columbia

Regulation sets out buffer zones that apply to forestry practices. Within these buffer zones, certain activities are prohibited, including road construction, tree cutting and removal, and the use of livestock.¹⁶

Finally, with respect to the agricultural sector, the provincial government in British Columbia has not imposed any binding set-back or buffer zone requirements. However, it has put together resources for voluntary best practices to protect riparian health, including identifying set-backs for agricultural buildings, assessing and monitoring riparian areas, and watering livestock.¹⁷

[Local Example: Cowichan Watershed Board](#)

The Cowichan Watershed Board is a local governance entity that was formed in 2010 to promote watershed sustainability within the Cowichan and Koksilah watersheds, which are located towards the southern end of Vancouver Island.¹⁸ The Board is co-chaired by the Cowichan Tribes and the Cowichan Valley Regional District.

The Cowichan Watershed Board has set two targets with respect to riparian areas:

- 50% of intact riparian habitat protected by 2021; and
- 10% of impacted riparian habitat restored by 2021.¹⁹

Alberta

In Alberta, the provincial government has legislated a number of industry specific set-back requirements:

- The *Alberta Timber Harvest Planning and Operating Ground Rules Framework for Renewal* establishes buffer zones for the forestry industry;²⁰
- The *Agricultural Operations and Practices Act*²¹ and its regulations establish set-backs for the storage and application of manure in agricultural operations;²² and

https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/silviculture/provincial_timber_targets_2019-20_status_report_2021jan18.pdf.

¹⁶ *Forest Planning and Practices Regulation*, *supra* note 14, Division 3.

¹⁷ See “Management of riparian areas”, online: Government of British Columbia <https://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/riparian-areas/management?keyword=riparian>.

¹⁸ See “About” (2021), online: Cowichan Watershed Board <https://cowichanwatershedboard.ca/about/>.

¹⁹ “Riparian Target” (2021), online: Cowichan Watershed Board <https://cowichanwatershedboard.ca/riparian-target/>.

²⁰ *Alberta Timber Harvest Planning and Operating Ground Rules Framework for Renewal*, online: Government of Alberta [https://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/formain15749/\\$FILE/TimberHarvestPlanning-OperatingGroundRulesFramework-Dec2016.pdf](https://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/formain15749/$FILE/TimberHarvestPlanning-OperatingGroundRulesFramework-Dec2016.pdf).

²¹ *Agricultural Operations Practices Act*, RSA 2000, c A-7.

²² See *Standards and Administration Regulation*, Alta Reg 267/2001.

- The *Oil and Gas Conservation Act*²³ and related regulations establish set-backs for the siting of oil and gas wells and related pits.²⁴

In addition to these set-back requirements, the Government of Alberta is also able to manage riparian zones through some of its powers under the *Water Act*.²⁵ In particular, under the *Act*, the responsible Minister is able to require the government or another person to create a water management plan, which may include a plan for managing the riparian areas within the watershed.²⁶

Additionally, under the *Water Act*, the Alberta government has an indirect ability to manage riparian zones through the approvals it issues for activities that affect the flow of water.²⁷ Notably, an approval for any activity taking place in a wetland will likely be subject to the *Alberta Wetland Policy*, which sets out requirements to avoid or minimize the impacts of the activity on the wetlands or, in circumstances where that is not possible, to replace them.²⁸

Similarly, under the *Public Lands Act*²⁹, the Government of Alberta manages the activities that may take place on public lands, including beds and shores owned by the provincial government. Decisions under this *Act* for any activities that take place in a wetland will likely also consider the *Alberta Wetland Policy*.³⁰

Beyond these legal structures, it is worth noting that the provincial government has also developed some voluntary tools to help individuals and local governments manage riparian areas. Specifically, the Government of Alberta has put forward resources on evaluating the impact of livestock use and managing their effects on riparian zones.³¹ The government has also created a guide for decision-makers wanting to implement riparian setbacks, which provides recommendations for setback widths and buffers.³²

Aside from government programs and requirements, in Alberta, a number of not for profit organizations have also put together resources for managing riparian areas. Most importantly, the Cows and Fish

²³ *Oil and Gas Conservation Act*, RSA 2000, c O-6.

²⁴ See *Oil and Gas Conservation Rules*, Alta Reg 151/1971, s 2.120(1).

²⁵ *Water Act*, RSA 2000, c W-3.

²⁶ *Ibid*, s 9; *Framework for Water Management Planning* (1 January 2001), online: Government of Alberta at 10 <https://open.alberta.ca/publications/0778517381>.

²⁷ See *Water Act*, *supra* note 25, s 38.

²⁸ *Alberta Wetland Policy* (1 September 2013), online: <https://open.alberta.ca/publications/9781460112878>.

²⁹ *Public Lands Act*, RSA 2000, c P-40.

³⁰ See *Public Lands Administration Regulation*, Alta Reg 187/2011, ss 9-16.

³¹ "Grazing and range management – Riparian areas" (2021), online: Government of Alberta <https://www.alberta.ca/grazing-and-range-management-riparian-areas.aspx>.

³² *Stepping Back from the Water: A Beneficial Management Practices Guide for New Development Near Water Bodies in Alberta's Settled Region* (2012), online: Government of Alberta at s 6.0 <https://open.alberta.ca/dataset/1c70eb43-a211-4e9c-82c3-9ffd07f64932/resource/6e524f7c-0c19-4253-a0f6-62a0e2166b04/download/2012-steppingbackfromwater-guide-2012.pdf>.

program has produced several publications to assist landowners in evaluating and managing riparian zones.³³

Local Example: The City of Calgary

In response to the 2013 flood, the City of Calgary adopted a Riparian Strategy, which established a high level framework for protecting riparian zones within the municipality.³⁴ The City subsequently came out with a Riparian Action Program, which laid out more specific details for how the City would monitor, conserve, and restore its riparian zones.³⁵

As part of this Action Program, the City of Calgary has set targets for maintaining its riparian zones. In particular, it has set the following targets for maintaining undeveloped riparian spaces along major perennial creeks and rivers.³⁶

City wide	73%
Bow River	75%
Elbow River	62%
Nose Creek and West Nose Creek	67%

Note that these targets reflect the baseline or current level of development, with a goal of no net loss by 2026. In future, the City will determine similar targets for riparian open spaces along ephemeral and intermittent watercourses in future.³⁷

In addition, the City of Calgary has also set the following targets for riparian health with its municipal boundaries, with the goal of reaching these targets by 2026.³⁸

City wide	72%
Conservation zones	77%
Restoration zones	71%
Recreation zones	60%
Flood and erosion control zones	54%

Note that these targets all represent improvements from baseline levels of riparian health

³³ See “Publications: Riparian Areas & Management”, online: Cows and Fish <https://cowsandfish.org/product-category/riparianareasandmanagement/>; “Publications: Riparian Health Assessment”, online: Cows and Fish <https://cowsandfish.org/product-category/riparianhealthassessment/>.

³⁴ *Riparian Strategy: Sustaining Healthy Rivers and Communities*, online: City of Calgary <https://www.calgary.ca/content/dam/www/uep/water/documents/water-documents/calgary-riparian-strategy.pdf>.

³⁵ *Riparian Action Program*, online: City of Calgary <https://www.calgary.ca/content/dam/www/uep/water/documents/water-documents/riparian-action-program-report.pdf>.

³⁶ *Ibid* at 15.

³⁷ *Ibid*.

³⁸ *Ibid* at 18-19.

within the municipality, with an intention to rely on bank and riparian restoration techniques to reach the target levels.³⁹

Saskatchewan

In Saskatchewan, the provincial government has not implemented any binding legal measures to assess or protect riparian health, other than fairly limited requirements that holders of grazing and haying authorizations in provincial forests must submit a plan for how they will minimize effects on riparian areas.⁴⁰ As well, the province requires municipalities to consider the importance of riparian areas in land use planning, although there are no specific requirements for how to consider riparian areas or how to take them into account in land use planning.⁴¹

In Saskatchewan, the more significant effort to manage riparian health comes from a multi-stakeholder partnership between industry, government, and ENGOs, called the Prairie Conservation Action Plan. This organization has published two guides to assessing riparian health, which are intended for use by private land owners and on the ground staff persons of agencies and organizations charged with managing riparian health.⁴² The guides are based off of similar publications that were created by the Cows and Fish program in Alberta.⁴³

To carry out a riparian health assessment, the guides instruct the user to assign numerical scores based on nine factors:

- Vegetation cover;
- Invasive species cover;
- Disturbance-caused vegetation cover;
- Presence and regeneration of woody vegetation;
- Animal utilization of woody vegetation;
- Human alteration of vegetation;
- Human alteration of the shore and bank;
- Human-caused bare ground; and
- Artificial modification of water level.⁴⁴

Once the scores have been assigned, the guide assigns the riparian area in question one of three possible classifications: healthy, healthy but with some problems that should be addressed, and

³⁹ *Ibid* at 17. For more information about how the health assessment was conducted, see *ibid* at 60-65.

⁴⁰ *Forest Resources Management Regulations*, RRS c F-19.1 Reg 1, ss 59, 67.

⁴¹ *Statements of Provincial Interest Regulations*, RRS c P-13.2 Reg 3, s 6.2.

⁴² *Lakes, sloughs and wetlands: Riparian Health Assessment* (2008), online: Prairie Conservation Action Plan https://www.pcap-sk.org/rsu_docs/documents/Lakes_Sloughs_and_Wetlands-Blue.pdf [*Lakes Assessment*]. See also *Streams and small rivers: Riparian Health Assessment* (2008), online Prairie Conservation Action Plan https://www.pcap-sk.org/rsu_docs/documents/Streams_and_Small_Rivers-Green.pdf.

⁴³ See “Publications: Riparian Health Assessment”, online Cows and Fish <https://cowsandfish.org/product-category/riparianhealthassessment/>.

⁴⁴ See e.g., *Lakes Assessment*, *supra* note 42 at 41-66.

unhealthy.⁴⁵ This allows the land owner or other user of the guide to determine the most appropriate actions to take to ensure riparian health, including which areas to target for restoration.⁴⁶

Manitoba

In Manitoba, the provincial government has the power to assign responsibility for watershed planning to lower level authorities, including watershed districts and municipalities.⁴⁷ Once a watershed planning authority has been designated, that authority must produce a watershed management plan, which may include objectives, policies, or recommendations for the activities to be permitted in riparian areas.⁴⁸ To carry out this work, some watershed planning authorities have conducted riparian health assessments.⁴⁹

On a practical level, each watershed planning authority is responsible for carrying out its own work, so the specific measures in place vary from planning authority to planning authority.

In addition to watershed planning, the Government of Manitoba has also required municipalities to consider the protection of riparian areas as part of their land use planning.⁵⁰ This includes a specific requirement that municipalities must implement 15m and 30m development set-backs to protect riparian areas.⁵¹

Ontario

In Ontario, the provincial government has allowed municipalities to set up governing bodies with the power to manage riparian areas at the watershed level. Specifically, the provincial government allows any group of two or more municipalities to set up a conservation authority, which is a watershed-level authority that is responsible for delivering programs and services for the conservation, restoration, development, and management of natural resources in watersheds in Ontario.⁵²

Under the *Conservation Authorities Act*, conservation authorities have the power to study their respective watersheds, purchase land, and build works relating to water.⁵³ Additionally, with the approval of the responsible minister, conservation authorities are able to enact regulations restricting any development that may cause flooding, erosion, or pollution, or otherwise affect land conservation.⁵⁴

⁴⁵ *Ibid* at 79-80.

⁴⁶ *Ibid* at 80-82.

⁴⁷ *Water Protection Act*, CCSM c W65, s 14.

⁴⁸ *Ibid*, s 14(c).

⁴⁹ See e.g. "East Interlake Conservation District: Watershed 05SB Riparian Assessment survey" (2008), online: Government of Manitoba [Microsoft Word - 05SB_Report_final_March7_08.doc \(gov.mb.ca\)](#).

⁵⁰ *Provincial Planning Regulation*, Man Reg 81/2011, Part 3, Policy Area 5.

⁵¹ *Ibid*.

⁵² *Conservation Authorities Act*, RSO 1990, c C.27, ss 0.1, 2, 20.

⁵³ *Ibid*, s 21.

⁵⁴ *Ibid*, s 28.

With respect to riparian areas, the province requires each conservation authority to enact regulations that prohibit development in:

- areas close to the Great Lakes-St Lawrence River system;
- areas close to any inland lakes that may be affected by flooding, erosion, or dynamic beach hazards;
- rivers and stream valleys; and
- wetlands;⁵⁵

unless the development will not impact flooding, erosion, dynamic beaches, pollution, or land conservation.⁵⁶

In addition to watershed conservation authorities, the province of Ontario has also implemented some more targeted programs that support riparian health. These include legislated standards for managing nutrient run-off in agricultural operations,⁵⁷ monitoring programs for assessing the degree of watershed disturbance within forested areas,⁵⁸ and small grant funding for local restoration initiatives in the Great Lakes area.⁵⁹

Local Example: Niagara Peninsula Conservation Authority

The Niagara Peninsula Conservation Authority is responsible for the Twenty Mile Creek Watershed, which is located in southern Ontario, on the Niagara peninsula. As part of its watershed management plan for this watershed, the Conservation Authority has adopted federally recommended targets for riparian health.⁶⁰ In particular, the Plan adopts the following target:

*75 percent of stream length should be naturally vegetated (i.e., minimum 15 metres naturally vegetated buffer on both sides of a Type 2 and 3 fish habitat classed stream, and a minimum 30 metres on both sides of a Type 1 fish habitat classed stream).*⁶¹

⁵⁵ *Content of Conservation Authority Regulations Under Subsection 28(1) of the Act: Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*, O Reg 97/04, ss 3-7.

⁵⁶ *Ibid.*

⁵⁷ See *Nutrient Management Act, 2002*, SO 2002, c 4; *General*, O Reg 267/03.

⁵⁸ See “Disturbance within watersheds” (6 June 2021), online: Queen’s Printer for Ontario <https://www.ontario.ca/page/disturbance-within-watersheds>.

⁵⁹ See “Great Lakes Local Action Fund” (19 July 2021), online: Queen’s Printer for Ontario <https://www.ontario.ca/page/great-lakes-local-action-fund>.

⁶⁰ *Twenty Mile Creek Watershed Plan* (2006), online: Niagara Peninsula Conservation Authority <https://npca.ca/images/uploads/common/NPCA-Watershed-Plan-20Mile-Creek.pdf>.

⁶¹ *Ibid.*

Quebec

In Quebec, the provincial government has developed two non-binding protocols that may be used by interested individuals to assess riparian health. The first protocol was designed to assess the extent and impact of development around a given lake. To do this, the protocol classifies sections of the riparian zone according to their primary use, such as for agricultural, residential, or natural uses. Then the protocol assesses the overall degree of development within the riparian zone.⁶²

The second protocol developed by the Quebec government is for assessing the riparian health of a river network. This protocol divides the length of the river network's riparian zones into sections according to nine different ecological types—such as, forested, natural vegetation, and developed.⁶³ The protocol then uses a mathematical formula to assign numerical values to each ecological type, based on its importance to the overall riparian health and the percentage of the riparian zone that it occupies. This formula produces a health score of between one and one hundred, with one being very weak riparian health and one hundred being excellent riparian health.⁶⁴

In addition to the two non-binding protocols for riparian health assessment, the Government of Quebec has also implemented buffer zones for riparian areas within the province. Most notably, the *Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains*⁶⁵ sets out a complicated scheme for restricting the structures, undertakings, and works that are permitted on lakeshores and riverbanks.⁶⁶ Importantly, for those works or structures that are permitted, the *Environment Quality Act*⁶⁷ requires the project proponent to obtain a government authorization. This process includes an environmental assessment of the effects the project will have on the riparian zone's ecological functions.⁶⁸

Finally, in addition to the general buffer zone restrictions, the Quebec government has also implemented some restrictions that specifically apply to the agricultural and forestry sectors. In particular, the *Agricultural Operations Regulation*⁶⁹ prohibits allowing livestock to access riparian areas, except to ford water.⁷⁰ It also implements restrictions on the application of fertilizers in riparian areas.⁷¹

⁶² “Protocole de caractérisation de la bande riveraine” (May 2009), online: Gouvernement du Québec https://www.environnement.gouv.qc.ca/eau/rsvl/bande_riveraine.pdf.

⁶³ “Protocole d'évaluation et méthode de calcul de l'indice de qualité de la bande riveraine” (2021), online: Gouvernement du Québec https://www.environnement.gouv.qc.ca/eau/eco_aqua/IQBR/protocole.htm.

⁶⁴ See “Qualité de la bande riveraine: Fiche synthèse”, online: Gouvernement du Québec [fiche_synthese.png](https://www.gouv.qc.ca/fiche_synthese.png) (845x562) (gouv.qc.ca). Note that both Quebec protocols were developed based on the work of Saint-Jacques and Richard (1998), whose papers are cited on the Quebec provincial government website. For more information, see “Indice de qualité de la bande riveraine (IQBR)” (2021), online: Gouvernement du Québec https://www.environnement.gouv.qc.ca/eau/eco_aqua/IQBR/index.htm.

⁶⁵ *Protection Policy for Lakeshores, Riverbanks, Littoral Zones and Floodplains*, CQLR c Q-2, r 35.

⁶⁶ *Ibid*, ss 2.2, 3.1. See also *ibid*, s 5.1.

⁶⁷ *Environment Quality Act*, CQLR c Q-2.

⁶⁸ *Ibid*, Chapter IV, Division V.1

⁶⁹ *Agricultural Operations Regulation*, CQLR c Q-2, r 26.

⁷⁰ *Ibid*, s 4.

⁷¹ *Ibid*, s 30.

Similarly, the *Regulation respecting the sustainable development of forests in the domain of the State*⁷² sets out buffer zones for forested areas and implements detailed restrictions on a number of activities related to forestry.

Federal Government

The federal government has not implemented any major legislative programs dealing with riparian health or riparian health targets. Instead, the federal government has mainly focused on providing scientific research to support the assessment and management of riparian zones.

Notably, Environment Canada has included targets for riparian intactness in its publication, *How Much Habitat is Enough? A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern*.⁷³ With respect to riparian habitat, the guide recommends that 75% of streams should be naturally vegetated, with buffer of at least 30m on the adjacent land and overall less than 10% impervious surfaces.⁷⁴

United States

Federal water law in the United States, particularly the *Clean Water Act*, can have a significant impact on how riparian areas are managed by virtue of imposing statutory requirements on states relating to the assessment and loading of water bodies (which applies to nutrients, sediment, and other impairing factors).⁷⁵ For water bodies that are evaluated as impaired, the *Act* requires the formulation of total maximum daily loads or TMDLs.⁷⁶

Riparian area health and function can play a significant part in managing toward TMDLs, particularly in relation to non-point source pollution.⁷⁷ An example of how the TMDL system relates to riparian areas and stream temperature is provided below, as part of the discussion of the state of Montana.

In addition to the regulatory requirements around surface water assessments and the development of TMDLs, the federal *Clean Water Act* provides a linkage of federal funding for state programs around maintenance and restoration of riparian areas.

⁷² *Regulation respecting the sustainable development of forests in the domain of the State*, CQLR c A-18.1, r 0.01.

⁷³ *How Much Habitat is Enough: A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern* (2004), online: Environment Canada <https://publications.gc.ca/collections/Collection/CW66-164-2004E.pdf>.

⁷⁴ See *ibid* at 21.

⁷⁵ *Clean Water Act*, 13 U.S.C. 1251 (1977).

⁷⁶ *Ibid* at §301-304.

⁷⁷ Eddy J. Langendoen, Ronald L. Bingner, Carlos V. Alonso, and Andrew Simon, "Process-Based Stream-Riparian Modeling System to Assess Stream TMDLs" Proceedings of the Seventh Federal Interagency Sedimentation Conference, March 25 through 29, 2001, Reno, NV https://pubs.usgs.gov/misc/FISC_1947-2006/pdf/1st-7thFISCs-CD/7thFISC/7Fisc-V2/7FISC2-7.pdf#page=59.

The TMDL system in the United States is a central aspect of surface water management that is missing both federally and provincially in Alberta.

Observations of State Systems

The challenges of riparian governance in the states that were reviewed are reflective of similar challenges seen in Canada and Alberta. Regulation is typically limited to waterbodies, their beds and shores, and public land resource management. On private lands, there are mechanisms for municipal regulation of riparian areas and consideration of riparian areas in development, but, by and large, there is deferral to private property rights, such that many activities were permitted that could impair riparian areas. In this regard, there is significant reliance on local authorities implementing and enforcing local riparian ordinances.⁷⁸ Most notably, the states reviewed often relied on voluntary restoration and incentive programs to address impairment related to agriculture activities or other general private property uses.

This review focuses on legislation specific to riparian areas. There are a large number of other pieces of legislation that are also relevant, including those specific to resource extraction (forestry and energy) and watershed planning. We highlight general state approaches to riparian management with examples for the states of Connecticut, Montana, Oregon, Washington, and Ohio.⁷⁹

The desktop review undertaken by the ELC did not identify any state level targets of the nature contemplated by the NSWA in either statute or regulation.

Connecticut

The primary piece of legislation used to manage wetlands in Connecticut is the *Inland Wetlands and Watercourses Act*.⁸⁰ This legislation creates an administrative decision making process for municipal

⁷⁸ For further information, see Seth J. Wenger and Laurie Fowler, “Protecting Stream and River Corridors: Creating Effective Local Riparian Buffer Ordinances”, Public Policy Research Series, 2000, University of Georgia, online: https://www.ohioenvironmentallawblog.com/wp-content/uploads/sites/576/uploads/file/UGA%20riparian_buffer_guidebook.pdf. In reference to riparian corridor extent these authors note: “It is very clear that riparian buffers must be preserved on as many stream miles as possible. We recommend that, at a minimum, all perennial and intermittent streams be protected by buffers.” See also National Research Council, *Riparian Areas: Functions and Strategies for Management* (Washington, DC: The National Academies Press, 2002), online: <https://doi.org/10.17226/10327>.

⁷⁹ Other jurisdictions were reviewed however were not included in the report as they did not provide additional context or learning on approaches. This includes Texas and Pennsylvania.

⁸⁰ See Conn. Gen. Stat. Chapter 440. The Act provides a notably broad definition of wetlands to include “land, including submerged land, not regulated pursuant to sections 22a-28 to 22a-35, inclusive, which consists of any of the soil types designated as poorly drained, very poorly drained, alluvial, and floodplain by the National Cooperative Soils Survey, as may be amended from time to time, of the Natural Resources Conservation Service of the United States Department of Agriculture” at sec. 22a-38(15).

development and provides guidelines for riparian buffer widths. The *Department of Environmental Protection Inland Fisheries Division Policy* indicates relevant guidelines:

Perennial Stream: A buffer zone 100 feet in width should be maintained along each side.

Intermittent Stream: A buffer zone 50 feet in width should be maintained along each side.

Buffer zone boundaries should be measured from either, (1) edge of riparian inland wetland as determined by Connecticut inland wetland soil delineation methods or (2) in the absence of a riparian wetland, the edge of the stream bank based on bank-full flow conditions. ***The riparian corridor buffer zone should be retained in a naturally vegetated and undisturbed condition. All activities that pose a significant pollution threat to the stream ecosystem should be prohibited [emphasis added].***⁸¹

The guideline buffer zone is therefore recommended for the entire riparian corridor.

The limits to application of this buffer may turn on the type of land use as certain land uses are permitted under the Act as of right.⁸² In this regard, for properties where inland wetland and water body use is “as of right” there is reliance on state and local governments, land trusts, and other non-government organizations to seek acquisition of priority lands, either through fee simple purchase or the purchasing of easements.⁸³

A local example of riparian targets: Long Island Sound

Source: Long Island Sound Management Plan and related documents

Long Island Sound has published a suite of ecological indicators and targets. This includes a target for “Riparian Buffer Extent”.⁸⁴

The Target

“Increase the percent area of natural vegetation within 300 feet of any stream or lake in the Connecticut and New York portions of the Long Island Sound watershed to 75% (1,030 square miles of natural vegetation) by 2035 from 2010 baseline of 65%.”⁸⁵

⁸¹ *Inland Fisheries Division Riparian Policy*, online: <https://portal.ct.gov/search-results/?q=riparian%20guideline#gsc.tab=0&gsc.q=riparian%20guideline&gsc.page=1>.

⁸² See Gen. Stat. Conn., Title 22a, Chapter 440. See sec. 22a-40 where there are certain agricultural and property uses (among others), which do not require a permit.

⁸³ See USDA Natural Resources Conservation Service, “Where the Land and Water Meet: A Guide for Protection and Restoration of Riparian Areas” (September 2003) Tolland, CT-TP-2003-3, online: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_010931.pdf.

⁸⁴ *Long Island Sound Study*, online: <https://longislandsoundstudy.net/research-monitoring/liss-ecosystem-targets-and-supporting-indicators/>.

⁸⁵ *Long Island Sounds Study, Riparian Buffer Extent*, online: <https://longislandsoundstudy.net/ecosystem-target-indicators/riparian-buffer-extent/>.

Scope

Watershed

The Basis for the Target

“Naturally vegetated zones around the shorelines of all waterbodies provide a buffer that has been shown to be effective in removing contaminants from groundwater before it enters into receiving waters. The target is to have 75 percent of areas within 300 feet of a stream or lake within the Connecticut and New York portions of the LIS watershed naturally vegetated by 2035, based on UCONN CLEAR land use data

(http://clear.uconn.edu/projects/riparian_buffer/results/CLEAR_Summary_021508.pdf).

Naturally vegetated includes forest, grassland, shrub, and wetland land use categories, but not turf grass or agriculture field classes. This target is based on analysis of land use and water quality in CT (Goetz, 2003; Wilson and Arnold 2008).”⁸⁶

Cited basis for targets

Goetz SJ, Wright RK, Smith AJ, Zinecker E, Schaub E. 2003. "IKONOS imagery for resource management: Tree cover, impervious surfaces, and riparian buffer analyses in the mid-Atlantic region." *Remote Sensing of Environment* 88(1-2), 195-208.

Wilson E, Arnold C. 2008. “The Status of Connecticut’s Coastal Riparian Corridors”, Center for Land Use Education and Research (CLEAR).

Underlying policy

Long Island Sound Vision and Management Plan

Objective 1-1b: To balance multiple uses and maximize ecosystem services through watershed-based planning

Strategy 1-1b2: Protect wetlands, healthy watersheds, riparian buffers, and open land to minimize land disturbance and impervious cover through land protection, sustainable development, and green infrastructure

- Vision: <https://longislandsoundstudy.net/about/our-vision/>
- Management Plan: <https://longislandsoundstudy.net/wp-content/uploads/2021/01/LISSCCMP-Update-2020-2024.pdf>

Comment

The Long Island Sound Management Plan and related Riparian Targets are a good example of

⁸⁶ *Long Island Sounds Study, Long Island Sound Comprehensive Conservation and Management Plan 2015*, at Appendix B (page 62), online: <https://longislandsoundstudy.net/2015/09/2015-comprehensive-conservation-and-management-plan/>.

the value of target based systems to track progress. It is also an example of the substantial resources that go into data collection, research, and restoration of riparian habitats.

Montana

The Montana *Natural Streambank and Land Preservation Act* applies for the beds and banks of lakes and streams across the state, sets up the regional specific Flathead Basin Commission to undertake activities that promote the health of the basin and advise state and local decision makers, and regulates prescribed phosphorus compounds.⁸⁷ The *Act* enables specific decision making by conservation districts (or county commissions) to consider and permit activities that may impact streambeds. It also enables local government authorities to regulate developments in areas adjacent to lakes.⁸⁸

Further, for forested areas the State has passed the *Streamside Management Zone Law*.⁸⁹ This law sets out prohibited activities within certain buffer widths surrounding surface waters (of prescribed types).

Local governments play a role in riparian management both through their jurisdiction over developments but also through the designated authority under the *Natural Streambank and Land Preservation Act*.

No specific riparian corridor targets were identified in state policy and regulation through our desktop review.

Example of function specific target in Montana

The State of Montana has undertaken work to further understand and highlight conservation actions in relation to riparian areas and the impact on temperature in White Pine Creek. This is a specific example of how function will dictate both targets and restoration practices. This work flows from federal *Clean Water Act* requirements to respond to impaired waters with total maximum daily loads. This work dealt with the loading of temperature (with a corresponding valued species of westslope cutthroat trout, which will be of interest in Alberta to government decision makers).

It is important to note that these targets are highlighted merely as a product of the TMDL work in this case and our desktop research did not find these targets being reflected in specific policy documents.

Source

The temperature TMDL research and modelling focused on assessing current shading of the

⁸⁷ See *Montana Code*, Title 75, Chapter 7, Aquatic Ecosystem Protections. Online: https://leg.mt.gov/bills/mca/title_0750/chapter_0070/parts_index.html.

⁸⁸ *Ibid.*

⁸⁹ *Montana State Code*, Title 77, Chapter 5, Part 3.

creek versus a baseline. The current shading of the creek was highly variable and lower reaches were assessed as lacking historic stands of cottonwoods and other species that would provide mitigation of temperature changes to the creek. The measure of impairment that triggered the TMDL work was 1°F attributable to anthropogenic changes in the riparian area.

The Target

A modeled scenario target of 45% daily shade target was identified as a reasonable scenario across all river segments. This acknowledged significant variability in shade (from 70% to various reaches averaging 30%).⁹⁰

To reach this target, extensive restoration would be required across most segments that were studied.

Underlying policy

The underlying policy driver related to the target is the federal *Clean Water Act* requirement to assess water ways and to create TMDLs for these waterbodies.

Washington

Washington State relies significantly on local authorities in its approach to regulating and managing riparian areas. This is done through the operation of the *Growth Management Act* and the use of specific designations under that *Act*.⁹¹ In particular, the *Act* requires local authorities to identify and plan around “critical areas”.⁹²

Critical areas are defined in the legislation:

(6) "Critical areas" include the following areas and ecosystems: (a) Wetlands; (b) areas with a critical recharging effect on aquifers used for potable water; (c) fish and wildlife habitat conservation areas; (d) frequently flooded areas; and (e) geologically hazardous areas. "Fish and wildlife habitat conservation areas" does not include such artificial features or constructs as irrigation delivery systems, irrigation infrastructure, irrigation canals, or drainage ditches that lie within the boundaries of and are maintained by a port district or an irrigation district or company.⁹³

⁹⁰ Department of Environmental Quality, Montana, *White Pine Creek Temperature TMDL* – Appendix B at B-33, online: https://deq.mt.gov/files/Water/WQPB/TMDL/PDF/WhitePine/C13-TMDL-05a_App_B.pdf. See specifically Table B-10 at B-33.

⁹¹ Revised *Code of Washington*, Title 36. (RCW).

⁹² RCW §36.70A.170 and §36.70A.040. Specifically, “the county and each city located within the county shall designate critical areas, ... and adopt development regulations ...protecting these designated critical areas, under RCW §36.70A.170 and §36.70A.060”.

⁹³ *Ibid.* RCW at §36.70A.030.

Local authorities must create development regulations for the protection of critical areas as prescribed by §36.70A.060, and these regulations must be reviewed and amended as required. These regulations are reflected in the counties' and cities' local ordinances.

Similarly, Washington's *Shorelines Management Act* requires local authorities to promulgate ordinances and procedures to protect the State's shorelines.⁹⁴ "Shorelands" are defined as "those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all wetlands and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter".⁹⁵

An example of local critical area and shoreline regulation

An example of an ordinance of this nature can be seen in the *Whatcom County Code*, where activity restrictions, permitting, and related administration are set out.⁹⁶ The *Code* regulates developments around various critical areas, including hazard lands, habitat conservation areas, aquifer recharge areas, and wetlands.⁹⁷ In addition, the *Code* sets out specific regulation of shorelines.⁹⁸

The regulatory approaches for conservation areas under the local ordinance includes "no net loss" of riparian function in certain instances and mandates the establishment of "conservation farm plans" that apply to prescribed farm operations.⁹⁹ The use of conservation farm plans are focused on managing activities within riparian areas and restricting activities that may impair the areas below a "baseline condition" (as identified in the drafting of the plan).

Specific to shorelines, the *Whatcom County Code* has a stated goal of:

"the timely restoration and enhancement of ecologically impaired areas in a manner that achieves a net gain in shoreline ecological functions and processes above baseline conditions as of the adoption of this program".¹⁰⁰

⁹⁴ RCW, Title 90, Chapter 90.58.

⁹⁵ RCW §90.58.030(2)(d).

⁹⁶ Whatcom County Code: Title 16.16, online:

<http://www.codepublishing.com/wa/whatcomcounty/html/whatco16/Whatco1616.html#16.16> (WCC).

⁹⁷ *Ibid.*

⁹⁸ *Ibid* at Title 23.

⁹⁹ *Ibid* at §16.16.720 Habitat conservation areas – General standards and Article 8. Conservation Program on Agriculture Lands (CPAL).

¹⁰⁰ WCC at Title23, §23.20.100 Restoration and enhancement.

The “baseline condition” appears to have been last reviewed and formally adopted in 2007 in the Shoreline Management Program, with related standards in relation to open areas and impervious surfaces (depending on shoreline designations).¹⁰¹

Ohio

Ohio’s riparian areas rely significantly on local authorities to implement local riparian ordinances. A review of local setback widths was conducted in 2013, with a typical range of setbacks between 30 feet and 300 feet (dependent on the catchment size).¹⁰²

Unlike other jurisdictions that have delegated this role to municipalities, the Ohio ordinances arise from a state level requirement around stormwater management and regulation of non-point discharges under Chapter 3745 of the *Ohio Environmental Protection Agency Administrative Code*.¹⁰³

Example of local riparian setback ordinances: County of Summit

The County of Summit has issued a riparian setback in Chapter 937 of its county code, which sets out various riparian buffer widths around waterbodies (rivers and wetlands), permits prescribed uses of riparian areas within these buffers, and prohibits other uses.¹⁰⁴ Variances and appeals of permitting decisions are also set out.

The following buffers are adjusted for slope.¹⁰⁵

- (1) A minimum of 300 feet on each side of all streams draining an area greater than 300 square miles.
- (2) A minimum of 100 feet on each side of all streams draining an area greater than 20 square miles and up to 300 square miles.
- (3) A minimum of 75 feet on each side of all streams draining an area greater than 0.5 square miles (320 acres) and up to 20 square miles.
- (4) A minimum of 50 feet on each side of all streams draining an area greater than 0.05 square miles (32 acres) and up to 0.5 square miles (320 acres).

¹⁰¹ See Title 23, Shoreline Management Program, Adopted by Whatcom County May 27, 1976. This revised Program was adopted February 27, 2007 to comply with the Shoreline Master Program Guidelines, Washington Administrative Code (WAC) 173-26. Approved by the Department of Ecology August, 8, 2008.

<https://www.whatcomcounty.us/DocumentCenter/View/1892/Shoreline-Management-Program-Code-PDF>.
¹⁰² See Chagrin River Watershed Partners, Inc., “Summary of Riparian and Wetland Setback Regulations in Ohio” (2013), online: <https://crwp.org/wp-content/uploads/2020/08/Riparian-Wetland-Regulation-summary-November2013.pdf>.

¹⁰³ O.A.C. Chapter 3745, online: <https://codes.ohio.gov/ohio-administrative-code/3745>.

¹⁰⁴ *Riparian Setback Ordinance* (Chapter 937 of Codified Ordinances), online: <https://sswcd.summitoh.net/sites/default/files/2018-11/CHAPTER%20937.pdf>.

¹⁰⁵ *Ibid.* § 937.05.

(5) A minimum of 30 feet on each side of all streams draining an area less than 0.05 square miles (32 acres).

In addition, the code sets out buffers around various classes of wetlands (ranging from no buffer to 50 feet).¹⁰⁶

Oregon

The State of Oregon delegates local authorities' various responsibilities in riparian management. Much of the regulatory approach in Oregon flows from a statewide plan for land use, and, in particular, Goal 5, which is "To protect natural resources and conserve scenic and historic areas and open spaces".¹⁰⁷ This goal includes specific requirements for local authorities in relation to inventorying "Riparian corridors, including water and riparian areas and fish habitat".¹⁰⁸

The *Oregon Administrative Rules* require that local authorities inventory and assess riparian areas, and they provide for default setback rules for prescribed waterbodies.¹⁰⁹ The rules also oblige local authorities to manage and regulate prescribed activities for the furtherance of protection of riparian corridors and of Goal 5 and the state wide plans.

Example of Oregon's riparian corridors in Portland

In furtherance of Oregon's Goal 5, the City of Portland undertook extensive analysis around riparian corridors and habitat within its boundary, as reflected in its 2012 inventory.¹¹⁰ The methodology used involved the allocation of qualitative metrics to various functions of riparian corridors, both biophysical and ecological.

Ranking of riparian corridors was conducted by allocated metrics to the following functions.¹¹¹

- *Microclimate and shade – Open water bodies, wetlands, and surrounding trees and woody vegetation are associated with localized air cooling and increased humidity.*

¹⁰⁶ §937.05

¹⁰⁷ *Oregon's Statewide Planning Goals & Guidelines*, Goal 5: Natural Resources, Scenic and Historic Areas, and Open Spaces, OAR 660-015-0000(5), online: <https://www.oregon.gov/lcd/OP/Documents/goal5.pdf>.

¹⁰⁸ *Ibid.*

¹⁰⁹ See *Oregon Administrative Rules*, Rule 660-023-0090 Riparian Corridors, online:

https://oregon.public.law/rules/oar_660-023-0090. See also Rule 660-023-0050 Programs to Achieve Goal 5, online https://oregon.public.law/rules/oar_660-023-0050.

¹¹⁰ Bureau of Planning and Sustainability, *Natural Resources Inventory Update: Riparian Corridors and Wildlife Habitat* (City of Oregon, 2012) <https://www.portland.gov/sites/default/files/2019-08/natural-resource-inventory-update-riparian-corridors-and-wildlife-habitat.pdf>.

¹¹¹ *Ibid* at 39.

- *Bank function and control of sediments, nutrients, and pollutants – Trees, vegetation, roots and leaf litter intercept precipitation, hold soils, banks and steep slopes in place, slow surface water runoff, take up nutrients, and filter sediments and pollutants found in surface water.*
- *Stream flow moderation and flood storage – Waterways and floodplains provide for conveyance and storage of streamflows and floodwaters, while trees and vegetation intercept precipitation and promote infiltration which tempers streamflow fluctuations or “flashiness” that often occurs in urban watersheds.*
- *Large wood and channel dynamics – Streams, riparian wetlands, floodplains and large trees and woody vegetation contribute to the natural changes in location and configuration of stream channels over time.*
- *Organic inputs, food web and nutrient cycling – Water bodies, wetlands and nearby vegetation provide food for aquatic species (e.g., plants, leaves, twigs, and insects) and are part of an ongoing chemical, physical and biological nutrient cycling system.*
- *Wildlife habitat/corridors – Vegetated corridors along waterways, and between waterways and uplands, allow wildlife to migrate and disperse among different habitat areas, and provide access to water.*

No specific reach or valley segment targets were identified. A technical review of the evaluation framework did identify the need to ensure vegetative cover was an appropriate reflection of function (as turf was considered sufficient to garner a high vegetative cover rating).

Underlying this evaluation methodology is the assumption that all riparian areas are intact and healthy as a baseline (i.e., 100% intactness of riparian areas). River reaches which are less than 100% intact results in a lower evaluation.

European Union

The European Union and its member states are guided in their riparian management by the *Water Directive*. This directive is further augmented by the *Habitat Directive*, the *Flood Directive*, and the *Bird Directive* due to the overlapping functions of riparian habitats. As described by Nicola Clerici et al:

At European level the Water Framework Directive (2000/60/EC) introduced the legal obligation for Member States to assess river and riverine habitats ecological conditions, as a basis to support effective water management policies. Council Regulation (EC) 73/2009 establishing common rules for direct support schemes for farmers under the Common Agricultural Policy (CAP) introduces as a Statutory Management Requirement the definition of buffer strips to protect water courses by no later than 2012. The Habitat Directive (Council Directive 92/43/EEC), whose main aim is biodiversity conservation through protection and monitoring of

natural habitats and species, also addressed the importance of habitat mapping, together with the assessment of their change dynamics (Ledoux et al., 2000).¹¹²

The value and evaluation of green infrastructure has also been a driving force in riparian area monitoring, modelling, and evaluation.¹¹³ The relevant function assessment has been set out in Table 1 below, from *Knowledge Conversion for Enhancing Management of European Riparian Ecosystem and Services: Guidance to Implement the Protocol for the Status/Pressures Assessment*.¹¹⁴

Table 1. Potential indicators used to characterize riparian vegetation at different spatial scales, under different analysis approach.

ANALYSIS APPROACH (MAIN DATA SOURCE)	PLANT / PATCHES RIVER REACH (0.1-1 km)	RIPARIAN CORRIDOR RIVER SEGMENT (1-10 km)	CORRIDOR / FOREST TYPES LANDSCAPE UNIT / CATCHMENT (10-100 km²)
Taxonomy based (field work)	Species composition, Abundance, Diversity	Plant formations, Plant communities	Phytosociological classes, Habitat types, Dominant species
Landscape-mosaic approach (GIS analysis)	Size, Shape, Coverage, Relative location to channel, Spatial distribution	Riparian corridor width, overage, Connectivity, Fragmentation	Corridor types, Spatial assemblage of patches, Landscape diversity
Functional approach (process-based) (field work + GIS analysis)	Pioneer recruitment areas (size, location), Plant functional traits, Genetic diversity	Functional zones based on dominant fluvial processes, Vegetation guilds	Broad Longitudinal / Transversal zonation of Plant communities, Broad location of Pioneer / Late-seral species

¹¹² Clerici Nicola, Weissteiner Christof J., Paracchini M.Luisa, Strobl Peter, *Riparian zones: where green and blue networks meet Pan-European zonation modelling based on remote sensing and GIS* (2011) European Commission, Joint Research Centre, Institute for Environment and Sustainability, EUR 24774 EN – 2011, online: <https://publications.jrc.ec.europa.eu/repository/bitstream/JRC63959/lb-na-24774-en-c.pdf>.

¹¹³ *Ibid.*

¹¹⁴ González del Tánago M., V. Martínez-Fernández, D. García de Jalón, P.M. Rodríguez-González, S. Dufour, V. Garófano Gómez (2020). *Knowledge Conversion for Enhancing Management of European Riparian Ecosystem and Services: Guidance to Implement the Protocol for the Status/Pressures Assessment*. Report, COST Action CA16208 CONVERGES, 60 p. at 14.

This can then be fed into an evaluation framework, as illustrated in the *Guidance*, reproduced here.¹¹⁵

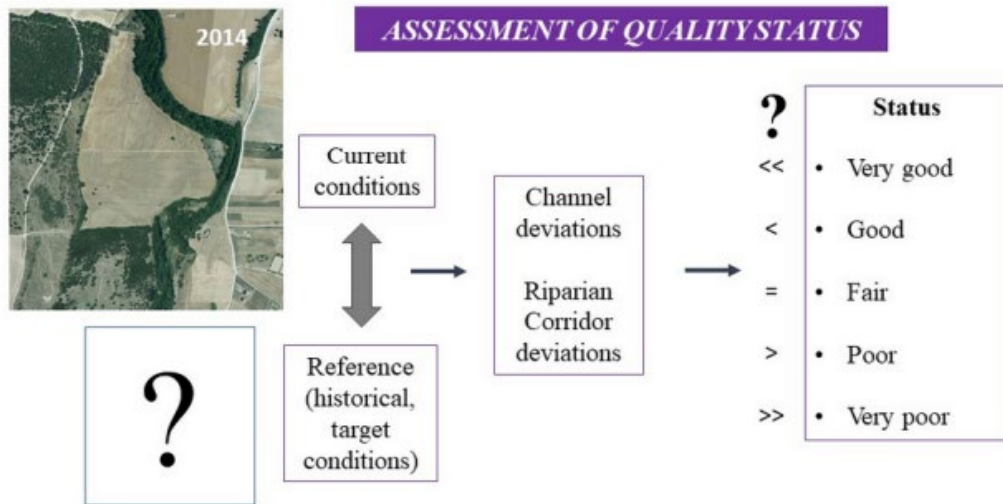


Figure 10. Assessment of the current riparian vegetation status, which is compared to reference conditions, based on natural, historical or target conditions, and according to thresholds of the quality status.

This guidance can incorporate the use of a “riparian quality index” that has been the subject of academic literature for use in the EU. Marta González del Tánago *et al* highlight the relevance of higher scale metrics for evaluating riparian quality.¹¹⁶

According to current scientific literature (e.g., Malanson, 1993; Hughes et al., 2003; Ward et al., 2002; Brierley & Fryirs, 2005; Naiman et al., 2005; Hupp & Rinaldi, 2007; Corenblit et al., 2009), the “natural conditions” of riparian systems should be defined in general terms by using the following characteristics.

- Extensive and continuous riparian corridors, occupying the banks and the total active floodplain area and including a more or less continuous vegetation corridor, of variable dimensions and coverage depending on valley type and natural constraints. The vegetation corridor connects with adjacent upland or terrestrial vegetation.
- Species composition typical of the biogeographical area and hydrogeomorphological conditions, with only native species and including natural regeneration.
- Dynamic banks with natural mobility resulting from erosion and deposition and the presence of geomorphological units characteristic of the flow regime and the caliber of transported materials.

¹¹⁵ *Ibid* at 19.

¹¹⁶ Marta González del Tánago and Diego García de Jalón Riparian, “Quality Index (RQI): A methodology for characterising and assessing the environmental conditions of riparian zones” (2011) *Limnetica* 30(2): 235-254.

- Lateral and vertical connectivity maintaining an exchange of organisms, matter and energy at different spatial and temporal scales.

In characterizing the broader scale connectivity of riparian areas for the purpose of riparian quality, González del Tánago *et al* set out the following as metrics (using a scale of 1-15, with 15 being very good).¹¹⁷

- Very Good: Vegetative cover over full length of segment.
- Good: Slightly reduced coverage (>60% of natural coverage) and includes several vegetative strata or “it forms a dense but partly fragmented corridor, with open spaces less than 50 m long, free of land uses which may compromise corridor or filtering functions or continuity and coverage of riparian corridor slightly promoted by flow regulation, with an increasing of tree dominance.”
- Moderate: “Riparian vegetation covers the full length of the segment but with moderately reduced coverage (between 30 % and 60 % of the natural coverage), including several strata, or with a higher coverage but only of tree canopy layer. Or it appears in patches, leaving open spaces more than 50 m long, with agro-forest land uses that moderately compromise corridor and filtering functions.”
- Poor: “Riparian vegetation appears in small patches covering less than 30 % of the length of the segment, or refers to isolated tree or shrub individuals, with scattered rushes or bushes. Or more than 60 % of the riparian area has no vegetation and contains urban or agricultural occupations, or riparian corridor strongly promoted by flow regulation, containing only tree species.”
- Bad: Riparian vegetation is reduced to isolated trees or shrubs, leaving large open areas with buildings or land-uses that severely compromise corridor and filtering functions. Or no riparian woody species and only herbaceous communities exist due to human actions. Use the score 0 in areas where no woody riparian species exist (i.e., paved reaches) where natural riparian corridor functions are completely prevented.

It is important to note that this is only one part of the assessment that goes into the quality index and as such should not be relied upon in isolation to determine the overall health of riparian areas in a reach or catchment.

Australia: New South Wales

¹¹⁷ *Ibid.*

The State of New South Wales regulates activities within riparian areas under the *Water Management Act 2000* (and the *Water Management (General) Regulation 2018*).¹¹⁸ This sets out which activities are permitted, with and without a permit, on “waterfront land”, which is defined as lands within 40m of the banks or shores of prescribed waterbodies (or as otherwise dictated by regulation).¹¹⁹ Decisions in relation to “waterfront land” are made by the Natural Resource Access Regulator.¹²⁰

The State based *State Environmental Planning Policy (Infrastructure) 2007* and local environmental planning are also relevant to riparian area assessment and management.¹²¹ The state of New South Wales has published regional plans with specific actions focused on river corridors. Specific to the Riverina Murray region, the regional plan sets out key actions.¹²²

- 14.1 *Prepare and implement a waterfront management strategy for the Murray River.*
- 14.2 *Retain riverfront setback provisions in local plans and limit ribbon development along the Murray River.*
- 14.3 *Consider and assess the potential impacts of new development on biodiversity along river corridors, including the Murray and Murrumbidgee Rivers, and manage offsets.*

In addition, “local environmental plans” (LEP) are also used for regulating developments and activities at the local government area. For example, the *Eurobodalla Local Environmental Plan 2012* has specific provisions dealing with development within riparian areas. Section 6.7 of the plan states:

6.7 Riparian lands and watercourses

- (1) The objective of this clause is to protect and maintain the following—
 - (a) water quality within watercourses,
 - (b) the stability of the bed and banks of watercourses,
 - (c) aquatic and riparian habitats,
 - (d) ecological processes within, and continuity and connectivity between, waterways and riparian areas.
- (2) This clause applies to land identified as follows on the Riparian Lands and Watercourses Map and situated within the distances specified below in relation to the top of the bank of the watercourse concerned—

¹¹⁸ *Water Management Act 2000* No 92, online: <https://legacy.legislation.nsw.gov.au/~pdf/view/act/2000/92/whole>.

¹¹⁹ *Ibid.*

¹²⁰ *Natural Resources Access Regulator Act 2017* No 64, online: <https://legislation.nsw.gov.au/view/html/inforce/current/act-2017-064>.

¹²¹ Further details about the regulatory structure can be found in Ailsa Kerswell, Mark Adams, Warren McGrath, Andrew Buick, ‘Eco Logical Australia 2016. *Murray River Planning Controls Study*. Prepared for NSW Department of Planning and Environment.

¹²² New South Wales Government, Planning and Environment, *Riverina-Murray Regional Plan 2036* (2017), online: <https://www.planning.nsw.gov.au/-/media/Files/DPE/Plans-and-policies/riverina-murray-regional-plan-2017.pdf>.

- (a) Riparian Category 1 watercourse—40 metres,
 - (b) Riparian Category 2 watercourse—20 metres,
 - (c) Riparian Category 3 watercourse—10 metres.
- (3) Before determining a development application to carry out development on land to which this clause applies, the consent authority must consider whether or not the development—
- (a) will cause any adverse impact on the following—
 - (i) water quality and flows within a watercourse,
 - (ii) aquatic and riparian species, habitats and ecosystems,
 - (iii) the stability of the bed, shore and banks of a watercourse,
 - (iv) the free passage of fish and other aquatic organisms within or along a watercourse,
 - (v) any future rehabilitation of the watercourse and riparian areas, and
 - (b) will increase water extraction from a watercourse.
- (4) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that—
- (a) the development is designed, sited and will be managed to avoid any significant adverse environmental impact, or
 - (b) if that impact cannot be reasonably avoided by adopting feasible alternatives—the development is designed, sited and will be managed to minimise that impact, or
 - (c) if that impact cannot be minimised—the development will be managed to mitigate that impact.¹²³

State level and local level targets for riparian connectivity or riparian extent were not found for New South Wales in the desktop review.

¹²³ Eurobodalla Local Environmental Plan 2012, online:
<https://legislation.nsw.gov.au/view/whole/html/inforce/current/epi-2012-0333#statusinformation>.

MANAGEMENT TOOLS

There are a number of legal tools that can be employed to protect riparian areas from development and degradation in order to achieve riparian health targets. In this section, we will provide a brief overview of the most important legal tools that can be used to further riparian health targets, with a specific focus on the tools available to municipal governments.

Acquisition

In some circumstances, it may be desirable to actually acquire ownership of a piece of riparian land in order to ensure the health of the riparian ecosystem. This may be done with the consent of the owner by directly purchasing the property.¹²⁴ Alternatively, where the landowner does not consent to the purchase, the property may be expropriated by the municipal authority.¹²⁵

The advantage of acquisition is that it allows full-scale control over riparian property, which allows for any degree of protection the municipality may wish to pursue. However, the notable disadvantage of acquisition is that it is a relatively costly measure. As well, any use of the *Expropriation Act* may cause bad will amongst private landowners.

Zoning

Many jurisdictions use zoning-based mechanisms to restrict the activities that may take place in a riparian zone, including set-backs or buffer zones, which restrict behaviours within a set distance of a waterbody or watercourse. Some zoning restrictions prevent all activities within a riparian zone, while others may allow some lower impact activities to take place. Still others may require a permit in order to carry out an activity within a riparian zone, which gives the governing authority the opportunity to assess the potential impacts of the activity before allowing it to take place.

The advantage of zoning restrictions is that they are effective at prohibiting or restricting the types of development that are most likely to cause negative impacts on riparian areas. The disadvantage of zoning restrictions is that they tend to restrict individual activities that impact riparian health, rather than taking a cumulative approach to riparian health assessment. As well, municipal land use bylaws may have limited force, insofar as they are subordinate to any project approval decisions made by provincial regulatory bodies, including the Natural Resources Conservation Board, the Alberta Energy Regulator and the Alberta Utilities Commission.¹²⁶ This includes any decisions by these regulators made under the *Water Act* or the *Environmental Protection and Enhancement Act*¹²⁷.

¹²⁴ See *Municipal Government Act*, RSA 2000, c M-26, s 6.

¹²⁵ See *ibid*, s 14.

¹²⁶ See *ibid*, s 619.

¹²⁷ *Environmental Protection and Enhancement Act*, RSA 2000, c E-12.

Development permits of a municipality may be subordinate to authorizations of Alberta Environment and Parks under the *Water Act* and the *Environmental Protection and Enhancement Act* where there is a conflict between the permit and the provincial authorization. This provision and the determination of whether there is a “conflict” between the provincial authorization and a development permit has been clarified through the case law. The case of *Northland Material Handling Inc. v. Parkland (County)* involved an application for judicial review of a municipal development permit condition and whether it conflicted with a sand extraction and landfilling authorization granted by Alberta Environment (now AEP, and notably not one of the enumerated s.619 tribunal/regulator).¹²⁸

In discerning whether a conflict existed, the court concluded that more onerous environmental conditions put in place by a municipality are not in conflict with Alberta Environment’s authorization conditions and that the applicant must simply comply with both authorizations.¹²⁹ The *Municipal Government Act* was recently amended to adjust appeals of development permits of this nature, moving appeals the municipal government board from local subdivision and development appeal boards.¹³⁰

Environmental Reserves

Under the *Municipal Government Act*, municipalities are able to set aside land as an environmental reserve in order to preserve the natural features of the land, to prevent pollution on the land, to allow public access to an adjacent body of water, or to prevent development where there is significant risk of personal injury or property damage.¹³¹

Under the *Act*, environmental reserves can be created on riparian lands, so long as they:

- consist of a swamp, gully, ravine, coulee, or natural drainage course;
- are subject to flooding; or
- are within 6m of the bed and shore of a waterbody.¹³²

To create an environmental reserve, municipalities can either take private land or set aside land that the municipality already owns.¹³³ For private land, the municipality may only take the land when it is being subdivided, although, in that case, the owner is legally obligated to provide the land to the municipality without compensation.¹³⁴

Environmental reserves can be an effective legal tool for preserving riparian areas, because they allow the municipality to take ownership of the land and preserve it in its natural state. However, in order to

¹²⁸ *Northland Material Handling Inc. v. Parkland (County)*, 2012 ABQB 407 (CanLII), <https://canlii.ca/t/fs1pp> (Northland)

¹²⁹ *Ibid.*

¹³⁰ For more information see Environmental Law Centre, *Municipal Planning and Environmental Autonomy: An update on provincial paramountcy and its implications for progressive environmental planning and decision making* (Edmonton: Environmental Law Centre 2021) online: https://www.communityconserve.ca/wp-content/uploads/2021/05/Municipal-planning_Provincial-paramountcy_May2021.pdf

¹³¹ *Municipal Government Act*, *supra* note 124 at s 664(1.1).

¹³² *Ibid.*, ss 664(1), (1.2).

¹³³ See *ibid.*, s 665(1).

¹³⁴ See *ibid.*, ss 661, 663.

create an environmental reserve, the municipality must ensure that the legal requirements are met, which may limit the circumstances where this tool is available.

Environmental Reserve Easements

As an alternative to an environmental reserve, a municipality may instead enter into an agreement with a landowner to implement something called an environmental reserve easement.¹³⁵ Like an environmental reserve, an environmental reserve easement implements legally binding restrictions on how a piece of land may be used, in order to preserve it in a natural state.¹³⁶ However, unlike an environmental reserve, the landowner retains ownership of the property, subject to the conditions in the easement. As well, instead of taking ownership of the property, the municipality is able to register the easement on title, so that it binds any future owner of the property.¹³⁷

An environmental reserve easement is a slightly more flexible tool than an environmental reserve, because it allows the landowner to retain ownership of the property, while still creating legally enforceable protections. That said, it is important to keep in mind that an environmental reserve easement is only available as an alternative to an environmental reserve, which means that it is only available in the same circumstances that an environmental reserve could be created.

Conservation Reserves

Under the *Municipal Government Act*, municipalities can create conservation reserves to preserve land with environmentally significant features, in any instance where the land does not qualify to be an environmental reserve.¹³⁸ To create a conservation reserve, municipalities can either take private land or set aside land the municipality already owns.¹³⁹

As with environmental reserves, conservation reserves can only be created from private land when that land is being subdivided. However, unlike environmental reserves, a municipality is required to compensate the owner of the land that is taken for the conservation reserve, which makes conservation reserves a more expensive option for preserving riparian property.¹⁴⁰

¹³⁵ *Ibid*, s 664(2).

¹³⁶ *Ibid*, s 664(3).

¹³⁷ *Ibid*, s 664(3)-(9).

¹³⁸ *Ibid*, ss 661.1., 664.2.

¹³⁹ See *ibid*, s 665(1).

¹⁴⁰ *Ibid*, s 664.2(2).

Conservation Easements

Under the *Alberta Land Stewardship Act*¹⁴¹, the owner of a piece of property can choose to preserve that property by granting a conservation easement in favour of a municipality.¹⁴² When this happens, the owner of the property continues to own the property, but it can only be used for the purposes set out in the conservation easement, and the municipality has the power to legally enforce those restrictions.¹⁴³ As well, the municipality may register the easement on the title of the property, so that it binds any future owner of the property.¹⁴⁴

The major drawback of conservation easements is that the easement must be granted by the owner of the property, which means that the property owner makes the decision to create a conservation easement and not the municipality.

Tax Breaks

Tax breaks can be a way of providing a financial incentive for landowners to preserve riparian areas on their properties. This tool is most effective when it is tied to a binding legal obligation on the part of the landowner, so that the landowner must protect the riparian area in order to benefit from the tax break.

As an example, in British Columbia, municipalities have a specific statutory power to exempt riparian properties from municipal taxes.¹⁴⁵ However, in order to qualify for this exemption, the property in question must be subject to a restrictive covenant requiring the protection of the riparian areas, which is in favour of the municipality. This ensures that the tax exemption will only apply to a landowner who is legally obligated to protect the riparian area on his or her property.

The major benefit of tax breaks is that they can incentivize private landowners to take action to protect riparian areas, without the municipality having to take over ownership of the riparian property. The disadvantage of tax breaks is that they can add administrative complexity to the tax system, which adds to the cost and administrative burden of collecting taxes. As well, municipalities are limited to the tax tools that are specifically permitted by the *Municipal Government Act*, which may limit the possible approaches to setting a different level of taxation for riparian properties.

Grant Funding

Grant funding can be used to incentivize individual landowners to take measures to preserve and protect riparian areas on their properties. Grant funding is most effective when it can be used to cover the costs of protection measures that the landowner might not otherwise undertake. To the contrary, it

¹⁴¹ *Alberta Land Stewardship Act*, SA 2009, c A-26.8.

¹⁴² *Ibid*, ss 28, 29.

¹⁴³ *Ibid*, s 30.

¹⁴⁴ *Ibid*, ss 32-34.

¹⁴⁵ *Community Charter*, SBC 2003, c 26, s 225.

is a less effective tool for incentivizing landowners to leave riparian property unused or undeveloped, since the grant is usually tied to a specific project or activity to be undertaken by the landowner.

Direct Regulation

Under the *Municipal Government Act*, municipalities in Alberta have the power to manage and control the waterbodies that are located within the municipality. This includes the ability to regulate the shores of the waterbodies, which are defined as the land next to the water, up to the point where the vegetation and soil noticeably change.¹⁴⁶ This power gives municipalities the ability to directly regulate riparian areas within the municipality, including the potential for implementing riparian health targets.

The major disadvantage of this approach is that municipalities are unable to impose any direct regulations that contradict provincial laws or provincial approvals. As a result, municipalities have only limited jurisdiction to impose riparian health standards through direct regulation. As well, municipalities are only able to manage the waterbodies that are located within the municipality, which limits the geographic scope of any possible regulation.

¹⁴⁶ *Municipal Government Act*, *supra* note 124, s 60. See also *Surveys Act*, RSA 2000, c S-26, s 17.

CONCLUSION

Riparian management policy and regulation across jurisdictions is largely dominated by regulatory setbacks, whereby riparian buffers are managed specifically to maintain function. More high level “targets” for riparian connectivity or riparian extent have not made their way into higher level policy or regulation. Instead, there is a presumption that riparian areas should be intact for entire reaches or basins. This results in regulatory structures that seek to maintain buffer areas that have yet to be impaired and programs and policies focused on restoring buffer areas that have been degraded.

Clear scientific guidance around the sufficiency of connectivity around riparian targets at different scales is not available. This is not surprising considering the multitude of functions and the difficulty of ascertaining the sufficiency of riparian areas in a given instance. The number of variables at play are such that a scientifically based target of what constitutes sufficiently healthy riparian areas are likely to make broader catchment scale targets elusive.

Nevertheless, with sufficient monitoring, target setting allows decision makers to assess how increased restoration contributes to various functions. Further, target setting provides a clear context and trajectory for decision makers, governments, funders, land owners, and civil society, thereby supporting the implementation of riparian restoration programming.