ALBERTA LENTIC WETLAND HEALTH ASSESSMENT (Survey) USER MANUAL

This document is intended to accompany the Alberta Lentic Wetland Health Assessment (Survey) Form for the rapid evaluation of the functional health status of lentic (still water) wetlands. Other forms are available for lotic (flowing water) wetlands.

ACKNOWLEDGEMENT

Development of these assessment tools has been a collaborative and reiterative process. Many people from many agencies and organizations have contributed greatly their time, effort, funding, and moral support for the creation of these documents, as well as to the general idea of devising a way for people to look critically at wetlands and riparian areas in a systematic and consistent way. Some individuals and the agencies/organizations they represent who have been instrumental in enabling this work are Dan Hinckley, Tim Bozorth, and Jim Roscoe of the USDI Bureau of Land Management in Montana; Karen Rice and Karl Gebhardt of the USDI Bureau of Land Management in Idaho; Bill Haglan of the USDI Fish and Wildlife Service in Montana; Barry Adams and Gerry Ehlert of Alberta Public Lands Division; Lorne Fitch of Alberta Environmental Protection; and Greg Hale and Norine Ambrose of the Alberta Cows and Fish Program.

BACKGROUND INFORMATION

Introduction

Public and private land managers are being asked to improve or maintain wetland (lentic) habitat and water quality on lands throughout the western North America. Three questions that are generally asked about a wetland site are: 1) What is the potential of the site (e.g., climax or potential natural community)? 2) What plant communities currently occupy the site? and 3) What is the overall health (condition) of the site? For a lentic (still water) site, the first two questions can be answered by using the Alberta Lentic Wetland Inventory Form along with *Classification and management of riparian and wetland sites of Alberta's Grassland Natural Region* (Thompson and Hansen 2002) or a similar publication.

This Alberta Lentic Wetland Health Assessment (Survey) is a method for rapidly addressing the third question above: what is the site's overall health (condition)? It provides a site rating useful for setting management priorities and stratifying wetland sites for remedial action or closer analytical attention. It is intended to serve as a first approximation, or "coarse filter," by which to identify lentic wetlands in need of closer attention so that the manager can more efficiently concentrate effort. We use the term "lentic (still water wetland) health" to mean the ability of a lentic wetland to perform certain functions. These functions include sediment trapping, shoreline maintenance, water storage, aquifer recharge, wave energy dissipation, maintenance of biotic diversity, and primary production.

Flowing Water (Lotic) vs. Still Water (Lentic) Wetlands

Cowardin and others (1979) point out that no single, correct definition for wetlands exists, primarily due to the nearly unlimited variation in hydrology, soil, and vegetative types. Wetlands are lands transitional between aquatic (water) and terrestrial (upland) ecosystems. Windell and others (1986) state that "wetlands are part of a continuous landscape that grades from wet to dry. In many cases, it is not easy to determine precisely where they begin and where they end."

In the semi-arid and arid portions of western North America, a useful distinction has been made between wetland types based on association with different aquatic ecosystems. Several authors have used ***lotic*** and ***lentic*** to separate wetlands associated with running water from those associated with still water. The following definitions represent a synthesis and refinement of terminology from Shaw and Fredine (1956), Stewart and Kantrud (1972), Boldt and others (1978), Cowardin and others (1979), American Fisheries Society (1980), Johnson and Carothers (1980), Cooperrider and others (1986), Windell and others (1986), Environmental Laboratory (1987), Kovalchik (1987), Federal Interagency Committee for Wetland Delineation (1989), Mitsch and Gosselink (1993), and Kent (1994).

Lentic wetlands are associated with still water systems. These wetlands occur in basins and lack a defined channel and floodplain. Included are permanent (i.e., perennial) or intermittent bodies of water such as lakes, reservoirs, potholes, marshes, ponds, and stockponds. Other examples include fens, bogs, wet meadows, and seeps not associated with a defined channel.

Lotic wetlands are associated with rivers, streams, and drainageways. They contain a defined channel and floodplain. The channel is an open conduit, which periodically or continuously carries flowing water. Beaver ponds, seeps, springs, and wet meadows on the floodplain of, or associated with, a river or stream are part of the lotic wetland.

Functional vs. Jurisdictional Wetland Criteria

Defining wetlands has become more difficult as greater economic stakes have increased the potential for conflict between politics and science. A universally accepted wetland definition satisfactory to all users has not yet been developed because the definition depends on the objectives and the field of interest. However, scientists generally agree that wetlands are characterized by one or more of the following features: 1) ***wetland hydrology,*** the driving force creating all wetlands, 2) ***hydric soils,*** an indicator of the absence of oxygen, and 3) ***hydrophytic vegetation,*** an indicator of wetland site conditions. The problem is how to define and obtain consensus on thresholds for these three criteria and various combinations of them.

Wetlands are not easily identified and delineated for jurisdictional purposes. Functional definitions have generally been difficult to apply to the regulation of wetland dredging or filling. Although the intent of legislation is to protect wetland functions, the current delineation of jurisdictional wetland still relies upon structural features or attributes. The hydrogeomorphic (HGM) approach being developed by the US Corps of Engineers is intended to focus more specifically on wetland functions.

The prevailing view among many wetland scientists is that functional wetlands need to meet only one of the three criteria as outlined by Cowardin and others (1979) (e.g., hydric soils, hydrophytic plants, and wetland hydrology). On the other hand, jurisdictional wetlands need to meet all three criteria, except in limited situations. Even though functional wetlands may not meet jurisdictional wetland requirements, they certainly perform wetland functions resulting from the greater amount of water that accumulates on or near the soil surface relative to the adjacent uplands. Examples include some woody draws occupied by the *Acer negundo/Prunus virginiana* (Manitoba maple/choke cherry) habitat type (Thompson and Hansen 2002) and some floodplain sites occupied by the *Artemisia cana/Agropyron smithii* (silver sagebrush/western wheatgrass) habitat type or the *Populus tremuloides/Cornus stolonifera* (aspen/red-osier dogwood) habitat type. Currently, many of these sites fail to meet jurisdictional wetland criteria. Nevertheless, these functional wetlands provide important wetland functions vital to wetland dependent species and may warrant special managerial consideration. The current interpretation is that not all functional wetlands are jurisdictional wetlands, but that all jurisdictional wetlands are functional wetlands.

Lentic Wetland Health

As noted above, the health of a lentic site (a wetland located adjacent to a still water body) may be defined as the ability of that system (including the saturated and inundated near-shore emergent wetland and all the shoreline area that is influenced by the lentic waters) to perform certain wetland functions. These functions include sediment trapping, shoreline maintenance, water storage, aquifer recharge, wave energy dissipation, and primary biotic production. A site's health rating may also reflect management considerations. For example, although *Cirsium arvense* (Canada thistle) or *Euphorbia esula* (leafy spurge) may help to trap sediment and provide soil-binding properties, other functions (i.e., productivity and wildlife habitat) will be impaired; and their presence should be a management concern. Excellent sources of practical ideas and tips on good management of these wetland sites in Alberta are found in *Caring for Shoreline Properties* (Valastin and others 1999) and *Caring for the Green Zone* (Adams and Fitch 1995), and *Riparian Areas: A User's Guide to Health* (Fitch and Ambrose 2003). In Saskatchewan some excellent resources are *Streambank Stewardship, Your Guide to Caring For Riparian Areas in Saskatchewan* (Huel 1998) and *Managing Saskatchewan Wetlands—A Landowner's Guide* (Huel 2000).

No single factor or characteristic of a wetland site can provide a complete picture of either site health or the direction of trend. The lentic wetland health assessment is based on consideration of physical, hydrologic and vegetation factors. It relies heavily on vegetative characteristics as integrators of factors operating on the landscape. Because they are more visible than soil or hydrological characteristics, plants may provide early indications of riparian health as well as successional trend. These are reflected not only in the types of plants present, but also by the effectiveness with which the vegetation carries out its wetland functions of stabilizing the soil, trapping sediments, and providing wildlife habitat. Furthermore, the utilization of certain types of vegetation by animals may indicate the current condition of the wetland and may indicate trend toward or away from potential natural community (PNC).

In addition to vegetation factors, an analysis of site health and its susceptibility to degradation must consider physical factors (soils and hydrology) for both ecologic and management reasons. Changes in soil or hydrologic conditions obviously affect functioning of a wetland ecosystem. Moreover, changes in physical characteristics are often (but not always) more difficult to remedy than vegetative changes. For example, downcutting of an unstable overflow point may lower the water table and thus change site potential from a *Typha latifolia* (cattail) habitat type to a *Calamagrostis canadensis* (bluejoint) habitat type or even to an upland type. Sites experiencing significant hydrologic, edaphic (soil), or climatic changes will likely also have a change in plant community potential.

This method is not designed for an in-depth, comprehensive, analysis of ecologic processes. Such analysis may be warranted on a site and can be done after this evaluation has identified areas of concern. Nor does this approach yield an absolute rating

to be used in comparison with wetlands in other areas or of other types. Appropriate comparisons using this rating can be made between neighbouring wetlands of similar size and type and between subsequent assessments of the same site.

A single evaluation provides a rating at only one point in time. Due to the range of variation possible on a wetland site, a single evaluation cannot define absolute status of site health or reliably indicate trend (whether the site is improving, degrading, or stable). To monitor trend, health assessments should be repeated in subsequent years during the same time of year. Evaluation should be conducted when most plants can be identified in the field and when hydrologic conditions are most nearly normal (e.g., not during peak spring runoff or immediately after a major storm). Management regime should influence assessment timing. For example, in assessing trend on rotational grazing systems, one should avoid comparing a rating after a season of use one year to a rating another year after a season of rest.

Pre-Assessment Preparation

The lentic health assessment process incorporates data on a wide range of biological and physical categories. The basic unit of delineation upon which an assessment is made is referred to as a ***polygon.*** A lentic polygon is a wetland, or portion of a wetland, not associated with a waterway (stream or river) and which has no defined channel. Polygons are delineated on topographic (topo) maps before evaluators go to the field. It is important to clearly mark and number the polygons on the maps.

If aerial photos are available, polygon delineations can be based on vegetation differences, geologic features, or other observable characteristics. On larger systems with wide wetland areas, aerial photos may allow delineation of multiple vegetation-based polygons away from the water source. In these cases, where polygons can be drawn as enclosed units a minimum mapping unit of possibly 5 to 10 acres (2 to 4 ha) should be followed. The size of the minimum mapping unit should be based on factors such as management capabilities, available funds, and capabilities of data collection.

If pre-delineated polygons are drawn on the maps, and pre-assigned numbers are given, be sure the inventoried polygons correspond exactly to those drawn. Evaluators are allowed to move polygon boundaries, create new polygons, or consolidate polygons if the vegetation, geography, location of fences, or width of the wetland zone warrant. If polygon boundaries are changed, the changes must be clearly marked on the field copies of the maps. Evaluators should draw the complete polygon boundary onto their field maps if possible at the 1:20,000 or 1:50,000 scale.

In most cases involving small bodies of water or small lentic wetlands, the inventoried polygon will be a single unit of area. Around larger lakes, extensive marshes, or other large lentic wetlands, it may be necessary to divide the wetland into separate polygons (Figure 1). Polygons should be divided at distinct locations such as fences, stream entrances or exits, or other features easily recognized in the field. ***Polygons should not cross fences between areas with different management.***

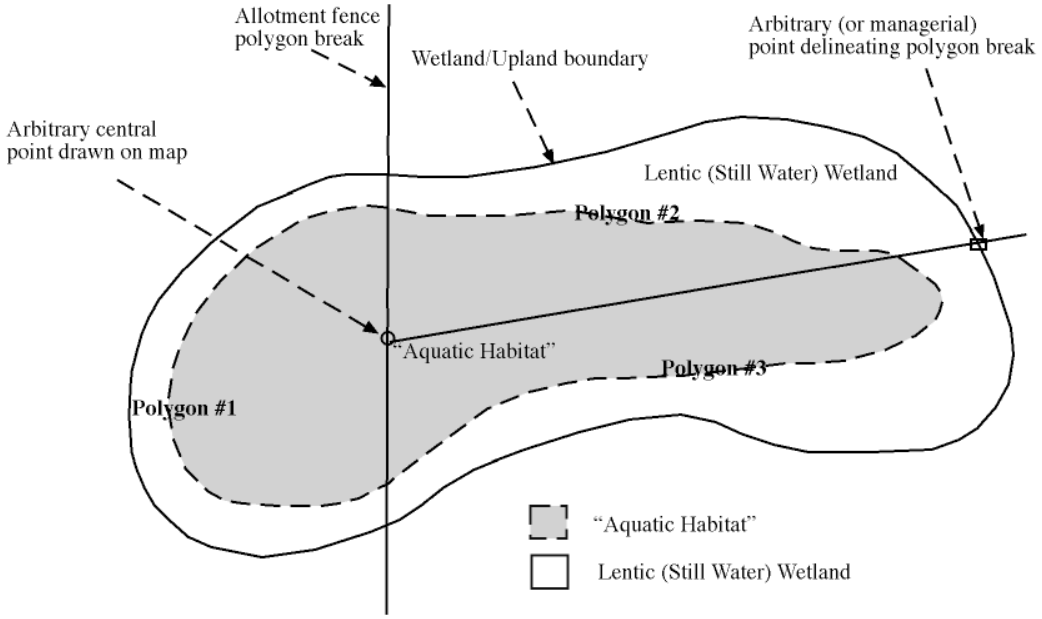


Figure 1. Schematic drawing of a lentic (still water) wetland showing: 1) delineation of polygons on larger systems, i.e. those too big to inventory as a single polygon (more than about one half mile in length) or

those with managerial breaks across them; 2) a typical relationship between "aquatic habitat" (open water) and surrounding lentic wetland, which includes areas of persistent emergent vegetation in standing water.

The outer boundaries of polygons are usually at the wetland ecosystem outer edges. These boundaries are sometimes easily determined by abrupt changes in the landform and/or vegetation, but proper determination often depends on experienced interpretation of more subtle features. The inner polygon boundary is the landward edge of the deep-water habitat, or where persistent vegetation gives way to open water. Deep-water habitat is the area covered by surface water deeper than 6.6 ft [2 m], or where sunlight cannot penetrate to support erect, rooted, plant life. Persistent emergent vegetation consists of emergent species that normally remain standing at least until the beginning of the next growing season, e.g., *Typha* spp. (cattails) or *Scirpus* spp. (bulrushes) (Cowardin and others 1979).

Identification of plant communities by vegetation type (Thompson and Hansen 2001, Hansen and others 1995) will be useful both in delineating lentic areas and, later, in determining appropriate management. These may be in a mosaic difficult to map. An area may have a mix of herbaceous communities, shrubs, and forest. These communities have diverse resource values and may respond differently to a management action, but it is seldom practical to manage such communities separately. Community composition can be described as percentages of component types comprising the polygon vegetation. Management actions can then be keyed to the higher priority types present.

DATA FORM ITEMS

Record ID No. This is the unique identifier allocated to each polygon. This number will be assigned in the office when the form is entered into the database.

Administrative Data
A1. Identify what organisation is doing the evaluation field work.

A2. Identify what organisation is paying for the work.

A3a. Identify any Indian or Métis Reserve on which work is being done.

A3b. Identify any National or Provincial Park, Preserve, or Sanctuary on which work is being done.

A3c. Identify any local Ecological or Municipal Reserve (Exclude national or provincial reserves) on which work is being done.

A3d. Was the work done on Private or Deeded Land? Simply answer "Yes" or "No."

A4. Observers: Name the evaluators recording the data in the field.

A5a. Date that the field data was collected**:** Use the format: month/day/year

A5b. Record the year that the field data was collected**.**

A6a. Identify any grazing lease or grazing reserve on which work is being done.

A6b. Give any grazing disposition identifying number.

A6c. Give any other grazing name (e.g. Community Pasture) to identify where the work is being done.

Note: Items A7a-h are completed in the office; field evaluators need not complete these items.

A7. The several parts of this item identify various ways in which a data record may represent a resampling of a polygon that may have been inventoried again at some other time. The data in this record may have been collected on an area that coincides precisely with an area inventoried at another time and recorded as another record in the database. It may also represent the resampling of only a part of an area previously sampled. This would include the case where this polygon

overlaps, but does not precisely and entirely coincide with one inventoried at another time. One other case is where more than one polygon inventoried one year coincides with a single polygon inventoried another year. All of these cases are represented in the database, and all have some value for monitoring purposes, in that they give some information on how the status on a site changes over time.

A7a. Does this record represent the latest data recorded for this polygon?

A7b. Has any part of the area within this polygon been inventoried previously, or subsequently, as represented by another data record in the Lentic Wetland database? Such other records would logically carry different dates.

A7c. Does the areal extent of this polygon exactly coincide with that of any other inventory represented in the Lentic Wetland database? In many cases, subsequent inventories only partially overlap spatially. The purpose of this question is to identify those records that can be compared as representing exactly the same ground area.

A7d. If A7c is answered "Yes," then enter the years of any inventories of this exact polygon.

A7e. If A7c is answered "Yes," also enter the record ID number(s) of any other previous or subsequent reinventories (resamplings) of this exact polygon for purposes of cross-reference in the database.

A7f. Even though this polygon is not a re-inventory of the exact same area as any other polygon, does it share at least some common area with one or more polygons inventoried at another time?

A7g. If A7f is answered "Yes," enter the years of any other inventories of polygons sharing common area with this one.

A7h. If A7f is answered "Yes," also enter the record ID number(s) of any other polygon(s) sharing common area with this one.

A8a. Has a management change been implemented on this polygon?

A8b. If A8a is answered "Yes," in what year was the management change implemented?

A8c. If A8a is answered "Yes," describe the management change implemented.

Location Data
B1. Province in which the field work is being done.

B2a, b. Identify the Natural Region and Sub-Region in which the field work is being done. Use the Natural Regions and Subregions of Alberta (Alberta Natural Heritage Information Centre (1999).

B3. County or municipal district in which the field work is being done.

B4a. The city, town, or village in which the field work is being done.

B4b. The subdivision in which the field work is being done.

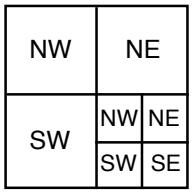
B4c. The subdivision lot on which the field work is being done.

B5. Identify the allotment, range unit, or landowner where the field work is being done.

B6. Name the waterbody or area on which the field work is being done.

B7. Polygon number is a sequential identifier of the actual piece of land being surveyed. This is referenced to the map delineations. Sequences normally progress clockwise on lentic systems.

B8. The location of the polygon is presented as a legal land description: 1/4,1/4 section, 1/4 section, Township, Range, and Meridian are read from smallest to largest unit.



B9. Elevation (feet or meters) of the polygon ***centroid.*** Elevation is usually interpolated from a topographic map

B10a. Name the major watershed (e.g. North Saskatchewan River) of which the site being surveyed is a part.

B10b. Name the minor watershed (e.g. Battle River) of which the site being surveyed is a part. This is normally subordinate to the major watershed named above in #B10a.

B10c, d. The minor watershed area (km^2) and perimeter (km) are obtained from the map in the office.

B10e. Name the sub-basin (e.g. Iron Creek). This is the local watershed of which the site being surveyed is a part. This is normally subordinate to the minor watershed named above in #B10b.

B11a-c. Universal Transverse Mercator (UTM) coordinates are recorded for the upper (or most northerly and westerly) and lower (or most southerly and easterly) ends of the polygon using GPS units in the field. Other locations of special interest may be recorded using the GPS unit. These coordinates are considered accurate to within approximately 50 m. Field observers are to use GPS units to obtain these coordinates following standard protocol. Record UTM coordinates at each end of the long axis of the polygon.

Enter the UTM coordinate data, including the UTM zone and the identifying waypoint number, on the form for each point collected. Save the data in the GPS unit for downloading to the computer later. When starting work in a new location, always check the GPS receiving unit against a known point by using the UTM grid and map.

B11d, e. Identify the GPS unit used, and the name or number designator of the waypoints saved for the upper and lower ends of the polygon and for other locations. Describe any comments worth noting about the waypoints (i.e., monument referenced or general location descriptions).

B12a-c. Record the name(s), scale, and publication year of the quadrangle map(s) or any other map(s) locating the polygon. Use precisely the name listed on the map sheet. Provision is made for listing two maps in case the polygon crosses between two maps.

B13. Record identifying data for any aerial photos used on this polygon.

Selected Summary Data

C1. Wetland type is a categorical description of predominant polygon character. Select from the following list of categories that may occur within a lentic system the one that best characterizes the majority of the polygon. Evaluators will ***select only one category*** as representative of the entire polygon. If significant amounts of other categories are present, indicate this in the "General Comments," or consider dividing the original polygon into two or more polygons.

Category Description
Wet Meadow. This type of wetland may occur in either riparian (lotic) or in still water (lentic) systems. A lotic wet meadow has a defined channel or flowing surface water nearby, but is typically much wider than the riparian zone associated with the classes described above. This is often the result of the influence of lateral groundwater not associated with the stream flow. Lotic and lentic wet meadows may occur in proximity (e.g., when enough groundwater emerges to begin to flow from a mountain meadow, the system goes from lentic to lotic). Such communities are typically dominated by herbaceous hydrophytic vegetation that requires saturated soils near the surface, but tolerates no standing water for most of the year. This type of wetland typically occurs as the filled-in basin of old beaver ponds, lakes, and potholes.
Spring/Seep. Groundwater discharge areas. In general, springs have more flow than seeps. This wetland type may occur in a riparian (lotic) or still water (lentic) system.
Reservoir. An artificial (dammed) water body with at least 20 acres (8 ha) covered by surface water.
Stock pond. An artificial (dammed) body of water of less than 20 acres (8 ha) covered by surface water.
Lake. A natural topographic depression collecting a body of water covering at least 20 acres (8 ha) with surface water.

Pothole, Slough, or Small Mountain Lake. A natural topographic depression collecting a body of water covering less than 20 acres (8 ha) with surface water.

Other. Describe any other wetland type encountered that is not associated with a surface water channel.

Non-wetland (Upland). This designation is for those areas which are included in the inventoried polygon, but which do not support functional wetland vegetation communities. Such areas may be undisturbed inclusions of naturally occurring high ground or such disturbed high ground as roadways and other elevated sites of human activity.

C2. The size (acres/hectares) of polygons large enough to be drawn as enclosed units on available maps may be determined in the office using a planimeter, dot grid, or GIS. For polygons too narrow or small to be accurately drawn as enclosed units on available maps, size is calculated using polygon length (item C5) and average polygon width (item C7).

C3a-d. Evaluators may be asked to survey some areas that have not been determined to be wetlands for the purpose of making such a determination. Other polygons include areas supporting non-wetland vegetation types. A "Yes" answer here indicates that no part of the polygon keys to a riparian habitat type or community type (HT/CT). Areas classified in item C8 as any vegetation type described in a riparian and/or wetland classification document for the region in which you are working are counted as functional wetlands. Areas listed as UNCLASSIFIED WETLAND TYPE are also counted as functional wetlands. Other areas are counted as non-wetlands, or uplands. The functional wetland fraction of the polygon area is listed in item C3c in acres and as a percentage of the entire polygon area in item C3d.

C4. Some lentic polygons may not contain a defined shoreline between wetland and open water. In some cases these polygons are in ephemeral depressions which may be inundated infrequently, but do support wetland plant communities. In other cases, these polygons may be part of large marsh systems that may or may not be associated with lakes, but where polygons may be delineated in areas not adjacent to open water.

C5. Polygon length (usually equivalent to the length of shore along the polygon) is measured in the field or by scaling from the map. This data is considered accurate to the nearest 0.1 mile (0.16 km).

C6. In some cases, the polygon data is used to characterize, or represent, a much larger shoreline. The length represented by the polygon is given here. For example, a 0.5 mile (0.8 km) polygon may be used to represent 2 miles (3.2 km) of total shoreline length. In this case, 0.5 (0.8 km) is the shoreline length in the polygon (item C5), and 2 miles (3.2 km) is the overall shoreline miles (kilometres) entered in item C6.

C7. Record average width of the polygon, which in smaller wetlands corresponds to the width of the entire wetland area.

C8. List the riparian habitat type(s) and/or community type(s) found in the polygon (Thompson and Hansen 2001). If the habitat type cannot be determined for a portion of the polygon, then list the appropriate community type(s) of that portion. If neither the habitat type nor community type can be determined for any portion of the polygon (or in areas [outside of Montana] where the habitat and community types have not been named and described), list the area in question as "unclassified wetland type" and give the dominant species present. Indicate with the appropriate abbreviation if these are habitat types (HT), community types (CT), or dominance types (DT), for example, POPUTRE/CORNSTO HT. For each type listed, estimate the percent of the polygon represented. If known, record the successional stage (i.e., early seral, mid-seral, late seral, and climax), or give other comments about the type. As a minimum, list all types that cover 5% or more of the polygon. The total must approximate 100%. Slight deviations due to use of class codes or to omission of types covering less than 5% of the polygon are allowed. ***Note:*** For any area designated as an "unclassified wetland type," it is important to list any species present that can indicate the wetness or dryness of the site.

Optional Physical Site Characteristics

D1a, b. Make a call on whether the polygon has potential for tall woody type(s), and if the answer is "Yes," then tell whether such types are present on the polygon. Tall woody types are any tree HTs or CTs and such taller shrubs as willows, Saskatoon, Alder, birch, etc. Not included are shorter shrub species, such as buckbrush/snowberry, rose, etc.

D2. Give the waterbody number (FMIS/Hydro code).

D3. If water quality data is available on this waterbody, list the reference where the data can be found.

Photograph Data

Note: At a minimum, take two photos from identifiable points along the upland edge of the polygon viewing toward the water body and along the long axis of the polygon. Identify all photo point locations sufficiently, so that they could be relocated by another individual.

E1. Identify the film roll number, photo (frame) number, and description of each photograph taken at the most northerly/westerly end or side of the polygon. List them in the order of northerly/westerly views first, then southerly/easterly views, and then each other shot taken to show other features of interest. Also identify the photographer and camera used.

E2. Tell if there is another polygon adjacent to this one to the ***north/west***..

E3. Same as E1 above for shots taken at the most southerly/easterly end or side of the polygon.

E2. Tell if there is another polygon adjacent to this one to the ***south/east***..

E5. Identify all additional photos taken outside of polygon (i.e., non-polygon photos) by giving roll number, frame number, and description of view.

E6. Record the brand of film, film speed, camera lens size, and lens focal length or magnification.

THE LENTIC HEALTH ASSESSMENT SCORE SHEET (SURVEY)

Some factors on the evaluation will not apply on all sites. For example, sites without potential for woody species are not rated on factors concerning trees and shrubs. Vegetative site potential can be determined by using a key to site type (e.g., Hansen and others 1995, Kovalchik 1987, or another appropriate publication). On severely disturbed sites, vegetation potential can be difficult to determine. On such sites, clues to potential may be sought on nearby sites with similar landscape position.

Most of the factors rated in this evaluation are based on ocular estimations. Such estimation may be difficult on large, brushy sites where visibility is limited, but extreme precision is not necessary. While the rating categories are broad, evaluators do need to calibrate their eye with practice. It is important to remember that a health rating is not an absolute value. The factor breakout groupings and point weighting in the evaluation are somewhat subjective and are not grounded in quantitative science so much as in the collective experience of an array of riparian scientists, range professionals, and land managers.

Each factor below will be rated according to conditions observed on the site. The evaluator will estimate the scoring category and enter that value on the score sheet.

1. Vegetative Cover of the Polygon. Around lentic water bodies vegetation cover helps to stabilize shorelines, control nutrient cycling, reduce water velocity, provide fish cover and food, trap sediments, reduce erosion, reduce the rate of evaporation (Platts and others 1987), and contributes primary production to the ecosystem. This question focuses on how much of the entire polygon area is covered by live plant growth. Item #10 below assesses the amount of human-caused bare ground. Although there is some overlap between these two items, the bare ground to be counted in item #10 is strictly limited in definition, whereas all unvegetated area not inundated by water is counted in this item. The only area within the polygon exempt from consideration here is area covered by water. Areas such as boat docks, hardened pathways, and artificial structures are counted as unvegetated along with any bare ground, human-caused or natural. The rationale is that all such unvegetated areas contribute nothing to several of the important lentic wetland functions.

The evaluator is to estimate the fraction of the polygon covered by plant growth. Vegetation cover is ocularly estimated using the canopy cover method (Daubenmire 1959).

Scoring:
6 = More than 95% of the polygon area is covered by live plant growth.
4 = 85% to 95% of the polygon area is covered by live plant growth.
2 = 75% to 85% of the polygon area is covered by live plant growth.
0 = Less than 75% of the polygon area is covered by live plant growth.

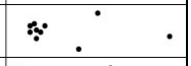
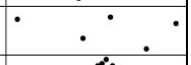
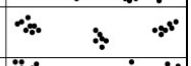
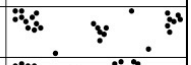
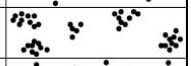
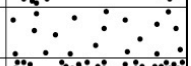
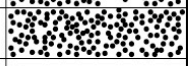
2. Invasive Plant Species (Weeds).
Invasive plants (weeds) are alien species whose introduction does or is likely to cause economic or environmental harm. Whether the disturbance that allowed their establishment is natural or human-caused, weed presence indicates a degrading ecosystem. While some of these species may contribute to some riparian functions, their negative impacts reduce overall site health. This item assesses the degree and extent to which the site is infested by invasive plants. The severity of the problem is a function of the density/distribution (pattern of occurrence), as well as canopy cover (abundance) of the weeds. In determining the health score, all invasive species are considered collectively, not individually. A weed list should be used that is standard for the locality and that indicates which species are being considered (i.e., *Invasive Weed and Disturbance-caused Undesirable Plant List* [Cows and Fish 2002]). Some common invasive species are listed on the form, and space is allowed for recording others. ***Leave no listed species field blank, however;*** enter "0" to indicate absence of a value.

2a. Total Canopy Cover of Invasive Plant Species. The observer must evaluate the total percentage of the polygon area that is covered by the combined canopy of all plants of all species of invasive plants. Determine which rating applies in the scoring scale below.

Scoring:
3 = No invasive plant species (weeds) on the site.
2 = Invasive plants present with total canopy cover less than 1 percent of the polygon area.
1 = Invasive plants present with total canopy cover between 1 and 15 percent of the polygon area.
0 = Invasive plants present with total canopy cover more than 15 percent of the polygon area.

2b. Density Distribution Pattern of Invasive Plant Species. The observer must pick a category of pattern and extent of invasive plant distribution from the chart below that best fits what is observed on the polygon, while realizing that the real situation may be only roughly approximated at best by any of these diagrams. Choose the category that most closely matches the view of the polygon.

Scoring:
3 = No invasive plant species (weeds) on the site.
2 = Invasive plants present with density/distribution in categories 1, 2, or 3.
1 = Invasive plants present with density/distribution in categories 4, 5, 6, or 7.
0 = Invasive plants present with density/distribution in categories 8, or higher.

CLASS	DESCRIPTION OF ABUNDANCE	DISTRIBUTION PATTERN
0	No invasive plants on the polygon	
1	Rare occurrence	
2	A few sporadically occurring 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 a 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 polygon.	

3. Disturbance-Caused Undesirable Herbaceous Species. A large cover of disturbance-increaser undesirable herbaceous species, native or exotic, indicates displacement from the potential natural community (PNC) and a reduction in riparian health. These species generally are less productive, have shallow roots, and poorly perform most riparian functions. They usually result from some disturbance which removes more desirable species. Invasive species considered in the previous item are not reconsidered here. As in the previous item, the evaluator should state the list of species considered. A partial list of undesirable herbaceous species appropriate for use in Alberta follows. A list should be used that is standard for the locality and that indicates which species are being considered (i.e., *Invasive Weed and Disturbance-caused Undesirable Plant List* [Cows and Fish 2002]). The evaluator should list any additional species included.

Antennaria spp. (pussy-toes)
Brassicaceae (mustards)
Bromus inermis (smooth brome)
Fragaria spp. (strawberries)
Hordeum jubatum (foxtail barley)
Plantago spp. (plantains)
Poa pratensis (Kentucky bluegrass)
Potentilla anserina (silverweed)
Taraxacum spp. (dandelion)
Trifolium spp. (clovers)

Scoring:
3 = Less than 5% of the site covered by disturbance-caused undesirable herbaceous species.
2 = 5% to 25% of the site covered by disturbance-caused undesirable herbaceous species.
1 = 25% to 45% of the site covered by disturbance-caused undesirable herbaceous species.
0 = More than 45% of the site covered by disturbance-caused undesirable herbaceous species.

4. Preferred Tree and Shrub Establishment and/or Regeneration. (Skip this item if the site lacks potential for trees or shrubs; for example, the site is a herbaceous wet meadow or marsh.) Not all riparian areas can support trees and/or shrubs. However, on those sites where such species do belong, they play important roles. The root systems of woody species are excellent bank stabilizers, while their spreading canopies provide protection to soil, water, wildlife, and livestock. Young age classes of woody species are important indicators of the continued presence of woody communities not only at a given point

in time but into the future. Woody species potential can be determined by using a key to site type (Thompson and Hansen 2001, Hansen and others 1995). On severely disturbed sites, the evaluator should seek clues to potential by observing nearby sites with similar landscape position. *(**Note:*** Vegetation potential is commonly underestimated on sites with a long history of disturbance.)

One species (*Elaeagnus angustifolia* [Russian olive]) and three other shrub genera (*Symphoricarpos* spp. [buckbrush/snowberry], *Rosa* spp. [rose], and *Crataegus* spp. [hawthorn] are excluded from the evaluation of establishment and regeneration. These are species that may reflect long-term disturbance on a site, that are generally less palatable to browsers, and that tend to increase under long-term moderate-to-heavy grazing pressure; ***AND*** for which there is rarely any problem in maintaining presence on site. *Elaeagnus angustifolia* (Russian olive) is considered an especially aggressive, undesirable exotic plant.

The main reason for excluding these plants is that they are far more abundant on many sites than are species of greater concern (i.e., *Salix* spp. [willows], *Cornus stolonifera* [red-osier dogwood], *Amelanchier alnifolia* [Saskatoon], and many other taller native riparian species), and they may mask the ecological significance of a small amount of a species of greater concern. ***FOR EXAMPLE***: A polygon may have *Symphoricarpos occidentalis* (buckbrush/snowberry) with 30% canopy cover showing young plants for replacement of older ones, while also having a trace of *Salix exigua* (sandbar willow) present, but represented only by older mature individuals. We feel that the failure of the willow to regenerate (even though there is only a small amount) is very important in the health evaluation, but by including the snowberry and willow together on this polygon, the condition of the willow would be hidden (overwhelmed by the larger amount of buckbrush/snowberry).

For shrubs in general, seedlings and saplings can be distinguished from mature plants as follows. For those species having a mature height generally over 6.0 ft (1.8 m), seedlings and saplings are those individuals less than 6.0 ft (1.8 m) tall. For species normally not exceeding 6.0 ft (1.8 m), seedlings and saplings are those individuals less than 1.5 ft (0.45 m) tall or which lack reproductive structures and the relative stature to suggest maturity. (***Note:*** Evaluators should take care not to confuse short stature resulting from heavy browsing with that due to youth.)

Scoring: *(If the site has no potential for trees or shrubs [except for the species listed above to be excluded], replace both Actual Score and Possible Score with NA. If the observer is not fairly certain potential exists for preferred trees or shrubs, then enter NC and explain in the comment field below.)*

6 = More than 15% of the total canopy cover of preferred trees/shrubs is seedlings and saplings.
4 = 5% to 15% of the total canopy cover of preferred trees/shrubs is seedlings and saplings.
2 = Less than 5% of the total canopy cover of preferred tree/shrubs is seedlings and saplings.
0 = Preferred tree/shrub seedlings or saplings absent.

5. Utilisation of Preferred Trees and Shrubs. (Skip this item if the site lacks trees or shrubs; for example, the site is a herbaceous wet meadow or cattail marsh.) Many riparian woody species are browsed by livestock and/or wildlife. Heavy browsing can prevent establishment or regeneration of these important species. Excessive browsing can eliminate them from the community and result in their replacement by undesirable invaders.

One tree species (*Elaeagnus angustifolia* [Russian olive]) and three other shrub genera (*Symphoricarpos* spp. [buckbrush/snowberry], *Rosa* spp. [rose], and *Crataegus* spp. [hawthorn] are excluded from the evaluation of utilisation of woody species. These are plants that may reflect long-term disturbance on a site, that are generally less palatable to browsers, and that tend to increase under long-term moderate-to-heavy grazing pressure; ***AND*** for which there is rarely any problem in maintaining presence on site. *Elaeagnus angustifolia* (Russian olive) is considered an especially aggressive, undesirable exotic plant.

The main reason for excluding these plants is they are far more abundant on many sites than are species of greater concern (i.e., *Salix* spp. [willows], *Cornus stolonifera* [red-osier dogwood], *Amelanchier alnifolia* [Saskatoon], and many other taller native riparian species), and they may mask the ecological significance of a small amount of a heavily utilised species of greater concern. ***FOR EXAMPLE***: A polygon may have *Symphoricarpos occidentalis* (buckbrush/snowberry) with 30% canopy cover showing only light utilisation, while also having a trace of *Salix exigua* (sandbar willow) present showing heavy utilisation. We feel that, although there is only a small amount of willow present, the fact that it is being heavily utilized is very important to the health evaluation. By including the snowberry and willow together on this polygon, the condition of the willow would be hidden (overwhelmed by the larger amount of buckbrush/snowberry).

When estimating degree of utilisation, count browsed second year and older leaders on representative plants of woody species normally browsed by ungulates. Do not count current year's use since this may not accurately reflect actual use because significant browsing can occur late in the season. Determine percentage by comparing the number of leaders browsed with the total number of leaders available (those within animal reach) on a representative sample (at least three plants) of each tree and shrub species present. Do not include use of dead plants unless it is clear this condition was the result of over-grazing.

Scoring: *(If the site has no potential for trees or shrubs [except for the species listed above to be excluded], replace both Actual Score and Possible Score with NA. If the observer is not fairly certain potential exists for preferred trees or shrubs, then enter NC and explain in the comment field below.)*

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).

6. Human Alteration of Polygon Vegetation. Human alteration of the vegetation is meant to include all changes to the plant community composition or structure on the polygon caused by human actions (e.g., logging, mining, roads, construction, or development) or by agents of human management (e.g., livestock). It is not meant to include transitory or short-term removal of plant material that does not impact plant community composition (i.e., grazing at carefully managed levels). Of concern are the kinds of change that diminish or disrupt the natural wetland function of the vegetation. These include, but are not limited to, vegetation clearing, mowing yards or hay, changing plant community composition (e.g., replacing willows with rose and buckbrush, woody species with herbaceous species, etc.), replacing native plants with tame plants, replacing deep rooted plants with shallow rooted plants, and/or replacing tall species with short species.

On polygons adjacent to deep water, remember that the polygon extends out to where the water is two meters deep. (***NOTE:*** Do not count the same area twice by including it as both a vegetative and a physical alteration, unless there clearly are both kinds of alteration. Decide into which category a particular effect should go. For example: A timber harvest may clear vegetation, but not necessarily cause physical damage on one area; while on another area cause both clearing of vegetation and disruption of the soil by skidding of logs.)

Scoring:

6 = Less than 5% of polygon vegetation is altered by human activity.
4 = 5% to 15% of polygon vegetation is altered by human activity.
2 = 15% to 35% of polygon vegetation is altered by human activity.
0 = 35% or more of polygon vegetation is altered by human activity.

7. Human Alteration of Polygon Physical Site. This evaluation of human alteration of the physical site is meant to include all changes to the physical attributes of the site caused by human actions (e.g., logging, mining, housing development) or by agents of human management (e.g., livestock). The kinds of physical change that diminish or disrupt the natural wetland functions on the site include, but are not limited to, hummocking, pugging, and trails by livestock; human roads, trails, buildings, landscaping, boat launches/docks, beach clearing and building, or rip-rapping shores and banks. (***NOTE:*** Do not count the same area twice by including it as both a vegetative and a physical alteration, unless there clearly are both kinds of alteration. Decide into which category a particular effect should go. For example: A cottage owner may clear vegetation to gain a view of the lake without causing physical damage to one area; whereas, if he/she hauls in sand to enhance the beach, there is also physical alteration.)

Scoring:

12 = Less than 5% of the polygon is physically altered by human activity.
8 = 5% to 15% of the polygon is physically altered by human activity.
4 = 15% to 35% of the polygon is physically altered by human activity.
0 = 35% or more of the polygon is physically altered by human activity.

8. Human-Caused Bare Ground. Bare ground is exposed soil surface (not covered by plants, litter or duff, down wood, or rocks larger than 2.5 inches [6 cm]). Bare ground may result naturally from several processes (i.e., sedimentation, flood erosion, fire, tree fall, and exposure of lakebed by low water level), but that caused by human activity always indicates an impairment of wetland health. Exposed soil is vulnerable to erosion and is where weeds become established. Bare soil is not producing, nor providing habitat. Sediment deposits and other natural bare ground are excluded as normal and probably beyond management control. Human land uses often causing bare ground include livestock grazing, recreation, off road vehicle use, and resource extraction activities. After considering the causes of all bare ground on the site, the evaluator must estimate what percent of the site (polygon) area is human-caused bare ground.

Scoring:

6 = Less than 1% of the polygon is human-caused bare ground.
4 = 1% to 5% of the polygon is human-caused bare ground.
2 = 5% to 15% of the polygon is human-caused bare ground.
0 = 15% or more of the polygon is human-caused bare ground.

9. Degree of Artificial Withdrawal or Raising of Water Level. Although water levels naturally fluctuate on a seasonal basis in most systems, many wetland systems are affected by water removal for human uses. This artificial drawdown of

water level often does not follow a temporal regime conducive to maintaining healthy native wetland plant communities. The result is often a barren band of shore exposed for much of the growing season. This withdraws soil water from the rooting zone of established shore vegetation communities, causes shore material to destabilize, and provides sites for weeds to invade. Such conditions are extremely detrimental to the riparian vegetation, site productivity, and wildlife values.

In a few cases water level may be artificially raised by influx of runoff from such activities as drainage of one wetland into another, or irrigation return flows. The evaluator must evaluate the degree to which this change of water level affects the vegetation community and overall riparian/wetland functional health.

Not all lentic wetlands evaluated with this form will have surface water potential, but any wetland may have its water table degraded by draining, pumping, or diverting its surface or subsurface supply. On such lentic wetlands as marshes and wet meadows, look for evidence of drainage ditching, pumping, and the interruption of normal surface drainage inputs by livestock watering dugouts, cross slope ditches, or dams upslope.

In this item the evaluator is asked to categorize the degree to which the system is subjected to artificially rapid or unnaturally timed fluctuations in water level. Reservoirs intended for storage of water for power generation, irrigation, and/or livestock watering typically exhibit the most severe effects, but water may be diverted or pumped from natural systems for many other reasons (domestic use, industrial use, livestock watering, etc.). This item requires the evaluator to make a subjective call by choosing as a "best fit" one of the categories of drawdown severity described below. (***NOTE:*** Be careful to consider the scale of the water body as it relates to the scale of water removal. Pumping a small dugout full of water for livestock might severely impact a two acre slough, but be negligible to a lake covering a section of land.)

Be sure to document the grounds for your estimate here. If there is no way to know with any reasonable degree of certainty how much water is being removed, it may be better to document the situation and to "zero out" this item (not answer it). During periods of drought lakebeds become exposed and often exhibit wide zones of almost barren shore. ***The evaluator must be careful not to attribute this natural phenomenon unfairly to a human cause.***

Categories of Severity of Lentic Wetland Artificial Water Level Change	
Not Subjected	The water body, or wetland, is not subjected to artificial water level change.
Minor	The water body, or wetland, is subject to no more than minor artificial water level change. The shore area remains vegetated. Withdrawal of water occurs slowly enough, or is small enough, to allow vegetation to maintain coverage of exposed ground. A relatively narrow band affected by fluctuation of water level may be occupied only by annual plant species.
Moderate	The water body, or wetland, is subject to a moderate level, speed, and/or frequency of drawdown, but the rate and timing of withdrawal will have allowed pioneer plants to vegetate at least half the exposed area of the "drawdown zone" by the time of evaluation.
Extreme	The water body, or wetland, is subject to an extreme extent, speed, and/or frequency of water withdrawal. A wide "drawdown zone" of exposed bottom material remains unvegetated.

Scoring:
9 = The waterbody, or wetland, 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.

10. Comments and Observations. Add any necessary commentary to explain or amplify the data recorded. Do not leave this space blank. Describe any unique characteristics of the site and other observations relating to the vegetation or to the physical conditions of the site. Each item in the health rating has a small space provided for specific information to enlighten the score given. This larger space is the place for more general commentary to help the reader understand the larger context of the data. Such things as landscape setting and local land use history are appropriate here.

Calculating the Lentic Health Score
To arrive at the overall site health rating, the scores are totalled for all the factors, and that total is divided by the possible perfect score total. A sample score sheet is shown below.

Vegetation Factors	**Actual Pts**	**Possible Pts**
1. Vegetative Cover of Polygon	6	6
2a. Total Canopy Cover of Invasive Plant Species	1	3
2b. Density/Distribution Pattern of Invasive Plant Species	1	3
3. Disturbance-Caused Undesirable Herbaceous Species	2	3
4. Preferred Tree and Shrub Establishment and Regeneration	2	6
5. Utilization of Preferred Trees and Shrubs	2	3
6. Human Alteration of Polygon Vegetation	4	6
Vegetative Score:	18	30
Soil/Hydrology Factors		
7. Human Alteration of Polygon Physical Site	8	12
8. Human-Caused Bare Ground	2	6
9. Degree of Artificial Withdrawal of Water	9	9
Soil/Hydrology Score:	19	27
TOTAL SCORE:	**37**	**57**

Rating = (Total Actual) / (Total Possible) X 100%

Rating = (37) / (57) X 100% = 65%

Rating Category: 80-100% = Proper Functioning Condition (Healthy)
60-79% = Functional At Risk (Healthy, but with Problems)
Less than 60% = Nonfunctional (Unhealthy)

The manager should realize that a less than perfect score is not necessarily cause for concern. An area rated at 80% is still considered to be functioning properly. At the same time, ratings of individual factors can be useful in detecting strengths or weaknesses of a site. A low score on any factor warrants management focus. For example, the sample score sheet shown above has low scores for invasive plant species, tree and shrub regeneration, and bare ground (items 2, 4, and 8). These are factors in which a management change might result in improvement on a subsequent assessment.

ADDITIONAL MANAGEMENT CONCERNS (OPTIONAL)

The following items do not contribute to a site's health assessment rating. Rather, they may help to quantify inherent physical site characteristics that reveal structural weaknesses or sensitivities or to assess the direction of change on a site. These data can be useful for planning future site management.

11. Overflow Structure Stability. Often the most dynamically unstable point in a lentic system is at the overflow, or outlet. Natural systems usually evolve behind a relatively stable outlet structure, but the overflow structures, or spillways, of human-made water bodies often become unstable and erode, wash out, or downcut causing severe disruption to the lentic system dependent on that body of water.

Scoring: (If the water body is not human constructed nor structurally altered, and lacks an overflow structure, replace both Actual and Possible Scores with NA.)

6 = The overflow structure is made of concrete, pipe, or armoured rock and appears stable.
4 = The overflow structure is unprotected or is made of other material, but still appears stable.
2 = The overflow structure is made of concrete, pipe, or armoured rock, but appears unstable.
0 = The overflow structure is unprotected or is made of other material and appears unstable.

12. Shoreline Rock Volume and Size. The composition of shoreline materials influences the susceptibility of the shoreline to erosion caused by trampling, wave action, or other disturbance. In general, larger rocks provide better protection against disturbance than smaller materials. Thus, shoreline composed primarily of silts and clays—characteristic of many lentic systems in the Great Plains—require more vegetative protection to compensate for the smaller particle sizes.

12a. Shoreline Rock Volume. Rate the shoreline rock volume as the highest appropriate of the following categories:

Scoring:

3 = More than 40% of shoreline volume is rocks at least 2.5 inches.
2 = 20% to 40% of shoreline volume is rock at least 2.5 inches.
1 = 10% to 20% of shoreline volume is rock at least 2.5 inches.
0 = Less than 10% of shoreline volume is rocks at least 2.5 inches.

12b. Shoreline Rock Size. Rate the shoreline rock size for the polygon as the highest appropriate of the following categories:

Scoring:

3 = At least 50% of rocks present are boulders and large cobbles (>5 inch).
2 = 50% of rocks present are small cobbles and larger (>2.5 inches).
1 = At least 50% of rocks present are coarse gravels and larger (>0.6 inches).
0 = Less than 50% of rocks present are coarse gravels and larger (>0.6 inches).

13. Vegetation Use by Animals. Record the rating category, which best describes the vegetation use by animals (Platts and others, 1987).

Code	Category Description
0 to 25%	Vegetation use is light or none. Almost all plant biomass at the current development stage remains. Vegetative cover is close to that which would occur without use. Unvegetated areas (such as bedrock) are not a result of land uses.
26 to 50%	Vegetation use is moderate. At least half the potential plant biomass remains. Average stubble height is more than half its potential at the present stage of development.
51 to 75%	Vegetation use is high. Less than half the potential plant biomass remains. Plant stubble height is usually more than 2 inches (on many ranges).
76 to 100%	Vegetation use is very high. Only short stubble remains (usually less than 2 inches on many ranges). Almost all plant biomass has been removed. Only the root systems and parts of the stems remain.

14. Susceptibility of Parent Material to Erosion. The soils derived from shale or having a large clay content are highly susceptible to compaction and trampling when wet. There is evidence that trampling by hooves and subsequent loss of herbaceous vegetation when soils are wet are major contributions to site degradation. In contrast, those sites having soils derived from sandstone or any of the hard metamorphosed rock found in the northern Rocky Mountains commonly have a fine sandy loam to loam texture and are more resistant to damage when wet. Intermediate of these soils are those having textures of clay loam to loam. Texturing the soil by the ribboning technique or by feel will be required for this determination. Rate the polygon soil according to one of these categories based on indicators as described above.

Scoring:

3 = Not susceptible to erosion (well armoured).
2 = Slightly susceptible to erosion (moderately armoured).
1 = Moderately susceptible to erosion.
0 = Extremely susceptible to erosion.

15. Percent of Shoreline Accessible to Livestock. Record the percent of shoreline length accessible to livestock. In general, only consider topography (steep banks, deep water, etc.) and dense vegetation as restricting access. Fences, unless part of an exclosure, do not necessarily restrict livestock access even though they may appear to be doing so at the time.

16. Quantify the percent of tree and shrub cover in the polygon that is dead and/or decadent. A decadent plant is one having at least 30% of its upper canopy dead. Dead lower branches are not a problem if the upper canopy is vigorous.

17. Polygon Trend. Select the ***one category*** (Improving, Degrading, Static, or Status Unknown) which best indicates the current trend of the vegetative community on the polygon to the extent possible. Trend refers, in the sense used here, not specifically to successional pathway change, but in a more general sense of apparent community health. By definition, trend implies change over time. Accordingly, a trend analysis would require comparison of repeated observations over time. However, some insights into trend can be observed in a single visit. For example, the observer may notice healing (revegetating) of a degraded shoreline and recent establishment of woody seedlings and saplings. This would indicate changing conditions that suggest an improving trend. If such indicators are not apparent, enter the category "status unknown."

18. Break Down the Polygon Area into the Land Uses Listed. Name any "Others" Observed.

19. Break Down the Area Adjacent to the Polygon into the Land Uses Listed. Name any "Others" Observed.

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ALBERTA LENTIC WETLAND SURVEY FIELD SCORE SHEET

1. Vegetative Cover of the Polygon. **Score:** _____

6 = More than 95% of the polygon area is covered by live plant growth.
4 = 85% to 95% of the polygon area is covered by live plant growth.
2 = 75% to 85% of the polygon area is covered by live plant growth.
0 = Less than 75% of the polygon area is covered by live plant growth.

2a. Total Canopy Cover of Invasive Plant Species (Weeds). **Score:** _____

3 = No invasive plant species on the site.
2 = Invasive plants present with total canopy cover less than 1 percent of the polygon area.
1 = Invasive plants present with total canopy cover between 1 and 15 percent of the polygon area.
0 = Invasive plants present with total canopy cover more than 15 percent of the polygon area.

2b. Density/Distribution Pattern of Invasive Plant Species. **Score:** _____

3 = No invasive plant species (weeds) on the site.
2 = Invasive plants present with density/distribution in categories 1, 2, or 3.
1 = Invasive plants present with density/distribution in categories 4, 5, 6, or 7.
0 = Invasive plants present with density/distribution in categories 8, or higher.

3. Disturbance-Caused Undesirable Herbaceous Species. **Score:** _____

3 = Less than 5% of the site covered by disturbance-caused undesirable herbaceous species.
2 = 5% to 25% of the site covered by disturbance-caused undesirable herbaceous species.
1 = 25% to 45% of the site covered by disturbance-caused undesirable herbaceous species.
0 = More than 45% of the site covered by disturbance-caused undesirable herbaceous species.

4. Preferred Tree and Shrub Establishment and Regeneration. **Score:** _____

(If site lacks potential for woody species, replace both Actual and Possible Scores with NA.)
6 = More than 15% of the total canopy cover of preferred trees/shrubs are seedlings and saplings.
4 = 5% to 15% of the total canopy cover of preferred trees/shrubs is seedlings and saplings.
2 = Less than 5% of the total canopy cover of preferred tree/shrubs are seedlings and saplings.
0 = Preferred tree/shrub seedlings or saplings absent.

5. Utilization of Preferred Trees and Shrubs. **Score:** _____

(If site lacks potential for woody species, replace both Actual and Possible Scores with NA.)
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).

6. Human Alteration of Polygon Vegetation. **Score:** _____

6 = Less than 5% of polygon vegetation is altered by human activity.
4 = 5% to 15% of polygon vegetation is altered by human activity.
2 = 15% to 35% of polygon vegetation is altered by human activity.
0 = 35% or more of polygon vegetation is altered by human activity.

7. Human Alteration of Polygon Physical Site. **Score:** _____

12 = Less than 5% of the polygon is physically altered by human activity.
8 = 5% to 15% of the polygon is physically altered by human activity.
4 = 15% to 35% of the polygon is physically altered by human activity.
0 = 35% or more of the polygon is physically altered by human activity.

8. Human-Caused Bare Ground. **Score:** _____

6 = Less than 1% of the polygon is human-caused bare ground.
4 = 1% to 5% of the polygon is human-caused bare ground.
2 = 5% to 15% of the polygon is human-caused bare ground.
0 = 15% or more of the polygon is human-caused bare ground.

9. Degree of Artificial Withdrawal or Raising of Water Level. **Score: _____**

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.

10. Comments and Observations.

ADDITIONAL MANAGEMENT CONCERNS (OPTIONAL)

11. Overflow Structure Stability. **Score: _____**

(If the water body is not human constructed nor structurally altered, and lacks an overflow structure, replace both Actual and Possible Scores with NA.)
6 = The overflow structure is made of concrete, pipe, or armoured rock and appears stable.
4 = The overflow structure is unprotected or is made of other material, but still appears stable.
2 = The overflow structure is made of concrete, pipe, or armoured rock, but appears unstable.
0 = The overflow structure is unprotected or is made of other material and appears unstable.

12. Shoreline Rock Volume and Size.

12a. Shoreline Rock Volume. Rate the shoreline rock volume as the highest appropriate category: **Score:_____**

3 = More than 40% of shoreline volume is rocks at least 2.5 inches.
2 = 20% to 40% of shoreline volume is rock at least 2.5 inches.
1 = 10% to 20% of shoreline volume is rock at least 2.5 inches.
0 = Less than 10% of shoreline volume is rocks at least 2.5 inches.

12b. Shoreline Bank Rock Size. Rate the shoreline rock size for the polygon as the highest category: **Score:_____**

3 = At least 50% of rocks present are boulders and large cobbles (>5 inch).
2 = 50% of rocks present are small cobbles and larger (>2.5 inches).
1 = At least 50% of rocks present are coarse gravels and larger (>0.6 inches).
0 = Less than 50% of rocks present are coarse gravels and larger (>0.6 inches).

13. Vegetative Use by Animals. Use the categories below to score the amount of utilization. **Score:_____**

3 = 0 to 25% available forage taken.
2 = 26 to 50% available forage taken.
1 = 51 to 75% available forage taken.
0 = 76 to 100% available forage taken.

14. Susceptibility of Parent Material to Erosion. **Score:_____**

3 = Not susceptible to erosion (well armoured).
2 = Slightly susceptible to erosion (moderately armoured).
1 = Moderately susceptible to erosion.
0 = Extremely susceptible to erosion.

15. Percent of Shoreline Accessible to Livestock. **Percent:**_____

16. Percent of Tree and Shrub Cover in the Polygon that is Dead and/or Decadent. **Percent:**_____

17. Polygon Trend. Select one: Improving, Degrading, Static, or Status Unknown **Trend:**_____

18. Break Down the Polygon Area into the Land Uses Listed (must total to approx. 100%):

No land use apparent:_____
Turf grass (lawn): _____
Tame pasture (grazing): _____
Native pasture (grazing): _____
Recreation (ATV paths, campsites, etc.): _____
Development (buildings, corrals, paved lots, etc.): _____
Tilled cropping: _____
Perennial forage (e.g., alfalfa hayland): _____
Roads: _____
Logging: _____
Mining: _____
Railroads: _____
Other: _____

Description of Other Usage Noted:_____
_____
_____

19. Break Down the Area Adjacent to the Polygon Into the Land Uses Listed (must total to approx. 100%):

No land use apparent:_____
Turf grass (lawn): _____
Tame pasture (grazing): _____
Native pasture (grazing): _____
Recreation (ATV paths, campsites, etc.): _____
Development (buildings, corrals, paved lots, etc.): _____
Tilled cropping: _____
Perennial forage (e.g., alfalfa hayland): _____
Roads: _____
Logging: _____
Mining: _____
Railroads: _____
Other: _____

Description of Other Usage Noted:_____
_____
_____