GREEN ZONE

CARING FOR THE

Riparian Health Assessment for Lakes, Sloughs and Wetlands

April 2020

Field Workbook

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To obtain additional copies of this workbook:

Visit our website www.cowsandfish.org and follow the links to Publications and an online order form. Or see Cows and Fish contacts on the inside back cover.

Note: See our website for a similar field workbook for streams/small rivers

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Riparian Health Assessment for Lakes, Sloughs and Wetlands

FOREWORD

This workbook describing riparian health assessment has been written for those people who can most effectively influence riparian areas and their management - landowners, farmers, ranchers, lakeshore residents, agency and organization staff and others who use and value these green zones and wet areas.

Riparian health assessment blends many fields of science and undergoes periodic additions and modifications. In addition, the language describing the method of assessing riparian health undergoes continual revision, to clarify, expand and increase understanding. This printing of the Field Workbook incorporates the feedback from dozens of training workshops involving hundreds of participants.

Riparian health assessments form part of a larger package of awareness about riparian areas, leading to choices on managing these vital landscapes. When used as part of the Cows and Fish program, it provides a starting point for future plans and management decisions.

WHAT'S IN THIS WORKBOOK? CONTENTS

INTRODUCTION

Why use this workbook?

When we look at a riparian areas (the wet area next to lakes, wetlands, springs, sloughs, streams and rivers), what we see and how we interpret our observation is often based on our backgrounds, experiences and perceptions. Even though we may be standing on the same lakeshore or wetland margin, we often don't "see" all the same things. Riparian health assessment is a tool that allows us all to "tune our eyes", begin to appreciate the key pieces of the riparian landscape and evaluate what we see. It is an ecological measuring stick that provides some structure to our observations and allows us to evaluate the condition or health of a lake, slough, or wetland. We need to use riparian health assessment to build a common language so we can communicate better with one another, maybe reduce the arguments, and begin to move toward fixing what's broken in riparian areas and maintaining what is healthy. This workbook gets us on that road together.

What will the workbook do for me?

This workbook is for use in the field. It will help you learn the basics of evaluating the riparian health of a lake, slough or wetland. Riparian health assessment requires instruction and practice; both should be easier with the use of this workbook. With knowledge and experience gained from classroom and field training you will be able to apply this riparian health assessment procedure on your own place. The workbook gives you a place to record and store your observations. It will start you down the road to recognizing riparian health on your home turf, which is the first step to making better management decisions to maintain or restore your riparian areas. This workbook also sets a standard, so we all use a common measuring technique.

Who is it for?

This workbook is for farmers, ranchers, lakeshore residents, landowners, land/resource managers and others who want to learn to evaluate riparian health. Community groups, municipalities, counties and watershed groups will find this workbook helpful in understanding the procedures of riparian health assessment and to interpret the results of watershed level riparian health inventories.

Where can I use it?

This workbook is designed for lakes, sloughs and wetlands in Alberta. It will be useful for other jurisdictions, with modifications to acknowledge vegetation differences. Different tools are available and should be used when measuring riparian health in stream or river systems. It has not been tested on bogs and fens. Check with the Cows and Fish program for other riparian health assessment tools (www.cowsandfish.org).

℞ RIPARIAN HINTS

Where Does This Workbook Apply?

- ✓ Lakes, wetlands, sloughs, marshes, springs or seeps (non-flowing waterbodies)
- ✓ Temporary, seasonal, semi-permanent, and permanent wetlands, sloughs and lakes
- ✓ Dry: lakes, wetlands, sloughs, marshes, and seeps

★ **Other assessment tools are available for streams, rivers, and coulees/draws.**

How to use the workbook

This Field Workbook has been designed to use with other riparian awareness materials, to train people to quickly assess riparian health and to interpret the results of a health evaluation.

- This workbook is designed for use with *Riparian Areas: A User's Guide to Health,* an illustrated guide which provides more detail on the concept of riparian health and what the elements of riparian health look like. Contact Cows and Fish for a copy.
- This workbook can be used with the Riparian Vegetation Classification guides, reference documents that describe the major riparian plant communities and their management requirements for several natural regions of Alberta. Contact Cows and Fish for a copy.
- To be effective, riparian health assessment requires some basic preparatory classroom time and field training. This workbook will help you to participate in a riparian health training session, such as those put on by Cows and Fish.
- Once you have some training and experience, the workbook will allow you to carry out riparian health assessment and monitoring on your own land base.
- The workbook will also help you to interpret the results of a riparian health assessment or inventory that may be undertaken in your community.

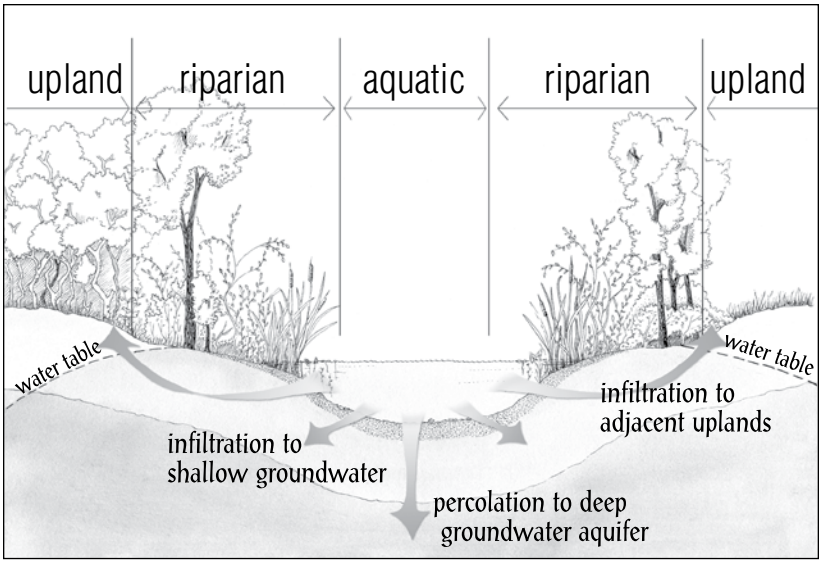
BACKGROUND

What's Riparian?

To measure the health of a riparian area, you first need to understand what "riparian" means. Riparian areas are transitional: they exist between the aquatic part (the waterfilled basin of the lake or wetland) and the surrounding terrestrial (or upland) area. Think of them as "wetter than dry" but "drier than wet". There is considerable variation in riparian areas, where water, soil, and vegetation interact. Common to all riparian areas are the following features:

- a combined presence and abundance of water, either on the surface or close to the surface, even when the waterbody may appear dry;
- vegetation that responds to, requires and survives well with abundant water; and
- soils that are often modified by abundant water (as in high water tables), lake and wetland processes (like sediment deposition and nutrient cycling) and lush, productive and diverse vegetation.

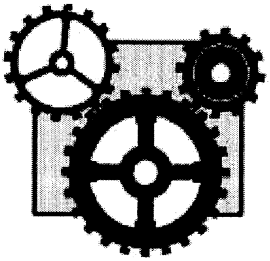
Riparian areas are part of a larger, continuous landscape that grades from wet to dry. Sometimes it will not be easy to determine precisely where a riparian area begins and ends. However, lakes, sloughs, wetlands, and ponds all have riparian areas adjacent to them, as do streams and rivers. There will most often be a basin that continuously or seasonally holds standing water, and an adjacent area where high water levels may periodically escape the basin. This workbook deals only with evaluating the riparian health of lakes, wetlands, ponds, and sloughs. Use the illustration on the next page to help you recognise what a riparian area looks like next to lakes and wetlands.



What is Riparian Health?

The word "health" conveys an impression of something that is 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, energy storage and movement. If these functions are occurring, within standards, we are healthy. In a similar way, landscapes, including riparian areas, perform certain functions. "Riparian health" means the ability of a section or entire lake, slough, wetland, stream, river or a watershed composed of many lakes, wetlands, or rivers to perform a number of key ecological functions.

℞ RIPARIAN HINTS



What Do Healthy Riparian Areas Do?
Key Ecological Functions

- ✓ Trap and store sediment
- ✓ Build and maintain banks and shores
- ✓ Store water and energy
- ✓ Recharge aquifers
- ✓ Filter and buffer water
- ✓ Reduce and dissipate energy
- ✓ Maintain biodiversity
- ✓ Create primary productivity

Why does riparian health 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, services, benefits, functions, and values; and
- stability -- landscapes that maintain themselves, persist and are sustainable.

The following table indicates key riparian functions and reasons these functions are important:

Why are riparian functions of lakes, wetlands and sloughs important?

Riparian Functions	Why Is This Function Important? and How Can This Function Benefit You?
Trap and store sediment	• Trapped sediment adds to and builds soil, storing moisture and providing fertile areas for plant growth • Sediment helps top soil to hold and store moisture • Plants trap sediment that may carry contaminants and nutrients - improving water quality and water clarity • Excess sediment can harm the aquatic environment, including fish and invertebrate habitat
Build and maintain banks and shores	• Adding bank and shore elsewhere reduces erosion effects • Limiting erosion and bare soil increases site stability and resilience, plus speeds up recovery from disturbance. It also keeps land from disappearing due to erosion • Maintains or restores bank/shore contour and shape,which is important for spawning fish.
Store water and energy	• Provides water for humans, livestock, fish and wildlife • Slower water and less erosion means less flood damage • Acts as a watershed safety valve - riparian plants slow down, capture and hold run-off or flood water, holding it in both the riparian area and waterbodies, allowing infiltration and storage in underground aquifers (groundwater)
Recharge aquifers	• Maintains water levels in lakes, wetlands, streams and rivers through releases from the riparian area • Maintains high water table and extends width of productive riparian area
Filter and buffer water	• Reduces amount of contaminants, nutrients and pathogens reaching the water, improving water quality • Riparian plants and microorganisms, uptake and absorb nutrients (like nitrogen and phosphorus), preventing excess nutrients from reaching and contaminating the waterbody
Reduce and dissipate energy	• Reduces wave action, which decreases erosion and sediment transport • Slower water allows more sediments to be captured
Maintain biodiversity	• Creates, maintains and connects habitats, escape cover, shelter and food for fish, wildlife, invertebrates and plants • Maintains a high number of individuals and species *Note: Biodiversity = variety of living things*
Create primary productivity	• Maintaining productivity ensures high shelter and forage values for wildlife and livestock • Diverse plant life (ages and species) links to other riparian functions, like improved filtering and building of banks • Plant growth enhances soil development • Plants capture and recycle nutrients

More on the Value of Wetlands and Sloughs

In addition to the information in the table above on why riparian functions are important, there are more reasons to value these areas. They also:

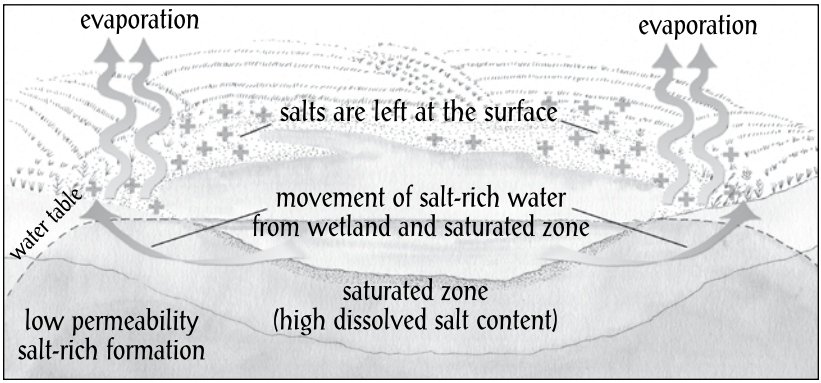
- Recharge groundwater
- Increase soil moisture
- Control salinity
- Create recreational opportunities
- Remove nutrients and pollutants
- Increase forage production
- Increase crop yield
- Sequester carbon
- Create economic benefits
- Influence local weather

Read on to find more about how these areas function and why they are valuable, and remember:

Dry wetlands and sloughs continue to provide many benefits, particularly when the wet cycle returns and they begin to fill. Compared to the many values included in the above list, draining and then developing or cultivating these areas as crops have a questionable return to the landowner and society.

Control of salinity: how does it work?

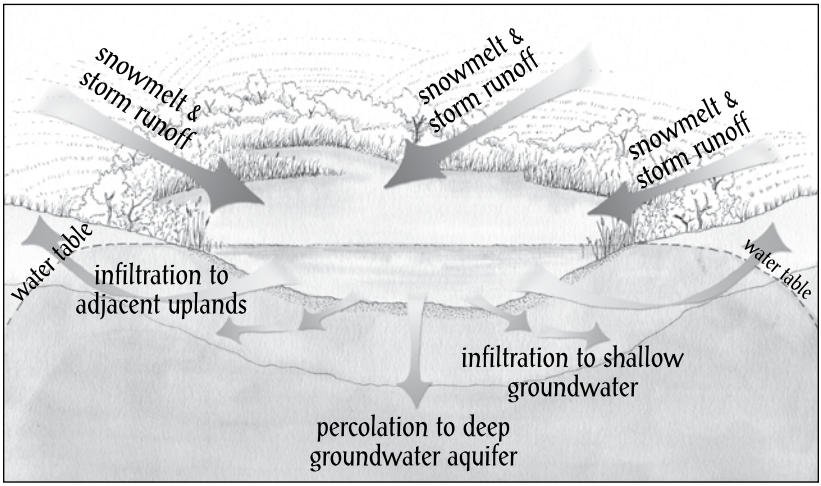
Keeping wetlands intact reduces the spread of salts. Often, wetlands accumulate salts, so draining and cultivating through them can spread the salts over a larger area, increasing the size of the problem.



- Large, permanent wetlands and sloughs usually receive groundwater (discharge). As the water evaporates, salts are left behind, resulting in higher salinity.
- Smaller and less permanent wetlands or sloughs often do not receive much groundwater, but instead recharge (add to) groundwater, so salts usually move downward. If you drain these wetlands, the outer edges may act as a source of salt, but salinity may go unnoticed until cultivated, and then it reduces the soil's suitability for growing crops.

Wetlands stabilise flows: how does it work?

Wetlands and sloughs are connected to groundwater and surface water in other waterbodies.



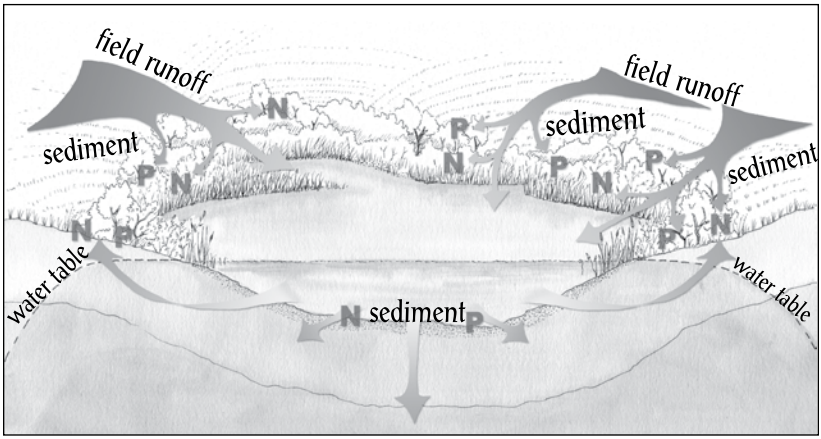
- Wetlands act as natural sponges to store and slowly release water from floods, rain, or snowmelt. These releases help maintain stream flows during dry periods.
- Studies show that significantly larger peak flows occur when less than 10% of the watershed is in wetlands; flood protection improves with more wetlands and sloughs in good riparian health

Local weather effects: how does it work?

- Lakes, wetlands and sloughs are linked to the water cycle, including weather. Draining them can lower the local or regional water table and reduce potential precipitation.
- Water evaporates from wetlands and transpires from trees and other riparian plants, creating water vapour; the water vapour condenses, creating local circulations that produce clouds, thunderstorms and local or regional precipitation.
- Wetlands are slow to heat and cool, and therefore have a moderating effect on local temperature, maintaining lower temperatures in summer and increasing minimum temperatures during cooler periods.
- You may get benefits from distant wetlands

Riparian areas filter nutrients: how does it work?

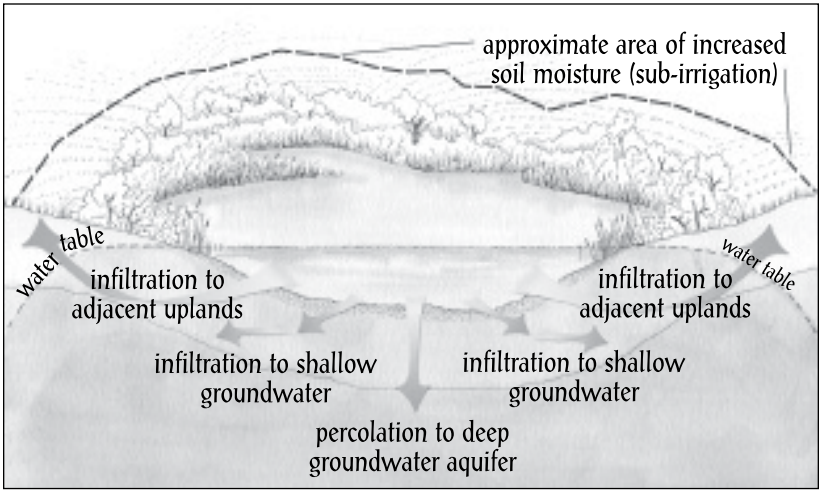
- Plants around the waterbody trap sediment from runoff, filter out nutrients and keep sediment out of the water.
- Phosphorus (P) is often attached to sediment in runoff, and preventing it from reaching the water is good, since in water, P can cause excess algal growth and deplete oxygen.
- Roots capture nitrate and incorporate it into plant growth.



- Nutrient forms may be changed (particularly various forms of carbon, nitrogen (N), and phosphorus) before entering surface or groundwater, which improves water quality.
- How effective filtration is depends on the width of vegetated area, plant types, size of contributing area, slope, and amount and speed of runoff.

Increased soil moisture and shallow groundwater recharge: how does it work?

Wetlands are hydraulically connected to shallow groundwater (the water table). Water infiltrates into shallow groundwater from recharge wetlands. Small amounts of water also reach the deep groundwater.



- Riparian plants transpire ("exhale") water, causing or increasing hydraulic pressure that draws groundwater closer to their roots and the surface; this pulls water from the wetland to outer riparian and upland soils via horizontal groundwater flow, creating sub-irrigation and increasing moisture for crops. Crops on uplands can draw ground-water from up to 2 m depth.

- Fallowing fields may cause shallow groundwater to move toward the wetland, away from the upland, because there is little or no hydraulic pressure in the field.
- Direction and quantity of water movement varies as hydraulic pressure from plants changes, with more movement in spring / summer (towards the upland), and less movement in fall (mostly towards the wetland).
- Shrubs and broad-leaved plants can draw water from up to 2 m below surface; trees can draw water from up to a 14 m depth
- Riparian plants trap snow and slow runoff, increasing available surface water.

Economic wetland values: how does it work?

- Wetlands are particularly valuable for livestock shelter and forage.
- Field research suggests it may be more costly to drain and crop wetlands than to keep them intact. Contact Cows and Fish for more information.
- The sum of ecological, recreational and flood control benefits of wetlands are much greater than the small potential returns from draining and cropping them.

Some Basics of Riparian Health Assessment

No one characteristic can provide a complete picture of riparian site health or health trend. Riparian health assessment knits together several key health characteristics, including vegetative (plants) and physical (soils and hydrology) features. The assessment relies heavily on vegetation characteristics because they reflect and interact with the effects of soils and hydrology that form, and operate in, riparian areas. Plants and their characteristics are seen and interpreted more easily than those for soils and hydrology, providing you with an early indication of riparian health, helping you to understand the successional trend on the site.

The types of plants present on a site provides some insight into:

- an indication of trend toward or away from the potential of the site (what the site could be);
- utilisation rates of certain types of vegetation that are key to riparian function (e.g. woody plants); and
- effectiveness of the vegetation in performing key ecological functions of riparian areas.

In addition to vegetative features, riparian health assessment also considers physical factors for both ecological and management reasons. Changes in soils or hydrology can have significant effects on riparian function and may be more difficult to remedy than changes in vegetation. Examples include:

- extensive artificial removal of water will lower the water table, shrink the size of the riparian area, change the vegetation to drier or upland types, and reduce forage and shelter values;
- chronic overuse and removal of vegetation that creates bare soil reduces the site's ability to trap sediment, build soil and protect soil from erosion; and

- trampling and compaction reduces moisture-holding capacity and storage ability in the soil profile.

There is an interrelationship between physical and vegetative features. Reaches with significant hydrological and soil changes will likely show changes in plant community structure and potential. Changes in vegetation, the “glue” of riparian systems, may have a rebounding effect on hydrologic and soil features.

The health of a riparian reach is a function or a result of what has or is happening in the upland, and/or on the adjacent riparian area. Sometimes health can be affected by what occurs at a distance too. Health can often be linked directly to current management on the site or the effects of previous management. Sometimes there may already be clues to problems:

- many weeds or disturbance species;
- low forage production;
- shelter and habitat declining;
- many eroding, slumping banks;
- extensive bare soil; and,
- few fish or wildlife present

What riparian health assessment does is put those observations into a format that allows you to understand the significance of the site changes and to measure the condition of the reach against a standard. This is what your doctor does when you have a check-up.

Riparian health assessment gets you to focus your observations and measure 9 parameters on the reach you've selected. The observations and measurements you will make relate to the ability of the reach to perform key ecological functions that translate to health.

Limitations of Riparian Health Assessment

Riparian health assessment balances the need for a simple, quick and easily-taught index of health against the reality of a complex landscape with many variable situations (management and environment). This approach may not work perfectly every time, and it requires some practice to become proficient. In most cases, it provides a reasonably accurate and repeatable measure of riparian health. With training, you can use this tool to help you pursue sound management decisions.

Riparian health assessment is not designed for an in-depth and comprehensive analysis and investigation of ecological processes and issues. Riparian health assessment may provide the first step in clarifying whether an issue or problem exists and in identifying areas of concern. The next step, Riparian Health Inventory, involves more measurements, taken in greater detail. It is often used at a drainage or watershed scale to provide a more comprehensive analysis of riparian function.

Riparian health assessment does not directly measure fish production, wildlife habitat, forage produced, water quality or other goods, products and benefits of healthy, functioning riparian areas. It does follow, though, that impaired riparian area function results in decreased potential of the site to produce these items. Assessment is an indirect method of determining the potential of the site. Riparian Health Inventory, a more detailed measuring stick, does allow a relationship to be established between health and some aspects of riparian area benefits and values. Refer to the following table to see the differences between "Assessment" and "Inventory".

Avoid making comparisons using the assessment method with lakes, or wetlands of different types, different sizes, or from outside the immediate locality or watershed. Appropriate comparisons using this method can be made between reaches

of one lake, between adjacent wetlands of similar size and type, and between repeated assessments at the same site.

A single riparian health assessment provides a rating at only one point in time. Like a health check-up for us, once may not be enough. A single assessment cannot define the absolute status of site health or reliably indicate trend (whether the site is improving, degrading or stable), but it may provide a warning signal. To monitor trend and to account for the range of variation possible on a site, health assessments should be repeated, in subsequent years, at the same location, at the same time of year.

There is no simple way to measure some changes to riparian area health, even though these may be obvious and visible. These changes may result from problems that exist elsewhere in the drainage or in the watershed and are not part of the site being assessed. However, the effect of these distant impacts on the health rating of the site may be negative and result from:

- excessive amounts of sediment, deposited on the substrate (bottom) of the waterbody or dumped on the shore/banks;
- diversion or removal of water in upstream areas, or directly from the waterbody;
- addition of water to the lake, slough or wetland;
- changes in flow into or out of the waterbody (timing of flow, duration of flooding or high water, higher peak flows, lower volumes) resulting from damming, major modification to vegetation cover, drainage or road networks; and
- extreme flooding or overfilling from greater than normal precipitation or fast snowmelt.

Watershed scale evaluations, using the Riparian Health Inventory, instream flow assessment and water level monitoring may be required to analyse these effects.

Assessment vs Inventory: What's the Difference?

ASSESSMENT	INVENTORY
• understanding the basic pieces of riparian areas	• measuring, analysing and recording; detecting ecological problems, diagnosing them and decision making
• most useful at the site level	• useful at the site, drainage and watershed level
• 9 questions or parameters evaluated	• 77 questions or parameters evaluated
• minimal training and experience required	• significant training, background and experience required for proficiency
• a first step; overview, initial or preliminary impression of condition	• comprehensive measurement and evaluation
• quick and relatively easy to grasp; useful for awareness and education	• more time required for measurement and analysis; uses include problem diagnoses, management decisions, monitoring and watershed scale evaluations
• identify and stratify reaches for inventory	• detailed measurements to determine watershed condition, aid in preparation of management plans and monitoring
• assess current condition	• measures current condition and evaluates site potential; identifies the current plant community and the successional pathway with current management

Why develop Riparian Health Assessment? Some history and uses

Riparian areas are the focus of attention, 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 readily apparent. 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 mechanism to link management actions to improving or maintaining ecological function.

In response to many concerns in the United States, the University of Montana, through the Riparian and Wetland Research Program, devised a system to survey and measure the overall health or condition of a riparian site. Many scientific disciplines participated to determine what the key ecological functions of riparian areas were and how these could be measured with a relatively quick and easy assessment technique. This method was initially used to evaluate riparian health on approximately 8,000 km of rivers and streams in Montana, Idaho, Wyoming, North Dakota and South Dakota. The testing and refinement of the method was expanded to include Alberta, British Columbia and Saskatchewan. With this experience, the method has evolved into the present riparian health assessment. It has been adapted to include riparian situations that will be encountered in Alberta and has been useful for other jurisdictions.

There are four equally important purposes behind the development and use of a riparian health assessment.

- Riparian health assessment is a standard method to allow landowners, land/resource managers and others to quickly assess current health, and to identify the presence, scale and magnitude of issues and problems.
- It can be repeated, over time, to monitor changes that may result from natural variation or management actions and choices.
- 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.
- This is an educational tool, to allow those who 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 communications among riparian users.

HOW TO ASSESS RIPARIAN HEALTH

When to do your assessment

- When plants are in the growth phase and can be identified (June, July, August and September).
- When water levels are close to normal --- assessments should not be done during peak spring run-off or immediately after a major storm that increases water levels.
- If repeating an assessment on a site or monitoring a site for changes, complete follow-up assessments at the same time of year.
- If the management regime includes grazing, to be consistent, either do your assessment before or after grazing use.

Pick your site

Start by walking or riding the length of shore you want to assess. That will give you the opportunity to make observations and choose sites to assess health. You will be assessing a reach - a stretch of shore with its width determined by the extent of the riparian area (from open water to the upland) and with length based on a number of selection criteria (see below). If time is available, or the wetland or lake is small, you might want to consider assessing the entire shore length. If time and distance are impediments, you have a couple of choices:

- pick a “critical” site, one that may be sensitive, or already has some specific problems, for assessment; or
- choose a “representative” site that is typical of a much longer stretch of shore and that will provide an overall impression of health.

To select a site that is representative, become familiar with the entire length of shore and riparian area. What you are picking is a short reach that will represent the average condition of a longer stretch of shoreline. Vegetation, use/utilization, shore and bank characteristics and slope in the representative reach should all reflect what is found in and is common to a longer reach. If there is too much variation, divide the shore into units that differ and then select a representative piece from each different unit and do separate assessments.

The reasons for picking either or both critical and representative reaches may include:

Critical	Representative
• problem spots indicating management concern	• overall impression or average of riparian condition for a long stretch of shore
• sensitive areas, including key habitats for plants, fish or wildlife	• broader measurement of management actions or choices
• places that may respond to management change quickly	• broader measurement of vegetation characteristics, especially key indicators like woody vegetation, weeds or disturbance species
• shorter reaches, easy to monitor	• longer reaches for more comprehensive monitoring

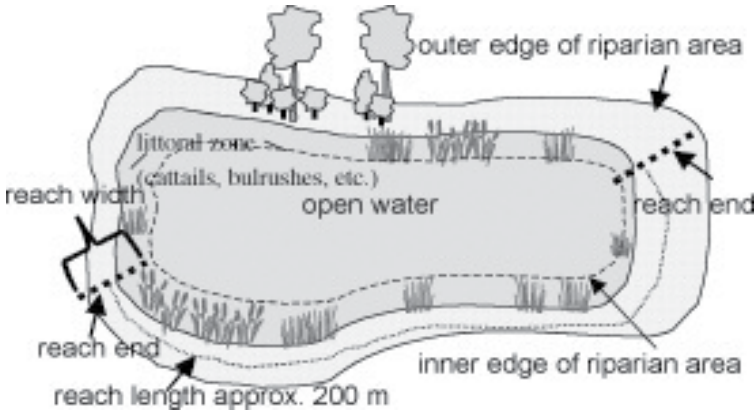
It may be useful to assess both critical and representative reaches to understand both the strengths and weaknesses of a stretch of shore.

Identify a reach to assess

A site is a spot on the ground to begin from; **a reach has length and width. A reach is the place to start pacing over, to measure and to complete a health assessment.**

Reach length

The first step is to determine the length of the reach. For measurements on small bodies of water and wetlands, the length of the reach may include the entire shore and riparian area around that system. For large bodies of water and wetlands it may be necessary to divide the shore into separate lengths or select a representative length (see previous page). To select a reach length that is representative of the entire shore, choose a site that is typical of the topography, vegetation and soils within the riparian area and the water and wind action on the shore (eg. bays versus points). A good rule of thumb is to assess a minimum of 200 m of shore length. If your property is less than 200 m in length, for example a lakeshore cottage lot, complete an assessment on the full length of your property. If you have a small wetland or slough, you should assess the entire waterbody.



If you have defined your reach as “critical”, a length should be picked that is appropriate to what you want to assess.

Reach width

The next step is to determine riparian area width, within the reach length. The area to be assessed starts at the open water and includes the portion of the aquatic area where persistent emergent vegetation (plants growing up through the water such as cattails, bulrushes and sedges) exists (these plants may go out to 2 m deep water). This area, called the littoral zone, forms the inner edge of the riparian area. For those situations where there is no emergent vegetation, the aquatic area is not included in the assessment.

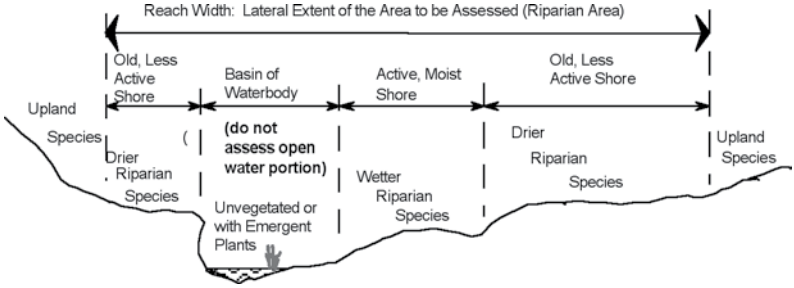
Lakes and wetlands that go dry or have receding water levels still have riparian areas and the lake/wetland basin may remain unvegetated after the water is gone. This non-vegetated area is included in the measurements; make all the same observations. Vegetation may also have been removed by human causes (eg. grazing, mowing, logging, cultivation or construction) and these areas are also included.

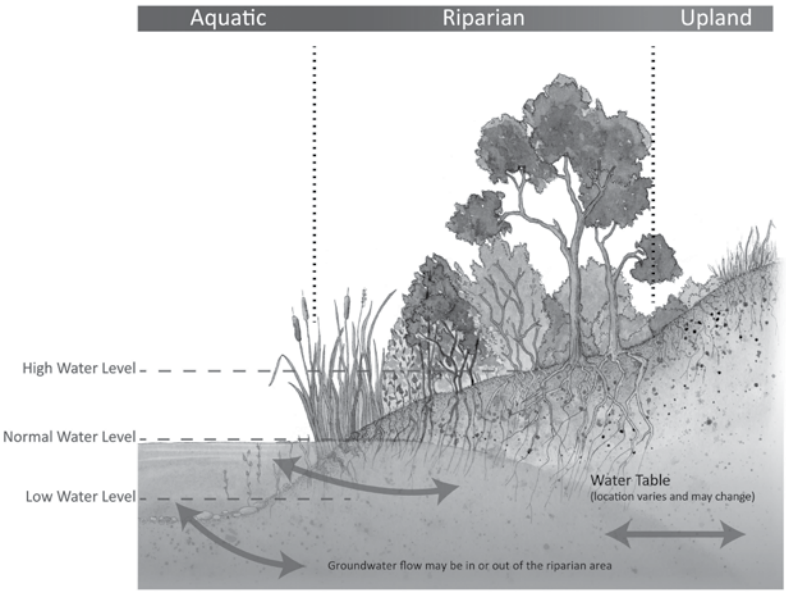
That's the easy part; now you have to find the outer edge of the riparian area. Review the definition of "riparian area" on Page 7. The outer boundary of the riparian area exists where:

- vegetation changes from plants responding to or requiring abundant water to drier, upland types;
- topographic change like terraces or banks that signal a clear line between the greener, lusher or denser vegetation of the riparian area and the upland;
- old terraces or banks exist that show movement patterns of water levels and may (but not always) indicate a high groundwater table;
- past or near where flood water reaches seasonally, or on a regular basis, as high water breaks out of the lake/wetland basin.

A combination of vegetation changes, topographic breaks and water/flood evidence (or local knowledge of flooding extent) will help you find the edge. The area between the aquatic and terrestrial zones will have vegetation dominated by water loving plants or plants that respond well to abundant moisture, the aquatic area will generally have emergent vegetation (eg. cattails, bulrushes). If you are unsure of where riparian ends and upland starts, it is better to overestimate the width or extent of the riparian area than to underestimate it. Review the illustration below to help you decide "Where do I measure?".

Where do I measure?





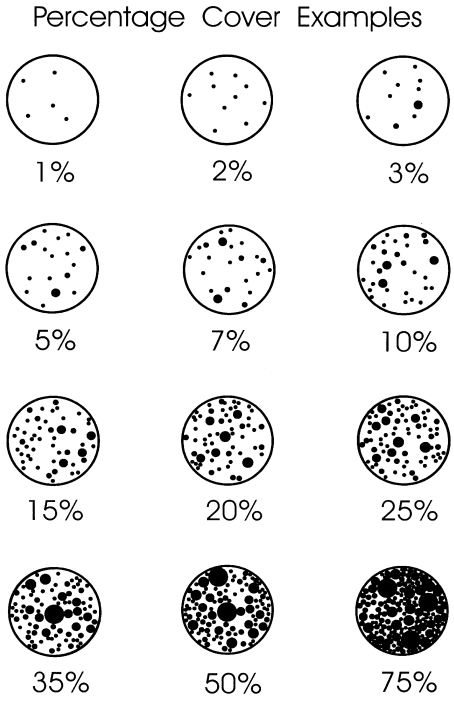
Reach tips

Assessments generally should not cross fences, property lines, roads or areas with different management. If the shoreline to be assessed crosses more than one management unit (eg. pasture or property line), at least one reach should be assessed in each unit. Fences, roads and sometimes trails exert a strong influence on livestock movement, grazing patterns and other traffic (eg. people and off-highway vehicles). To eliminate this bias, try to locate your reaches at least 75 m (250 ft.) from the influence of a fence or a road. An exception to this might occur where holdings are small, roads or trails are throughout the length of your reach or where there are many fences, because these factors could also exert a major influence on overall riparian health. In these situations you may want to measure the effect or influence of fences and roads on riparian condition and your reach selection will be done with this in mind.

Before you start to do an assessment, turn to the "Field Sheet" on Page 69 and fill in, under "site description", where reach length boundaries are located. Next year, or in a few years time, you may not be able to find them if you haven't penned a reminder to yourself. Link them with some visible landmark or measure the distance to them from that landmark. You might want to put in a couple of fence posts, rebar pounded flush with the ground or some other easily relocated item. Keep in mind that shorelines migrate and change. Your memory of the locations may be imperfect. Take a photograph to help jog your memory in the future and remind you of the visible signs of health present today.

GETTING STARTED

There are 9 questions to answer that relate to components or factors of the riparian reach you have selected. Many deal with the element of "coverage", that is, how much of the reach area is covered by vegetation or structural impacts. The categories to choose from are expressed in percentages of the reach area. Start by pacing off the length and width of the reach (excluding the open water/aquatic part but including the area with emergent vegetation). Calculate the area. Now you have some context to determine coverage for many of the questions (eg. 10 m^2 of tree seedlings in a 1,000 m^2 reach equals 1% coverage). As you become more practiced you can use the cover class standards shown here.

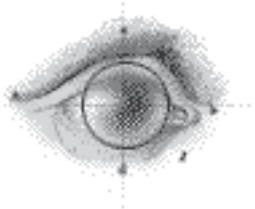


Cover class standards for judging vegetation canopy cover and bare soil

Most of the factors rated in this assessment are based on measurements using your eyes and your judgement. It may seem imprecise but with practice this method is repeatable and reasonably accurate. Extreme precision is not required for riparian health assessment since we are not attempting to determine an absolute value, only a broad impression of health. However, practice and training are invaluable to ensure consistency and appropriate use of the method.

℞ RIPARIAN HINTS

Tuning Your Eye



- ✓ **Riparian Health Assessment** is about tuning your eye to see what pieces might be missing from a riparian system.
- ✓ It gets you beyond "if it's green, it's good".
- ✓ It helps you understand the pieces - how they fit together and how to rate the key pieces of the riparian area.

The maximum possible scores vary between the factors. This weighting system between the factors measured reflects the:

- relative importance of the factor;
- influence on or relationship to other factors; and
- significance of the factor to an ecological function or 30 functions.

Things you will face

Move around

- Don't stand in one place to do the assessment. You will need to move around the entire reach, evaluating factors and mentally accumulating observations that you will then sum up. If you stand in one spot you will end up with an assessment of only what you observed in a narrow sphere around you. This may not give you an accurate, unbiased assessment for the reach.

Consider riparian functions

- If a question on a particular reach perplexes you, go back and reconsider "Riparian Functions". Ask yourself if the factor measured is contributing to ecological function. An example might be a site covered with weeds or disturbance species. Are these plants present on the reach during high water to dissipate wave energy and trap sediment? Do these plants have the type of root systems that are deep and that bind shore materials together? If the answer is no, then these plants do not contribute to ecological function and you should rate the site low for these categories.

Should it have wood or not?

- Some questions on the assessment will not apply on all reaches. Reaches without the potential for woody species (trees and shrubs) will not be rated on factors involving regeneration or browse. On some prairie systems, on wet meadows with saturated soils, on severely disturbed riparian areas and on reaches with a history of chronic overuse, vegetation potential can be difficult to determine. To determine vegetation potential, where it is not immediately evident, you can:

- use the Riparian Vegetation Classification guide (contact Cows and Fish);
- observe vegetation present outside of the reach in the adjacent riparian areas or search for stumps, snags or roots remaining on the site;
- consider vegetation present on similar reaches of nearby lakes, sloughs or wetlands in the area; and,
- use archival photographs or pictures in family albums that indicate vegetation presence in previous times; and
- ask the elders of the community for their memories of woody species.

If, at the end of this evaluation, you conclude the reach has no potential for tree and shrub growth, eliminate questions 4 and 5 and readjust the maximum possible total score accordingly. If the site does have potential, but no woody species are currently present, answer question 4 but eliminate question 5. (keep 5b on woody use if woody plants have been removed).

Other considerations and observations

- No measurement system can capture all of the variation you are likely to encounter, nor will the categories in the questions exactly resemble what you see on the lake or wetland. You will have to select the answer you think is the closest, or the best fit, for the condition you observe.

- Because there is a spread between the scores you may be tempted to pick a number that reflects an average. The only choices for scores are those indicated. Make your best estimate and enter the value in the "actual" column of the Field Sheet.

- You must consider only the conditions that you observe at the time of the assessment. Don't guess on what conditions might have been previous to the assessment or speculate on future conditions.

- Don't stop when you've completed the scores. Make observations in the "Comments" section. Use the comments section to:
    - expand on the information and measurements, especially if you are considering making management changes;
    - describe the reach in some detail and provide some characteristics of the vegetation types or plant distribution, especially weeds;
    - note your impressions of grazing, cultivation, recreational and other uses, wildlife use, fish and/or wildlife observations and water clarity and levels;
    - summarize the flood or water level history of the reach, making note of time of high water and when the last major flood occurred;
    - note the vulnerability or sensitivity of some sites or reaches; and
    - make note of things happening outside the reach or beyond the riparian area, especially land uses that contribute to current condition or could affect future condition.

Take a photograph that captures the condition of the reach at the time of your evaluation. Include, in that photograph, a recognizable landmark that will allow you to retake the photograph in subsequent years. You may also want to take photographs at each end of the reach to help you identify these end locations later.

These observations can help you relate current condition to management, especially as you track reach health over time.

Notes:

RIPARIAN HEALTH ASSESSMENT QUESTIONS (1-9)

1. How much of the riparian area is covered by vegetation?
Vegetation cover of the riparian area

Vegetation reduces the erosive forces of raindrop impacts and the velocity of water moving over the shore or along the shore and banks. Vegetation cover also:

- traps sediment and stabilizes shore and banks;
- absorbs and recycles nutrients;
- reduces the rate of evaporation; and
- provides shelter and forage values.

Vegetation cover is visually estimated using the canopy cover method. Use the illustrations to help you estimate canopy cover on the reach.

- Exposed shoreline or lake bed and sediment deposited on the reach are considered "bare ground".

Scoring:

6 = More than 95% of the reach soil surface is covered by plant growth (less than 5% bare soil).

4 = 85% to 95% of the reach soil surface is covered by plant growth (5-15% bare soil).

2 = 75% to 85% of the reach soil surface is covered by plant growth (15-25% bare soil).

0 = Less than 75% of the reach soil surface is covered by plant growth (greater than 25% bare soil).

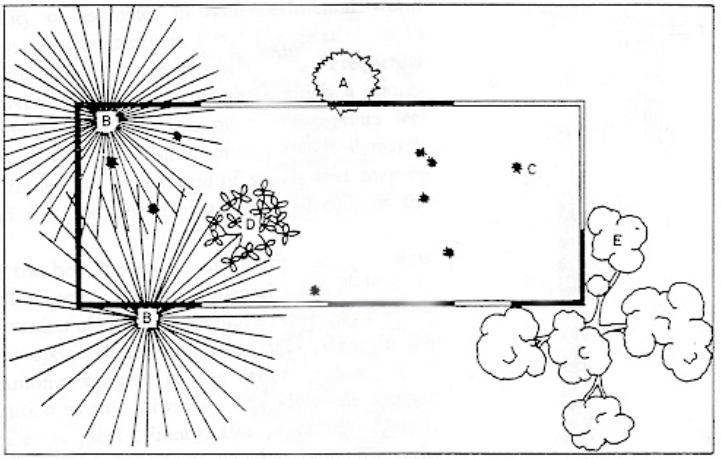
Scoring Tip 1: Vegetation cover includes all standing, rooted plants (live or dead). Do not include litter or downed wood as vegetation cover.
Scoring Tip 2: Do not consider the area of the reach covered by water, such as the water between cattail plants.

Scoring Tip 3: Bare soil, paved areas, boat docks or other artificial surfaces are considered unvegetated.

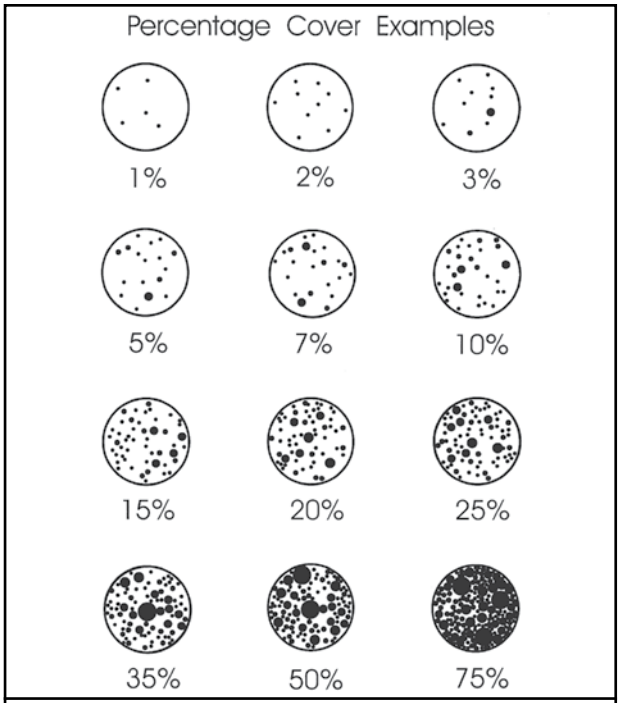
Foliar Cover

Canopy Cover

Imagine a line drawn about the leaf tips of the undisturbed canopies and project that coverage onto the ground. This projection is considered “canopy coverage”.



Vegetation canopy cover is estimated for the riparian reach, in much the same way as for this plot frame. Imagine that you are observing the reach from above and estimate the vegetation canopy cover for all plant species combined. What percentage of the riparian area is covered by plant growth?



Cover standards from 1 to 75% canopy cover.

Rx RIPARIAN HINTS

Vegetation Canopy Protects Soil

- ✓ Like a tent or umbrella, vegetation canopy protects shores, banks and soil from the erosive impact of raindrops.
- ✓ It takes a lot of grasses, broad-leaved plants, trees and shrubs to create this canopy over the ground.

2. How much of the riparian area is covered by weeds?

Invasive plant species

Invasive plants are "alien species whose introduction does or is likely to cause economic or environmental harm". Many of them are referred to as "noxious weeds."

- The presence of invasive species indicates a threat to the reach or indicates a degraded ecosystem.
- While some of these species may contribute to some riparian functions, their negative impacts reduce overall reach health.
- This question considers 2 parts: canopy cover and the degree of infestation (density distribution).
- The term canopy cover is used here to describe the area of the reach that is covered by invasive plants.
- Infestation is a function of weed plant density and patchiness over the reach. Infestation is evaluated based on density distribution in the reach.
- On your worksheet, you will want to record each invasive plant species and its density distribution (see table on the next page) as you move through the reach.
- Measurement of canopy cover and density/distribution are done separately. To score each question, consider all invasive plant species together.

Canopy Cover

Scoring:

3 = No invasive species (noxious weeds) on the reach.

2 = Invasive plants present with total canopy cover less than 1% of the reach.

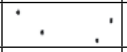
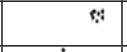
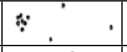
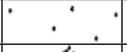
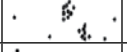
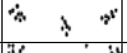
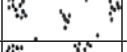
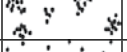
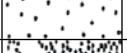
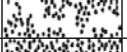
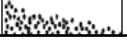
1 = Invasive plants present with total canopy cover between 1 and 15% of the reach.

0 = Invasive plants are present with total canopy cover more than 15% of the reach.

Density/Distribution

Scoring:

- **3 =** No invasive species (noxious weeds) on the reach.
- **2 =** Invasive plants present with density/distribution in class 1, 2, or 3.
- **1 =** Invasive plants present with density/distribution in class 4, 5, 6, or 7.
- **0 =** Invasive plants are present with density/distribution in class 8 or higher.

CLASS	DESCRIPTION OF ABUNDANCE	DISTRIBUTION PATTERN	SCORE
0	No invasive plants on the reach		
1	Rare occurance		
2	A few sporadically ocurring individual plants		
3	A single patch		
4	A single patch plus a few sporadically occurring plants		
5	Several sporadically occurring plants		
6	A single patch plus several sporadically occurring plants		
7	A few patches		
8	A few patches plus several sporadically occurring plants		
9	Several well spaced patches		
10	Continuous uniform occurrence of well spaced plants		
11	Continuous occurrence of plants with few gaps in the distribution		
12	Continuous dense occurrence of plants		
13	Continuous occurrence of plants associated with a wetter or drier zone within the reach		

Scoring Tip 1: All (invasive) weed species are considered collectively, not individually.

Scoring Tip 2: Use a weed list that is standard for the locality and be sure to indicate the species you found. See Alberta's standardised list, starting on page 91.

Examples of invasive species (see appendix for a complete list)

Common Name	Latin Name
nodding thistle	*Carduus nutans*
spotted knapweed	*Centaurea maculosa*
Canada thistle	*Cirsium arvense*
hound's tongue	*Cynoglossum officinale*
leafy spurge	*Euphorbia esula*
broad-leaved/dalmatian toadflax	*Linaria dalmatica*

℞ RIPARIAN HINTS

What do weeds tell us?

Weeds normally provide a strong message about riparian health. Weeds most often invade riparian areas where disturbance has resulted in available niche space such as bare soil or openings in the vegetation canopy. These micro-habitats are normally occupied by native plants, but are now available to weeds due to over-grazing or some other land use or natural disturbance.

- ✓ **NO WEEDS**
  - ✓ Unable to establish, reach is well vegetated, no bare soil and no seed source
- ✓ **ONE WEED**
  - ✓ Potential for invasion, seeds are available
- ✓ **SEVERAL WEEDS**
  - ✓ Present threat for quick invasion
  - ✓ Space is available for them to move in
- ✓ **MANY WEEDS**
  - ✓ System is degraded

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

Disturbance-caused undesirable herbaceous species

A large cover of disturbance-caused, undesirable herbaceous species, either native or introduced, indicates alteration of the normal plant community that would occur on the site.

- Like weeds, disturbance-caused species are well adapted to an environment of continual stress, where the competitive advantage of better riparian species has been diminished.
- Their presence or abundance may indicate a long history of heavier grazing use or other human impacts.

These species may have some grazing value but tend:

- to be shallow rooted and less productive; and
- have limited value for shore / bank binding and erosion prevention, especially if they are annuals.

Scoring:

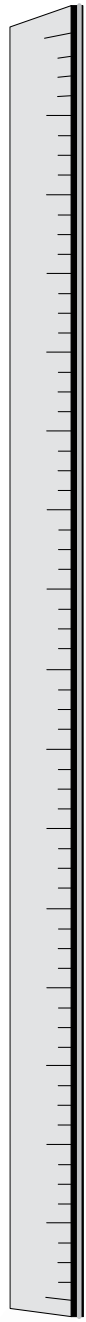
3 = Less than 5% of the reach covered by disturbance-caused undesirable herbaceous species.

2 = 5% to 25% of the reach covered by disturbance-caused undesirable herbaceous species.

1 = 25% to 50% of the reach covered by disturbance-caused undesirable herbaceous species.

0 = More than 50% of the reach covered by disturbance-caused undesirable herbaceous species.

Scoring Tip 1: Invasive species (weeds) considered in the previous questions **are not** reconsidered here.
Scoring Tip 2: The list in the appendix (page 91) will help you identify those species that are disturbance-caused, undesirable herbaceous species, and use a standardised list of species.



Examples of disturbance-caused undesirable herbaceous species (refer to the appendix for a complete list)

Common Name	Latin Name
foxtail barley	*Hordeum jubatum*
timothy	*Phleum pratense*
plantains	*Plantago* spp.
Kentucky bluegrass	*Poa pratensis*
common dandelion	*Taraxacum officinale*
stinkweed	*Thlaspi arvense*
clovers	*Trifolium* spp.

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What Are Disturbance-Caused Species?

✓ Plants which are absent, or present in low amounts, in undisturbed areas but that invade reaches with continuous use.

Why Are They a Concern?

✓ They do a poor job of binding the soil and preventing erosion.

✓ They show a history of overuse.

4. Is Woody Vegetation Present and Maintaining Itself?

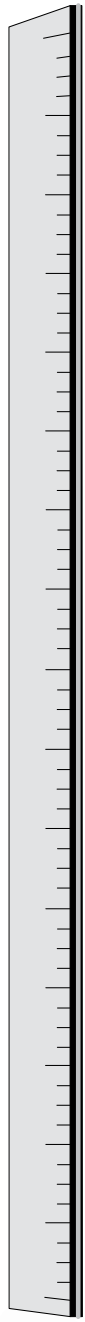
Preferred tree and shrub establishment and regeneration

Most, but not all, riparian areas can support woody vegetation (trees and shrubs). Where trees and shrubs exist, they play an important role in riparian condition. Their root systems generally are excellent shore and bank 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 play a role in modifying shorelines and stream valleys. A good indicator of 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.

Not all trees and shrubs are equally important, useful or desirable for maintaining ecological function. Several species of woody vegetation are excluded from this evaluation of establishment and regeneration. See the table on page 47 for a list of these species.

Why are they excluded?

- These species often reflect long-term disturbance of the reach.
- They tend to increase and predominate under long-term, heavier grazing pressure or other human pressures



- There is rarely a problem in maintaining their presence on a reach.
- They are far more abundant on disturbed sites than are preferred woody species.
- Their abundance masks the ecological significance of the smaller amount of preferred species.
- They are generally small in height and have less shelter value.
- Their root systems may not be as capable of stabilizing banks or shores and reducing erosion, compared to preferred species.
- They are generally less palatable to browse users.
- In particular, some, like Russian olive and salt cedar, are aggressive, invasive, undesirable exotic species.

For this question, first determine the total canopy cover of all preferred woody vegetation on the reach. Then, estimate what percentage of the total canopy cover is made up of of seedlings and saplings (the youngest age classes) following these guidelines:

For trees:

- consider seedlings to be up to 1.5 m (5 ft) tall with a stem diameter of up to 2.5 cm (1 in); and
- tree saplings could be greater than 1.5 m tall with a stem diameter up to 12.5 cm (5 in).

For shrubs:

- seedlings and saplings can be quite variable so consider relative heights to obvious mature plants; look for recent growth that is below your knee in height; these age classes will generally have stems less than the diameter of your thumb; they will be pliable compared with mature growth.

For woody plants in general:

- sometimes heavy browse use produces a plant with short stature; don't confuse these mature plants with seedling/sapling age classes; and
- growth and size of seedlings/saplings may be enhanced on some sites where growing conditions are ideal; look less at height and observe stem diameter and the pliable nature of the stems.

Scoring:

6 = More than 15% of the total canopy cover of preferred trees/shrubs is seedlings and/or saplings.

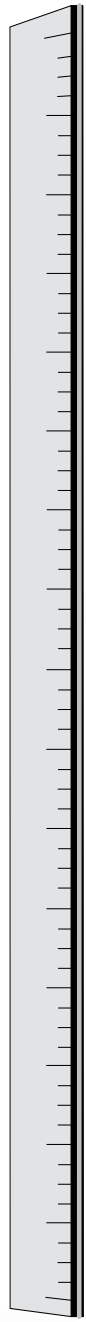
4 = 5% to 15% of the total canopy cover of preferred trees/shrubs is seedlings and/or saplings.

2 = Less than 5% of the total canopy cover of preferred trees/shrubs is seedlings and/or saplings.

0 = Preferred tree/shrub seedlings and saplings absent.

Scoring Tip 1: If you have established that the reach has no potential for preferred woody vegetation (see page 31), replace the actual score and possible score with N/A and readjust the total score accordingly.

Scoring Tip 2: It takes a lot of seedlings / saplings to equal the canopy of one mature tree or shrub.



Rx RIPARIAN HINTS

How To Know If Trees and Shrubs Belong Here

- ✓ Use the Riparian Vegetation Classification available from the Cows and Fish program.
- ✓ Look up or down the shore at the next field or neighbouring property.
- ✓ Look at other similar stream reaches or lakes and wetlands nearby.
- ✓ Check for historical photos or in family albums.
- ✓ Ask the elders in the community for their memories of woody species.

Rx RIPARIAN HINTS

Examples of Preferred Trees and Shrubs

Trees: Cottonwoods, aspen, poplars, birches, conifers

Shrubs: Willows, alders, hazelnut, saskatoon, pin cherry, chokecherry, cranberry, honeysuckle, dogwood, buffaloberry, gooseberry, raspberry

Do not include these species when evaluating a reach for regeneration:

Common Name	Latin Name	Category
snowberry / buckbrush	*Symphoricarpos* spp.	Shrub
rose	*Rosa* spp.	Shrub
hawthorn	*Crataegus* spp.	Shrub
shrubby cinquefoil	*Potentilla fruticosa*	Shrub
silverberry / wolfwillow	*Elaeagnus commutata*	Shrub
Russian olive	*Elaeagnus angustifolia*	Tree / Shrub
tamarisk / salt cedar	*Tamarix* spp.	Shrub
caragana	*Caragana* spp.	Shrub
alder-leaved and European / common buckthorne	*Rhamnus alnifolia* and *carthartica*	Shrub
greasewood	Sarcobatus vermiculatus	Shrub
silver and big sagebrush	*Artemisia cana* and *tridentata*	Shrub

5. Is Woody Vegetation Being Used?

Because woody species have such an important role to play in riparian health, measurements of the level of use helps us understand whether they will persist in the reach. Livestock will often browse woody plants, especially in late summer and fall. Wildlife, including beaver, make use of woody plants year round, as do people. Effects from any tree and shrub use can be immediate or cumulative over time. Woody plants can sustain low levels of use but heavier use can:

- deplete root reserves;
- inhibit establishment and regeneration;
- lead to replacement by less desirable woody species;
- cause the loss of preferred woody species; and
- reduce or remove taller species from the plant community;
- change wildlife habitat; and
- lead to invasion by disturbance or weed species.

Browse of Preferred Trees and Shrubs

Not all woody species are palatable or used by animals. Some species do not contribute significantly to riparian condition and stability although some browse may occur. Other species may persist under high use but are not good indicators to evaluate the effect of browse. These species are excluded from this evaluation of browse. See the table on the next page for a list of these species.

To establish the amount of browse:

- first, randomly pick 2 to 3 plants of each of the preferred woody species found on the reach;
- for each plant, select a branch that would be available or accessible to browsing animals;
- count the total number of leaders (twigs) that are second year growth and older on the branch;
- now count only the older leaders (2nd year growth and older) that have been clipped off by browsing;
- determine the percentage of browse by comparing the number of leaders browsed with the total number of leaders available on the branch; and
- do not count the use of the current year's growth since an estimate in mid-season does not accurately reflect the entire year's use, because browsing can continue year-round.

Scoring:

3 = None (0% to 5% of available second year and older leaders of preferred species are browsed).

2 = Light (5% to 25% of available second year and older leaders of preferred species are browsed).

1 = Moderate (25% to 50% of available second year and older leaders of preferred species are browsed).

0 = Heavy (more than 50% of available second year and older leaders of preferred species are browsed).

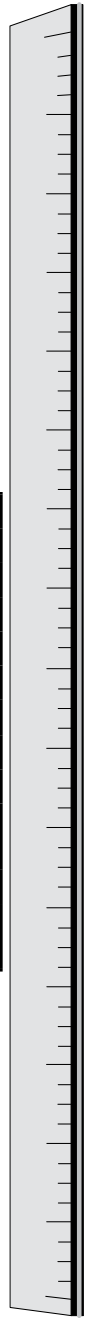
Scoring Tip 1: If you have established that the reach has no potential for preferred woody vegetation (see page 31), replace the actual score and possible score with N/A and readjust the total score accordingly.

Scoring Tip 2: Beaver or people may cut or remove trees or shrubs. Measure these impacts in the next part of the question.

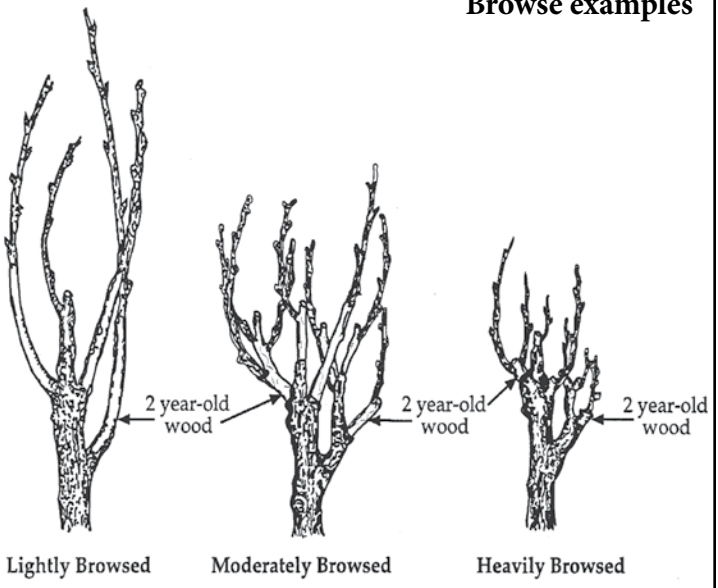
Scoring Tip 3: Count long-term heavy livestock use causing "umbrella" shaped shrubs as heavy browse.

Do not include these species when evaluating a reach for browse:

Common Name	Latin Name	Category
snowberry / buckbrush	*Symphoricarpos* spp.	Shrub
rose	*Rosa* spp.	Shrub
hawthorn	*Crataegus* spp.	Shrub
shrubby cinquefoil	*Potentilla fruticosa*	Shrub
silverberry / wolfwillow	*Elaeagnus commutata*	Shrub
Russian olive	*Elaeagnus angustifolia*	Tree / Shrub
tamarisk / salt cedar	*Tamarix* spp.	Shrub
caragana	*Caragana* spp.	Shrub
alder-leaved and European / common buckthorne	*Rhamnus alnifolia* and *carthartica*	Shrub
greasewood	Sarcobatus vermiculatus	Shrub
silver and big sagebrush	*Artemisia cana* and *tridentata*	Shrub



Browse examples



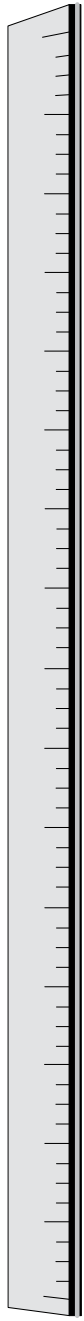
℞ RIPARIAN HINTS

Use Affects Woody Plant Vigour

- ✓ Light to moderate use helps plants maintain vigour.
- ✓ Heavy use reduces vigour.
- ✓ Long-term, heavy use eliminates the best woody plants.

★ **Like the old stockman's saying: "If you keep down the shoot, you kill the root."**

Other Use of Trees and Shrubs



Cutting or removing parts of or entire trees or shrubs by means other than browsing animals can result in many of the same negative effects to the plant community that are caused by heavy browsing. Causes of tree and shrub use other than browsing may include clearing, logging, mowing, cutting, and beaver. Do not include natural phenomena such as natural fire, insect infestation, prolonged flooding, or drought. Evaluate all tree and shrub species except those in the table below.

To establish the amount of live woody vegetation removal by means other than browse:

- determine the extent of tree and shrub removal (include partial and entire) in the recent past (stumps or slash piles are visible).
- then compare that to the amount remaining uncut/re-grown, and choose a "best fit estimate".
- Give credit for re-growth. Consider how much the removal of a tree or shrub may have now been mitigated with young replacements or new growth.

Look at volume (three dimensions) and not canopy cover (two dimensions). For example, if an old spruce tree is removed, a number of new seedlings/saplings may become established and could soon achieve the same canopy cover as the old tree had. However, the value of the old tree to wildlife and overall habitat values is far more than that of the seedlings/saplings. It will take a very long time before the seedlings/ saplings can grow to replace all the habitat values that were provided by the tall old tree. Some shrubs, such as willows, grow faster than trees and may replace the volume of removed plants in a much shorter time.

Do not include these species when evaluating a reach for removal of woody vegetation by means other than browsing:

Common Name	Latin Name	Category
Russian olive	*Elaeagnus angustifolia*	Tree / Shrub
European/common buckthorne	*Rhamnus cathartica*	Shrub
salt cedar	*Tamarix* spp.	Shrub
caragana	*Caragana* spp.	Shrub

Scoring Tip 1: If you have established that the reach has no potential for native woody vegetation (see page 31) AND there are no stumps or cut woody plants to indicate that it ever had any, replace the actual score and possible score with N/A and readjust the total score accordingly.

Scoring Tip 2: In general, the more recent the removal, the more fully it is counted; and conversely, the older the removal, the more likely it has been mitigated by re-growth.

Scoring:

3 = None (0% to 5% of live woody vegetation expected on the site is lacking due to removal by humans and/or beavers).

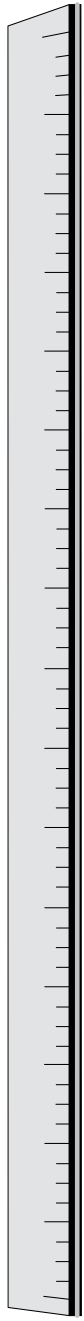
2 = Light (5% to 25% of live woody vegetation expected on the site is lacking due to removal by humans and/or beavers.

1 = Moderate (25% to 50% of live woody vegetation expected on the site is lacking due to removal by humans and/or beavers.

0 = Heavy (More than 50% of live woody vegetation expected on the site is lacking due to removal by humans and/or beavers.

6. How much of the riparian area vegetation has been changed?

Human alteration of the vegetation



Vegetation in riparian areas is key to holding soils on the bank and shore together, limiting erosion. Stems, leaves and roots slow water down and reduce the erosive force from runoff or wave action, and in winter resist ice damage. Vegetation also filters water, reducing sediment or contaminants reaching the water. The plant community provides the basis for habitat, shelter and food for wildlife. If we modify the natural plant community, either by changing or replacing species or proportions of species present, we reduce or disrupt how the area can perform these functions.

Activities that may result in changes to the plant community composition include (but are not limited to): clearing, home/yard development, creation of lawns, seeding of tame species, timber harvest, heavy grazing over many years, and recreational traffic or activities leading to removal of vegetation.

Changes in the vegetation or plant community included in this question are long-term or permanent changes, such as:

- loss or change of plant community structural layers, for example:
    - in a forest that would usually have trees and shrubs, only tall trees and grass remain, with all shrubs removed;
    - in a setting which normally has tall and short shrub species, plus grasses and flowers, all of the tall shrubs may have been removed;
    - replacing tall species with short species

- native plants being replaced by non-native plants
- loss of species diversity, with only a few species remaining
- changing community composition (eg. replacing willows with buckbrush)
- changing proportions of species (eg. native wild-flowers have increased and cover areas previously covered by native grasses)
- complete removal of vegetation (eg. clearing of cattails from the near shore area)

Transient or short term removal that does not lead to altered plant community composition **is not** included in this question.

Scoring:

6 = Less than 5% of the reach vegetation is altered by human activity.

4 = 5% to 15% of the reach vegetation is altered by human activity.

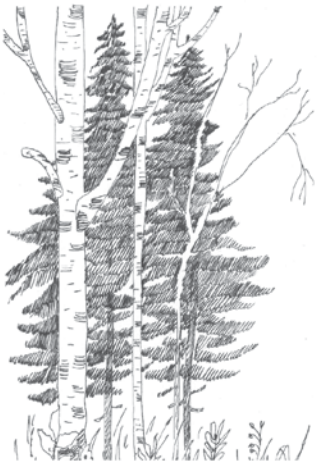
2 = 15% to 35% of the reach vegetation is altered by human activity.

0 = 35% or more of the reach vegetation is altered by human activity.

Scoring Tip 1: Remember to include the area out to 2m deep water if you have emergent plants (eg. cattails or bulrushes), or if the site should have them, but they have been removed.

Scoring Tip 2: Do not count the same area for vegetation alteration and physical alteration (Question 7) unless there are clearly both vegetation changes and structural changes to the bank or shore. Eg. If all the trees are cut down, it is vegetation change; if the ground is bulldozed to remove roots, then it is both vegetation and physical alteration.

What does change in the plant community look like?



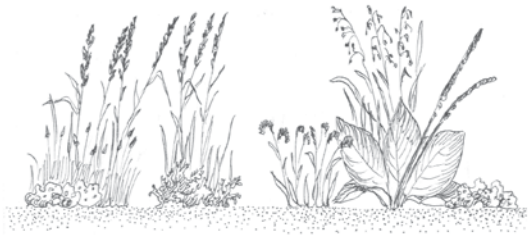
Above, at left: Many layers present: a riparian forest has tall trees, tall and short shrubs, tall, medium and short flowers, plus tall and short grasses.

Above, at right: Some layers lost: the riparian forest has lost the tall shrub species, tall flowers and some of the grasses.

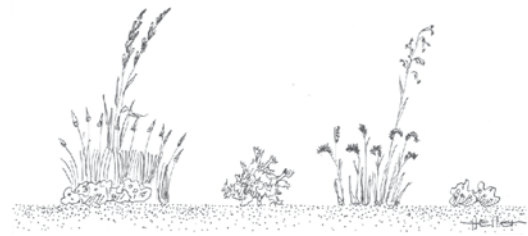
At right: Most layers lost: the riparian forest only has the trees and some medium flowers and short grasses left. All shrub layers are missing. Spaces occur between plants.

Changes to a riparian plant community without trees may be less obvious, but are still important:

At top: Many layers: Tall medium and short grass species plus tall, medium and short flower (broad-leaved) species

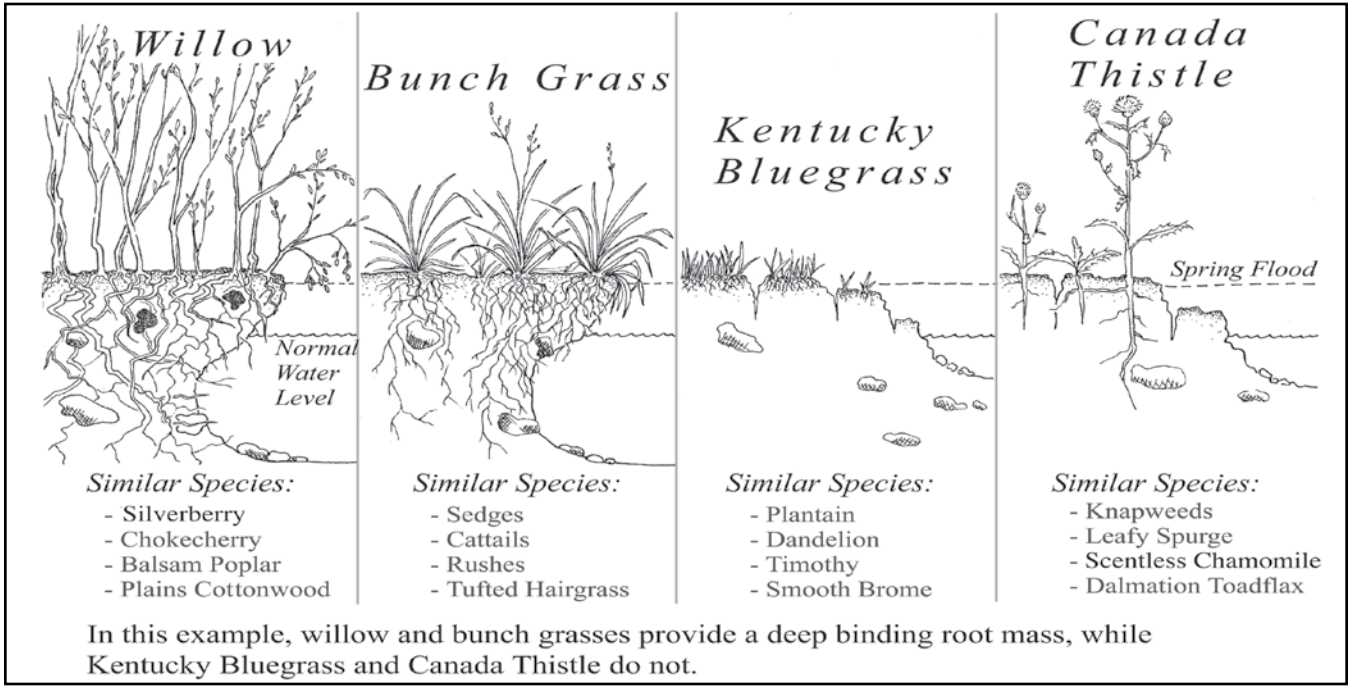


Middle: Some layers lost: Tall grass and tall flower species lost



Bottom: Many layers and species lost: All tall species and most medium height species lost, plus plants are widely spaced

Changes to plant communities include losses of certain layers or group of species, and reducing or increasing the proportion of some species compared to other species.

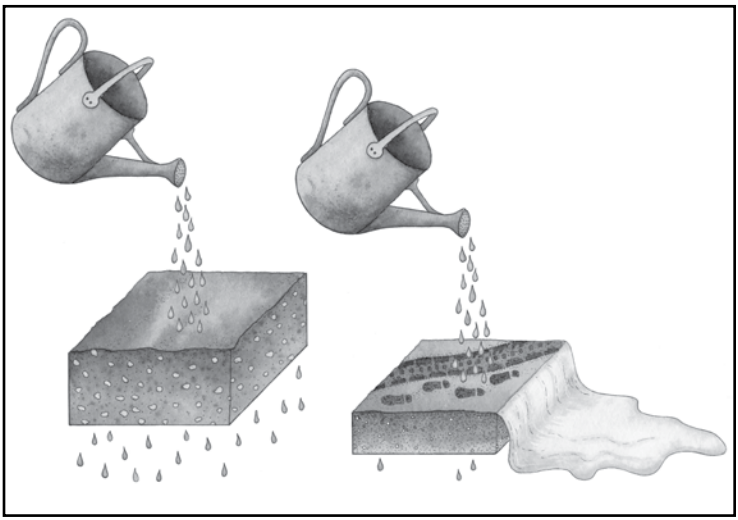


Why are changes to the plant community important?

7. How much of the shore and bank has been physically changed?

Changes in shore and bank shape, contour, and soil structure due to human activities will alter infiltration of water, increase soil compaction, and change the amount of sediment naturally contributed to the waterbody.

These physical changes reduce the water-holding capacity of the soil, thus impacting storage of water and aquifer recharge. Filtration and nutrient uptake, shore and bank maintenance, and primary productivity may all be altered as a result of physical changes.



Compressing the sponge reduces the amount of water that soaks in!

Examples of physical changes included in this question:

- hummocking and pugging by livestock (pugs are the depressions large animal hooves leave in soft soil; hummocks are the raised humps of soil 15 cm (6 in) or higher that result from the soil pushed up from the pug);

- rutting: compacted trails or ruts (ruts are usually 5 cm [2”] or greater) from people, vehicles or livestock (ruts or trails are compacted and compressed soils);
- roads, bridges, pipeline crossings, docks, boat launches or other types of construction and development;
- landscaping and reshaping of bank/shore, including use of riprap, sand or other materials; and
- clearing of vegetation that modifies shore or bank structure/shape

Measurement of physical alterations is done separately for area and severity.

Human alteration of the physical site (area)

Scoring:

12 = Less than 5% of the reach has been physically altered by human activity.

8 = 5% to 15% of the reach has been physically altered by human activity.

4 = 15% to 35% of the reach has been physically altered by human activity.

0 = 35% or more of the reach has been physically altered by human activity.

Severity of Physical Alterations

Of the area with physical alterations, select the best fit category to describe the severity (see details in the following table):

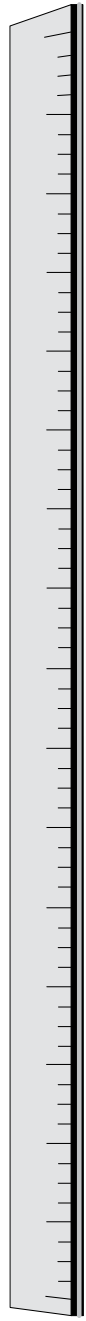
Scoring:

3 = No physical alterations to the site by human activity.

2 = Human alterations to the physical site are slight.

1 = Human alterations to the physical site are moderate.

0 = Human alterations to the physical site are severe.



Severity of Human-Caused Physical Alterations	
None	No human-caused physical alterations present.
Slight	Physical site integrity is near natural. Alterations (including recovery from past severe alterations) is apparent, but reflects minimal impact to plant communities and hydrological function in the altered areas (e.g., the plant community is little changed from that on nearby sites lacking physical alteration; any pugging, hummocking or other soil profile changes are relatively shallow and well vegetated with appropriate species).
Moderate	Compared with nearby unaltered sites, human-caused physical alterations on the site (including recovery from any severe alterations) has noticeably altered the physical site integrity to the point that plant communities and hydrological function on the altered areas show visible impact. The plant community differs noticeably (by having introduced or missing components) from nearby sites that are on similar landscape position and that lack physical alterations. Pugging, hummocking or other soil profile changes are moderate in depth or height. Such alteration is becoming re-vegetated with appropriate species, or is well covered with a mixture of less desirable and appropriate species.
Severe	Human-caused physical alterations have compromised the physical integrity of the altered areas (even if only a small area is altered). Old alterations have not recovered and are still affecting the vegetation or hydrological functions (e.g., the plant community differs radically from nearby sites in similar position that lack physical alterations, reflecting altered hydrologic and/or soil conditions). Pugging, hummocking or other soil profile changes are severe/extreme in depth or height.

Scoring Tip 1: Remember to examine the area out to 2m deep water if you have emergent plants (eg. cattails or bulrushes), or if the site should have them, but they have been removed.

Scoring Tip 2: Do not count the same area for vegetation alteration (Question 6) and physical alteration unless there are clearly both vegetation changes and physical changes to the bank or shore.

8. How much of the riparian area has bare ground caused by human activity?
Human-caused bare ground.

Soil not covered by plants, litter or duff, downed wood or rocks larger than 6 cm (2.5 in) is considered bare ground. Bare ground is unprotected soil that is capable of being eroded by rain drops, overland flow or wind. Bare ground can exist under a tree or shrub canopy and still be subject to erosion from overland flow. It represents an opportunity for erosion and invasion by disturbance or weed species.

- Significant bare ground caused by human activity indicates a deterioration of riparian health.
- Bare ground resulting from natural events or processes, including erosion, deposition, landslides, wildlife, salinity/alkalinity, and drought is excluded from this question.
- Human land uses causing bare ground may include livestock grazing, cultivation, recreation, development, roads/trails, timber harvest and industrial activities.

Consider the entire riparian reach in this question. Estimate, looking down from your eye level, what percentage of the reach has human-caused bare ground using the cover standards illustration on the next page as a guide.

Scoring:

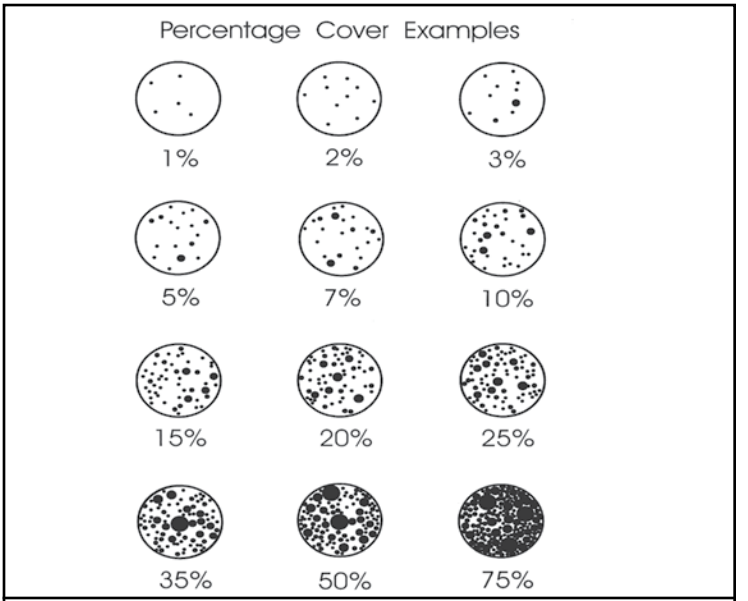
6 = Less than 1% of the reach is human-caused bare ground.

4 = 1% to 5% of the reach is human-caused bare ground.

2 = 5% to 15% of the reach is human-caused bare ground.

0 = More than 15% of the reach is human-caused bare ground.

Scoring Tip: DO NOT include hardened, impervious surfaces (eg. asphalt, concrete); they will not erode or provide weeds an opportunity to grow. They will alter the score when considering Question 1 vegetation cover (which they are not).



Cover standards for estimating percent bare ground

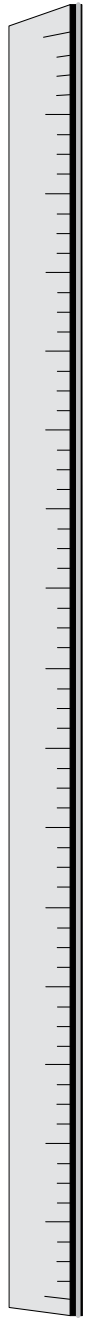
℞ RIPARIAN HINTS

Estimating Human-Caused Bare Ground

✓ Vegetation canopy and bare ground measurements are interrelated. Before judging bare ground, go back and check your vegetation canopy estimate (see Question 1). Example: High vegetation canopy means low bare ground and low vegetation canopy may mean high bare ground.

✓ Does human-caused bare ground include recently exposed soil due to drought? **NO.**

9. Has the water level been artificially modified?
Degree of artificial withdrawal or raising of water level



Lakes, wetlands and sloughs have naturally fluctuating water levels, both between different times of the year, and between years. Humans sometimes remove water, changing the timing or degree of fluctuation, which can inhibit maintenance of healthy riparian plant communities. In extreme cases, this may result in extensive areas of exposed shore, providing opportunities for weeds, increasing erosion, and preventing establishment and maintenance of native plant communities.

Artificially raising water levels, through drainage of other areas into the waterbody, or weirs and control structures, preventing release of water may result in flooding or prevent the normal timing and scale of natural fluctuations.

Look for signs of drainage, pumping, diversion, or other means by which water may be added or removed from the lake or wetland. Consider the scale of the waterbody in relation to the scale of addition or removal. For example creating a drainage ditch from a shallow 1 ha (2 acre) wetland may quickly result in significant removal of water, whereas a ditch of the same size and slope will have a much smaller impact on a lake 10 km (6 mi) in diameter.

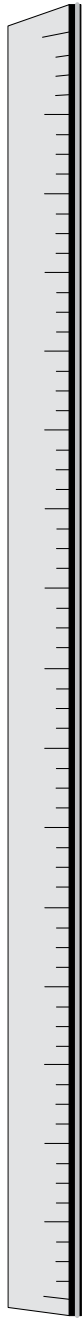
Severity of Artificial Water Level Change	
Not Subjected	The waterbody or wetland is not subjected to artificial water level change
Minor	The waterbody or wetland is subject to no more than minor artificial water level change. The shore area remains vegetated, and withdrawal of water is limited or slow enough that vegetation is able to maintain growth and prevent exposed soil. A relatively narrow band affected by the water level fluctuation may support only annual plants.
Moderate	The waterbody or wetland is subject to moderate quantities, speed and/or frequency of water level change. Where water is removed, some pioneer plants are able to vegetate at least half of the exposed area resulting from drawdown. Where water is added, some flooding may occur at levels or times not typical to the area/season.
Extreme	The waterbody or wetland is subjected to extreme changes in water level due to the volume (extent), speed and/or frequency of water addition or removal. Frequent or unnatural levels of flooding occur where water is added, including extensive flooding into riparian and/or upland areas; or no natural drawdown occurs, reducing the vegetation gradient expected on waterbodies of that type and shore slope. In drawdown situations, a wide, unvegetated band remains.

Scoring:

- **9 =** The waterbody is not subjected to artificial water level change.
- **6 =** The degree of artificial water level change is minor.
- **3 =** The degree of artificial water level change is moderate.
- **0 =** The degree of artificial water level change is extreme.

Scoring Tip 1: If you are cannot assess this question with reasonable certainty, it is better to not answer it and remove the question from the total score.

Scoring Tip 2: In wetlands that do not have surface water (standing water) normally, their water table may be altered by artificial means-look for drainage ditches or changes in normal drainage patterns.



Notes:

HOW TO USE THE FIELD SHEET

In the following section, copies of a field worksheet are provided for you to record the results of your training exercise or to apply the riparian health assessment on your own land base. The field sheet provides a permanent record for future reference and monitoring. In addition to health scores, space is also available to record specific details of what you have observed. For example:

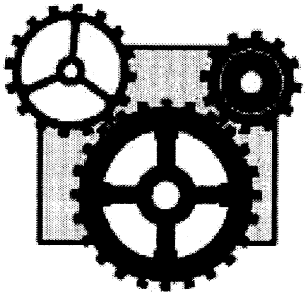
- list the species of invasive species (weeds) or disturbance-caused species that you have observed and where they are located;
- if preferred woody species are being browsed, note the species that show the heaviest use levels;
- extra space is provided on the back of the sheet for more detailed comments on any of the 9 questions;
- there is also space to make a small sketch of where the reach occurs within a particular piece of land and to note where photographs may have been taken; and lastly,
- another very important step is to record the current management of the land you are on:
    - what is the current grazing intensity in the pasture (heavy, moderate, light)?
    - how long is the pasture grazed and when is it rested?
    - when are rest periods provided?
    - what livestock distribution tools are being used (salt, off-site water, supplemental feed)?
    - if this is a cropped field, how is it managed?
    - for lakeshore residents, do you mow or clear it? - what type and intensity of recreational traffic and other uses occur here?

A total of 15 field worksheets are provided. This will allow you to record scores for multiple sites as well as repeated measures over time. You can store the sheets in the workbook, or tear them out and file them away with photographs and other management records.

How Do I Use the Results?

The field sheet knits together the 9 separate questions into one measure of riparian health. **Go to the section following the field sheets to consider what the health score tells you, so you can take the first steps to apply the results of the health rating to your management practices.**

℞ RIPARIAN HINTS



What Do Healthy Riparian Areas Do?
Key Ecological Functions

- ✓ Trap and store sediment
- ✓ Build and maintain banks and shores
- ✓ Store water and energy
- ✓ Recharge aquifers
- ✓ Filter and buffer water
- ✓ Reduce and dissipate energy
- ✓ Maintain biodiversity
- ✓ Create primary productivity

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: _____ **Date:** _____ **Reach No.:** _____

Wetland/Slough/Lake: _____

Site Description: _____ **Scores or N/A**

_____ *Actual / Possible*

1. Vegetative Cover of the Riparian Area (Polygon)

6 4 2 0 ____/____

2. Invasive Plant Species

Canopy Cover

3 2 1 0 ____/____

Density/Distribution

3 2 1 0 ____/____

3. Disturbance-Caused Undesirable Herbaceous Species

3 2 1 0 ____/____

4. Preferred Tree and Shrub Establishment and Regeneration

6 4 2 0 ____/____

5. Use of Trees and Shrubs

Preferred Trees and Shrubs - Browse

3 2 1 0 ____/____

All Trees and Shrubs – Use other than browse

3 2 1 0 ____/____

6. Human Alteration of Riparian Area - Vegetation

6 4 2 0 ____/____

7. Human Alteration of Riparian Area – Physical

Alteration of Area

12 8 4 0 ____/____

Severity

3 2 1 0 ____/____

8. Human-Caused Bare Ground

6 4 2 0 ____/____

9. Degree of Artificial Addition/Removal of Water

9 6 3 0 ____/____

TOTAL _____/_____

PTS	19/63	25/63	32/63	35/63	38/63	41/63	44/63	51/63	58/63
%	**30**	**40**	**51**	**56**	**60**	**65**	**70**	**81**	**92**
		Unhealthy			***Healthy with problems***			***Healthy***	

Riparian Health Assessment - Field Sheet

Comments

1. Vegetative Cover of the Riparian Area (Polygon)

---

2. Invasive Plant Species:
Canopy Cover

Density Distribution

---

3. Disturbance-Caused Undesirable Herbaceous Species

---

4. Preferred Tree and Shrub Establishment and Regeneration

---

5. Use of Trees and Shrubs:
Preferred Trees and Shrubs - Browse

All Trees and Shrubs – Use other than browse

---

6. Human Alteration of Riparian Area - Vegetation

---

7. Human Alteration of Riparian Area - Physical
Alteration of Area

Severity

---

8. Human-Caused Bare Ground

---

9. Degree of Artificial Addition/Removal of Water

Sketch riparian reach here	*Show photo locations*

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: _____ **Date:** _____ **Reach No.:** _____

Wetland/Slough/Lake: _____

Site Description: _____ **Scores or N/A**

_____ *Actual / Possible*

1. Vegetative Cover of the Riparian Area (Polygon)

6 4 2 0 ____/____

2. Invasive Plant Species

Canopy Cover

3 2 1 0 ____/____

Density/Distribution

3 2 1 0 ____/____

3. Disturbance-Caused Undesirable Herbaceous Species

3 2 1 0 ____/____

4. Preferred Tree and Shrub Establishment and Regeneration

6 4 2 0 ____/____

5. Use of Trees and Shrubs

Preferred Trees and Shrubs - Browse

3 2 1 0 ____/____

All Trees and Shrubs – Use other than browse

3 2 1 0 ____/____

6. Human Alteration of Riparian Area - Vegetation

6 4 2 0 ____/____

7. Human Alteration of Riparian Area – Physical

Alteration of Area

12 8 4 0 ____/____

Severity

3 2 1 0 ____/____

8. Human-Caused Bare Ground

6 4 2 0 ____/____

9. Degree of Artificial Addition/Removal of Water

9 6 3 0 ____/____

TOTAL _____/_____

PTS	19/63	25/63	32/63	35/63	38/63	41/63	44/63	51/63	58/63
%	**30**	**40**	**51**	**56**	**60**	**65**	**70**	**81**	**92**
		Unhealthy			***Healthy with problems***			***Healthy***	

Riparian Health Assessment - Field Sheet

Comments

1. Vegetative Cover of the Riparian Area (Polygon)

---

2. Invasive Plant Species:
Canopy Cover

Density Distribution

---

3. Disturbance-Caused Undesirable Herbaceous Species

---

4. Preferred Tree and Shrub Establishment and Regeneration

---

5. Use of Trees and Shrubs:
Preferred Trees and Shrubs - Browse

All Trees and Shrubs – Use other than browse

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6. Human Alteration of Riparian Area - Vegetation

---

7. Human Alteration of Riparian Area - Physical
Alteration of Area

Severity

---

8. Human-Caused Bare Ground

---

9. Degree of Artificial Addition/Removal of Water

Sketch riparian reach here	*Show photo locations*

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: _____ **Date:** _____ **Reach No.:** _____

Wetland/Slough/Lake: _____

Site Description: _____ **Scores or N/A**

_____ *Actual / Possible*

1. Vegetative Cover of the Riparian Area (Polygon)

6 4 2 0 ____/____

2. Invasive Plant Species

Canopy Cover

3 2 1 0 ____/____

Density/Distribution

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Alteration of Area

Severity

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Severity

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RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

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RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

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Wetland/Slough/Lake: _____

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RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

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		Unhealthy			***Healthy with problems***			***Healthy***	

Riparian Health Assessment - Field Sheet

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RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

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9. Degree of Artificial Addition/Removal of Water

Sketch riparian reach here	*Show photo locations*

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: _____ **Date:** _____ **Reach No.:** _____

Wetland/Slough/Lake: _____

Site Description: _____ **Scores or N/A**

_____ *Actual / Possible*

1. Vegetative Cover of the Riparian Area (Polygon)

6 4 2 0 ____/____

2. Invasive Plant Species

Canopy Cover

3 2 1 0 ____/____

Density/Distribution

3 2 1 0 ____/____

3. Disturbance-Caused Undesirable Herbaceous Species

3 2 1 0 ____/____

4. Preferred Tree and Shrub Establishment and Regeneration

6 4 2 0 ____/____

5. Use of Trees and Shrubs

Preferred Trees and Shrubs - Browse

3 2 1 0 ____/____

All Trees and Shrubs – Use other than browse

3 2 1 0 ____/____

6. Human Alteration of Riparian Area - Vegetation

6 4 2 0 ____/____

7. Human Alteration of Riparian Area – Physical

Alteration of Area

12 8 4 0 ____/____

Severity

3 2 1 0 ____/____

8. Human-Caused Bare Ground

6 4 2 0 ____/____

9. Degree of Artificial Addition/Removal of Water

9 6 3 0 ____/____

TOTAL _____/_____

PTS	19/63	25/63	32/63	35/63	38/63	41/63	44/63	51/63	58/63
%	**30**	**40**	**51**	**56**	**60**	**65**	**70**	**81**	**92**
		Unhealthy			***Healthy with problems***			***Healthy***	

Riparian Health Assessment - Field Sheet

Comments

1. Vegetative Cover of the Riparian Area (Polygon)

---

2. Invasive Plant Species:
Canopy Cover

Density Distribution

---

3. Disturbance-Caused Undesirable Herbaceous Species

---

4. Preferred Tree and Shrub Establishment and Regeneration

---

5. Use of Trees and Shrubs:
Preferred Trees and Shrubs - Browse

All Trees and Shrubs – Use other than browse

---

6. Human Alteration of Riparian Area - Vegetation

---

7. Human Alteration of Riparian Area - Physical
Alteration of Area

Severity

---

8. Human-Caused Bare Ground

---

9. Degree of Artificial Addition/Removal of Water

Sketch riparian reach here	*Show photo locations*

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: _____ **Date:** _____ **Reach No.:** _____

Wetland/Slough/Lake: _____

Site Description: _____ **Scores or N/A**

_____ *Actual / Possible*

1. Vegetative Cover of the Riparian Area (Polygon)

6 4 2 0 ____/____

2. Invasive Plant Species

Canopy Cover

3 2 1 0 ____/____

Density/Distribution

3 2 1 0 ____/____

3. Disturbance-Caused Undesirable Herbaceous Species

3 2 1 0 ____/____

4. Preferred Tree and Shrub Establishment and Regeneration

6 4 2 0 ____/____

5. Use of Trees and Shrubs

Preferred Trees and Shrubs - Browse

3 2 1 0 ____/____

All Trees and Shrubs – Use other than browse

3 2 1 0 ____/____

6. Human Alteration of Riparian Area - Vegetation

6 4 2 0 ____/____

7. Human Alteration of Riparian Area – Physical

Alteration of Area

12 8 4 0 ____/____

Severity

3 2 1 0 ____/____

8. Human-Caused Bare Ground

6 4 2 0 ____/____

9. Degree of Artificial Addition/Removal of Water

9 6 3 0 ____/____

TOTAL _____/_____

PTS	19/63	25/63	32/63	35/63	38/63	41/63	44/63	51/63	58/63
%	**30**	**40**	**51**	**56**	**60**	**65**	**70**	**81**	**92**
		Unhealthy			***Healthy with problems***			***Healthy***	

Riparian Health Assessment - Field Sheet

Comments

1. Vegetative Cover of the Riparian Area (Polygon)

---

2. Invasive Plant Species:
Canopy Cover

Density Distribution

---

3. Disturbance-Caused Undesirable Herbaceous Species

---

4. Preferred Tree and Shrub Establishment and Regeneration

---

5. Use of Trees and Shrubs:
Preferred Trees and Shrubs - Browse

All Trees and Shrubs – Use other than browse

---

6. Human Alteration of Riparian Area - Vegetation

---

7. Human Alteration of Riparian Area - Physical
Alteration of Area

Severity

---

8. Human-Caused Bare Ground

---

9. Degree of Artificial Addition/Removal of Water

Sketch riparian reach here	*Show photo locations*

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: _____ **Date:** _____ **Reach No.:** _____

Wetland/Slough/Lake: _____

Site Description: _____ **Scores or N/A**

_____ *Actual / Possible*

1. Vegetative Cover of the Riparian Area (Polygon)

6 4 2 0 ____/____

2. Invasive Plant Species

Canopy Cover

3 2 1 0 ____/____

Density/Distribution

3 2 1 0 ____/____

3. Disturbance-Caused Undesirable Herbaceous Species

3 2 1 0 ____/____

4. Preferred Tree and Shrub Establishment and Regeneration

6 4 2 0 ____/____

5. Use of Trees and Shrubs

Preferred Trees and Shrubs - Browse

3 2 1 0 ____/____

All Trees and Shrubs – Use other than browse

3 2 1 0 ____/____

6. Human Alteration of Riparian Area - Vegetation

6 4 2 0 ____/____

7. Human Alteration of Riparian Area – Physical

Alteration of Area

12 8 4 0 ____/____

Severity

3 2 1 0 ____/____

8. Human-Caused Bare Ground

6 4 2 0 ____/____

9. Degree of Artificial Addition/Removal of Water

9 6 3 0 ____/____

TOTAL _____/_____

PTS	19/63	25/63	32/63	35/63	38/63	41/63	44/63	51/63	58/63
%	**30**	**40**	**51**	**56**	**60**	**65**	**70**	**81**	**92**
		Unhealthy			***Healthy with problems***			***Healthy***	

Riparian Health Assessment - Field Sheet

Comments

1. Vegetative Cover of the Riparian Area (Polygon)

---

2. Invasive Plant Species:
Canopy Cover

Density Distribution

---

3. Disturbance-Caused Undesirable Herbaceous Species

---

4. Preferred Tree and Shrub Establishment and Regeneration

---

5. Use of Trees and Shrubs:
Preferred Trees and Shrubs - Browse

All Trees and Shrubs – Use other than browse

---

6. Human Alteration of Riparian Area - Vegetation

---

7. Human Alteration of Riparian Area - Physical
Alteration of Area

Severity

---

8. Human-Caused Bare Ground

---

9. Degree of Artificial Addition/Removal of Water

Sketch riparian reach here	*Show photo locations*

Now What?
What To Do When You Finish the Assessment

What does the health score mean?

The riparian health score is a cumulative measure of the 9 factors that you have considered on the reach you selected. If you picked a critical reach, the score is the condition for a short stretch of shore you thought might have problems, be sensitive to use or had some other values. If you picked a rep- resentative reach, the score is the average condition for a long stretch of the lake or wetland, within one pasture or management unit. Note that some questions have different possible scores. This gives questions a different weighting factor depending on what they are considered to contribute to a healthy functioning system.

When you have added up the scores for the individual questions to get a total score, calculate what the percentage is, based on the total possible score. The range on the bottom of the score sheet will help you to do this. The score you have derived for the reach falls into one of those categories. These categories (healthy, healthy, but with problems, and unhealthy) describe the reach condition and the reach's ability to perform riparian functions.

What do the health categories tell me?

- 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, provide a long list of benefits and values, and are stable.
- A health score between 60 and 79% puts the reach in the **"healthy, but with problems"** category. Many riparian functions are still being performed, but some clear signs

of stress are apparent. The reach may not be as capable of rebounding from use, is less able to recharge the aquifer, is more vulnerable to erosion and some of the potential of the riparian area has been lost. This is like an amber warning light that there could be problems ahead and management changes should be actively considered. At the same time, with effective management changes, it is likely that a return to a healthier condition is within your grasp.

- A health score of less than 60% means the reach is in an **"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.

What should our goals be for riparian area health? Clearly, we all want these landscapes to be resilient and stable, and provide us with a long list of ecological services, whether we are farmers, ranchers, lakeshore residents, anglers, bird watchers, hikers or downstream water drinkers. Riparian health can vary across the province, from lake to lake to wetland and within single waterbodies ranging from healthy to unhealthy. Some of this variation relates to how riparian landscapes have evolved. Natural disturbances like floods, grazing from native ungulates, fire, drought, beavers and landslides have always affected riparian condition. The results of these disturbances indicate that health could vary over time and from reach to reach. Because of the natural resiliency of these systems, however, it is likely that ecological function was restored relatively quickly. Our use of these landscapes represents an additive and cumulative effect that has often compromised

resiliency. That could be a consequence of what has happened on the reach, what has happened up or down slope, or what has happened upstream or downstream of the reach within the larger watershed. Additional variation in health conditions can be attributed to our use of riparian areas and, in some cases, that use has lead to a decline in condition.

Consider these general goals for riparian area health:

- We need to quickly stabilize the number and length of reaches in an **"unhealthy"** category and actively return them to a better condition.

There may always be a small percentage of sites in the "unhealthy" category. The occasional crossing site, pressure point or naturally unstable bank may not contribute to an overall decline in reach health or make the entire reach more vulnerable to erosion and disturbance events. When these sites are the exception and not the general average for a lake or wetland, the resiliency of the reach compensates.

- We want to carefully watch and actively manage those reaches in a **"healthy, but with problems"** category.

This category likely includes the majority of Alberta's riparian areas. The economic, environmental and social values of these areas are high and we don't want to become complacent about their condition. Active management implies monitoring. We should ensure that the trend over time is positive, indicating improvement in reach condition.

- We must keep **"healthy"** reaches intact, learn from the management that maintains them and apply that knowledge to other areas that are not in as good a condition.
- We need to recognize the most powerful restoration tool we have at our disposal is the natural resilience of these riparian systems, especially the vegetation components.

If we can recognize the stresses, reduce the pressures, be patient and let the system rebound, condition will improve, assuming most of the key pieces are still intact. If some of those key pieces (like woody vegetation) have gone missing, restoring health will be difficult and time consuming.

- We not only need to consider the reaches we stand on, we also need to look up and down the shore, and at associated streams, rivers, lakes and wetlands.

Often, we can improve or maintain health with reach management but sometimes, often even, because of distant effects, we need to work with our neighbours, within our communities and at a watershed level to reach our goals.

Using the health scores to plan management objectives.

Take time to review the overall health score and the rating for each of the 9 questions.

- The total score will tell you if riparian health is good (healthy), if there is cause for concern (healthy, but with problems) or if there is a need for urgent action (unhealthy).
- The scores for individual questions will help you to recognize the riparian "pieces" that have gone missing from the riparian reach and address specific management action.

Riparian health scores and management:

The most important aspect of riparian health assessment is to use the scores to help you formulate management changes. A couple examples follow, with comments and recommendations.

A sample field sheet:
LIVESTOCK GRAZING EXAMPLE
Riparian Health Assessment - Field Sheet

Below, a reach on Twin Moose slough, belonging to the Allan's, receives a health rating of 70%. The site got a score of 44 out of a possible 63 points (44/63 X 100 = 70%). This score puts the stretch of shore in the "healthy, but with problems" category - most riparian functions are being performed, but signs of stress are evident.

- In this example below, all questions apply and have been given a health rating.
- Review the comments to see what each score tells you.

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: *Doolie and Myrtle Allan* **Date:** *July 15/08* **Reach No.:** _____
Wetland/Slough/Lake: *Twin Moose Slough*
Site Description: *Willow-sedge-cattail/bulrush area of slough*

					Scores or N/A Actual / Possible
1. Vegetative Cover of the Riparian Area (Polygon)					
	6	*4*	*2*	*0*	**4 / 6**
2. Invasive Plant Species					
Canopy Cover					
	3	*2*	*1*	*0*	**2 / 3**
Density/Distribution					
	3	*2*	*1*	*0*	**1 / 3**
3. Disturbance-Caused Undesirable Herbaceous Species					
	3	*2*	*1*	*0*	**2 / 3**
4. Preferred Tree and Shrub Establishment and Regeneration					
	6	*4*	*2*	*0*	**4 / 6**
5. Use of Trees and Shrubs					
Preferred Trees and Shrubs - Browse					
	3	*2*	*1*	*0*	**3 / 3**
All Trees and Shrubs – Use other than browse					
	3	*2*	*1*	*0*	**3 / 3**
6. Human Alteration of Riparian Area - Vegetation					
	6	*4*	*2*	*0*	**4 / 6**
7. Human Alteration of Riparian Area – Physical					
Alteration of Area					
	12	*8*	*4*	*0*	**8 / 12**
Severity					
	3	*2*	*1*	*0*	**0 / 3**
8. Human-Caused Bare Ground					
	6	*4*	*2*	*0*	**4 / 6**
9. Degree of Artificial Addition/Removal of Water					
	9	*6*	*3*	*0*	**9 / 9**

Total Score = 44/63 x 100 = 70% ~ *Healthy, but with problems*

PTS	19/63	25/63	32/63	35/63	38/63	41/63	44/63	51/63	58/63
%	**30**	**40**	**51**	**56**	**60**	**65**	**70**	**81**	**92**
	.....	***Unhealthy***			***Healthy with problems***			***Healthy***	

Here's what the Riparian Health Assessment tells you... The Comments sheet (next page) has the details

Vegetation cover is slightly reduced and Canada thistle and Kentucky bluegrass have increased

Some young shrubs are present; there is light browsing on woody species

Kentucky bluegrass has replaced some of the native sedges, reducing deep-binding root mass

Some hoof shear and trampling has increased erosion potential and may be impacting the water's ability to soak in

LIVESTOCK GRAZING EXAMPLE - COMMENTS

Riparian Health Assessment - Field Sheet

Twin Moose Slough July 15/2008 *Comments*

1. Vegetative Cover of the Riparian Area (Polygon)

5% of the reach is not covered by plants

2. Invasive Plant Species:

Canopy Cover

Canada thistle is present with low cover and with a single patch and a few individuals

Density Distribution

3. Disturbance-Caused Undesirable Herbaceous Species

10% cover from foxtail barley, dandelion and Kentucky bluegrass

4. Preferred Tree and Shrub Establishment and Regeneration

A mixture of mature and old willows, with some saplings and seedlings

5. Use of Trees and Shrubs:

Preferred Trees and Shrubs - Browse

Above 25% of the second year and older growth is browsed

All Trees and Shrubs – Use other than browse

No other uses.

6. Human Alteration of Riparian Area - Vegetation

More than 5% of the riparian area is altered. Grazing has led to some changes to the plant community - some willows and tall sedges have been replaced by Kentucky bluegrass

7. Human Alteration of Riparian Area – Physical:

Alteration of Area

Hummocking and pugging occurs on just over 5% of the area

Severity

Hummocks are large and have some bare soil

8. Human-Caused Bare Ground

About 3% of the area is bare soil caused by hoof shear and trailing

9. Degree of Artificial Addition/Removal of Water

The slough is not subjected to artificial drawdown or removal

Sketch riparian reach here	*Show photo locations*

Livestock Grazing Example - Recommendations

The overall health score is 70% or healthy, but with problems. This large slough and its riparian area are performing most riparian functions. There is some naturally caused stress (drought) and some stress caused by livestock grazing. The latter is what we want to focus on managing. There are a number of things they might consider doing based on the riparian health assessment:

- The Allan's could look at their present grazing system and determine that salt can be placed further away from Twin Moose slough, as the water and green forage already act to attract the cattle to graze this area.
- They may want to consider some fine-tuning of their rotational grazing system such as deferring the grazing of this pasture from spring (current use) to later summer grazing, when the soils are drier and less susceptible to trampling.
- With assistance from their local weed inspector or agricultural fieldman, they may consider control of the invasive weeds, focused on the specific areas where the weeds are present.
- To check on how their management changes are working, they should consider monitoring the riparian area over the next couple of years to see if any positive health score changes have occurred. If so, a pat on the back! If not, investigate further and try some alternatives perhaps reexamining their stocking rate is required to reduce the grazing pressure.

A sample field sheet:
LAKESHORE RESIDENT EXAMPLE

Below, a reach on Speckled Lake, belonging to the Tucker's receives a health rating of 56%. The site got a score of 35 out of a possible 63 points (35/63 x 100 = 56%). This score puts the stretch of shore in the "unhealthy" category - most riparian functions are impaired or lost.

- In this example below, all questions apply and have been given a health rating.
- Review the comments to see what each score tells you.

RIPARIAN HEALTH ASSESSMENT - FIELD SHEET

Landowner/Lessee: *Dan and Sue Tucker* **Date:** *July 15/08* **Reach No.:** _____
Wetland/Slough/Lake: *Speckled Lake, Sunset Bay Subdivision, Lot 7*
Site Description: *Shoreline of lake about 1/4 mile in width*

					Scores or N/A *Actual / Possible*
1. Vegetative Cover of the Riparian Area (Polygon)					
	6	*4*	*2*	*0*	**6 / 6**
2. Invasive Plant Species					
Canopy Cover					
	3	*2*	*1*	*0*	**2 / 3**
Density/Distribution					
	3	*2*	*1*	*0*	**2 / 3**
3. Disturbance-Caused Undesirable Herbaceous Species					
	3	*2*	*1*	*0*	**0 / 3**
4. Preferred Tree and Shrub Establishment and Regeneration					
	6	*4*	*2*	*0*	**0 / 6**
5. Use of Trees and Shrubs					
Preferred Trees and Shrubs - Browse					
	3	*2*	*1*	*0*	**2 / 3**
All Trees and Shrubs – Use other than browse					
	3	*2*	*1*	*0*	**0 / 3**
6. Human Alteration of Riparian Area - Vegetation					
	6	*4*	*2*	*0*	**4 / 6**
7. Human Alteration of Riparian Area – Physical					
Alteration of Area					
	12	*8*	*4*	*0*	**8 / 12**
Severity					
	3	*2*	*1*	*0*	**0 / 3**
8. Human-Caused Bare Ground					
	6	*4*	*2*	*0*	**6 / 6**
9. Degree of Artificial Addition/Removal of Water					
	9	*6*	*3*	*0*	**9 / 9**

Total Score = 35/63 x 100 = 56% ~ *Unhealthy*

PTS	19/63	25/63	32/63	35/63	38/63	41/63	44/63	51/63	58/63
%	**30**	**40**	**51**	**56**	**60**	**65**	**70**	**81**	**92**
	←	***Unhealthy***	→		***Healthy with problems***	→		***Healthy***	→

Here's what the Riparian Health Assessment tells you... The Comments sheet (next page) has the details

Vegetation cover is well-established. Canada thistle is present

Lawn grass has replaced most native plants, reducing deep binding root mass

Mowing of shrubs is preventing a healthy woody plant community

Riprap is temporarily preventing some erosion, but imported sand is eroding into lake, adding sediement and nutrients

LAKESHORE RESIDENT EXAMPLE - COMMENTS

Riparian Health Assessment - Field Sheet

SpeckledLake July 15/2008 *Comments*

1. Vegetative Cover of the Riparian Area (Polygon)

More than 95% of the reach is covered by plants - this is good

2. Invasive Plant Species:

Canopy Cover

Canada thistle is present with just a few individuals

Density Distribution

3. Disturbance-Caused Undesirable Herbaceous Species

The majority of the area is lawn grass (Kentucky bluegrass)

4. Preferred Tree and Shrub Establishment and Regeneration

The neighbour's shoreline has a good supply of willows but this area of shoreline has been mowed and no young shrubs or trees are present.

5. Use of Trees and Shrubs:

Preferred Trees and Shrubs - Browse

All Trees and Shrubs – Use other than browse

Willows have been continually mowed on the site and never got very tall. Repeated mowing has killed some and resulted in few willows being left.

6. Human Alteration of Riparian Area - Vegetation

Nearly complete change of plant community from willows, sedges, etc to planted lawn grass. Mowing prevents non-lawn species from surviving and planting replaced almost all native species.

7. Human Alteration of Riparian Area – Physical:

Alteration of Area

Area has been physically altered by a combination of an older boat dock, imported sand, and riprap. About 10% of the area.

Severity

Complete alteration of natural conditions where the alterations are.

8. Human-Caused Bare Ground

There is almost no bare ground, with less than 1% of the area bare due to human actvivites - this is good. Imported sand is the only bare area.

9. Degree of Artificial Addition/Removal of Water

Lake is not subjected to artificial drawdown or removal.

Sketch riparian reach here	*Show photo locations*

Lakeshore Resident Example - Recommendations

The assessment of 58% indicates there are serious problems with the health and function of the shoreline riparian area of Speckled Lake. In particular, most of the native vegetation has been removed and replaced with a combination of lawn grass, imported sand, riprap, and historically, a boat launch. There are a number of things that the Tucker's might consider in terms of how they use and manage their riparian area to return some functions:

- It is quite likely that the removal of the deep binding root mass of the shrubs and sedges has created erosion problems and required the cottager to riprap the beach. Encouraging and allowing the native plants to return, particularly along the water's edge, will begin to stabilize the area and reduce erosion.
- To bring the riparian area back to a more healthy state, reducing or eliminating mowing would allow greater plant structure as well as make it possible for more native, non-lawn species to survive. If mowing continues, try limiting it to the area necessary to access the boat launch.
- Because of the relatively small area, invasive weed control is likely best done through hand pulling/digging.
- Over the long-term, the entire area should be allowed to return to as many native species as possible (eg. tall sedges and willows). If interested, speeding up the process through planting might be an option, using local plants, perhaps collected from a willing neighbour on the lake.

℞ RIPARIAN HINTS

THAT'S IT!
Once you reach a health score and you also understand the riparian health category it represents, it's the END OF THE BEGINNING!

Rx RIPARIAN HINTS

What Do the Health Scores Tell Me? Is My Lakeshore Lame? Take a Reading . . .

If the score is 80 or higher . . .

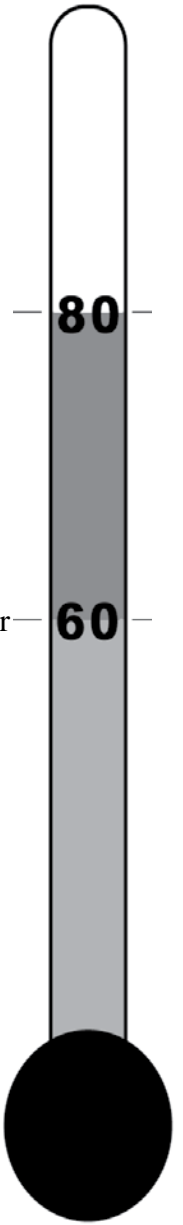
- Congratulations!
- This score means that your riparian area is performing the functions you want it to.
- You should make a record of your present management practices for future reference and share that information with others.

If the score is between 60 and 80 . . .

- Don't jump off the bridge - many riparian functions are still being performed, but your riparian area is showing signs of stress.
- Time to start paying attention to management practices on this site.

If the score is less than 60 . . .

- This riparian area needs attention!
- Who can you contact for advice? **See the list on the inside back cover.**
- What are the main areas of concern?
  - Woody species, weeds, bare soils?
- What can you do to change management?
  - More rest, off-site water, rotational grazing, fencing?
  - Reduce lawn and yard work, let the area return to natural vegetation?



CREDITS

Cover and illustrations on pages 8, 30, 57, 58, and 78 and concepts for illustration on pages 11 - 14 [concepts modified from Ernie Ewaschuk, Land Stewardship Centre of Canada, Edmonton, Alberta] by Elizabeth Saunders, Sandpiper Environmental Consultants, Monarch, Alberta.

Figure on page 25 by Norine Ambrose, Cows and Fish, Lethbridge, adapted from Hansen et al. 2000.

Figures on pages 27 and 50 adapted from: Hansen et al. 2000.

Figure on pages 29, 37, and 62 by Colin Stone, Public Lands Division, ASRD, Peace River.

Figure on page 36 reprinted from: Daubenmire, R. 1959. A canopy-coverage method of vegetational analysis. Northwest Science 33: 43-64.

Figure on page 39 by Darlene Moisey, Public Lands Divison, ASRD, Lethbridge

Figure on pages 55-56 by Eva Heller, St. Paul, Alberta, originally produced for Public Lands Division, ASRD

Field sheet concepts pg 69-70, 75-76, and 78-79 by Barry Adams, Public Lands Division, ASRD, Lethbridge, modified by Gerry Ehlert, Public Lands Division, ASRD, St. Paul and Norine Ambrose, Cows and Fish, Lethbridge.

OTHER REFERENCES FROM COWS AND FISH

Awareness Documents

- **Caring for the Green Zone - Riparian Areas and Grazing Management.** 2003. 3rd Edition. Cows and Fish program, Lethbridge. 46 pages.
- **Riparian Areas: A User's Guide to Health.** 2003. Cows and Fish program, Lethbridge. 46 pages.

Riparian Health and Classification Tools

- **Riparian Health Assessment for Streams and Small Rivers - Field Workbook.**
- **Riparian Health Assessment for Lakes, Sloughs and Wetlands - Field Workbook.** [this booklet]
- **Classification and management of riparian and wetland sites of Alberta.** W. H. Thompson and P. L. Hansen.
  Note that 2 are available:
  - Grassland Natural Regions and Part of Adjacent Subregions;
  - Parkland Natural Region and Dry Mixedwood Natural Subregion
- **Riparian Manuals & Forms for Alberta and associated areas:**
  Health Assessment (Survey) OR Inventory for:
  - Streams and Small Rivers
  - Large Rivers (Assessment only)
  - Lakes, Wetlands, and Sloughs

Cows and Fish Fact Sheets:

- Value of Wetlands
- Lakes and Wetlands
- Crops, Creeks and Sloughs
- The Cows and Fish Process
- Facing the Issues
- Water Quality & Riparian Areas
- Riparian Health Training
- Biodiversity and Riparian Areas
- Riparian Health Assessment and Inventory
- Invasive and Disturbance-caused Plants in Riparian Areas
- Riparian Health Checklists: Looking at my Lakeshore *OR* Streambank
- Getting Past the Talk - Working with Communities
- Riparian Demonstration Sites - a guide to selection and development
- Riparian Profile and Reference Sites
- Community Stories
- Producer Stories from Alberta Farms and Ranches

More fact sheets are available from our website (paper or digital). Cows and Fish provides presentations, workshops, training, extension material, and riparian health evaluations. We can also share management techniques, plus help create a pathway for your community to work on riparian management issues.

For a full list of Cows and Fish Tools, visit: http://www.cowsandfish.org

OTHER REFERENCES

Development of methodologies to Evaluate the Health of Riparian and Wetland Areas. Paul Hansen, William Thompson, Robert Ehrhart, Dan Hinckley, Bill Haglan, and Karen Price. 2000. In: Proceedings of the Fifth International Symposium of Fish Physiology, Toxicology, and Water Quality, Hong Kong, China, November 10-13, 1998. Vance Thurston, Editor. United States Environmental Protection Agency, Office of Research and Development, Washington, DC, 20460, EPA/600/R-00/015. pages 233- 244.

Range Health Assessment for Grassland, Forest and Tame Pasture. B. Adams, G, Ehlert, C. Stone, M. Alexander, D. Lawrence, M. Willoughby, D. Moisey, C. Hincz, and A. Bogen. 2003. Public Lands Division, ASRD, 105 pages. Pub. No. T/044.

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.

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.

Who else can I contact for information and resources?

- Cows and Fish Partners (see inside back cover)
- Agricultural Service Boards and Conservation Technicians of your local municipality or county
- Alberta Stewardship Network website: http://www.ab.stewardshipcanada.ca

Notes:

APPENDIX

[Please note: this information is also available from Cows and Fish as a fact sheet]

Invasive and Disturbance-caused Undesirable Herbaceous Species for Riparian Health Assessments

Why have a detailed species list for weeds and disturbance-caused undesirable plants?

In order to accurately determine the health of a riparian area, those completing the assessment or inventory need to know which species in the native plant community would be present with natural disturbance and which would not. In other words, which ones are **disturbance-caused** species (native or introduced, they increase or become more prevalent due to higher than natural levels of disturbance or activities) and **invasive weeds** (non-natives, see **What is a weed?** below). Weeds may be vigorous competitors that prevent a healthy, native riparian community from providing important riparian functions like sediment trapping, shore and bank stabilization, and filtration.

This list was generated for Alberta, to ensure consistency between those collecting and interpreting riparian health information. It was developed in conjunction with information from the Alberta Weed Designation Regulations and extensive experience and testing by Cows and Fish team members and Public Lands Division, ASRD.

There may be additional invasive or disturbance-caused species, or you may find some species respond differently in your region, however the purpose of this list is to create consistency based on considerable expertise and experience. If you feel a species needs to be added or modified on the list, be sure to talk to other plant community and riparian experts in your area.

What is a weed?

The Weed Control Act of Alberta designates certain weeds into two categories: *Prohibited Noxious* and *Noxious* (as of 2010).

By law, **prohibited noxious** weeds must be eradicated because of their highly competitive nature. Prohibited Noxious weeds pose a threat to agriculture and the environment because the spread rapidly and are difficult to control. **Noxious** weeds have potential for spreading rapidly and can cause severe crop losses resulting in economic hardship. By law, weeds in this category must be controlled to prevent their spread. Contact your local agricultural representative to confirm weed designations in your area.

Updated copies of Weed Designation Regulations for Alberta can be obtained from the Queen's Printer Bookstore (online or Edmonton or Calgary).

For riparian health assessment and inventory, we distinguish two categories of plants:

- **invasive plants** (restricted weeds and most noxious weeds)
- **disturbance-caused undesirable herbaceous species** (most nuisance weeds as well as other plant species that respond to site disturbance. Native and non-native species.)

Invasive plants are typically non-native perennial plants that are very aggressive, competitive, and difficult to eradicate.

Disturbance-caused undesirable species include native and non-native species that tend to increase with site disturbance, and are regarded as undesirable because they do not perform optimal riparian functions (eg. provide deep-binding root mass for bank and shore protection). Such site disturbance is often linked to a downward trend for plant communities from the potential natural community, and reduced riparian function or "health".

Impact of weeds

Invasive weeds and disturbance-caused plants can cause havoc in riparian areas, competing for space, nutrients, water and light

normally available to native plants. If left uncontrolled, they can eventually take over riparian areas, creating a vegetation community of just one or two species. Some weeds have the ability to alter soil chemistry, with subtle, but harmful effects on native plants. The result is:

- Reduced structural and habitat diversity for wildlife and livestock.
- Increased erosion, run-off and bank or shore instability as most weed species lack deep, binding root systems compared to the natural riparian plants they replace.
- Poorer food or forage for wildlife and livestock as most weeds are unpalatable and some are toxic.
- Reduced ability to perform natural ecological functions and lower resilience to natural disturbances such as floods and fire.

How to Read the Species Table

Please note that the list of designated weeds (restricted, noxious, and nuisance) is based on the Weed Designation Regulations of the Weed Control Act of Alberta, most current at the time this list was created. The list of disturbance-caused species includes all of the disturbance-caused species Cows and Fish has encountered-there may be others in your area. In addition, you may find that some species respond differently to disturbance, depending upon the region you are working in. Individual counties and municipal districts occasionally have by-laws that rate the regulated species (restricted, noxious, and nuisance) more stringently. Contact a local agricultural representative to confirm weed designations in your area.

Understanding the Species List Table:

Species Code (in the Species Table) refers to the seven letter code used to record the Latin (scientific) name of a species during riparian health evaluations. The first four letters are usually composed of the beginning of the genus, while the last three letters of the code are the start of the species name. If the genus

is only three letters, then four letters are taken from the species portion. These codes are used for consistency and speed of data collection. If you are unfamiliar with the codes or scientific name, ensure that whatever common name you use is verified with a scientific name at a later date, since common names tend to be more variable (and less common) than you might think.

Regulated Category refers to the designation given to weeds (prohibited noxious or noxious) under the Weed Designation Regulations.

Based on the Weed Designation Regulation (Weed Control Act) in Alberta:

- **Prohibited Noxious** weeds are listed as '**PN**', short for **P**rohibited **N**oxious. Due to the serious management implications these species pose, they are indicated by bold lettering.
- **Noxious** weeds are indicated by '**N**', short for Noxious.
- Species that are **not regulated** under the Weed Control Act are indicated by a '**0**'

Riparian Health Plant Category refers to the suggested categorization of these plants for riparian health assessment and inventory purposes. Two plant categories are important in riparian health assessment and inventory:

- **Invasive plants** are indicated by '**I**'. Invasive species generally includes all prohibited noxious, most noxious, and rarely other weeds.
- **Disturbance-caused undesirable herbaceous species** are indicated by '**D**'. They include mostly nuisance weed species (no longer on the Weed Regulations), rarely a noxious weed species, as well as native species that increase with disturbance in riparian areas.

Species	Latin Name	Common Name	Riparian Health[x]	Regulated[1]
AEGICYL	***Aegilops cylindrica***	**jointed goatgrass**	**I**	**PN**
ALLIPET	***Alliaria petiolata***	**garlic mustard**	**I**	**PN**
ARCTLAP	*Arctium lappa*	great burdock	I	N
ARCTMIN	*Arctium minus*	common burdock	I	N
ARCTTOM	*Arctium tomentosum*	woolly burdock	I	N
BERBVUL	***Berberis vulgaris***	**common barberry**	**I**	**PN**
BERTINC	***Berteroa incana***	**hoary alyssum**	**I**	**PN**
BROMJAP	Bromus japonicus	Japanese chess/brome	I	N
BROMTEC	Bromus tectorum	downy chess/brome	I	N
BUTOUMB	***Butomus umbellatus***	**flowering rush**	**I**	**PN**
CAMPRAP	*Campanula rapunculoides*	creeping bellflower; garden bluebell	I	N
CARAARB	*Caragana arborescens*	common caragana	I	0
CARDCHA	*Cardaria chalepensis (syn. Lepidium chalepense)*	hoary cress	I	N
CARDDRA	*Cardaria draba (syn. Lepidium draba)*	heart-podded hoary cress	I	N
CARDPUB	*Cardaria pubescens (syn. Lepidium appelianum)*	globe-podded hoary cress	I	N
CARDACA	***Carduus acanthoides***	**plumeless thistle**	**I**	**PN**
CARDNUT	***Carduus nutans***	**nodding thistle**	**I**	**PN**
CENTDIF	***Centaurea diffusa***	**diffuse knapweed**	**1**	**PN**
CENTJAC	***Centaurea jacea***	**brown knapweed**	**I**	**PN**
CENTMAR	***Centaurea macrocephala***	**bighead knapweed**	**I**	**PN**
CENTMAC	***Centaurea maculosa (syn. C. stoebe)***	**spotted knapweed**	**I**	**PN**
CENTNIG	***Centaurea nigra***	**black knapweed**	**I**	**PN**
CENTNIR	***Centaurea nigrescens***	**Tyrol knapweed**	**I**	**PN**
CENTREP	*Centaurea repens (syn. Rhaponticum repens)*	Russian knapweed	I	0
CENTSOL	***Centaurea solstitialis***	**yellow star thistle**	**I**	**PN**
CENTVIR	***Centaurea virgata***	**squarrose knapweed**	**I**	**PN**
CENTMON	***Centaurea x moncktonii***	**meadow knapweed**	**I**	**PN**
CENTPSA	***Centaurea x psammogena***	**hybrid knapweed**	**I**	**PN**
CHONJUN	***Chondrilla juncea***	**rush skeletonweed**	**I**	**PN**
CHRYLEU	*Chrysanthemum leucanthemum (syn. Leucanthemum vulgare)*	ox-eye daisy	I	N
CIRSARV	*Cirsium arvense*	Canada thistle	I	N
CIRSPAL	***Cirsium palustre***	**marsh thistle**	**I**	**PN**
CLEMTAN	*Clematis tangutica*	yellow clematis	I	N
CONVARV	*Convolvulus arvensis*	field bindweed	I	N
CRUPVUL	***Crupina vulgaris Persoon***	**common crupina**	**I**	**PN**
CUSCGRO	*Cuscuta gronovii*	common dodder	I	0

Species	Latin Name	Common Name	Riparian Health[x]	Regulated[1]
CYNOOFF	*Cynoglossum officinale*	hound's-tongue	I	N
CYPEESC	***Cyperus esculentus***	**yellow nutsedge**	**I**	**PN**
ECHIVUL	*Echium vulgare*	viper's-bugloss; blueweed	I	N
ELAEANG	*Elaeagnus angustifolia*	Russian olive	I	0
ELAEUMB	***Elaegnus umbellata***	**autumn olive**	**I**	**PN**
EUPHCYP	*Euphorbia cyparissias*	cypress spurge	I	0
EUPHESU	*Euphorbia esula*	leafy spurge	I	N
GALIAPA	*Galium aparine*	cleavers	I	0
GALISPU	*Galium spurium*	false cleavers	I	0
GYPSPAN	*Gypsophila paniculata*	common baby's-breath	I	N
HALOGLO	***Halogeton glomeratus***	**saltlover**	**I**	**PN**
HERAMAN	***Heracleum mantagazzianum***	**giant hogweed**	**I**	**PN**
HESPMAT	*Hesperis matronalis*	dame's rocket	I	N
HIERAUR	***Hieracium aurantiacum***	**orange hawkweed**	**I**	**PN**
HIERCAE	***Hieracium caespitosum***	**meadow hawkweed**	**I**	**PN**
HIERPIL	***Hieracium pilosella***	**mouse-ear hawkweed**	**I**	**PN**
HYOSNIG	*Hyoscyamus niger*	black henbane	I	N
HYPEPER	***Hypericum perforatum***	**common St John's-wort**	**I**	**PN**
IMPAGLA	*Impatiens glandulifera*	Himalayan balsam	I	N
IRISPSE	***Iris pseudacorus***	**pale yellow iris**	**I**	**PN**
ISATTIN	***Isatis tinctoria***	**dyer's woad**	**I**	**PN**
JACOVUL	***Jacobaea vulgaris (syn. Senecio jacobaea)***	**tansy ragwort**	**I**	**PN**
KNAUARV	*Knautia arvensis*	blue buttons; field scabious	I	N
LEPILAT	*Lepidium latifolium*	broad-leaved pepper-grass	I	N
LINADAL	*Linaria dalmatica*	broad-leaved/ Dalmatian toadflax	I	N
LINAVUL	*Linaria vulgaris*	yellow toadflax/ butter-and-eggs	I	N
LOLIPES	*Lolium persicum*	Persian darnel	I	0
LYTHSAL	***Lythrum salicaria***	**purple loosestrife**	**I**	**PN**
MATRPER	*Matricaria perforata (syn: Tripleurospermum perforatum)*	scentless chamomile	I	N
MYRISPI	***Myriophyllum spicatum***	**Eurasian water milfoil**	**I**	**PN**
ODONSER	***Odontites serotina (syn. O. vernus)***	**late-flowering eyebright; red bartsia**	**I**	**PN**
POLYCUS	***Polygonum cuspidatum (syn. Fallopia japonica)***	**Japanese knotweed**	**I**	**PN**
POLYSAC	***Polygonum sachalinensis (syn. Fallopia sachalinensis)***	**giant knotweed**	**I**	**PN**
POLYBOH	***Polygonum x bohemicum (syn. Fallopia x bohemica)***	**hybrid Japanese knotweed**	**I**	**PN**

Species	Latin Name	Common Name	Riparian Health[x]	Regulated[1]
POTEREC	***Potentilla recta***	**rough-fruited/ sulphur cinquefoil**	**I**	**PN**
RANUACR	*Ranunculus acris*	tall buttercup	I	N
RHAMCAT	***Rhamnus catharticus (cathartica)***	**European (common) buckthorn**	**I**	**PN**
SILEPRA	*Silene pratensis (syn. S. latifolia; Lychnis alba)*	white cockle	I	N
SONCARV	*Sonchus arvensis*	perennial sow-thistle	I	N
SONCULI	*Sonchus arvensis ssp. uliginosus*	smooth perennial sow-thistle	I	0
TAENCAP	***Taeniatherum caput-medusae (syn. Taeniatherum caput)***	**medusahead**	**I**	**PN**
TAMACHI	***Tamarix*** spp.	**tamarisk; salt cedar**	**I**	**PN**
TANAVUL	*Tanacetum vulgare*	common tansy	I	N
TRIBTER	***Tribulus terrestris***	**puncturevine**	**I**	**PN**
VERBTHA	*Verbascum thapsus*	common mullein	I	N
VICICRA	*Vicia cracca*	tufted vetch	I	0
AGROPEC	*Agropyron pectiniforme*	crested wheat grass	D	0
AGROREP	*Agropyron repens*	quack grass	D	0
AMARRET	*Amaranthus retroflexus*	red-root pigweed	D	0
ANTEALP	*Antennaria alpina*	alpine everlasting	D	0
ANTEANA	*Antennaria anaphaloides*	tall everlasting	D	0
ANTEAPR	*Antennaria aprica*	low everlasting	D	0
ANTEARO	*Antennaria aromatica*	scented everlasting	D	0
ANTECOR	*Antennaria corymbosa*	corymbose everlasting	D	0
ANTEDIM	*Antennaria dimorpha*	cushion everlasting	D	0
ANTELAN	*Antennaria lanata*	woolly everlasting	D	0
ANTELUZ	*Antennaria luzuloides*	silvery everlasting	D	0
ANTEMON	*Antennaria monocephala*	one-headed everlasting	D	0
ANTENEG	*Antennaria neglecta*	broad-leaved everlasting	D	0
ANTEPAR	*Antennaria parvifolia*	small-leaved everlasting	D	0
ANTEPUL	*Antennaria pulcherrima*	showy everlasting	D	0
ANTERAC	*Antennaria racemosa*	racemose everlasting	D	0
ANTEROS	*Antennaria rosea*	rosy everlasting	D	0
ANTEUMB	*Antennaria umbrinella*	brown-bracted mountain everlasting	D	0
APOCAND	*Apocynum androsaemifolium*	spreading dogbane	D	0
AVENFAT	*Avena fatua*	wild oat	D	0
AVENSAT	*Avena sativa*	cultivated oat	D	0
BRASCAM	*Brassica campestris*	rape	D	0
BRASKAB	*Brassica kaber (Sinapis arvensis)*	wild mustard	D	0
BRASNAP	*Brassica napus var. napus*	Argentine canola/rape	D	0
BRASRAP	*Brassica rapa*	Polish canola	D	0

Species	Latin Name	Common Name	Riparian Health[x]	Regulated[1]
BROMINE	*Bromus inermis*	smooth brome	D	0
CAPSBUR	*Capsella bursa-pastoris*	shepherd's-purse	D	0
CERAARV	Cerastium arvense	field mouse-ear chickweed	D	0
CERANUT	*Cerastium nutans*	long-stalked mouse-ear chickweed	D	0
CERAVUL	*Cerastium vulgatum*	common mouse-ear chickweed	D	0
CHENALB	*Chenopodium album*	lamb's-quarters	D	0
CONVSEP	*Convolvulus sepium*	wild morning-glory	D	0
CREPTEC	*Crepis tectorum*	annual hawk's-beard	D	0
DESCPIN	*Descurainia pinnata*	green tansy mustard	D	0
DESCSOP	*Descurainia sophia*	tansy mustard; flixweed	D	0
ERODCIC	*Erodium cicutarium*	stork's-bill	D	0
ERUCGAL	*Erucastrum gallicum*	dog mustard	D	0
ERYSCHE	*Erysimum cheiranthoides*	wormseed mustard	D	0
FAGOTAR	*Fagopyrum tartaricum*	tartary buckwheat	D	0
FRAGVES	*Fragaria vesca*	woodland strawberry	D	0
FRAGVIR	*Fragaria virginiana*	wild strawberry	D	0
GALETET	*Galeopsis tetrahit*	hemp-nettle	D	0
HORDJUB	*Hordeum jubatum*	foxtail barley	D	0
HORDVUL	*Hordeum vulgare*	cultivated barley	D	0
LAMIAMP	*Lamium amplexicaule*	henbit	D	0
LAPPSQU	*Lappula squarrosa (syn. L. echinata)*	bluebur	D	0
MALVROT	*Malva rotundifolia*	round-leaved mallow	D	0
MEDILUP	*Medicago lupulina*	black medick	D	0
MELIALB	*Melilotus alba*	white sweet-clover	D	0
MELIOFF	*Melilotus officinalis*	yellow sweet-clover	D	0
NESLPAN	*Neslia paniculata*	ball mustard	D	0
PHLEPRA	*Phleum pratense*	timothy	D	0
PISUSAT	*Pisum sativum*	field peas	D	0
PLANMAJ	*Plantago major*	common plantain	D	0
POACOMP	*Poa compressa*	Canada bluegrass	D	0
POAPRAT	*Poa pratensis*	Kentucky bluegrass	D	0
POLYCON	*Polygonum convolvulus*	wild buckwheat	D	0
POLYPER	*Polygonum persicaria*	lady's-thumb	D	0
POTEANS	*Potentilla anserina*	silverweed	D	0
POTENOR	*Potentilla norvegica*	rough cinquefoil	D	0
RAPHRAP	*Raphanus raphanistrum*	wild radish	D	0
SALSKAL	*Salsola kali*	Russian-thistle	D	0
SCLEANN	*Scleranthus annuus*	knawel	D	0
SECACER	*Secale cereale*	rye cereal	D	0
SETAVIR	*Setaria viridis*	green foxtail	D	0

Species	Latin Name	Common Name	Riparian Health[x]	Regulated[1]
SILECSE	*Silene cserei*	smooth catchfly	D	0
SILECUC	*Silene cucubalus*	bladder campion	D*	0
SILENOC	*Silene noctiflora*	night-flowering catchfly	D	0
SONCOLE	*Sonchus oleraceus*	annual sow-thistle	D	0
SPERARV	*Spergula arvensis*	corn spurry	D	0
STELMED	*Stellaria media*	common chickweed	D	0
TARAOFF	*Taraxacum officinale*	common dandelion	D	0
THLAARV	*Thlaspi arvense*	stinkweed	D	0
TRIFAUR	*Trifolium aureum*	yellow clover	D	0
TRIFHYB	*Trifolium hybridum*	alsike clover	D	0
TRIFPRA	*Trifolium pratense*	red clover	D	0
TRIFREP	*Trifolium repens*	white clover	D	0
TRITAES	*Triticum aestivum*	common wheat	D	0
VACCPYR	*Vaccaria pyramidata* (syn. *Saponaria vaccaria*)	cow cockle	D	0
TRITRIM	*X Triticosecale rimpaui*	triticale	D	0

1 Regulated refers to these categories: 0-not regulated; 1-restricted; 2-noxious; 3-nuisance

x Indicates suggested categorization of the species in riparian health assessment/inventories: I-invasive species; D-disturbance-caused undesirable species

* The categorization of this species may change

NOTE: Other non-native or agronomic species may be 'D' too, but are not listed here. If you find a species that is not listed here but should be considered in riparian health assessment or inventory, record it and note that it was included. Consistency is important: remember that if you add species you should consult with Cows and Fish or other plant community experts in your area.

Notes:

Notes:

GLOSSARY

Canopy cover - the ground area covered by vegetative growth. Different plant species can provide varying degrees of cover depending on their overall size and abundance.

Critical site - one that may be sensitive, or already has some specific problems, for assessment.

Disturbance-caused undesirable herbaceous species - native or introduced non-woody plant species that are well adapted to disturbance or an environment of continual stress.

Deep binding roots - the type of plant roots that hold together most of the shore or banks, in the face of regular waves, runoff and flooding.

Human-caused bare ground - areas devoid of vegetation as a result of human activity. This can include vehcle roads, recreational trails and livestock trails.

Invasive plant species - these are typically weed species classified as noxious or restricted by the Weed Control Act and have the potential to infest riparian areas.

Lake - large non-flowing waterbody, generally greater than 10 ha.

Lentic - this term means standing or still water (i.e. lakes, wetlands and sloughs).

Lotic - this term means flowing water (i.e. streams and rivers).

Pioneer species - plant species that are early or first to establish on recently made available habitat (eg. bare soil patch). Often these are annual weeds, but some native wildflower species, such as fireweed (not actually a weed) are also pioneer species.

Pugging and hummocking - the depressions (pugs) and raised mounds of soil (hummocks) resulting from large animals walking through soft or moist soil.

Reach - a stretch of shore assessed for riparian health, with width based on the extent of the riparian area (from open water to the upland) and with length based on selecting a representative or critical site within one management (and ownership) unit.

Representative site - a site that is typical of a much longer stretch of shore and that will provide an overall impression of health for that longer area.

Rutting - the compacted trails or ruts from people, vehicles or livestock, with trails compressed more than 5 cm (2 in) deep.

Slough - another name used commonly for wetland or prairie pothole.

Structural alteration - physical changes to the shape or contour of the shore or banks caused by human influences. Some examples are livestock trampling, riprap and excavation.

Tree and shrub regeneration - the presence of seedlings and saplings, or the new growth.

Tree and shrub utilisation - browse (eating by animals), rubbing off, or cutting/removal of woody growth on trees and shrubs (only utilisation of second year and older growth included in riparian health assessment).

Watershed - the area of land that drains into a single waterbody. While a small wetland will usually have a small watershed or drainage basin, a large river (eg. North Saskatchewan River) will have a very large watershed, composed of many smaller watersheds of other waterbodies.

Woody plant species - refers to trees and shrubs. These plants serve different riparian functions than grasses and broad-leaf plants, since they are typically more resilient and longer-lived, with deeper root systems.

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Riparian Specialist, Calgary Bearspaw:
Tel: 587-821-9030

Riparian Specialist, Airdrie:
Tel: 403-948-8519

Riparian Specialist, Rocky Mountain House:
Tel: 825-365-8557

Riparian Specialists, Edmonton:
Tel: 780-427-7940/3615

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