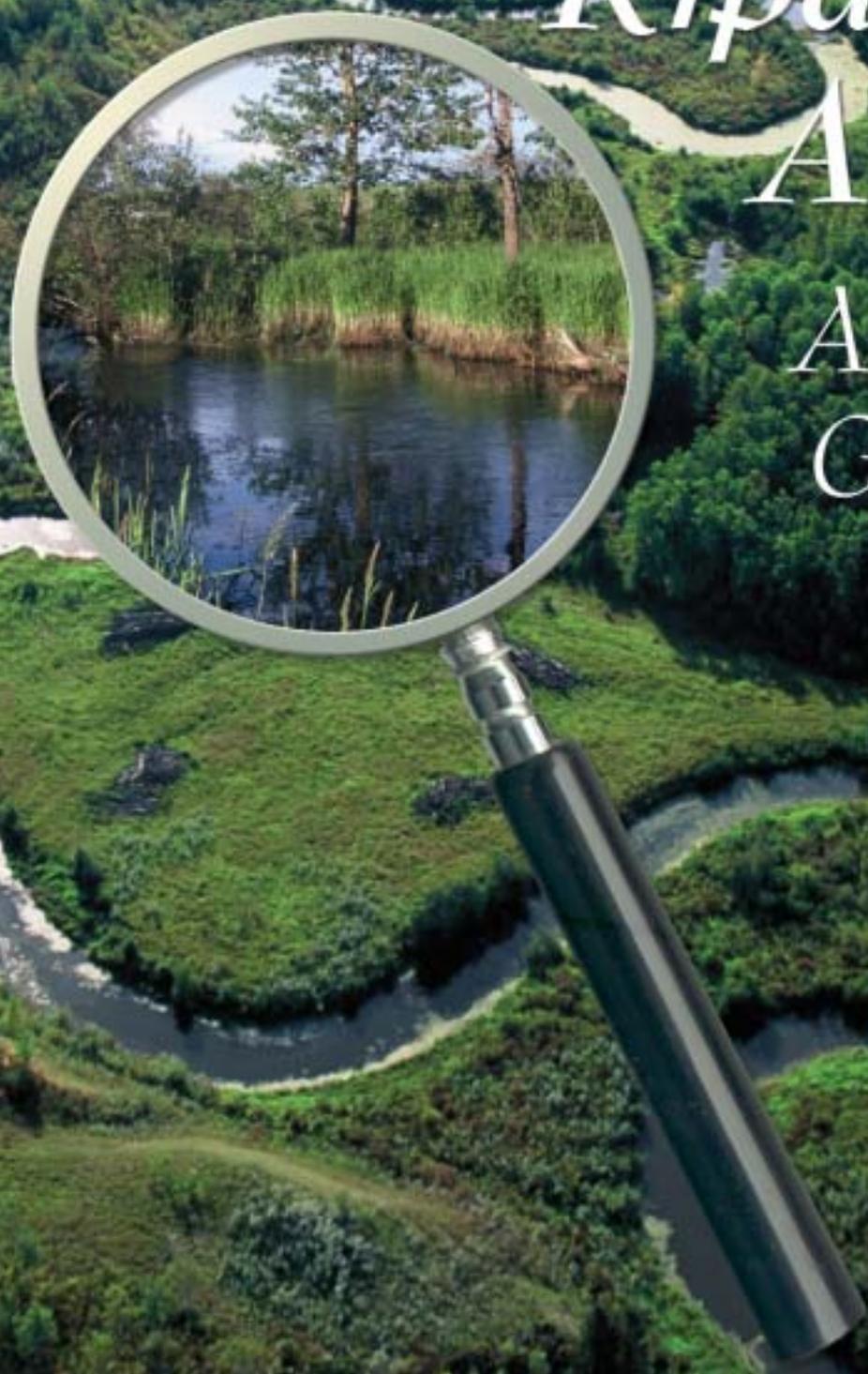


GREEN ZONE

CARING FOR THE

*Riparian
Areas*

*A User's
Guide to
Health*



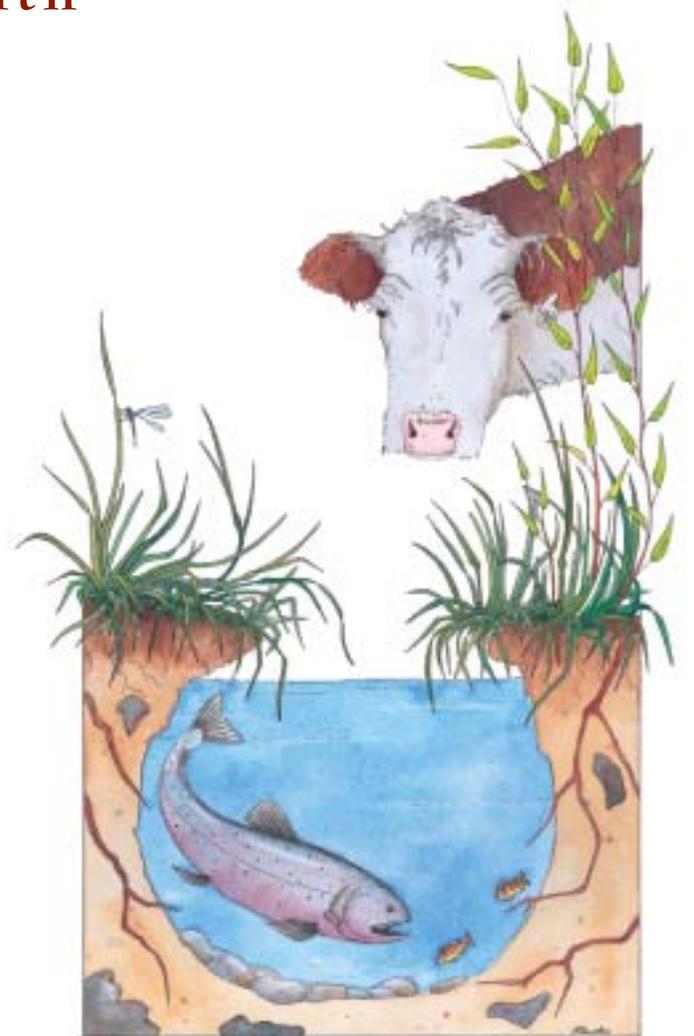
Riparian Areas: A User's Guide to Health

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What's in this Guide?

In this User's Guide to Health you'll find:

- ◆ An introduction to riparian area health
- ◆ Help in determining what is a riparian area
- ◆ Information on what riparian areas do, and why this is important to us
- ◆ A wake-up call for riparian health
- ◆ How to tune your eye so you know what is measured and how to use the results of riparian health evaluation
- ◆ Taking the next step - where to begin to improve riparian area health
- ◆ Standing back and looking at the bigger picture - the watershed
- ◆ Where to find additional information, resources and advice



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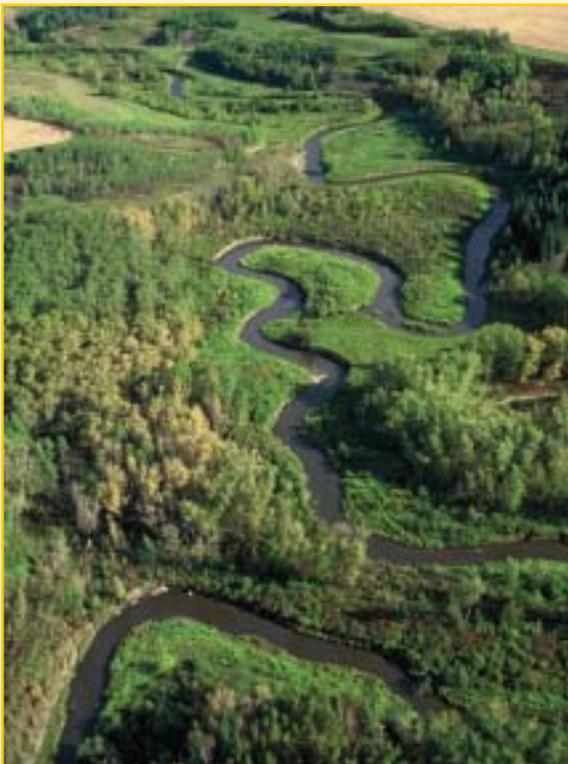
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Foreword

This booklet has been written for those people who can most effectively influence lakeshores, stream and river banks, wetlands and other riparian areas with their use and management - farmers, ranchers, cottage owners, resource managers and others who work and play in the “green zone”. Consider this an introduction to the concept of “health” - how well are these productive, valuable and sometimes fragile green zones performing many critical ecological functions essential to our needs? To evaluate health you need some tools, and you need to understand how the tools are used.



Riparian areas include the moist green zones that surround lakes and wetlands.



The emerald threads of vegetation that border rivers and streams are the riparian areas.

This User’s Guide will take you from the checklists to the measuring sticks of riparian health. Riparian health evaluation forms part of a larger package of awareness about riparian areas, leading to choices on managing these vital landscapes. This work is part of the Cows and Fish program, a cooperative effort between many organizations and agencies concerned about the health and management of riparian areas. Cows and Fish works to foster awareness about riparian areas, and how improvements in management can enhance landscape health and productivity, for the benefit of landowners and others who use and value these green zones.



Introduction



These are two riparian areas at different locations on the same stream.

Our eyes tell us one looks different from the other. Often we perceive there is a difference, but it may not be clear what is missing from one picture. We may struggle to convey our impressions of the scene to someone else because we lack the words to describe what we see. A riparian area may be green and that may disguise some problems or distract us from noticing some of the missing pieces. It would help us to be able to recognize the missing pieces and describe them to others. That's what riparian health is about, being able to recognize the critical pieces of a riparian area and to measure those pieces. We can then determine if the system is in good condition and functioning as it should. If the system isn't functioning, an understanding of what pieces are missing, or impaired, may help our management efforts, to restore the riparian area to a healthier state.

What do you see?

As you begin to train your eyes, you might notice that the riparian area on the left is missing young trees and shrubs and other deep-rooted plants. On the right these are present and glue the streambank together. That's a good start to an understanding of riparian health.



What is Riparian Health?

. . . and why do we need to measure it?

The word “health” conveys an impression of something in properly functioning condition - things working well. If health is applied to us, it relates to the ability of our bodies to perform certain functions within a measured set of standards. Our bodies undertake functions like respiration, circulation, digestion, filtration, cell repair, movement and many more. If these functions are occurring, within some standards, we consider ourselves healthy. In a similar way, landscapes, including riparian areas, perform certain functions. “Riparian health” means the ability of a reach of stream, a lakeshore, a wetland or a watershed (composed of many different riparian areas), to perform a number of key ecological functions. We’ll describe all of these functions in “What do riparian areas do?”. Some examples of these functions include maintenance of biodiversity (building habitat), creation of primary productivity (forage, shelter) and water quality improvement (filtering and buffering water).



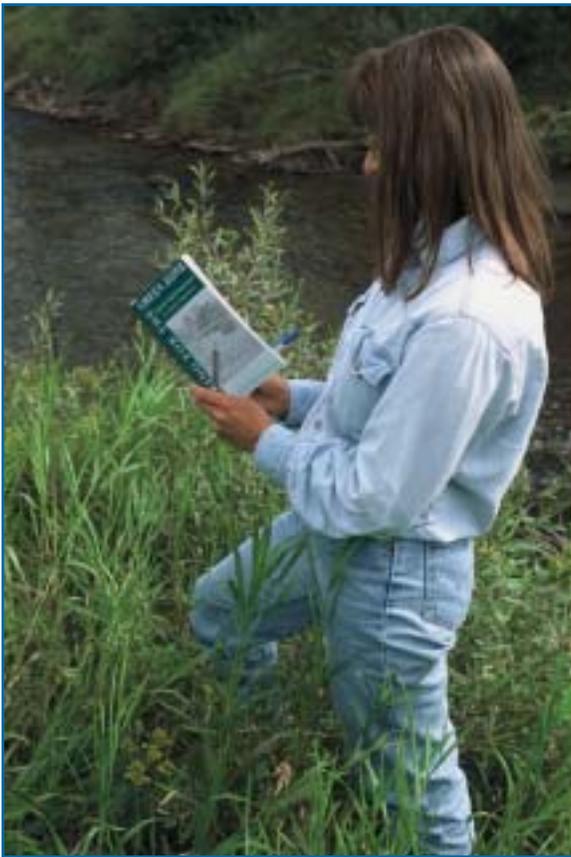
Why do we need to measure riparian health?

Because we don't all “see” the same thing!

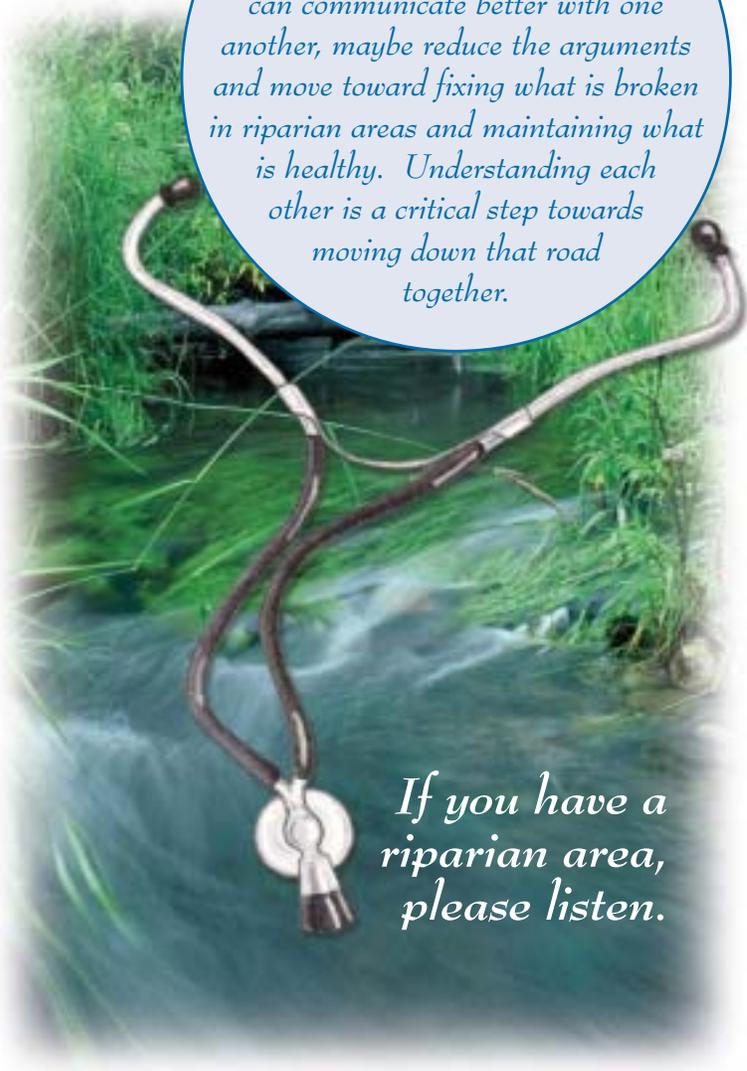


When we look at a riparian area, what we see and how we interpret our observations is often based on our backgrounds, experiences and perceptions. Even though we may be standing on the same streambank or lakeshore, we don't often “see” all of the same things, or the total picture. Because of our own unique focus we interpret the scene differently and sometimes argue with others over their perception of the riparian picture versus our own.

Riparian health evaluations allow us all to “tune our eyes”, to calibrate our observations with others, begin to appreciate the key pieces of the riparian landscape and assess what we see. These are ecological “measuring sticks” that provide some structure to our observations and allow us to determine the condition (or health) of our riparian areas.



We need to use riparian health evaluations to build a common language so we can communicate better with one another, maybe reduce the arguments and move toward fixing what is broken in riparian areas and maintaining what is healthy. Understanding each other is a critical step towards moving down that road together.



If you have a riparian area, please listen.



Show me the Riparian Area

You've seen them, crossed them, and walked in them; you may live on one. Riparian areas are the green zones around lakes and wetlands, the emerald threads of vegetation that border rivers and streams and the lush fringe in valleys. Riparian areas are transitional; they exist between the surface water of a river, wetland or lake and the surrounding drier upland. Think of them as "wetter than dry" but "drier than wet". Riparian areas are rarely uniform and show lots of variation. What is common to all of them is the interaction of water, soil and vegetation. A combination of the following clues will help you solve the mystery of what is "riparian".

Clue 1

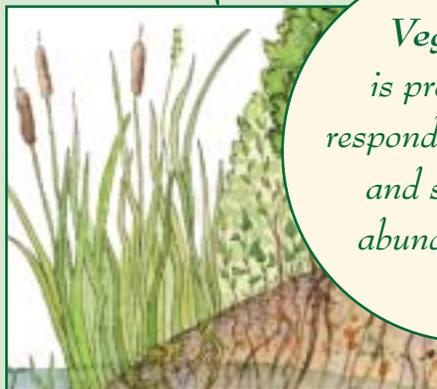


Lots of water is present, seasonally or regularly and that water is either on the surface or it's close to the surface.



Riparian areas are called many things. These are some of the terms used to describe them: shores, floodplain, bottomland, bogs, muskeg, slough, wetland, seep, floodprone, marsh, pothole and spring. Lentic riparian areas are associated with still water systems like lakes and wetlands. Lotic riparian areas are found along rivers and streams.

Clue 2



Vegetation is present that responds to, requires and survives in abundant water.

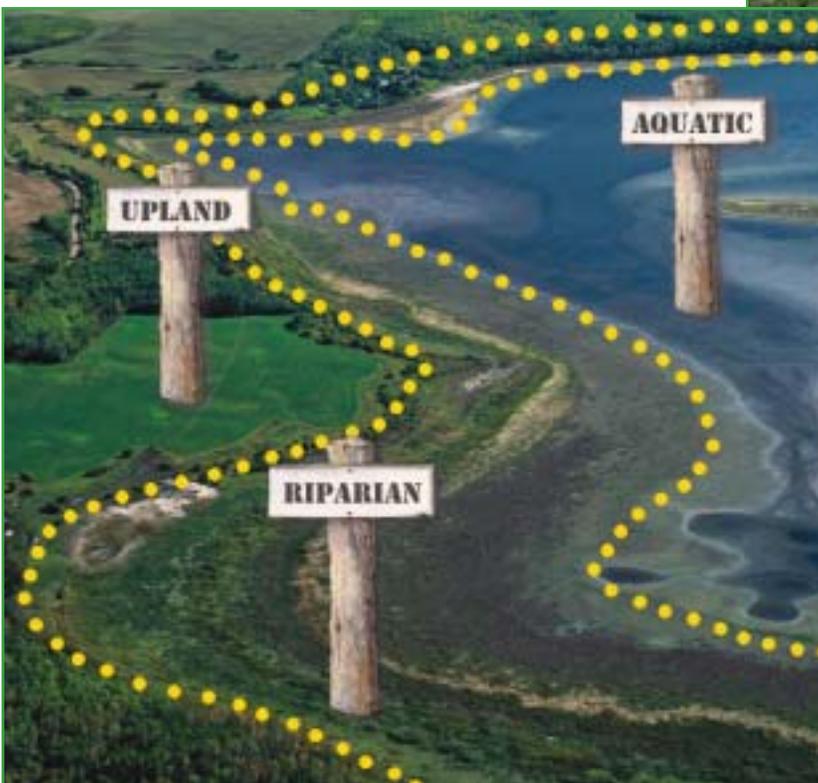
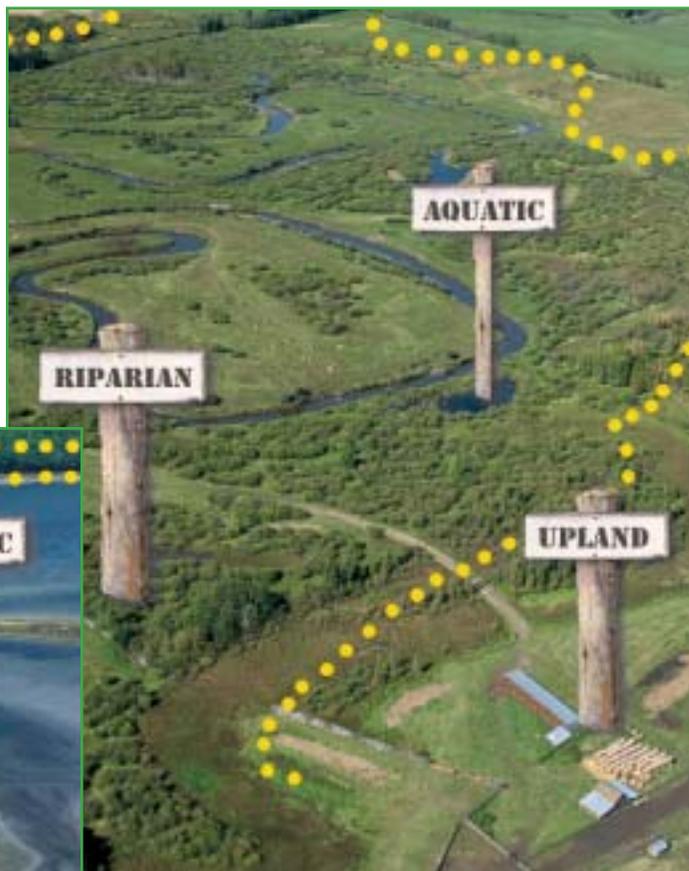
Clue 3



Soils have been modified by abundant water (as in high water tables), stream or lake processes (like sediment deposition) and lush, productive vegetation.



Riparian areas are part of a larger, continuous landscape that grades from wet to dry. They are the thin, green line in that landscape transition. Despite their small size (2-5%) riparian areas are a key piece of the landscape because they are the buffer, the edge and the border between uplands and the aquatic zone. Riparian areas buffer the impacts of uplands on the aquatic area as well as protect uplands from erosion. To measure the health of the riparian area and its ability to be the critical buffer, you need to understand what is "riparian".



Riparian areas on streams and rivers can be quite wide, reflecting high ground water tables, flood history and the profile of the valley.

Riparian areas on lakes and wetlands include emergent vegetation like cattails, as well as the vegetation on the wetter portion of the shoreline.



Sometimes it isn't easy to determine precisely the border, edge and size of the riparian area, especially where land use has modified some of the clues.





Look for the WATER





What do healthy Riparian Areas Do?

When we look at a piece of riparian landscape, we focus on what it does for us. We think about opportunities to fish, graze livestock, or a place to find shelter or shade. As we begin to understand how key riparian areas are, we begin to add water quality, water supply, fish and wildlife habitat, recreation, property value and many more attributes to the list of riparian products, services or values.

A long list of benefits is made possible when eight fundamental ecological functions are performed in healthy riparian areas. These functions are the foundation upon which everything else is built. When all are present, these functions mesh together, like a finely crafted Swiss watch. Riparian health evaluation helps us focus on what produces the benefits - a healthy, functioning riparian landscape. Riparian health represents how well all of these basic functions are being performed.



A watch keeps the time for us - that's the service. It does this through the correct meshing of many interconnected parts. We depend on riparian areas to do many things for us. Their ability to do these things also depends on the correct meshing of a complex series of interconnected functions.



What do Riparian Areas Do?

Key Ecological Functions



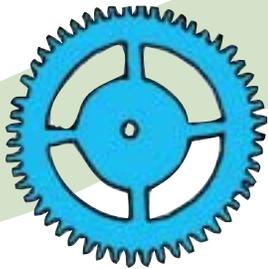
1. Trap & Store Sediment

- ◆ Sediment adds to and builds soil in riparian areas.
- ◆ Sediment aids in the ability of soils to hold and store moisture.
- ◆ Sediment can carry contaminants and nutrients - trapping it improves water quality.
- ◆ Excess sediment can harm aquatic animals like fish and insects.



2. Build & Maintain Banks & Shorelines

- ◆ Erosion is balanced with bank building - the effects of erosion are reduced by adding bank and shore elsewhere.
- ◆ Increase stability, resilience and recovery.
- ◆ Maintain or restore profile of channel - extends width of riparian area through higher water tables.

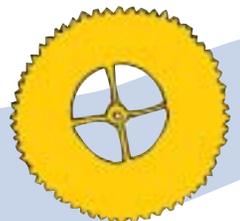


3. Store Water & Energy

- ◆ Watershed safety valve - storage of high water on the floodplain during floods.
- ◆ Reduce flood damage by slowing water and reducing erosion.
- ◆ Slow flood water allowing absorption and storage in underground aquifer.



4. Recharge Aquifers

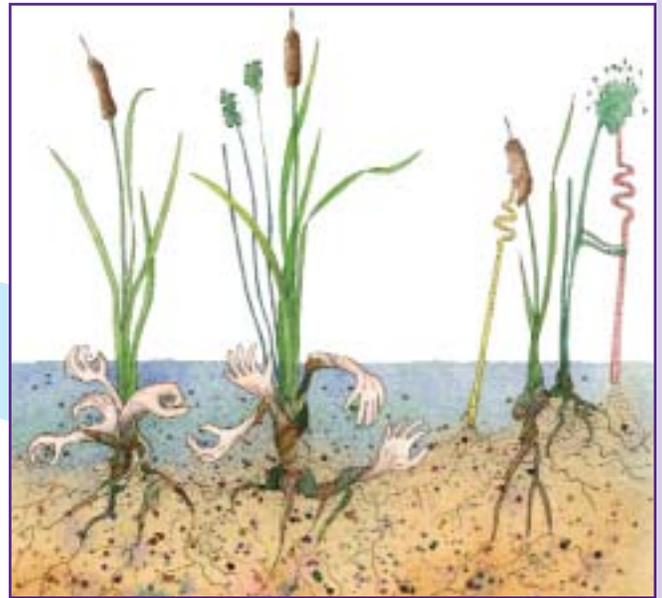


- ◆ Store, hold and slowly release water.
- ◆ Maintain surface flows in rivers and streams and levels in lakes and wetlands through storage and slow release.
- ◆ Maintain high water table and extend width of productive riparian area.

5. Filter & Buffer Water



- ◆ Reduce amount of contaminants, nutrients and pathogens reaching the water.
- ◆ Uptake and absorption of nutrients by riparian plants.
- ◆ Trap sediment, reduce water quality issues and enhance amount of vegetation to perform filtering and buffering function.



6. Reduce & Dissipate Energy



- ◆ Reduce water velocity, which slows erosion and sediment transport.
- ◆ Resist erosion and slow channel and shoreline movement.
- ◆ Aid in sediment capture.

7. Maintain Biodiversity

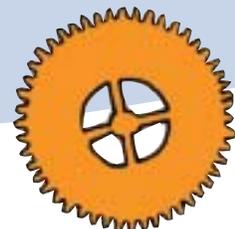


- ◆ Create and maintain habitats for fish, wildlife, invertebrates and plants.
- ◆ Connect other habitats to allow corridors for movement and dispersal.
- ◆ Maintain a high number of individuals and species.



8. Create Primary Productivity

- ◆ Vegetation diversity and age-class structure creates links to other riparian functions.
- ◆ High shelter and forage values.
- ◆ Enhance soil development .
- ◆ Capture and recycle nutrients.

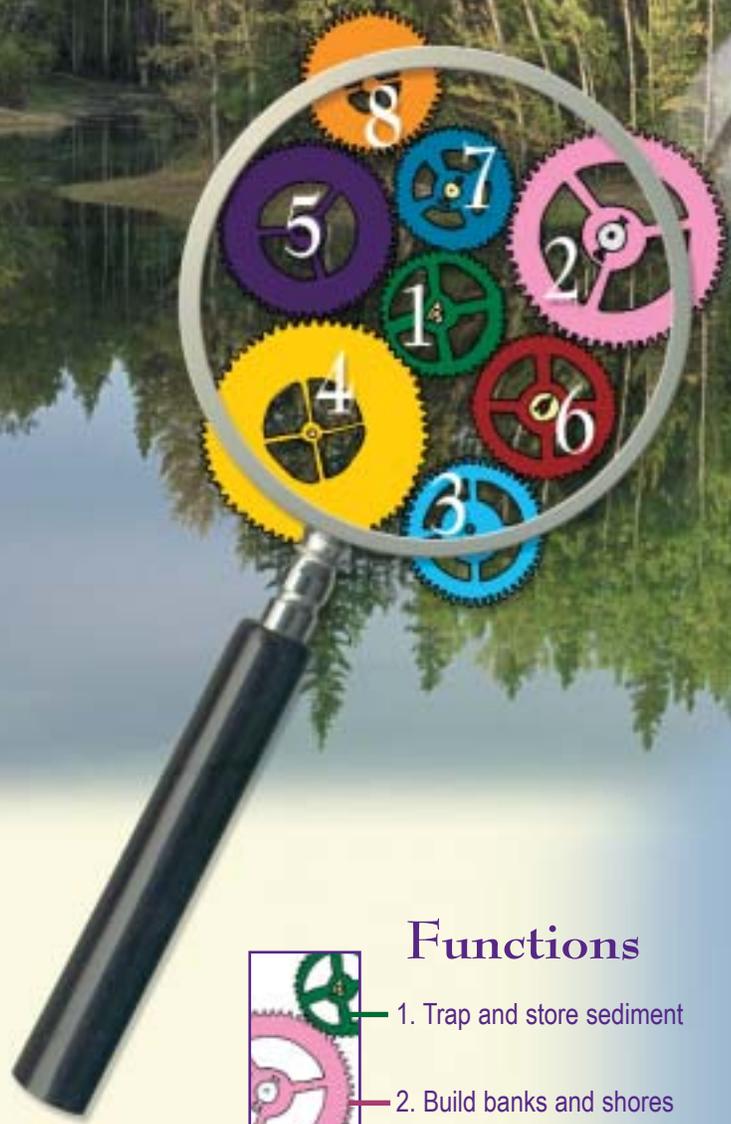


These are the basic functions; read on to see how they translate into products, services and benefits.

Riparian Products, Services & Benefits



products
services



Functions

- 1. Trap and store sediment
- 2. Build banks and shores
- 3. Store water and energy
- 4. Recharge aquifers
- 5. Filter and buffer water
- 6. Reduce energy
- 7. Maintain biodiversity
- 8. Create primary productivity

Clean water

- ◆ lower risk of human illness
- ◆ reduced water treatment costs
- ◆ fish populations maintained
- ◆ healthier livestock
- ◆ greater livestock weight gains

Water supply

- ◆ domestic, agricultural, industrial needs met
- ◆ reduce risk and cost of supply
- ◆ competitive advantage for business
- ◆ maintain fish and wildlife populations
- ◆ waste assimilation
- ◆ drought management and amelioration
- ◆ tourism, recreation



When all of these functions mesh together, in healthy riparian zones, look at what comes out of the tap. . .

Products benefits

Plants

- ◆ sustain livestock, fish and wildlife
- ◆ economic opportunities
- ◆ shade, shelter
- ◆ reduce risk to livestock
- ◆ moderate stream temperatures
- ◆ large woody debris supply
- ◆ maintains channel processes
- ◆ habitat connectivity, migration routes
- ◆ timber, fuel wood production
- ◆ trap carbon

Soil Creation

- ◆ higher agricultural production
- ◆ nutrient recycling
- ◆ higher property values
- ◆ greater water storage

Fish & Wildlife

- ◆ hunting and fishing
- ◆ recreational opportunity
- ◆ tourism, economic opportunity
- ◆ fur production
- ◆ subsistence use
- ◆ commercial fisheries

Buffering Capacity

- ◆ decreased incidence, risk and costs of floods
- ◆ decreased incidence, risk and costs of erosion.
- ◆ local climate control
- ◆ resilience to allow more rapid recovery from disturbance
- ◆ more stable production of other goods and services

Aesthetics

- ◆ tourism
- ◆ recreation
- ◆ competitive advantage for individuals to relocate
- ◆ higher property values
- ◆ enjoyment and pleasure in healthy ecosystem

Wow!
all of
that in a
small
package!



Riparian Health A Wake Up Call

Some of the changes to a landscape occur slowly, over periods of time beyond an individual's memory. Because of this, sometimes we fail to notice that change, even deterioration, has happened.



This 1890 photograph of Willow Creek is an image of health; woody vegetation is abundant and diverse.



Almost 100 years later, this same site on Willow Creek shows substantial change, although some remnant woody species still persist.



This 1920's photograph of Sylvan Lake is an image of health; the water was clear, clean and enjoyed by many.



In recent times many central Alberta lakes show signs of water quality problems.

These changes may affect us, our lives, livelihood, health and recreation. When we begin to recognize riparian condition it is a start towards changing the trend from one of decline to stability and perhaps improvement in health. If you drink water, farm or ranch, have a lakeside cottage, swim, fish or watch birds, riparian area health is important to you. Riparian areas make up a small portion of the landscape, but are much more important to us than their small size would indicate.



Riparian Health - Why Does it Matter?

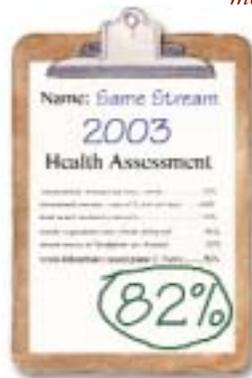
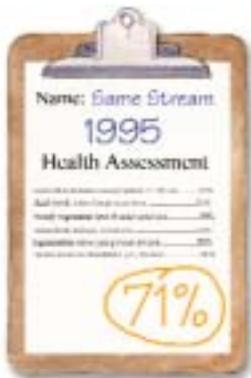
We depend on not only our own health to sustain us, but on the health of the environment in which we live. Riparian health matters for the same reason our own health matters! Healthy, functioning riparian areas offer us:

- ♦ Resiliency - the ability to bounce back from floods, droughts and human-caused problems;
- ♦ Ecological services - a long list of goods, benefits and values; and
- ♦ Stability - landscapes that maintain themselves, persist and are sustainable.

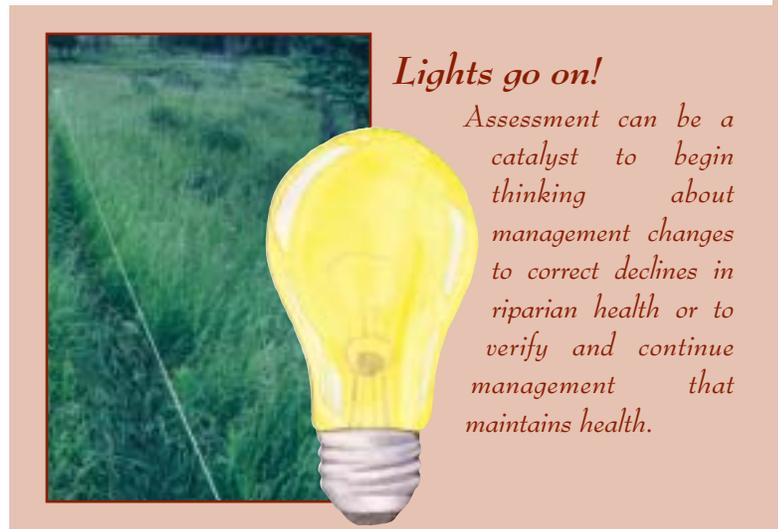
Why focus on riparian areas? They are the focus because of their agricultural benefits, the biodiversity values they represent and for concerns about water quality. Some riparian areas have declined in their ability to perform the ecological functions that relate directly to these benefits and values. Often the health of these valuable landscapes has changed over time, even though that decline isn't obvious. We need to understand the current status of riparian areas to improve or maintain their health. The **first** step is to determine the condition or health of the site. Once we know the health of a site, we have a way to link management actions and changes to improve or maintain ecological function.



Riparian health evaluations provide a standard method to allow landowners, resource managers and others to quickly assess current health and to identify the presence, scale and magnitude of issues and problems.



Riparian health evaluations can be repeated, over time, to monitor changes that may result from natural variation or management actions and choices.



Lights go on!

Assessment can be a catalyst to begin thinking about management changes to correct declines in riparian health or to verify and continue management that maintains health.



Riparian health evaluations are an educational tool, to allow those that use, manage and value riparian areas to better understand key functions, identify a way to measure those functions and to serve as a vehicle for better communication among riparian users. Sometimes even the cows join in.

Riparian health matters!



Where Are We?

Current Health Status & Future Goals

Riparian areas change naturally over time. What we do in them and in the watersheds that surround them 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 faster, flows may fluctuate more and downcutting can dry up productive riparian areas. These changes are compounded in lakes and wetlands with accumulations of sediments and nutrients, water level fluctuations and a speeding up of the ageing process. If we acknowledge that riparian areas change and that we are responsible for some of these changes, it is a step towards setting goals for tomorrow's riparian areas. Sometimes looking back gives us a vision of where we need to go. Goal setting begins by asking three questions:

Where were we?

Where are we today?

Where do we want to be?

Riparian health is described in the following categories:

	HEALTHY; all riparian functions are being performed
	HEALTHY, WITH PROBLEMS; many functions are being performed but signs of stress are apparent
	UNHEALTHY; most functions are severely impaired or have been lost

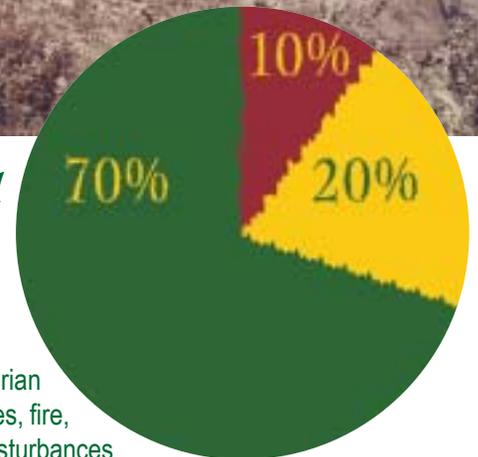


Where We Were

There is no simple answer to the question "how healthy were riparian areas in the past?". What is available to help us includes the written accounts of the observations by explorers, surveyors, fur traders, naturalists and the Northwest Mounted Police. Some early artwork exists and early photographs of the last part of the 1800s provide another visual window. We know from historical accounts that there were disturbances like buffalo grazing, fire, drought and floods affecting riparian health. From those same records we understand that beaver populations were much higher historically than now. The effect of beavers on riparian health was probably positive, especially through the maintenance of higher water tables that would have enhanced the amount of woody vegetation. By looking at riparian sites today we can also gain insight into vegetation potential - what could have existed on the site.



Past - 1801

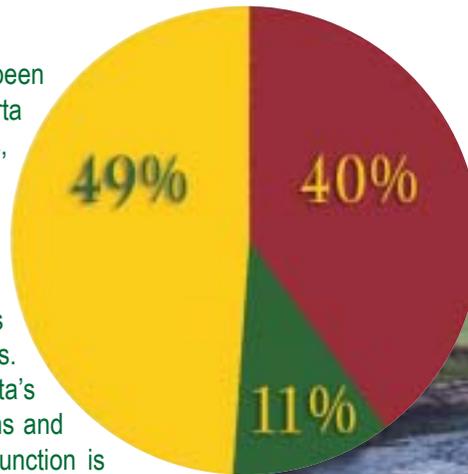


Based on all of these bits of evidence we can speculate that prior to settlement riparian areas were mostly healthy. Natural events such as floods, grazing from native ungulates, fire, drought, beavers and landslides did affect riparian condition and the results of these disturbances meant health could vary over time and from reach to reach. Because of the natural resilience of these systems and the long return intervals between use or disturbance, it is likely that ecological function was restored relatively quickly.



Where We Are

Information on riparian health has been collected in the settled portion of Alberta since 1995, on over 150 streams, rivers, lakes and wetlands. Measurements have been done randomly, so as not to bias the results and reaches are selected that are representative of much larger portions of the riparian landscape. More than 1000 reaches have been inventoried, representing over 2000 km of riparian areas along streams and rivers and around wetlands and lakes. The measurements indicate that about 11% of Alberta's riparian areas are healthy, 49% are healthy, with problems and 40% are unhealthy. Those figures tell us that riparian function is compromised in many of our watersheds. The results for Alberta are mirrored by the measurements for Saskatchewan and numerous states including Montana and Idaho. Lights are flashing; these results suggest we have issues to deal with that go well beyond what could be expected in the natural variation of riparian health.



Present - 2002

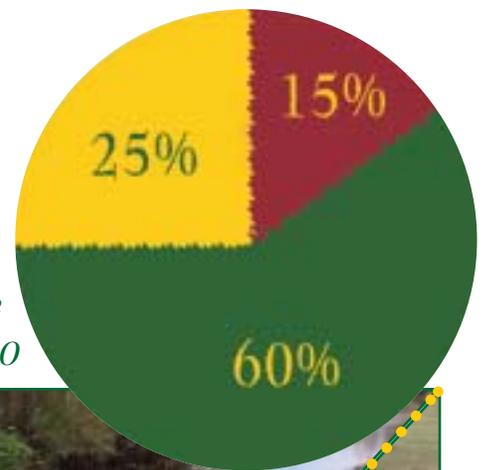


Where We Need to Be

Healthy riparian areas sustain us, especially their ability to store, filter and buffer water, combined with their agricultural and biodiversity values. Sustaining ourselves will require maintaining healthy riparian areas and restoring many that have declined in health.

What should our goals be for riparian health? Clearly we all want these landscapes to be resilient, stable and provide us a long list of ecological services, whether we are livestock producers, farmers, anglers, bird watchers, cottage owners, hikers or downstream water drinkers. Riparian health can vary across the province, from stream to stream and around a lake, ranging from healthy to unhealthy. Some of this variation relates to how riparian areas evolved. However, our use of these landscapes represents an additive and cumulative effect which has often compromised resiliency. That effect could be a consequence of what has happened on the reach or what has happened upstream or downstream. Additional variation in riparian health is due to our use of these areas. In some cases, that use has led to a decline in condition.

Our goals need to reflect that agriculture, urban development, transportation networks, recreational use, industrial uses and water management will have impacts and we cannot return to presettlement conditions. However, we should see progressively better riparian health as we adopt better land use practices, phase out some land uses and restore function to riparian landscapes. We will find that maintaining and restoring riparian health will have significant benefits.



*Future
2011-2030*



*We will either get the future we planned for. . .
or . . . the one we didn't plan for.*



Tuning Your Eye

Diagnosis for Riparian Health

Riparian health evaluations tune your eyes and allow you to see the components or pieces that contribute significantly to health or, when missing or degraded, impair ecological functions, the foundation of health.

Riparian Health Questions

What is measured? These characteristics are evaluated to assess the health of riparian areas along streams and rivers or around lakes and wetlands:



How much of the riparian area is covered by vegetation?

Vegetation reduces the erosive force of raindrops and the velocity of water moving over a floodplain, along a streambank or onto a lakeshore. Think of vegetation like a mesh umbrella that slows and blunts the force of moving water.

Vegetation cover:

- reduces erosion;
- traps sediment and stabilizes banks and shores;
- absorbs and recycles nutrients;
- allows water to infiltrate to refill and recharge aquifers;
- reduces the rate of evaporation; and
- provides shelter and forage values.

The amount and type of vegetation present determines how well these services are performed.



>95% cover



80% cover



<75% cover



As vegetation cover diminishes, the amount of runoff and sediment increases. That can affect water quality and quantity.



How much of the riparian area is covered by weeds (invasive plant species)?

Weeds are alien species; they have been imported from elsewhere and their introduction causes both economic and environmental harm. Invasive plants include “noxious” or “restricted” weeds. Weeds invade riparian areas where disturbance has created bare soil. The presence of weeds can indicate a threat to health. No weeds indicate the riparian area is well vegetated, there is no bare soil and there is no seed source. Several weeds indicate space is available and there is a threat of quick invasion. Many weeds signal the system is degraded.

Invasive plants may contribute marginally to some riparian functions, but their negative impacts reduce overall health. They are not present in early spring to trap sediment or protect banks and shorelines from runoff. Their presence inhibits other important and beneficial species that contribute to bank and shore stability, biodiversity and primary productivity.



- Examples of Invasive Weeds*
- Nodding Thistle*
 - Canada Thistle*
 - Knapweed*
 - Hound's Tongue*
 - Leafy Spurge*
 - Toadflax*



How much of the riparian area is covered by disturbance-caused vegetation?



- Examples of Disturbance-caused plants*
- Common Dandelion*
 - Festool Barley*
 - Timothy*
 - Stinkweed*
 - Kentucky Bluegrass*
 - Clovers*
 - Plantains*

Disturbance-caused species are plants which are absent, or present in small amounts, in undisturbed areas, but invade reaches with high levels of use or disturbance. A large cover of these plants, either native or introduced, indicates an alteration of the normal plant community that would be expected to occur on the site. Like invasive plants, disturbance-caused species are well adapted to an environment of continual stress, where the competitive advantage of better riparian species has been diminished. These species have more value than invasive plants, but are usually;

- ◆ shallow-rooted and less productive;
- ◆ have limited value for bank binding and erosion prevention; and
- ◆ inhibit other preferred plants.



Is woody vegetation present and maintaining itself?

Most, but not all, riparian areas can support woody vegetation (trees and shrubs). Trees and shrubs have an important and key role in riparian condition. Their root systems generally are excellent bank and shoreline stabilizers and play a key role in the uptake of nutrients that could otherwise degrade water quality. The canopies formed by trees and shrubs protect soil from erosion, provide shelter to wildlife and livestock, and modify the riparian environment. Even when dead the trunks provide erosion protection and structural complexity which plays a role in modifying stream valleys. A good indicator of the ecological stability of a riparian reach is the presence of woody plants in all age classes, especially young age classes. Without signs of regeneration of preferred woody plants (those species that contribute most to riparian condition and stability) the long-term stability of the reach is compromised.

Some trees and shrubs just aren't the right stuff. They don't do as good a job of gluing banks and shores together, they reflect a history of disturbance (e.g. rose, snowberry) and some are exotic, aggressive species (e.g. Russian Olive, Tamarisk) we don't need or want in riparian areas.



These poplar seedlings and saplings represent new age classes of trees that will replace the older individuals in the background.



What will replace these trees in the next few years?

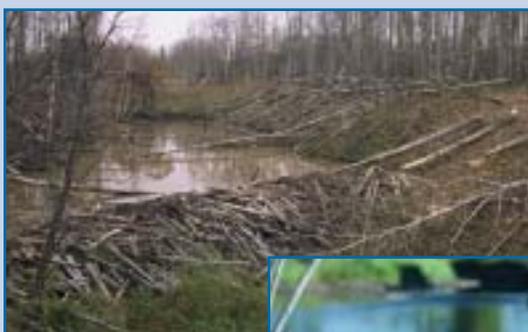
Examples of preferred Trees & Shrubs

Trees:
cottonwood, aspen, poplars, birches, conifers

Shrubs:
willows, dogwood, saskatoon, chokecherry, alders, hazelnut, pin cherry, cranberry, honeysuckle, raspberry



Is woody vegetation being used?



Beaver activity, for food and dam building, is an example of utilization of woody species.



Many animals browse woody plants, including domestic livestock.

Because woody species have such an important role to play in riparian health, measuring use helps us understand whether they will persist in the reach. Livestock will often browse woody plants, especially in late summer, fall and winter. Wildlife, including beaver, make use of woody plants year-round. Mowing, trimming and logging remove woody species. Woody plants can sustain low levels of use, but heavier browsing or removal can:

- ◆ deplete root reserves;
- ◆ inhibit establishment and regeneration;
- ◆ cause the loss of preferred woody species;
- ◆ lead to replacement by less desirable woody species; and
- ◆ lead to invasion by disturbance or weed species.

There is an old stockman's saying: "If you keep down the shoot, you'll kill the root". Grazing or browsing too much of the leafy material, the collectors of solar energy, will wear the plant down and reduce its ability to store energy in its roots for the next season. Long-term, heavy use eliminates the best woody plants.



How much dead wood is there?

The number of dead trees and shrubs or the amount of dead branches in their canopies can be a signal of declining health of a riparian reach.

A number of factors could be contributing to this:

- ◆ Large amounts of dead wood may indicate a change in water flow through the system due to either human or natural causes;
- ◆ De-watering of a reach, if severe enough, can dry the reach, changing vegetation potential from riparian to upland species;
- ◆ Flooding of a reach, or a persistent high water table, from beaver dams, crossings that restrict flow or man-made dams can kill and eliminate some riparian species;
- ◆ Heavy use of browse can stress woody plants, resulting in their eventual death;
- ◆ Physical damage from rubbing and trampling, if chronic, can result in the death of woody vegetation; and
- ◆ Climatic impacts (drought), weather (severe winters), disease and insect infestations can affect woody vegetation.

In all these cases, a high percentage of dead wood reflects declining vegetation health. This can lead to reduced streambank integrity, increased channel incisement, excessive bank and shoreline erosion and reduced shelter values.



A water level increase from a beaver dam flooded and killed these willows.

This willow has been severely browsed, rubbed and trampled by livestock.



Are streambanks and lakeshores held together with deep-rooted vegetation?



Kentucky bluegrass roots have very limited bank holding capabilities.

Only deep-binding roots, such as those of willows, can protect shorelines from ice, wind and wave erosion.

Streamside vegetation maintains the integrity and structure of the streambank by dissipating energy, resists erosion and traps sediment to build and restore banks. On lakeshores and wetland margins, vegetation resists wave action, ice movement and traps sediment.

Root systems bind soil particles together and provide the glue that stabilizes the zone where stream flow and wave energy have the most consistent, regular effect. Vegetation with deep and binding roots best accomplishes this function, especially if there is a diversity of these species found on the reach. Most tree and shrub species provide such deep roots. Herbaceous annuals and weeds lack this quality. Perennial herbs provide it in varying degree. Some species, such as sedges, are excellent streambank stabilizers, while others, such as Kentucky bluegrass and timothy, have shallow root systems and have limited capability.



How much of the riparian area has bare ground caused by human activity?

Bare ground is unprotected soil that results from our activities. It's an opportunity for invasion by weed and disturbance species into the vacuum caused by those activities. Bare ground represents a loss of vegetation to filter and buffer sediment, less reduction in energy (hence more wind and water erosion) and a decreased ability to allow water to infiltrate into the aquifer. Sediment deposited during a flood is a natural event and an indication the riparian area is doing what it should- trapping this material.

Human land uses that can cause bare ground include livestock grazing, cultivation, recreation, urban development, roads/trails, timber harvest and industrial activities. Significant bare ground caused by human activity indicates a deterioration of riparian health.



These riparian areas are very susceptible to erosion and the bare soil is a place for weeds to establish. Several riparian functions are impaired.



Has the streambank or shoreline been altered by human activity?



This shoreline has been altered through the clearing of trees.



Alteration can be subtle, like the infilling of the floodplain and the creation of a new, higher bank which doesn't allow the stream access to it's floodplain.

Stable streambanks and shorelines maintain channel configuration, integrity and bank shape. When streambanks and shorelines are physically altered, erosion can increase, moving channel and bank materials, water quality can deteriorate, and instability may increase within the reach and downstream.

Altering the shoreline or streambank vegetation can also have an impact on health. Removal of woody species or emergent plants (e.g. cattails) can increase erosion and disrupt nutrient recycling. Planting of non-native species or allowing invasion of weeds and disturbance-caused plants can inhibit native, deep-rooted ones.

Bank alteration can result from livestock hoof shear, livestock trails/watering sites, recreational trails, flood/erosion control methods, irrigation diversions/return flows, timber harvest, crossings/fords, bridges/culverts, landscaping and channelization/drainage.



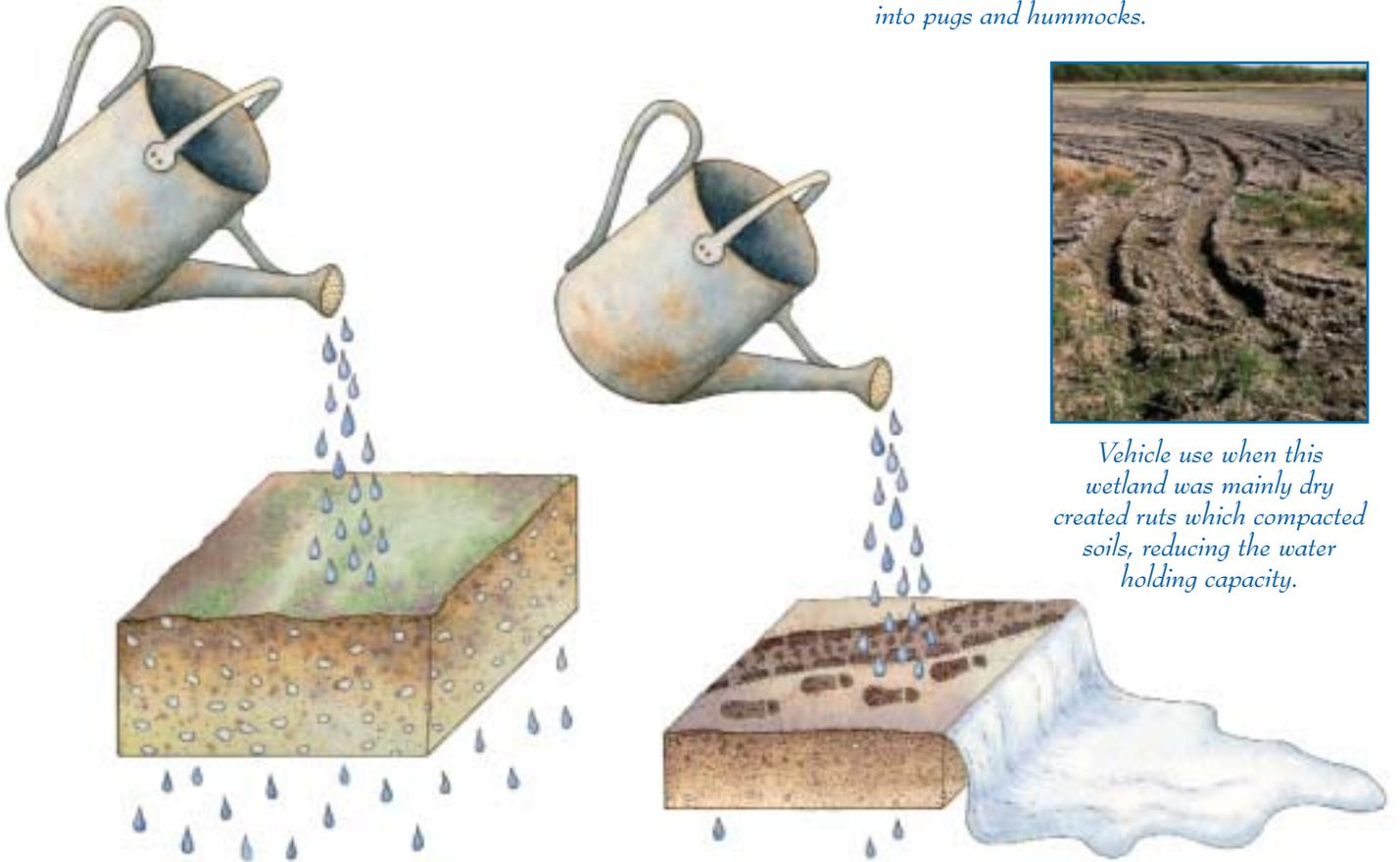
Are riparian area soils compacted from use?

Plants filter and trap sediments to build a riparian soil layer of moist, fine textured materials. Roots and underground fauna create soil structure and spaces that allow water infiltration and storage. This is the “sponge” that supports riparian vegetation. This sponge is very susceptible to vehicle traffic, hoof action and compaction. Compaction can be difficult to evaluate and the effect is often related to soil type. Evaluating the amount of pugging, hummocking and rutting provides some measure of soil compaction from livestock and vehicle use in riparian areas. Pugging describes large animal tracks left in soft soil. Pugged areas have a honeycomb appearance and an irregular soil surface difficult to walk across. Hummocking describes the raised mounds of soil above the surrounding ground. Rutting describes deep animal paths or vehicle tracks that indicate significant compaction of riparian soils.

With extensive animal or vehicle compaction, the water-holding capacity of the soil is reduced, normal plant succession is disrupted and the soil surface is exposed and roughened, which increases the possibility of erosion.



The soft soil of this wet meadow has been compacted and reconfigured through hoof action into pugs and hummocks.



Vehicle use when this wetland was mainly dry created ruts which compacted soils, reducing the water holding capacity.

Think of riparian areas as a sponge which collects, stores and slowly releases water. Compaction of the soil that makes up the sponge inhibits this key function.



Can the stream or river access its floodplain?

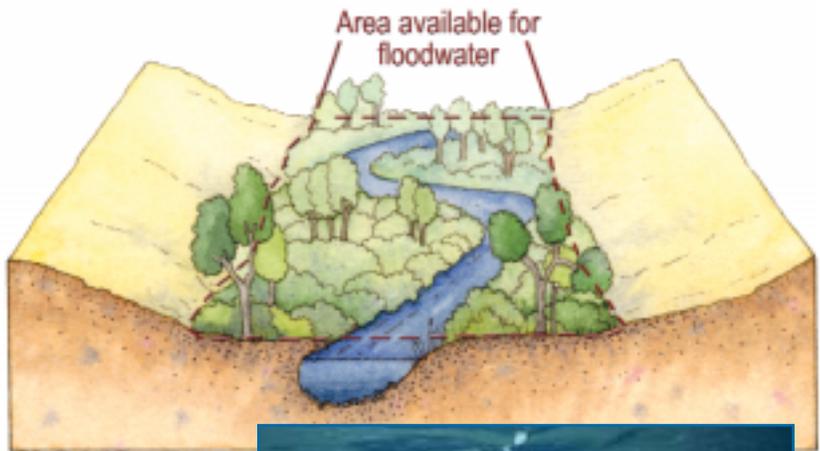
Floodplains, the riparian area that lies beyond the channel, provide a safety valve that allows water in excess of what the channel can hold to escape into a wider area. Floodplains provide temporary storage for high water and an opportunity to slow that water down, reducing energy and allowing sediment to be deposited outside of the channel. Incisement, or downcutting, and constructed features like berms and dykes can limit the ability of streams and rivers to access their floodplains during high water events.

The inability to access a floodplain can result from:

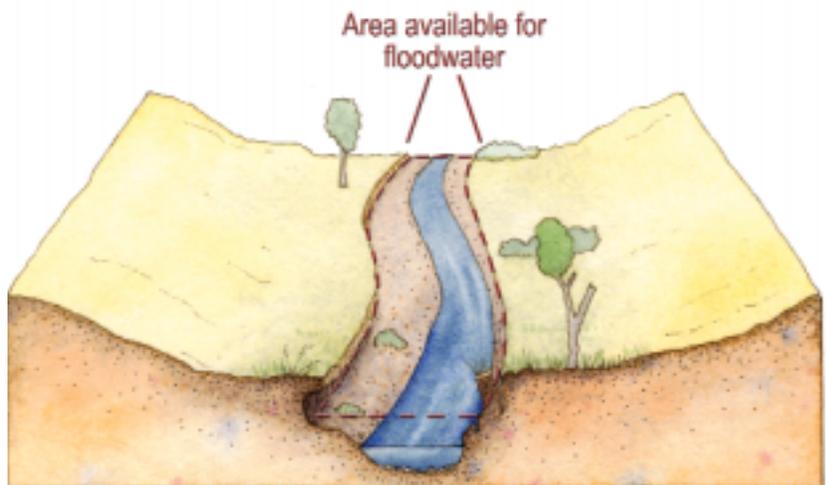
- Watershed scale, cumulative effects of vegetation removal, drainage and roading which affect runoff;
- Local drainage scale changes including vegetation removal, dams, water additions, roading and culvert installations occurring upstream of the reach (and sometimes downstream);
- Reach scale changes including vegetation removal, beaver dam removal, channelization and culverts;
- Natural events including landslides, beaver dam wash-outs and extreme flood events; and,
- Flood and erosion control works.

Incisement of a stream channel and the inability of a river to periodically access its floodplain can result in:

- A lowered water table that affects current vegetation and the potential of the reach for some types of vegetation;
- Increased stream energy with more erosion, sediment, and unstable banks which can persist downstream of the reach and potentially upstream as the stream readjusts;
- Reduced water storage and retention, leading to lower flows or flow ceasing during parts of the year;
- Decreased ability to trap sediment on the floodplain and deal with water quality issues;
- Impairment in the ability of the reach to rebound from natural and human caused impacts; and,
- Decreased productivity, forage, shelter and biodiversity values.



During flooding this river can access a wide floodplain to store water and reduce energy.



Flood water in this incised channel has nowhere to go and all the water and energy are compressed in the channel.

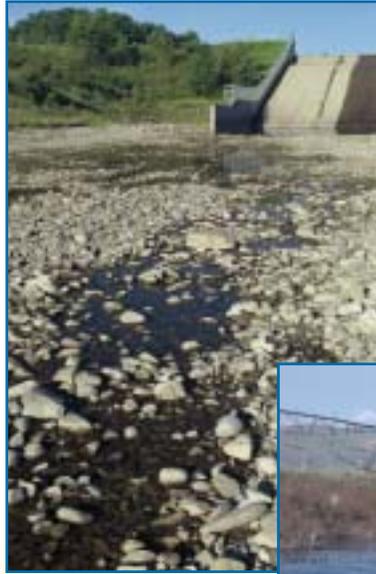


Is water removed and are flows/levels manipulated?

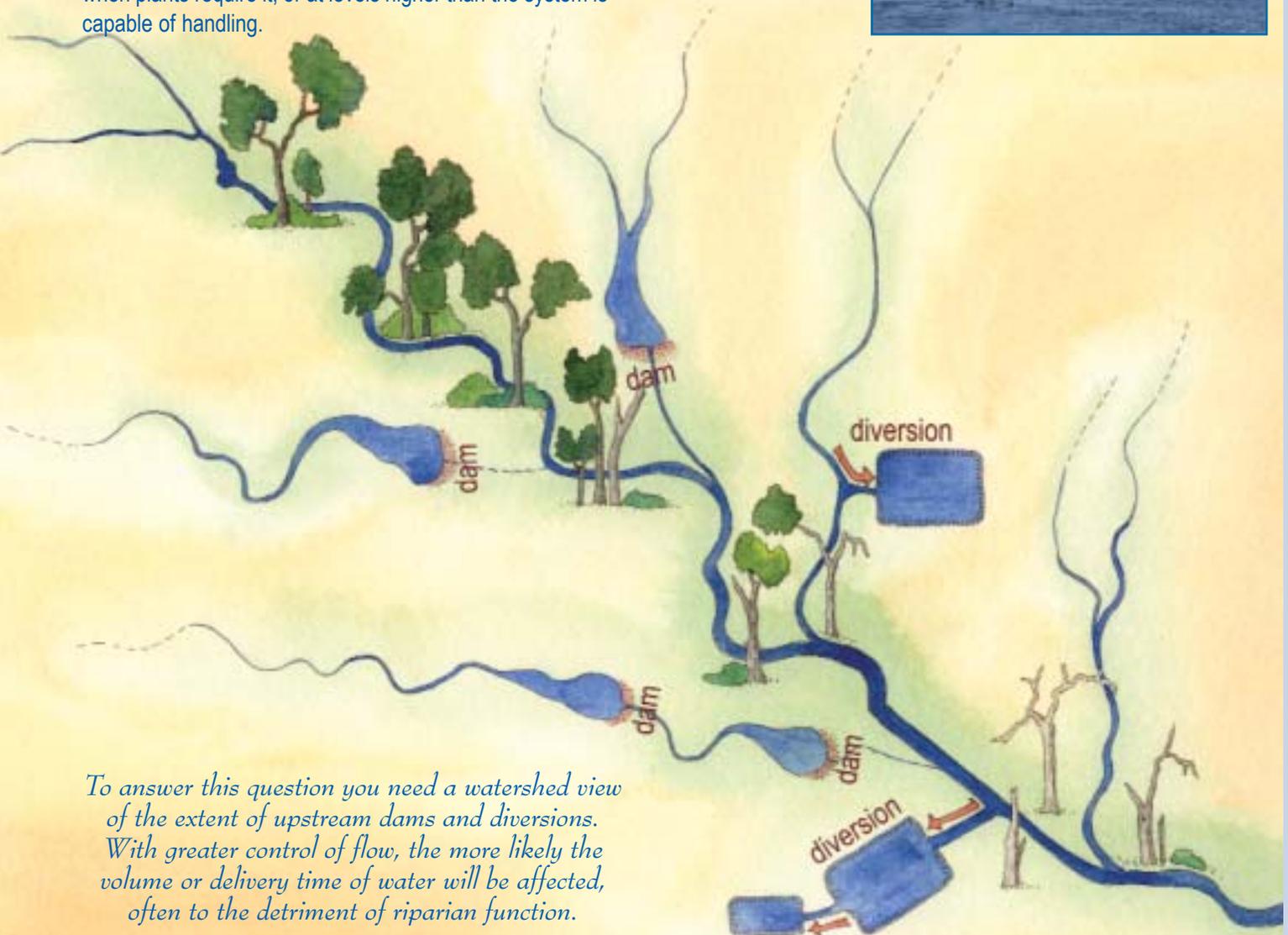
Riparian areas are built and maintained by water. Proper functioning depends on a regular supply of water. The degree to which water is removed or added directly affects riparian health. Dewatering a riparian system, during the critical growing season affects:

- ♦ the maintenance and persistence of riparian plant communities;
- ♦ the stability of banks and shorelines;
- ♦ fish and wildlife habitat; and,
- ♦ forage production and the maintenance of shelter.

Riparian areas are adapted to, and depend on, the volume and timing of annual peak flows and levels. The degree to which upstream reaches and tributaries are controlled by dams or diversions influences and affects delivery of water to downstream areas. Water may arrive at times other than when plants require it, or at levels higher than the system is capable of handling.



Significant changes to water flows and levels affects riparian vegetation and riparian health



To answer this question you need a watershed view of the extent of upstream dams and diversions. With greater control of flow, the more likely the volume or delivery time of water will be affected, often to the detriment of riparian function.

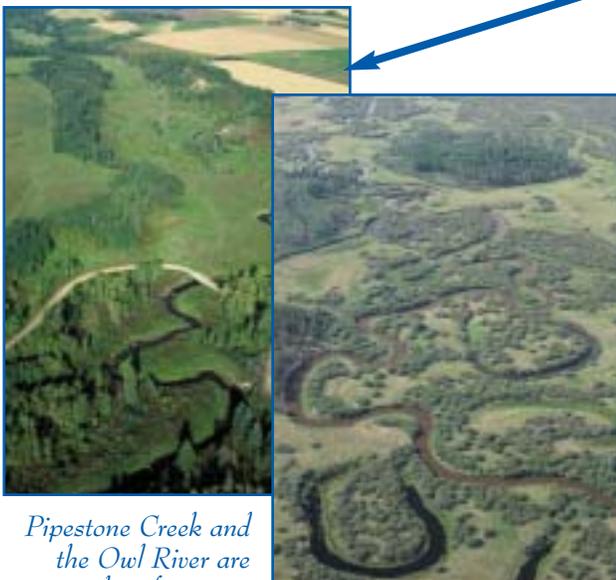


Riparian Characteristics Measured

There is an overlap in measurements between different sizes and types of riparian systems. This table provides a sense of what characteristics are measured for each type and size of riparian system.

Riparian System

Characteristics	Riparian System		
	Streams & small rivers	Large rivers	Lakes, wetlands
Vegetative cover of floodplain, shoreline or bank	✓	✓	✓
Invasive plant species (weeds)	✓	✓	✓
Disturbance related plant species	✓	✓	✓
Preferred tree and shrub establishment and regeneration	✓	✓	✓
Utilization of preferred trees and shrubs	✓	✓	✓
Decadent and dead wood	✓	✓	
Shoreline or bank root mass protection	✓	✓	
Human caused bare ground	✓	✓	✓
Compaction: Pugging, hummocking, rutting	✓	✓	✓
Shoreline, bank and vegetation altered by human activity	✓	✓	✓
Floodplain accessibility	✓	✓	
Water manipulation - dewatering, control of flows/levels		✓	✓



Pipestone Creek and the Owl River are examples of systems in the "Streams and Small Rivers" category



The Red Deer River is in the "Large River" category



Lower Therien Lake and the wetland complex next to it are examples of the "Lakes and Wetlands" category

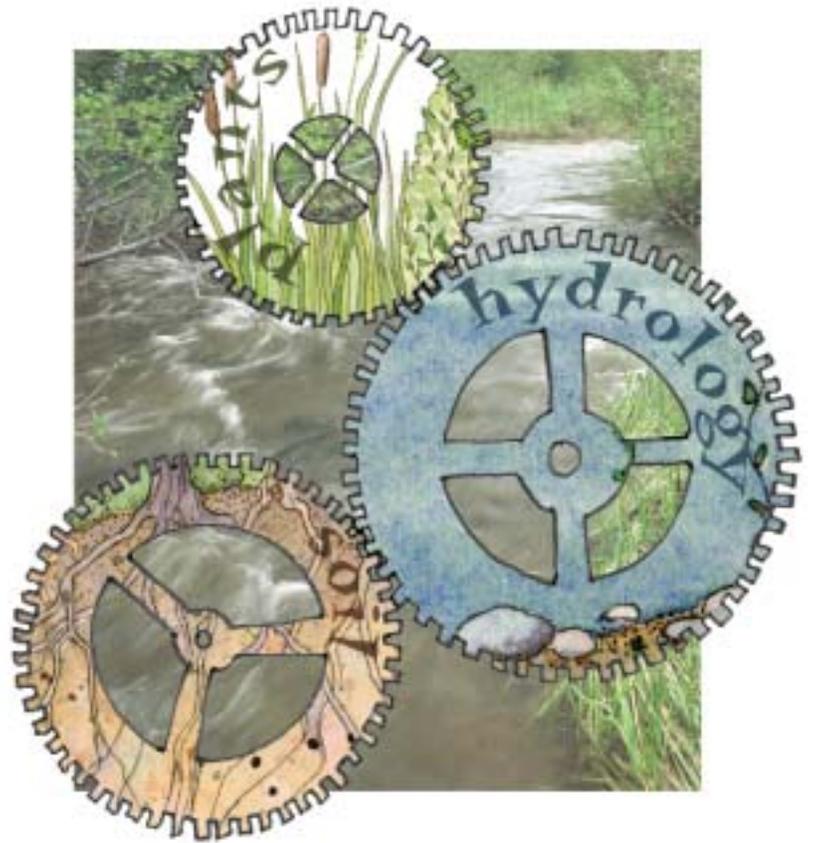


Common Concepts behind the Measurements

What are the Key Pieces?

Riparian health evaluation knits together physical (soils and hydrology) and vegetation features, because no one factor or characteristic provides a complete picture of site health or trend in health. These evaluations rely heavily on vegetation characteristics because many vegetation features integrate the effects of soil and hydrologic factors which form and operate in riparian areas. Plants are more visible than soil or hydrologic characteristics. They may provide an early indication of riparian health, help you see the past history of use and help you to understand the successional trend on the site.

There is a close relationship between physical and vegetation features. Riparian reaches with significant changes in hydrology and soil will show changes in plant community structure and potential. Changes in vegetation, the “glue” of riparian systems, may have a rebounding effect on hydrology and soils as well.



How Much is There?

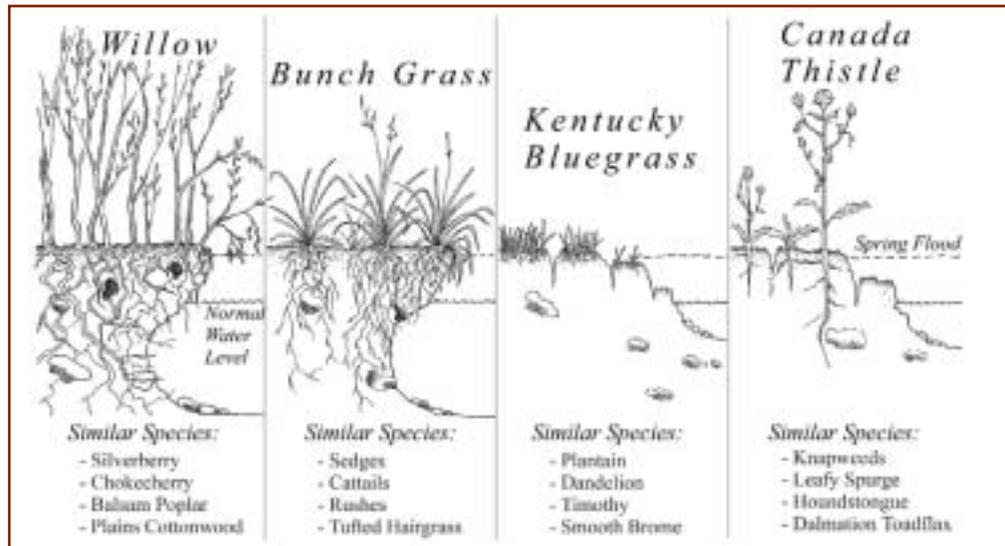
Many of the measurements deal with the element of “coverage”, that is, how much of the riparian area measured is covered, influenced or affected by vegetation or structural changes. The categories are usually expressed in percentages of the reach area. For example, in the illustration below, weeds cover about 3% of the riparian reach. Of the total canopy cover of trees, 16% is composed of seedlings or saplings. These measurements allow you to assign a score.





What's there and is it the right stuff?

The types of plants on the riparian area provide insight into health, so plant identification is important. Plants provide an indication of trend toward or away from the potential of the site (what the site could be). Coverage of native plants, woody species, weeds and disturbance-caused species provide clues to trends and to management influences. Utilization rates of some plants (e.g. woody species) that are key to riparian function provide clues to the ability of these plants to persist. The type of plants present is also an indicator of their effectiveness in performing several key functions like binding banks and shorelines together against the forces of erosion.



What is the right stuff? Willow and bunch grasses provide deep, binding root mass, while Kentucky bluegrass and Canada thistle do not.

A Guide to the Right Riparian Stuff

Vegetation Type

Riparian System	Vegetation Type						
	Trees	Preferred Shrubs	Other Shrubs	Native Grasses Forbs	Introduced Grass	Disturbance Species	Weeds
Large River	E	G	P	P	P	P	P
Small River	E	E/G	F/P	F/P	P	P	P
Large Stream	E	E	F	F	P	P	P
Small Stream	E	E	G	G	P	P	P
Intermittent Stream	E	E	E	E	G/F	P	P
Lake	E	E	G	G/F	P	P	P
Wetlands	E	E	E	E	F/P	P	P

Legend:

E=Excellent - these species have all the necessary properties of deep, binding and large root mass appropriate to riparian type or size.

G=Good - species meet most of the requirements for holding bank and shore materials together.

F=Fair - plants have marginal ability to perform stabilizing function.

P=Poor - vegetation unable to hold banks or shore together under normal circumstances.

Trees - e.g. cottonwoods, aspen, conifers, birch.

Preferred Shrubs - e.g. willows, saskatoon, dogwood, alder, silverberry, chokecherry.

Other Shrubs - e.g. rose, snowberry (buckbrush), shrubby cinquefoil.

Native Grasses, Forbs - e.g. sedges, cattails, tufted hairgrass, other bunch grasses and sod-forming grasses.

Introduced Grasses - e.g. Kentucky blue grass, timothy, smooth brome.

Disturbance Species - e.g. common dandelion, stinkweed, foxtail barley, plantains.

Weed Species - e.g. knapweeds, Canada thistle, leafy spurge.



How much have we changed things?

Riparian health can often be linked directly to current management or the effects of previous management. The degree to which banks and shorelines have been structurally altered or their vegetation has been changed or modified is an important measure. Because water is the driver of riparian systems, determining the degree of flow or level manipulation is important.



Shoreline or fence line contrasts help us understand that changes have happened to riparian areas. Both are measures of how much we have changed the vegetation or structurally altered the bank or shore.



What ruler do we use for measurement?

Most of the characteristics rated in health evaluation are based on measurements using your eyes and your judgment. The eye is a remarkable measuring device. It may seem imprecise, but with training and practice, the methods are repeatable and reasonably accurate. Extreme precision is not the goal for health evaluation since it is not an attempt to determine an absolute value, but rather, a broad impression of riparian condition.





How do the measurements link to health?

Riparian health reflects the ability of the site to perform eight basic ecological functions. The characteristics we measure help us understand the potential of the site to perform these functions and the degree to which the functions may be impaired.

In more detailed health evaluation, beyond the checklists, each characteristic measured has a range of values that translate into the site's potential to perform several functions. The breaks between the values indicate significant differences, or changes in potential. These were arrived at with expert review and opinion; the breaks represent inflections or thresholds significant enough to indicate change. The characteristics are weighted differently; this indicates that all of the characteristics do not contribute equally to ecological function. This weighting system reflects the relative importance of the characteristic, the influence or relationship to other characteristics and the significance of a characteristic to an ecological function or functions. Some characteristics, like the ability of a stream to access it's floodplain, are the foundation. Without them, most, or all other functions could not occur.



This riparian area is "healthy, with problems". Can you identify the missing pieces?

Measurement

	<i>Function</i>							
	Trap Sediment	Bind Banks	Store Water	Recharge Aquifer	Filter/Buffer	Dissipate Energy	Biodiversity	Primary Productivity
Vegetation cover	✓	✓	✓	✓	✓	✓	✓	✓
Weeds	✗	✗	-	-	-	✗	✗	✗
Disturbance Species	-	✗	-	-	-	✗	✗	✗
Woody regeneration	✓	✓	✓	✓	✓	✓	✓	✓
Wood utilization	-	✗	-	-	✗	✗	✗	✗
Dead wood	-	✗	-	-	-	✗	✗	✗
Deep roots	✓	✓	✓	✓	✓	✓	-	-
Bare ground	✗	✗	-	✗	✗	✗	✗	✗
Compaction	-	✗	-	✗	-	-	-	✗
Site alteration	✗	✗	✗	✗	✗	✗	✗	✗
Floodplain accessible	✓	✓	✓	✓	✓	✓	✓	✓
Water manipulation	✗	✗	✗	✗	✗	✗	✗	✗

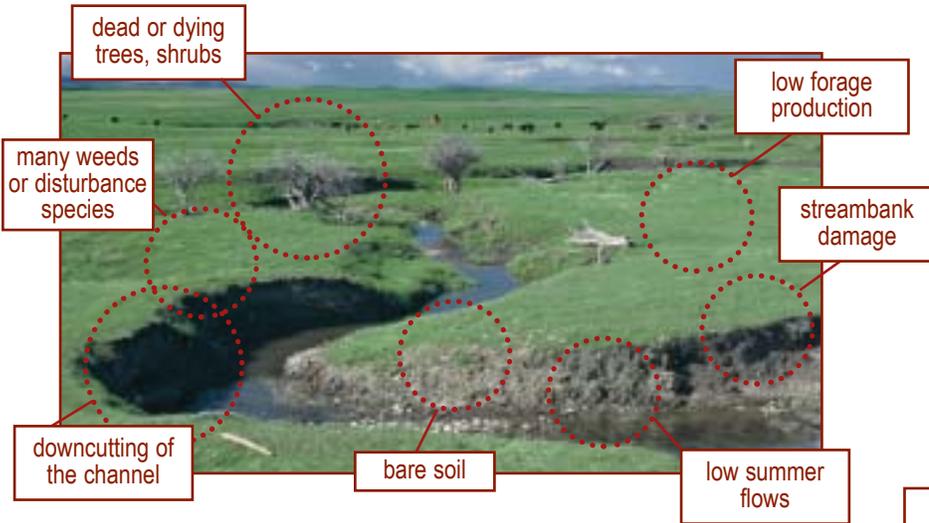
- ✓ major role in performing this function
- ✗ major impact on, or impairment of this function
- minor effect or impact



How do I check the health of my riparian area?

You may have already observed several things on a riparian area with which you are familiar. Some of these observations may concern you.

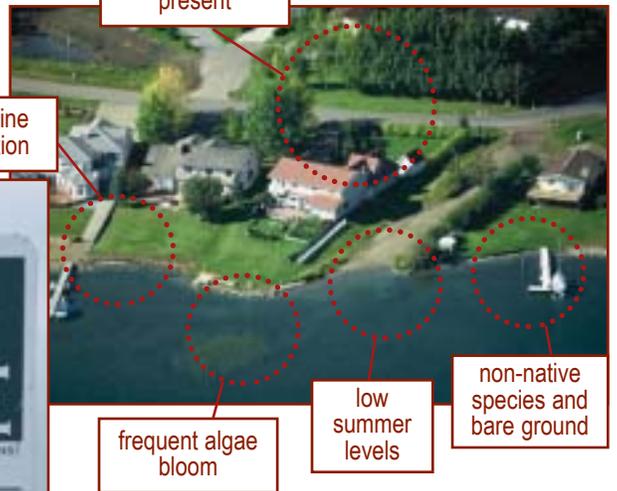
These could be signs that riparian health is declining



Getting an aerial perspective is a good start to checking riparian health. It provides insights on how much change has occurred. The Alberta Conservation Association has developed a videography tool to help lakeshore owners gain an aerial perspective of riparian areas.



Fish are a good measure of riparian health because they rely on riparian areas for habitat, water quality and maintaining streamflows and lake levels. If fish populations are in decline, riparian health might be one of the issues to resolve.



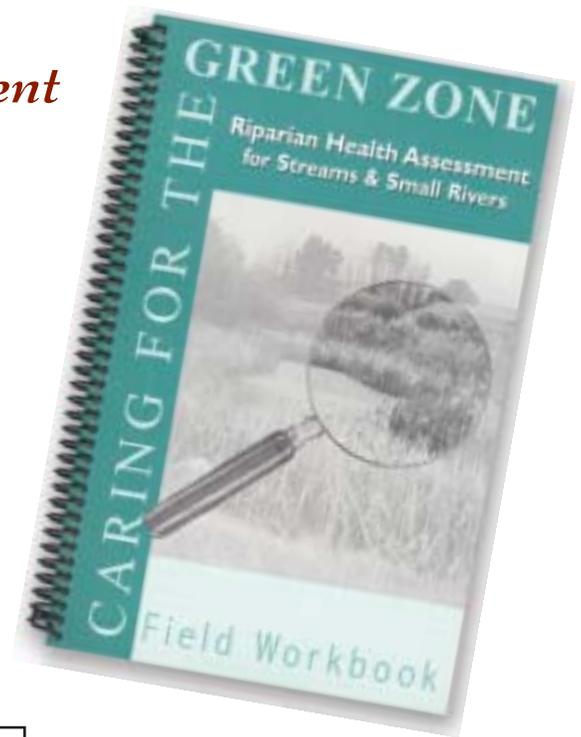
Riparian Health Checklist

To find out if your concerns are valid, first determine what type of riparian area you have. Are you on a river, a stream, a wetland or a lake? You could start with a simple checklist. If you are concerned about a lake or wetland, use our Lakeshore Riparian Health Checklist (Looking at My Lakeshore Fact Sheet); if it is a stream or river, use our Streambank Riparian Health Checklist (Looking at My Streambank Fact Sheet). Checklists help you understand if some of the symptoms are present that indicate declines in riparian health. Checklists don't measure health, but give you a clue as to issues and concerns. A checklist will help you determine if there are enough concerns to go to the next level of health evaluation.



Riparian Health Assessment

Riparian health assessment puts your initial observations into a format that allows you to understand the significance of your concerns and to measure the condition of the riparian area against a standard. This is what your doctor does when you have a checkup. Nine to sixteen measurements make up a riparian health assessment. These measurements relate to the ability of the riparian area to perform key ecological functions that translate into health. Riparian health assessment is a survey that landowners, resource managers and others can use to quickly check the health status of an area. Field workbooks and field forms are available for riparian health assessments of streams and small rivers, lakes and wetlands, and large rivers.



RIPARIAN HEALTH ASSESSMENT - FIELD SHEET				
Landowner/lessee: _____		Date: _____		Reach No.: _____
Stream/River: _____				
Site Description: _____				
				Scores of N/A
				Actual Possible
1. Vegetative Cover of Floodplain and Streambanks				
6	4	2	0	_____
2. Invasive Plant Species				
3	2	1	0 (cover)	_____
3	2	1	0 (density)	_____
3. Disturbance-increaser Undesirable Herbaceous Species				
3	2	1	0	_____
4. Preferred Tree and Shrub Establishment and Regeneration				
6	4	2	0	_____
5. Utilization of Preferred Trees and Shrubs				
3	2	1	0	_____
6. Standing Decadent and Dead Woody Material				
3	2	1	0	_____
7. Streambank Root Mass Protection				
6	4	2	0	_____
8. Human-Caused Bare Ground				
6	4	2	0	_____
9. Streambank Structurally Altered by Human Activity				
6	4	2	0	_____
10. Pudding, Hummocking and/or Rutting				
3	2	1	0	_____
11. Stream Channel Incisement (vertical stability)				
9	6	3	0	_____
TOTAL				_____

this one is for Streams and Small Rivers

some questions may not apply

possible scores are the maximum available for each question

actual scores are those you measure

a description is provided of what is measured and how to measure it on other pages

your observations will allow you to assign a score

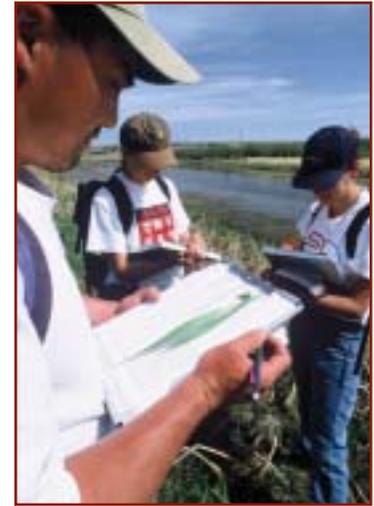
different questions are weighted differently based on the relative contribution to health

add up the individual scores and compare to the possible score



Riparian Health Inventory

Riparian health inventory is an in-depth measurement of riparian health. Inventories are conducted by resource specialists with extensive training and knowledge of riparian systems. Approximately 80 parameters are measured to provide a comprehensive and detailed evaluation of riparian health. These detailed measurements are used to determine watershed condition, aid in preparation of management plans and provide a tool for monitoring. A summary of an inventory may be provided in the same format as the field sheet of a riparian health assessment.



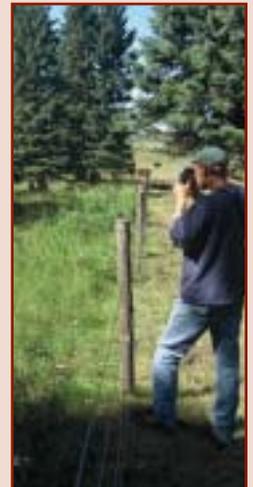
Riparian Health Training

Interested in more information on how to do these measurements? You might consider taking in a riparian awareness presentation. It will help you understand riparian areas better and allow you to use a checklist, to start you down the road. That's getting your feet wet! Wading into it will require some training in riparian health assessment. You will learn the basics of evaluating the riparian health of a stream, river, wetland or lake. With the knowledge from a workshop and some experience from field training you will be able to apply riparian health assessment procedure on your own place. Community groups, municipalities, counties and watershed groups will find these workshops useful in understanding the procedures of riparian health assessment and in interpreting the results of watershed level riparian health inventories. Detailed riparian health inventories require significant levels of training, plus a background in vegetation identification and other aspects of riparian landscapes. Diving into that level is a serious commitment! The Riparian Health Training Fact Sheet is a good place to start to determine the level that is right for you.



Take a Picture!

One of the best things you can do to help see the trend in riparian health is take a picture and follow-up with photographs in subsequent years. Combined with health evaluations, it will give you a visual reminder of where you began and where you are now. Make sure there is a visible landmark in the photograph, and remember to take the photograph from the same place at approximately the same time of year.



In 1995 this reach of stream had some significant riparian health issues, but management changes were underway, including the establishment of this photo point.



By 2000, some recovery has occurred, in terms of fewer weeds and regeneration of balsam poplars.



What do the riparian health scores tell me?

You've worked it out on your own, or you have the results in front of you. You can see the scores for each measurement on the field sheet. At the bottom is a percentage based on your actual score and the total possible score. What does it all mean?

Functions Performed



A health score of 80% or greater means the reach has scored in the top category called **“healthy”**. This tells you that all riparian functions are being performed and the reach exhibits a high level of riparian condition. Healthy, functioning riparian areas are resilient, stable and provide a long list of benefits and values.



- Trap sediment ✓
- Build and maintain banks ✓
- Store flood water and energy ✓
- Recharge the aquifer ✓
- Filter and buffer water ✓
- Reduce and dissipate energy ✓
- Maintain biodiversity ✓
- Create primary productivity ✓



A health score from 60 to 79% puts the reach in the **“healthy, with problems”** category. Many riparian functions are still being performed, but some signs of stress are apparent. The reach may not be as capable of rebounding from floods and use, it may be vulnerable to erosion and some of the potential of the riparian area has been lost. This is like an amber warning light indicating there could be problems ahead and management changes should be considered. At the same time, with effective management changes, a return to a healthier condition is within your grasp.



- Trap sediment ?
- Build and maintain banks ?
- Store flood water and energy ✓
- Recharge the aquifer ✓
- Filter and buffer water ?
- Reduce and dissipate energy X
- Maintain biodiversity ?
- Create primary productivity ✓



A health score of less than 60% means the reach is in the **“unhealthy”** category. Most riparian functions are severely impaired or have been lost. The reach has lost most of its resiliency, stability is compromised and much of the potential of the riparian area has been sacrificed. At this point, red lights are flashing and we need to stop and reflect on current management. Immediate changes are necessary to keep the reach from declining further and to begin the process of healing and restoration.



- Trap sediment X
- Build and maintain banks X
- Store flood water and energy X
- Recharge the aquifer ?
- Filter and buffer water X
- Reduce and dissipate energy X
- Maintain biodiversity X
- Create primary productivity X



Is My Crick Sick? Is My Lakeshore Lame?

Here are several riparian health examples to help you tune your eye.

Lake and Wetland Health Assessments



Score:

vegetation cover	<u>6/6</u>
invasive weeds	<u>0/6</u>
disturbance species	<u>3/3</u>
woody regeneration	<u>6/6</u>
wood utilization	<u>2/3</u>
vegetation alteration	<u>6/6</u>
site alteration	<u>12/12</u>
bare ground	<u>6/6</u>
water manipulation	<u>9/9</u>

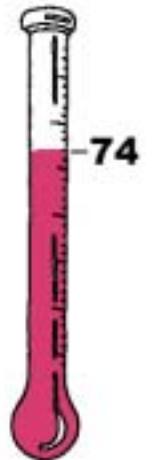
TOTAL: 50/57 = **88%**



Score:

vegetation cover	<u>6/6</u>
invasive weeds	<u>2/6</u>
disturbance species	<u>1/3</u>
woody regeneration	<u>4/6</u>
wood utilization	<u>2/3</u>
vegetation alteration	<u>4/6</u>
site alteration	<u>8/12</u>
bare ground	<u>6/6</u>
water manipulation	<u>9/9</u>

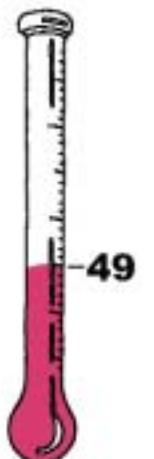
TOTAL: 42/57 = **74%**



Score:

vegetation cover	<u>4/6</u>
invasive weeds	<u>0/6</u>
disturbance species	<u>2/3</u>
woody regeneration	<u>6/6</u>
wood utilization	<u>0/3</u>
vegetation alteration	<u>2/6</u>
site alteration	<u>4/12</u>
bare ground	<u>4/6</u>
water manipulation	<u>6/9</u>

TOTAL: 28/57 = **49%**



Stream Health Assessments



Score:

vegetation cover	<u>6/6</u>
invasive weeds	<u>6/6</u>
disturbance species	<u>2/3</u>
woody regeneration	<u>6/6</u>
wood utilization	<u>1/3</u>
dead wood	<u>3/3</u>
root mass / deep roots	<u>6/6</u>
bare ground	<u>6/6</u>
site alteration	<u>6/6</u>
compaction	<u>3/3</u>
floodplain accessible	<u>9/9</u>

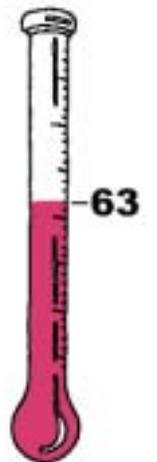
TOTAL: 54/57 = **95%**



Score:

vegetation cover	<u>6/6</u>
invasive weeds	<u>4/6</u>
disturbance species	<u>0/3</u>
woody regeneration	<u>4/6</u>
wood utilization	<u>0/3</u>
dead wood	<u>3/3</u>
root mass / deep roots	<u>4/6</u>
bare ground	<u>2/6</u>
site alteration	<u>6/6</u>
compaction	<u>1/3</u>
floodplain accessible	<u>6/9</u>

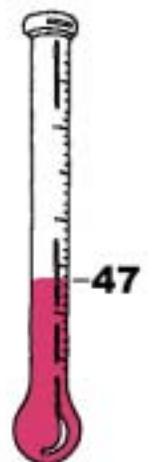
TOTAL: 36/57 = **63%**



Score:

vegetation cover	<u>6/6</u>
invasive weeds	<u>0/6</u>
disturbance species	<u>0/3</u>
woody regeneration	<u>2/6</u>
wood utilization	<u>0/3</u>
dead wood	<u>3/3</u>
root mass / deep roots	<u>2/6</u>
bare ground	<u>4/6</u>
site alteration	<u>2/6</u>
compaction	<u>2/3</u>
floodplain accessible	<u>6/9</u>

TOTAL: 27/57 = **47%**



Stream Health Assessments



Score:

vegetation cover	<u>6/6</u>
invasive weeds	<u>0/6</u>
disturbance species	<u>0/3</u>
woody regeneration	<u>6/6</u>
wood utilization	<u>2/3</u>
dead wood	<u>3/3</u>
root mass / deep roots	<u>6/6</u>
bare ground	<u>6/6</u>
site alteration	<u>6/6</u>
compaction	<u>3/3</u>
floodplain accessible	<u>9/9</u>

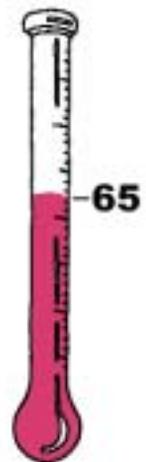
TOTAL: 47/57 = **82%**



Score:

vegetation cover	<u>6/6</u>
invasive weeds	<u>0/6</u>
disturbance species	<u>1/3</u>
woody regeneration	<u>4/6</u>
wood utilization	<u>2/3</u>
dead wood	<u>3/3</u>
root mass / deep roots	<u>4/6</u>
bare ground	<u>4/6</u>
site alteration	<u>6/6</u>
compaction	<u>1/3</u>
floodplain accessible	<u>6/9</u>

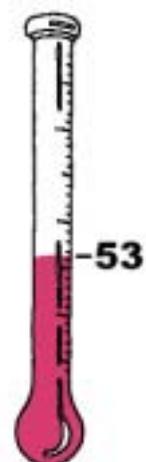
TOTAL: 37/57 = **65%**



Score:

vegetation cover	<u>4/6</u>
invasive weeds	<u>4/6</u>
disturbance species	<u>1/3</u>
woody regeneration	<u>2/6</u>
wood utilization	<u>0/3</u>
dead wood	<u>2/3</u>
root mass / deep roots	<u>4/6</u>
bare ground	<u>2/6</u>
site alteration	<u>2/6</u>
compaction	<u>0/3</u>
floodplain accessible	<u>9/9</u>

TOTAL: 30/57 = **53%**



When you look at all of these lake and stream examples it's good to remember that health assessments were made by evaluating hundreds of meters of shoreline and streambank, not just the portion shown in the photographs.

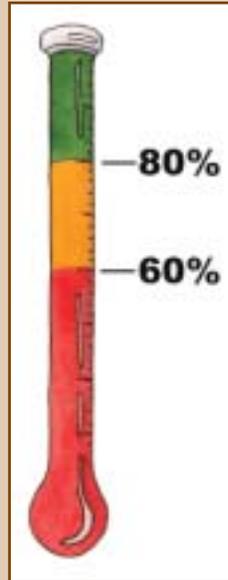


Take the Next Step

Link Measurement to Action

The step of measuring riparian health is really just the end of the beginning. When you look at the final score you might be pleasantly surprised to find your riparian areas are intact, mostly functioning, with just a few “hot” spots. You might also be surprised to find what you thought was intact and healthy isn’t and you face some real issues. The categories of health are the first level of diagnosis. Take a reading with the riparian thermometer.

For the next level of diagnosis, take a closer look at the scores for the individual questions.



If the reading is 80% or higher...

- ◆ Your riparian area is performing well - Congratulations!
- ◆ Ask yourself how you can maintain this condition.
- ◆ Make a record of your present management practices and share that information with others.

If the reading is between 60 and 80%...

- ◆ There are signs of stress, but many riparian functions are being performed - don't jump off the bridge!
- ◆ It is time to carefully watch and pay attention to management.
- ◆ Changing practices now will be relatively painless compared to later.

If the reading is below 60%...

- ◆ This riparian area needs attention - the red lights are flashing! Many riparian functions are impaired, or missing.
- ◆ Think about how to stabilize these areas to prevent their condition from worsening and management to improve them.

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET					
Landowner/lessee: <i>South Fork</i>		Date: <i>1 June 02</i>		Reach No.: _____	
Stream/River: <i>Beaver Creek</i>					
Site Description: <i>Lower end of Bull Pasture</i>					
		Scores of N/A		Actual	Possible
1. Vegetative Cover of Floodplain and Streambanks	6	4	2	0	4 / 6
2. Invasive Plant Species	3	2	1	0	7 / 3
	3	2	1	0	2 / 3
3. Disturbance-increaser Undesirable Herbaceous Species	3	2	1	0	7 / 3
4. Preferred Tree and Shrub Establishment and Regeneration	6	4	2	0	4 / 6
5. Utilization of Preferred Trees and Shrubs	3	2	1	0	1 / 3
					<i>moderate use of willows by cattle and moose</i>
6. Standing Decadent and Dead Woody Material	3	2	1	0	2 / 3
7. Streambank Root Mass Protection	6	4	2	0	4 / 6
8. Human-Caused Bare Ground	6	4	2	0	4 / 6
9. Streambank Structurally Altered by Human Activity	6	4	2	0	0 / 6
10. Pugging and/or Hummocking	3	2	1	0	7 / 3
					<i>at crossing and watering site</i>
11. Stream Channel Incisement (vertical stability)	9	6	3	0	6 / 9
					<i>initial signs of downcutting</i>
TOTAL				35	57

Vegetation canopy is reduced (Q1) and weeds and disturbance species (Q2&3) have increased in abundance on the site.

Shrub species are regenerating well (Q4) but utilization may be too high to sustain them (Q5).

Questions 7 & 8 show the early stages of decline in deep-binding root mass and an increase in human-caused bare ground.

Livestock are exerting physical impact at crossings and watering points (Q10). The stream is still able to access it's floodplain (Q11), but early signs of downcutting are apparent.

What are the **immediate** issues?

- ◆ Utilization of shrubs is high and may be impeding regeneration and streambank rootmass protection. That may be resulting in the stream beginning to downcut, which if left untended may sever the riparian area from it's water supply.
- ◆ The amount of bare ground may indicate too much pressure. That is giving weeds and disturbance species a competitive advantage over native plants, including trees and shrubs.

$35/57 = 61\%$ Healthy, with problems.

If the stress on this reach continues, there is a risk of losing several riparian functions.

Medical Guidebook

A Key to Symptoms and Treatments

This purpose of this guide is to describe the **signs** and **symptoms** of riparian ailments. If riparian health is failing, recognizing a condition, through observations or evaluations, is a **first step** to treatment. Treatment options help you begin to **fight riparian ailments**, but the emphasis should always be on prevention and avoidance of poor riparian health rather than treatment.

The Riparian Doctor

Condition

Symptom Of...

Treatment Options

SOILS

- ◆ Sediment deposits on riparian area
- ◆ Too much bare ground
- ◆ Poor vegetation cover
- ◆ Compacted soils
- ◆ Excessive soil erosion or movement

- ◆ Annual floods
- ◆ High levels of disturbance or use
- ◆ High traffic volume: animals, people, vehicles
- ◆ Landscaping or cultivation

- ◆ Natural event; do nothing
- ◆ Reduce use and traffic
- ◆ Rest the site; allow recovery
- ◆ Redistribute animal, human or vehicle use
- ◆ Change timing or season of use
- ◆ Reduce or remove hard surfaces

PLANTS

- ◆ Many weeds and disturbance related plants
- ◆ Altered vegetation composition
- ◆ Low forage production

Above symptoms plus:

- ◆ Too many disturbances, too early in growing season, use too long, use too often

Above treatments plus:

- ◆ Spot treatment on invasive weeds
- ◆ Develop management plan for property

TREES & SHRUBS

- ◆ Few young trees and shrubs
- ◆ Mushroom-shaped willows
- ◆ Dead trees and shrubs
- ◆ Trees and shrubs missing

Above symptoms plus:

- ◆ Trampling and chronic, heavy browsing
- ◆ High beaver population
- ◆ Dewatering, diversions, damming

Above treatments plus:

- ◆ Temporary fencing to allow regeneration
- ◆ Limit livestock use in spring and fall
- ◆ Manage beaver population
- ◆ Examine water management for area

BANKS & SHORES

- ◆ Unstable shorelines
- ◆ Eroding streambanks
- ◆ Widening of channel
- ◆ Downcutting of channel

Above symptoms plus:

- ◆ Loss or removal of plants with deep, binding roots and emergent plants (e.g. cattails)
- ◆ Loss of large woody debris
- ◆ Excess energy in the system from watershed changes and channelization

Above treatments plus:

- ◆ Stabilization to allow natural recovery
- ◆ Reestablish natural meander and flow patterns
- ◆ Monitor for recovery

FLOW & DEPTH

- ◆ Altered flow or water levels

Above symptoms plus:

- ◆ Drought (natural)
- ◆ Diversion, drainage, flow control, modified flood timing and magnitude

Above treatments plus:

- ◆ Trap more runoff with greater plant cover
- ◆ Block drainage ditches and stop draining wetlands
- ◆ Examine water management in watershed

WATER QUALITY

- ◆ Poor water quality
- ◆ Increased suspended sediment
- ◆ More frequent and intense algae blooms

Above symptoms plus:

- ◆ Excess soil erosion, excess chemicals or nutrients in or near riparian area
- ◆ Lack of plant cover

Above treatments plus:

- ◆ Reduce nutrient inputs in or near waterbody
- ◆ Keep plant cover, including cattails and bulrushes for filtration and nutrient uptake
- ◆ Add buffer zones next to riparian area

FISH & WILDLIFE

- ◆ Declines in fish and wildlife

Above symptoms plus:

- ◆ Habitat changes
- ◆ Cumulative impacts of all land uses in area

Above treatments plus:

- ◆ Restore habitat by restoring vegetation communities, through changes in use
- ◆ Protect key habitat areas

If only it was that easy - to look up a riparian condition and find one solution.



Set Some Goals for Your Riparian Area

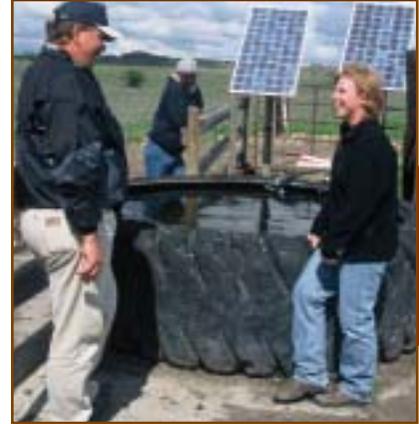
No matter what the score, or the category of health, taking the next step is about using riparian health evaluations to help you set some goals. These goals might look like this:

1



Prevent potential problems by maintaining the healthy reaches of stream or portions of shoreline; that way, you don't have to treat the symptoms.

2



Reduce the pressure or stress that is causing health to decline; don't let conditions get worse.

3



Encourage, protect and promote native vegetation to enhance recovery, restoration and maintenance of health.

4



Fix the broken pieces to restore structure and function; do it while the problems are small, and before they become larger.

5



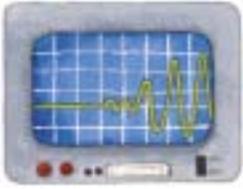
Monitor your progress, be patient with restoration and recovery efforts, and repeat what works.

6



Work with your neighbours to make sure your efforts meld together, on a larger scale.

If we can recognize the stresses, reduce the pressures, be patient and let the system rebound, conditions will improve, assuming most key pieces are still intact. If some of those key pieces (e.g. woody vegetation) have gone missing, recovery will be more difficult and take more time.



Riparian Revival

The restoration of riparian area health is a series of pathways that begin with some basic questions:

- ◆ *What did the riparian area look like in the past (sometimes the distant past)?*
- ◆ *What are the characteristics (physical and vegetative) now?*
- ◆ *What direction is the riparian area heading under present management?*
- ◆ *What is the potential of the riparian area if I make management changes?*

In most cases, riparian area health didn't change overnight. The unravelling of riparian areas and the decline in health are changes that have been going on for decades; largely unnoticed, unobserved, but cumulative in effect. It's part of our history of development. The rate of recovery will be based on where we start and where we live. Water is the driver of riparian areas so recovery will be slower in arid areas and faster in well-watered ones. Changes in the watershed or drainage area which affect amount and timing of runoff will also be a factor in predicting recovery rates. What is possible depends on the degree of change on the riparian reach and how many pieces are left to aid recovery. This diagram will help you appreciate the riparian revival pathways and also the chance of encountering a dead end.





The Bigger Picture

Thinking Like a Watershed

We can do many things on our own property to fix an ailing streambank or piece of lakeshore. It's important we do what we can as individuals but maintaining or restoring a watershed has to be an integrated collection of individual efforts. Our individual efforts can sometimes be less than effective, especially in the face of the cumulative effects of all upstream activities. Riparian health on your reach of the watershed is affected by what your neighbours do, and what activities occur, sometimes far from your place in the watershed. Watershed level work seems overwhelming because of the scale. However, there are ways to make watershed scale work manageable. The first step is to recognize that we can manage cooperatively what we can't individually. That is an old, powerful concept called "community". All of us belong to some community, usually at a municipal district or county level; it could be a small watershed group on one short stream or on a small lake. At those levels, every community boundary includes a larger portion of a watershed than that of an individual property owner. Add two or three communities together and most of a watershed will be found in those boundaries.



Mapping the watershed and getting to know your neighbours is the beginning of making the task manageable. Now is the time for some riparian awareness, helping people understand what riparian areas are, how they function, their value and the options for managing and caring for them.

Riparian health evaluation can help communities appreciate the current condition of riparian areas in their care and create a pathway for management changes. These evaluations link people in a watershed together to work on a common goal of improving or maintaining riparian health. Many communities have created a map using riparian health, water quality or land use information. The map helps to answer the question "where are we today?". This step can be a way to order all of the issues and create a priority for managing them. It is a signal to others that your community wants to move forward to resolve problems and restore health; it might be a way for you to get some help.

Alberta is divided into many watersheds. At the big end of the scale there are nine distinct drainages; one flows south to the Gulf of Mexico, three flow east to Hudson's Bay and five flow north to the Arctic Ocean. Each of these drainage basins accumulate water from smaller ones. A **watershed** is the collecting basin for water received as rain or snowmelt. It can be the sum of many streams, channels, drainages, wetlands, ponds and lakes. Sometimes the pathway that water takes is on the surface, in the form of rivers, streams and lakes. The pathway can also be subsurface movement of water. That can be harder to track but still connects pieces together to form a watershed.

All of us are part of a watershed and are connected to one another.

"Riparian health opened my eyes to stuff I hadn't thought about, like too many boat docks and beaches"

"This assessment helped me see what riparian health is now, gave me a feel for problems and got me thinking about what I could do"

"I like the idea of looking at the bigger picture. I can't do it all on my own place"

Thinking Like a Watershed

road construction & culverts

timber harvesting

gravel mining

cattle grazing

channelization

cultivation

Where do you live in the watershed?

Who are your watershed neighbours, both upstream and downstream?

What is the sum of all the activities that occur in your watershed?

Want to make a difference?

urban development

Try working together!



Working Together for Watersheds

Cows and Fish Program



Community Health Report

When a community has the information from a riparian health inventory it is a small step to setting some goals and developing management plans useful for individual landowners and the broader watershed. A riparian health evaluation sets a benchmark so the effect of management choices can be considered. A single health evaluation provides a rating for one point in time. Like a health check-up for us, once may not be enough. To monitor trends, measure effects of management and to account for natural variation, it is useful to repeat health evaluations at periodic intervals, such as every five years. It's a way of knowing, and showing, you're on the right track.



When a community works together, all of your individual efforts pay big dividends on a watershed scale.

Healthy, functioning riparian areas in an intact watershed would be something worthwhile to leave your children.





Where to Find Additional Information & Resources

Cows & Fish Publications

The following are available from the Cows and Fish program:

Fact Sheets:

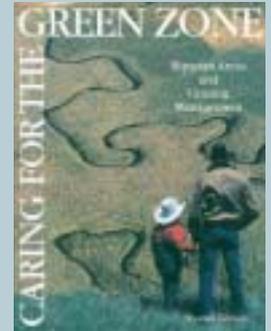
- ◆ Riparian Health Assessment and Inventory
- ◆ Riparian Health Training
- ◆ Invasive and Disturbance-caused Plants in Riparian Areas
- ◆ Invasive Weed and Disturbance-caused Undesirable Plant List
- ◆ Looking at my Lakeshore Riparian Health Checklist
- ◆ Looking at my Streambank Riparian Health Checklist
- ◆ Value of Wetlands
- ◆ Biodiversity and Riparian Areas-Life in the Green Zone
- ◆ Lakes and Wetlands
- ◆ Water Quality and Riparian Areas
- ◆ Economics of Riparian Areas
- ◆ Riparian Demonstration Sites - A guide to selection and development
- ◆ Riparian Profile and Reference Sites
- ◆ Crops, Creeks and Sloughs
- ◆ Tools for Riparian Management
- ◆ The Cows and Fish Process
- ◆ Facing the Issues
- ◆ Getting Past the Talk-Working with Communities
- ◆ Cows and Fish Brochure



Awareness Documents

Caring for the Green Zone: Riparian Areas and Grazing Management

Literature Review: Riparian health and water quality. Function, design, and management of riparian buffers. 2001. Sandy Holmes. Cows and Fish Report No. 011.



Riparian Health & Classification Tools

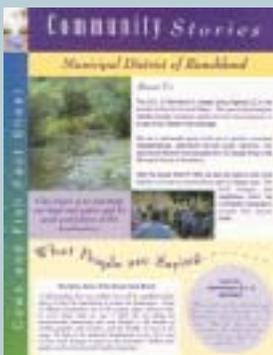
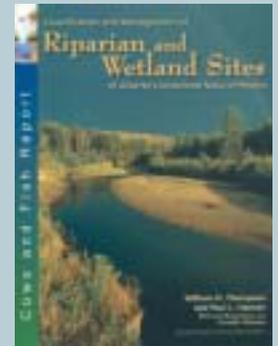
Riparian Health Assessment for Streams and Small Rivers - Field Workbook.

Riparian Health Assessment for Lakes and Wetlands - Field Workbook.

Classification and management of riparian and wetland sites in Alberta. W. H. Thompson and P. L. Hansen.

Manuals & Forms

- ◆ Alberta Lotic Wetland Health Assessment for Streams and Small Rivers (Survey) User Manual and Form
- ◆ Alberta Lentic Wetland Assessment User Manual and Form
- ◆ Alberta Lotic Health Assessment for Large River Systems (Survey) User Manual and Form



Community Stories:

- ◆ Upper Little Bow Basin Water Users Association
- ◆ Municipal District of Ranchland
- ◆ Lower Mosquito Creek Water Users Association
- ◆ City of Camrose - A Forward and Upstream View

Cows and Fish Resources

Cows and Fish provides presentations, workshops, training, extension material, riparian pasture walks and riparian health evaluations. We can also share management techniques, plus help create a pathway for your community to work on riparian management issues.



Where to Find Additional Information & Resources

Other Resources and Materials

Plant Identification

Guide to Restricted and Noxious Weeds in Southern Alberta. Contact your local southern Alberta Agricultural Fieldman for this pocket guide.

Weed Identification in Alberta. S. Bayley, D. Bigelow and B. Vanden Born. Alberta Environmental Protection, Ducks Unlimited Canada, Telus and Agriculture Industry. 30 pages.

Weeds of Canada and the Northern United States. R. Dickinson and F. Royer. 1999. The University of Alberta Press and Lone Pine Publishing. Edmonton, Alberta. 434 pages.

An Identification Guide to Alberta Aquatic Plants. G. Robert Burland. 1989. Alberta Environment, Pesticide Management Branch. 78 pages.

Northern Range Plants. C. Stone and D. Lawrence. 2000. Alberta Agriculture, Food and Rural Development. 200 pages.

Plants of the Western Boreal Forest and Aspen Parkland. D. Johnson, L. Kershaw, A. MacKinnon and J. Pojar. 1995. Lone Pine Publishing. Edmonton, Alberta. 392 pages.

A Habitat Field Guide: Trees and Shrubs of Alberta. K. Wilkinson. 1990. Lone Pine Publishing. Edmonton, Alberta. 191 pages.

Watershed Information

Watershed Restoration: Principles and Practices. J. E. Williams, C. A. Wood and M. P. Dombeck (eds.). 1997. American Fisheries Society, Bethesda, Maryland. 561 pages.

Stream Corridor Restoration: Principles, Processes and Practices. Federal Interagency Stream Restoration Working Group. 1998. Go to <http://www.ntis.gov/product.htm> and do advanced search (use title). 618 pages.

Community Watershed Toolkit for the North Saskatchewan River Watershed. From North Saskatchewan Watershed Alliance. 6th Flr, 9803-102A Avenue, Edmonton, Alberta T5J 3A3. 780-496-3474.

From AAFRD: [see AAFRD in Cows and Fish Partners]

Building Community Partnerships. 2001. 23 pages.

Getting to Know Your Local Watershed. Fiona Briody and Karen Yakimishyn. 2002. Agdex # 576-8. 22 pages.

General Information

The Stockman's Guide to Range Livestock Watering from Surface Water Sources. Prairie Agricultural Machinery Institute. Box 1060, 390 River Road, Portage la Prairie, Manitoba, R1N 3C5. Alberta Farm Machinery Research Centre, c/o Lethbridge Community College, Lethbridge, Alberta, T1K 1L6. Call toll-free in Canada: 1-800-567-7264.

Conservation and Logging on Private Land in Alberta. Byron Grundberg and D.S. Vanderwel. 1994. AAFRD. Agdex 581-2. 26 pages.

Cattle Wintering Sites. Brian West. From Alberta Beef Producers, PFRA, or AAFRD.

The Dock Primer - A Cottager's Guide to Waterfront-Friendly Docks. Max Burns. Fisheries and Oceans Canada. 23 pages.

The Shore Primer - A Cottager's Guide to a Healthy Waterfront. Ray Ford. Fisheries and Oceans Canada. 23 pages.

Caring for Shoreline Properties. Pat Valastin. 1999. Alberta Conservation Association. 29 pages.

On the Living Edge: Your Guide for Waterfront Living. Sarah Kipp and Clive Callaway. 2002. Living by Water (780-427-8124 <http://www.livingbywater.ca>).

Range/Pasture Health Assessment Short Form. 2000. Working draft prepared by the Alberta Rangeland Health Assessment Task Group, Alberta Agriculture, Food and Rural Development and Alberta Environment. 17 pages. See Public Lands Division, SRD, Cows and Fish Partners.

Other Contacts for Information

- ◆ Agricultural Service Boards and Conservation Technicians of your local municipality or county
- ◆ Alberta Environmental Farm Plans 1-866-844-2337
- ◆ Alberta Fish and Game Association, Operation Grassland Community <http://www.afga.org/Conservation/ogc.htm>
- ◆ Alberta Lake Management Society 780-492-1294 <http://www.alms.biology.ualberta.ca>
- ◆ Alberta Watersheds website <http://www.albertawatersheds.org>
- ◆ Cows and Fish Partners (see page 46)
- ◆ Ducks Unlimited Canada, Edmonton office 780-489-2002 <http://www.ducks.ca/contact/ab.html>
- ◆ Vincent Lake Working Group www.healthyshorelines.com

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Alberta Sustainable Resource Development

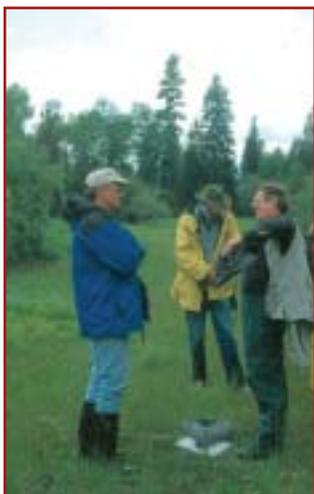
Alberta Agriculture, Food and Rural Development

Agriculture and Agri-Food Canada (PFRA)

Canadian Adaptation and Rural Development Fund

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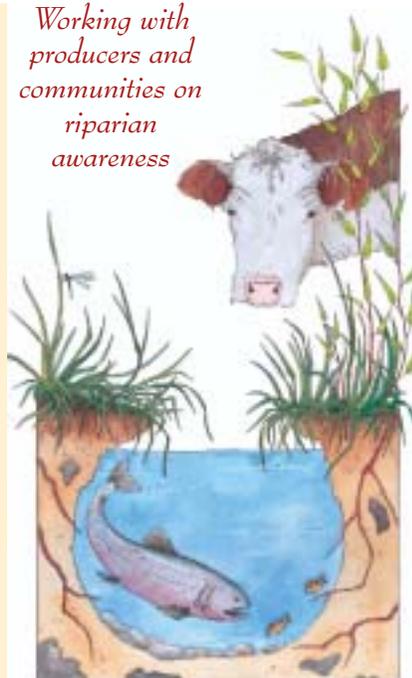
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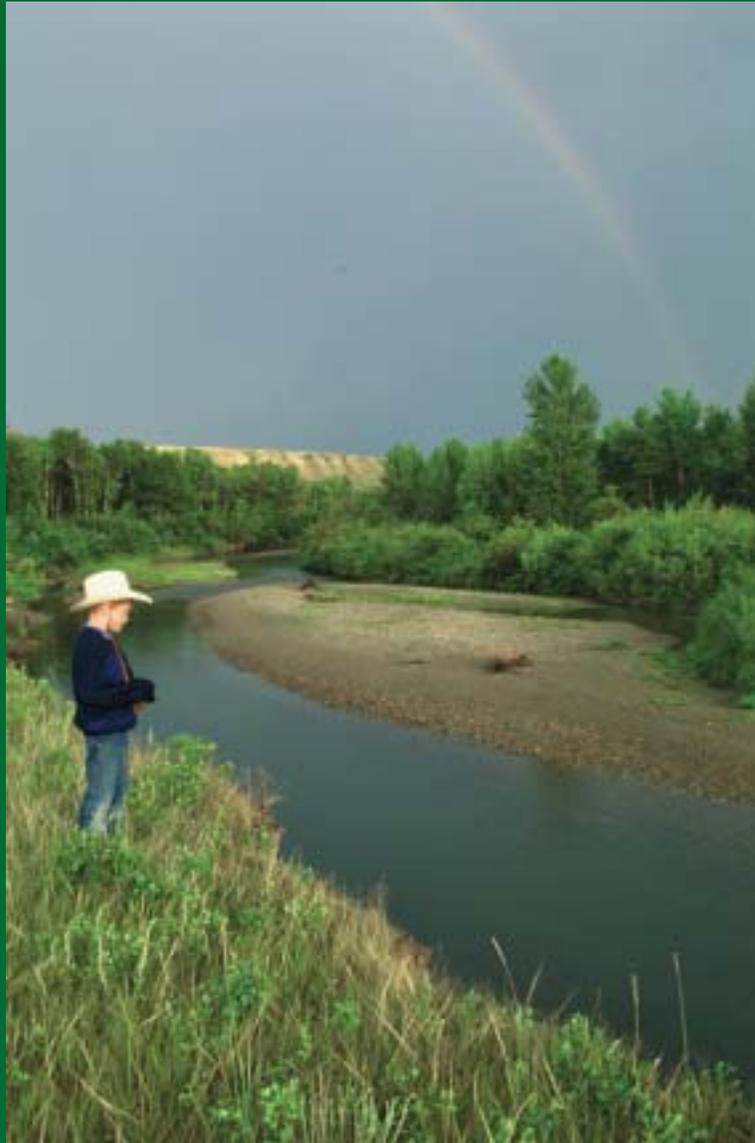
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*Working with
producers and
communities on
riparian
awareness*





Healthy riparian areas sustain us. We invite you to work with Cows and Fish to conserve, restore and maintain these vital green zones.