Range Inventory Manual

MAY 2020

Alberta

Range Inventory Manual | Environment and Parks
 | Published: May 2020 | ISBN: 978-1-4601-4809-9

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1.0 Introduction

Government grazing leases have been administered in Alberta since 1881, even prior to the provincial government being formed. These areas are still being managed for grazing with the current focus on either restoring or maintaining rangeland ecological processes. Grazing leaseholders are expected to employ practices which manage variables such as stocking rate and density, timing, frequency, and duration of grazing that preserve the functions of healthy rangelands and integrate other values. Successful planning depends on accurate, up-to-date rangeland resource inventories and rangeland health audits completed according to a standardized measurable and repeatable process.

Grazing leases are administered by Alberta Environment and Parks (AEP) Rangeland Agrologists through contracts with leaseholders. Typically these leases are reviewed for renewal every ten years. Prior to renewal, the current management is assessed, and changes may be administered to better compliment proper rangeland functions. An inventory is a useful tool at this stage to help quantify the land base and identify critical areas.

Within the Rocky Mountains Forest Reserve, the grazing is administered differently than leases but the need for consistent ecological data to help manage for improving or preserving rangeland functions is the same. The Forest Reserves Regulation section 15(1)(b) requires forest reserve permit holders to comply with the range management plan for the allotment they are grazing within. Section 1(h) of the regulations sets out the requirements for a management plan. In 2010, AEP introduced a new policy that requires allotment permit holders to provide a certified range inventory to support the development of the required allotment range management plan.

The following manual provides recommended methodology to carry out a range inventory or inventory reassessment that meets the certification criteria. The purpose of an inventory is to quantify the landscape to provide a basis for management decisions that will maintain the natural ecological functions of each management unit (i.e. distribution unit, pasture, or field). This is completed by mapping each management unit by vegetation type, determining the ecologically sustainable grazing capacity for the unit, and measuring how current management and disturbance regime is affecting the overall range health. These measurements hinge upon a mapping system that classifies the land base into descriptive and manageable units, and then measures these units according to established processes. The Range Plant Community Guides of Alberta provide the basis for classification. This classification is a hierarchal approach based on Natural Subregions. The Natural Subregions are split into ecological sites or ecological range sites depending on which Natural Region classification system is used. These in turn are subdivided into generalized plant communities. These plant communities are characterized by the constraints within the ecological (range) site and any disturbance the site may be subject to.

Once plant communities are defined, characteristics such as forage production, grazing tolerance, and successional pathways can be described. A key measure that each plant community is given is an Ecologically Sustainable Stocking Rate (ESSR). These rates are established to allocate a percentage of the forage production for livestock utilization and the remaining forage production as carryover for the maintenance of ecological functions (e.g. nutrient cycling, viable plant communities, hydrological function, soil protection, etc.) and plant community services (forage production, habitat maintenance, wildlife forage use, biodiversity, etc.). The ESSR reflects the maximum number of Animal Unit Months (AUMs) per acre or hectare that can be supported by the plant community given inherent biophysical constraints and the ecological goal of sustainable health and proper functioning of the plant community.

When the ESSR is expressed for the area of a plant community polygon, the result is termed that polygon's carrying capacity, and is written in AUMs. Once summed up by management unit, this carrying capacity is the number of AUMs that unit can sustain. Often the carrying capacity must be adjusted for access factors (e.g. areas that are inaccessible due to natural barriers), and management factors (e.g. reduced livestock distribution attributed to livestock management). This adjusted/reduced carrying capacity is termed the grazing capacity. Further information on all of these terms can be found in "Methodology for Calculating Carrying and Grazing Capacity on Public Rangelands" (Range Management Branch 2004) as well as "Grazing Management Adjustments for Health Rangelands" (Range Management Branch 2008).

The Rangeland Health Assessment is the primary tool utilized to measure how the current plant community is maintaining its ability to perform certain key functions. These functions include net primary production, maintenance of soil and site stability, capture and beneficial release of water, nutrient and energy cycling, and functional diversity of plant species. Measuring range health is performed by comparing key ecological attributes of the current plant community to a healthy reference community. For further information, refer to the "Rangeland Health Assessment for Grasslands, Forest, and Tame pasture Field Workbook." (Adams et al. 2016).

1.1 Inventory Requirements

Each range inventory project requires (1) a detailed map and (2) an inventory report. The detailed map consists of the inventoried area delineated by plant community polygons, with each polygon rated for rangeland health. These polygons are then summed up by management unit to calculate the carrying and grazing capacities. The report consists of management unit summaries, a description of physical and geographical characteristics, current range management practices and challenges, livestock distribution issues, grazing integration issues, and recommendations stemming from the inventory.

In cases where a previously accepted inventory exists, an inventory reassessment is conducted. Surveyors use the mapped plant community polygons from the previous inventory as the basis for the reassessment. Updates to a previous inventory are needed to reflect changes due to management, succession, and disturbance. In addition, several improvements to the range inventory process have evolved over time, such as development of plant community guides and classification, imagery improvement, range health assessment protocol (2003), and inventory standardization (2010). Where applicable, polygon lines are updated based on imagery interpretation and field observations to increase the accuracy of the visible vegetation boundaries and management unit boundaries. The following are examples of information that can be included in an inventory reassessment:

- Updated plant community calls when there is substantial difference in plant community (e.g., succession, disturbance, etc.) since the previous inventory, or if a new/ undescribed/ inadequately described plant community is encountered.
- Reassessment of range health (for trend purposes)
- Adjusted carrying and grazing capacities
- Boundary and asset updates
- Current management regime and range management considerations and recommendations
- Discussion of resource integration

Regardless if a new inventory or a reassessment is occurring, the range inventory process is composed of three stages. They are:

1. Pre Field Component
2. Field Component
3. Post Field Component and Map Creation

The recommended methodology to complete these three stages are described in this manual. The suggested survey methods to collect physical and vegetative data to complete the inventory are also outlined. How the inventory data are collected, mapped, and reported is specific to each particular inventory but this manual will provide guidance on how to obtain the relevant information to develop the various inventory components. The manual does not cover the methodology of plant community classification or range and riparian health assessments. These methods can be found in the plant community guidebooks for the appropriate Natural Subregions, and the range and riparian health assessment field workbooks. The current website locations of all published guidebooks and reference materials to aid inventories are located in Appendix 1.

2.0 Range Inventory Process

2.1 Pre Field Component

The pre field component entails gathering information and equipment to help conduct the range inventory. A literature and file search can be performed to find any relevant information for the land base being inventoried, such as past surveys. If the inventory being performed is an inventory reassessment, the previous plot data and detailed map information provide helpful information and an indication of trend by comparing the past data to present. Review of relevant plant community guides, riparian assessment field workbook, and range health assessment field workbook will help ensure familiarity with the plant communities and methodologies in the guide.

Where applicable, maps and data can be provided by AEP in either digital or hard copy formats, but a data sharing agreement must be attained from the AEP Rangeland Specialist for the area where the project is located. The following are examples of maps, data, and forms that AEP recommends for the inventory:

- Overview maps of the complete project area being inventoried including enough of the surrounding area to determine access. These maps will include the following base features: roads, trails, cutlines, hydrography, management unit boundaries, and the most recent high quality imagery. Other specific layers for the project may be provided if available, such as topologically correct polygons from the previous inventory, cutblock information, and available land cover (e.g. AVI - Alberta Vegetation Inventory, GVI - Grassland Vegetation Inventory, DEP – Derived Ecosite Phase).
- Overview maps of each management unit (i.e. field or DU) at 1:20,000 or better with base features as above, any pertinent information (e.g. recent cutblock plans), as well as plant community delineation if available. This may be derived from a previous inventory, a rangeland view of GVI, PLVI (Primary Land Vegetation Inventory), DEP, or AVI.
- Field map sheets (11x17) at scales of at most 1:15,000 showing features provided on the management unit maps. The management unit may be split into multiple sheets if required to maintain the scale. If this occurs a field sheet (11x17) of the complete field will also be provided.
- Paper copies of all relevant forms (e.g. Site Description, Vegetation Inventory, Range Health Assessments, Riparian Health Assessments, Invasive Plant Form, etc.) Example sheets of these are all available in Appendix 2.
- Up-to-date plant community guides for the Natural Subregions relevant to the project area.
- Standardized paper bags (e.g. 14H) for clipping if forage production sampling is part of the project.
- Species list of RRMP preferred scientific and common names (ECOSYS database export).

The field surveyor is required to be equipped with:

- Field, outdoor, and safety equipment based on being in remote and isolated locations.
- Means for travel to and within the inventory area (e.g. vehicle, ATV, horse).
- Up-to-date manuals pertinent to the project (e.g. Range Inventory Manual, Range Health Assessment Field Workbook, Riparian Health Field Workbooks, etc.).
- Navigational equipment (e.g. compass, GPS, clinometer, etc.).
- Survey equipment such as permanent markers, flagging tape, 30 meter tape, forage clippers, and frames relevant to the surveys required.

2.2 Field Component

The field component involves using provided field maps to ground truth and attribute each polygon that is deemed accessible by livestock. Most polygons are visited and surveyed utilizing the methods described below. Very remote polygons not deemed accessible by livestock still are assessed but can be done visually if no access is apparent. Before deciding to use a visual assessment to describe a remote polygon, efforts should be made to discuss with allotment holders or AEP staff to ensure the areas in question are not being utilized by livestock.

2.2.1 Vegetative Mapping

Surveyors typically use available basic plant community polygon line work (previous inventory/GVI/AVI/ PLVI/DEP) as a basis for inventory as it provides a rough first cut of mapping polygons. More detail is provided by the surveyor with a focus on primary and secondary range types[1]. Modifications made can include line deletions, additions, and alterations to increase accuracy of the visible vegetation boundaries. A polygon can contain up to three plant community calls or deciles that must add up to 100 per cent. Deciles can be utilized if the boundaries between communities are hard to discern on the imagery, if a mottling between 2 communities exist, or if the community boundary is below the minimum polygon size. Polygons are delineated by management unit (field or DU) as management is expected to change between units.

2.2.2 Upland Survey

For upland sites, the recommended minimum polygon size is 2 hectares. Polygons given in the basic plant community line work are visited or viewed and their deciles assessed by either a Detailed, Reconnaissance, or Visual plot level of assessment. These plots are considered relatively hierarchal with the most information required for a Detailed Plot and the least for a Visual Plot. For inventory reassessments, Detailed and Reconnaissance Plots from the previous inventory are reassessed, as well as previously surveyed range health assessment points. Detailed and Reconnaissance Plot data from the previous inventory may be used as a surrogate if sampled in the same location and there is no significant difference in species composition (i.e. plant community). In this circumstance, the surveyor would describe the site using the previous plot data and perform a new range health assessment for trend purposes.

- **A Detailed Plot** is used when no other plot within the field or local area being inventoried has the same plant community on the same Ecological (Range) Site. During an inventory reassessment, a Detailed Plot is only used when there is a substantial difference in plant community (e.g. succession, disturbance, etc.) since the previous inventory, or if a new / undescribed / inadequately described plant community is encountered. Please note the following:
  - A Detailed Plot is not necessary if that plot has already been described with a detailed plot in the present reassessment (same field / local area), in this case a reconnaissance plot is acceptable
  - A Detailed Plot should be conducted regardless of whether the new plant community was described in a different location in the previous inventory
  - If no change in species composition is observed, only a range health assessment is conducted at the reassessment location
- **A Reconnaissance Plot** is used when a Detailed Plot with the same plant community occurs within the field and local area being inventoried. Reconnaissance Plots are utilized after a Detailed Plot has been collected of the same plant community during the current inventory and are continued to be used until the surveyor is confident in accurately visually assessing the community using a visual plot. Please consider the following for inventory reassessments:
  - Similar to a new inventory, during inventory reassessments a Reconnaissance Plot can be used to link to a detailed plot that has been completed during the current reassessments.
  - If during the reassessment the plant community has not deemed to have changed from the original assessment, only a range health form is completed at the location.
- **A Visual Plot** is used when there is already adequate representation of the plot by a Detailed or Reconnaissance Plots and the areas are similar enough in landscape, vegetation, and health ranking (healthy, healthy with problems, or unhealthy) to be grouped together. For example, this can be used where there is much mottling of plant communities across a landscape. A Visual Plot may also be used to describe:
  - Subdominant deciles within polygons (30% or less) without significant management concern.
  - Polygons that contain no rangeland value (e.g. rocks, roads, etc.).
  - Polygons inaccessible to livestock that can only be viewed due to access reasons.
  - Tertiary Range Types areas such as forested areas that receive limited use by livestock. Forested plant community types (Archibald et al. 1996, Beckingham and Archibald 1996) may be substituted if the community is currently not described within the range plant community guide for that subregion.
  - For inventory reassessments, can be used to describe plant community polygons where detailed or reconnaissance plots were not collected in the previous inventory and the surveyor deems the plant community composition has not substantially changed since the previous inventory.
  - During inventory reassessments to update and/or add subdominant deciling and delineation of tertiary/non-use range.

[1] **Primary Range: range that animals prefer to graze when management is minimal (relative to distribution unit and time of year). Secondary Range: range that is lightly used or unused by livestock under minimal management and will ordinarily not receive much use until primary range has been over-utilized.**

The forms and measures collected differ between Natural Regions. These are itemized in Table 1 below. Specific details of each item are listed after the table.

Table 1. Examples of forms and measures collected at each level of assessment.

	Grassland Natural Region	All Other Natural Regions
Detailed Plot		
1. GPS location	Yes	Yes
2. Site Description Form		Yes
3. Vegetation Inventory Form	Full	Full
4. Plant community call	Yes	Yes
5. Access Factor	Yes	Yes
6. Riparian (%) and Health	Yes	Yes
7. Range Health Assessment	Full	Full
8. Forage Clip		Yes*
9. Plot Photographs	Yes	Yes

	Grassland Natural Region	All Other Natural Regions
Reconnaissance Plot		
1. GPS location	Yes	Yes
2. Site Description Form		Yes
3. Vegetation Inventory Form	Yes, transect omitted	Yes, transect omitted
4. Plant community call	Yes	Yes
5. Access Factor	Yes	Yes
6. Riparian (%) and Health	Yes	Yes
7. Range Health Assessment	Full	Full
8. Forage Clip		Yes*
9. Plot Photographs	Yes	Yes

	Grassland Natural Region	All Other Natural Regions
Visual Plot		
1. GPS location		
2. Site Description Form		
3. Vegetation Inventory Form	Optional	Optional
4. Plant community call	Yes	Yes
5. Access Factor	Yes	Yes
6. Riparian (%) and Health	Yes	Yes
7. Range Health Assessment	Rating	Rating
8. Forage Clip		
9. Plot Photographs	Optional	Optional

1. GPS locations are formatted in decimal degrees with 5 decimals and datum is either NAD83 or WGS84. This can be collected on either the Site Description Form or Vegetation Inventory Form (Section 3.1, 3.2).
2. The Site Description Form (PLD 021) describes the physical characteristics of the site (Section 3.1). These forms are required for Detailed and Reconnaissance plots.
3. There are three Vegetation Inventory Forms currently available; MF5-PL, Prairie MF5, and Prairie/Rocky Mountain MF5. The Grassland Natural Region uses the Prairie MF5 or Prairie/Rocky Mountain MF5; the other Natural Regions use any of the three (Section 3.2).
    - For Detailed Plots it is recommended that this form is filled out entirely, including the detailed transect information. The transect information can be omitted at the Reconnaissance level of assessment because a Reconnaissance Plot is linked to a Detailed Plot within the nearby area or at the same location in a previous survey.
    - For Visual Plots this form may be used to collect the relevant information, but the entire form does not have to be filled out.
4. Plant community estimation can be a code from the Natural Subregion's range community type guide book. If a community type cannot be found in a guide then a conditional call is used.
    - If the conditional community closely resembles an established community, but either at an earlier/ advanced seral stage, or disturbed, it can be documented as the established community code with a '_D" or '_S' for disturbed or seral related respectively.
    - If the conditional call is not linked to any established community, the naming convention is to list the dominant 2 or 3 species with "/" dividing life-forms, and "-"dividing species within life-forms. The appropriate Ecosite Phase is determined in order to set the ESSR.
5. Access factors provide an overview measure of how well livestock are able to access the polygon due to water and landscape constraints. The ratings are from 0 to 10, zero being no access and 10 being full access. This information is used to fill out the Range Management Form (Section 2.3.2). This data is not formally captured on the Vegetation Inventory Form, although cattle access is rated as good / fair / poor on the back page. This rating can be also included in this area as "AF= 0 - 10".

6. The percent riparian and estimated riparian health ranking (healthy, healthy with problems, unhealthy) are collect for each polygon and used to fill out the Range Management Form (Section 2.3.2). There is no formal location for this on the Vegetation Inventory Form, but there is Water Source information collected on the back page. This information may be collected at this location as well.
7. A full Range Health Assessment (forested, grassland, or tame pasture) is collected for Detailed and Reconnaissance Plots. For Visual Plots, just a health ranking (healthy, healthy with problems, unhealthy) is collected based on a visual review of the site and professional judgement.
8. Forage clipping is based on a 0.5m^2 forage clip, separating grass, forbs, shrubs, and litter (Section 3.3). Forage clipping is collected for Detailed or Reconnaissance Plots in the Rocky Mountain, Foothills, and Parkland areas.

   * Clipping is not collected if the project is an inventory renewal, unless a detailed plot is conducted or otherwise stated in the project conditions.
9. Two photographs are typically taken for a Detailed Plot. One photograph taken from a standing position capturing a micro plot. And a second photograph taken from the end of the transect from a kneeling position capturing the transect and horizon. Photographs are also taken at Reconnaissance Plots, usually at least one or two of the general area. This is good practice for Visual Plots as well. The allotment/lease name, plot number, and date are captured in each plot photograph. Plot photographs are included with the field plot sheets.

2.2.3 Riparian Survey

Riparian areas, wetlands and meadows can be delineated with a minimum polygon size of 0.5 hectares. The importance of riparian areas in range management has been highlighted recently with an increase in levels of assessment. If possible, the complete riparian zones are either delineated or deciled. For the purposes of inventory, the riparian zones are regarded as 2 major areas, the active floodplain and the upper terraces (Figure 1). Upper terraces usually have the highest livestock value, as these are relatively larger, drier areas and often have shorter periods where they are most susceptible to degradation due to livestock grazing. The upper boundaries of these areas are delineated, and described with a Detailed or Reconnaissance plot similar to grasslands, shrublands, etc. The active floodplain is usually a smaller area directly beside the flowing stream or standing water of a wetland that is directly affected by annual inundations of the water body. The percentage of active floodplain within the polygon is estimated as well as given an estimated health ranking (healthy, healthy with problems or unhealthy) based on the Riparian Health Assessment system (Fitch et al. 2009, Ambrose et al. 2009). These estimations are entered for each polygon as part of the Range Management Form explained in Section 2.3.2.

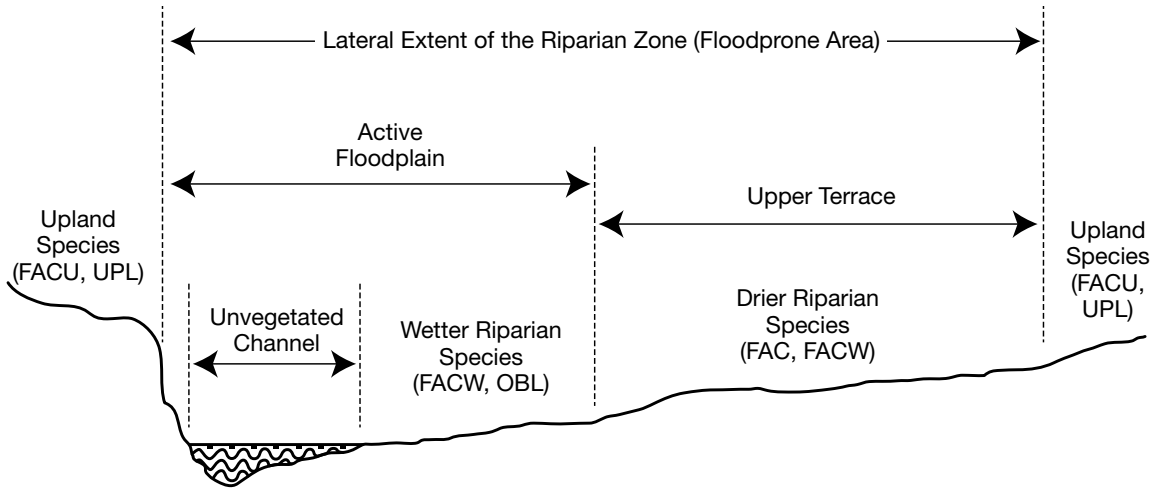

Figure 1. A schematic example of a typical riparian zone cross sections showing near-channel landform features. Note: FAC (facultative), OBL (obligate), UPL (upland), etc. refer to categories of frequency a species is found in wetlands (From Cows and Fish 2005).

For each inventory and reassessment, key critical riparian sites and the active floodplain are selected to be described in detail using the Cows and Fish Riparian Health Assessment (Fitch et al. 2009, Ambrose et al. 2009) (Section 3.5). Critical sites are reaches that have an existing problem, sensitive areas (plant, fish, or wildlife habitat), or areas that may respond quickly to disturbances or management changes that can be readily monitored. These areas will be utilized as benchmark sites to be monitored to support long term riparian health trend monitoring on individual management units within the inventory area.

Inventory projects often specify the minimum number of riparian sites but establishment of these sites are based on professional experience and knowledge gained from the area through completing the inventory, and by consultation with the Agrologists and range managers. Depending on water availability, it is recommended that at least one critical riparian health assessment per management unit is conducted. When selecting the sites, areas upstream and downstream of culverts, roads, fences and other factors that are directly affecting riparian health are avoided although these factors can be commented on as observations on the riparian health assessment form.

2.2.4 Management Inventory

Along with the plot information, it is recommended the following management considerations are collected while visiting range inventory polygons to ensure appropriate representation of the Distribution Units. This data is used to facilitate completion of the Range Management Form and the inventory report.

- **Livestock Utilization and Distribution**: Note successful management along with any problems.
- **Salt**: Map salting locations as well as note their impacts on livestock distribution. Also note successful management along with any problems.
- **Distribution Unit Boundaries**: Distribution Units can be separated by natural barriers or fences. Note whether the locations of these natural barriers are working and located where the map indicates. Also note the condition of the fences. It is important to document any irregularities in Distribution Unit boundaries particularly fencelines compared to the base feature map so that the map can be corrected.
- **Water Supply and Distribution**: Map existing developments and note their condition. Potential water developments should also be noted if it is deemed a location to enhance livestock distribution.
- **Invasive Plants**: Map invasive plant infestation locations and fill out an Invasive Plant Form including an estimation of the infestation area (m2, ac, ha). The form is available in Appendix 2.
- **Predators**: Note problems with predators and any management activities undertaken to deal with predators.
- **Overall Management Summary**: This is based on discussions with the allotment permit or disposition holder and on observations made during the inventory. Surveyors should indicate existing conflicts that are influencing management or affecting rangeland health, and discuss any potential future conflicts.

2.3 Post Field Component

Post field exercises typically involve creating and submitting a GIS spatial dataset of the inventory based on the line work provided, entering collected survey data into spreadsheet templates (range management form, range and riparian health assessments and invasive plant forms) and developing an inventory report. AEP can provide data entry training after the field component to help with consistency and minimize errors. Additionally, for applicable inventories the AEP Rangeland Geomatics Team can meet with the inventory GIS specialist after the draft map is completed to support mapping consistency.

A local AEP Rangeland Specialist will be available throughout the project to assist with technical questions and provide advisory support. If requested, transect data can be analysed through classification techniques by the Rangeland Specialist to support inventory community calls. Once completed, this information will be returned to the surveyor to finalize plant community calls. Other measurements such as the Ecological Sustainable Stocking Rate and range health may be updated according to the plant communities provided.

If forage production samples were collected (section 3.3), arrangements can be made with the local AEP Rangeland Specialist to have them dried and weighed. This data will be sent back to the surveyor to be used in the report. It is also used by AEP to help understand forage production variation of the plant communities they represent.

For efficiency, it is recommended the post field components are completed in this order:

1. Draft GIS spatial datasets including: inventory polygons; boundary line work; detailed and reconnaissance plot locations, and infrastructure locations (section 2.3.1)
2. Data form entry (section 2.3.2)
3. Contract summary meeting (section 2.3.3)
4. GIS spatial dataset and form finalization (section 2.3.4)
5. Inventory report (section 2.3.5)

2.3.1 Draft GIS Spatial Dataset Creation

Working with a GIS specialist, the surveyor maps and attributes range inventory polygons within an ESRI File Geodatabase. The draft spatial data can be submitted to AEP for specification analysis and comment. The spatial data typically includes:

- Topologically correct polygons representing the range inventory. The dataset usually encompasses the entire allotment with each polygon having a unique id. Polygon attributes are formatted in a provided spreadsheet and are linked to the geodatabase by the polygon unique ids.
- Detailed and reconnaissance plot locations
- Infrastructure points accompanied by feature descriptions.

Mapping is typically based on the initial range inventory polygons given. As mentioned previously, these polygons are based on previous inventories, Alberta Vegetation Inventory (AVI), Grassland Vegetation Inventory (GVI), or the Primary Land Vegetation Inventory (PLVI). It is recommended for allotment range inventories that the GIS Guidelines for Range Inventories in the Rocky Mountains Forest Reserve are reviewed prior to mapping in order to understand the recommendations and limitations for polygon delineation. Starting this process early in the post field process can ensure time to communicate if there are any discrepancies with the created or edited polygons.

The recommended minimum mapping unit (MMU) for upland sites is 2 hectares and for wetlands and meadows is 0.5 hectares. Discernable areas above the specified MMU are detailed as clearly as possible. Deciles are used if plant community boundaries are not discernible on the imagery or mottling of plant communities within a polygon make it impossible to delineate. Up to three deciles are used per polygon. Polygons are contained within the corrected management unit (field or distribution unit) boundary outline (even if vegetation type is the same it is assumed management is different between fields).

2.3.1.1 Point Features

Plot locations are captured in a GIS spatial database attributed with the unique plot identifier and plot type (Detailed or Reconnaissance). Infrastructure features can also be captured in a GIS spatial database. Infrastructure that is recommended to capture is salting locations, water developments, and any fence point that may document an irregularity in the distribution unit boundary. Recommendations on capturing infrastructure features can be found in Appendix 4. For allotment range inventories, a shapefile can be provided from AEP to capture infrastructure features. This shapefile is available to be uploaded on to some models of GPS units.

2.3.2 Data Form Entry

Survey forms can be submitted by the surveyor. For allotment range inventories, surveyors are no longer asked to enter plot data into ECOSYS. Vegetation Inventory and Site Information Form data may be entered by AEP directly into ECOSYS. Therefore, form completeness and legibility is important. The surveyor enters select data collected on field forms into spreadsheet templates provided by AEP. A spreadsheet template is provided for the Range Management Form (RMF), range and riparian health assessments and invasive plant forms. Range and riparian health assessment and invasive plant spreadsheet data corresponds directly with the assessment score sheet fields. The RMF spreadsheet is used to attribute the polygons. The possible RMF attribute fields are as follows:

Activity ID – The activity identifier of an allotment or lease (e.g. PNT000000 or GRL000000).

Inspection Date – The date when the inventory was conducted.

Inspector – The name of the inventory surveyor.

Allotment – If applicable, the name of the allotment surveyed.

Field Name – The management unit being inventoried (Field or Distribution Unit (DU)).

Polygon Number – Unique numeric used to identify the polygon. This number is unique for the entire project.

Area – The value calculated for the specific polygon is entered from the finalized map in acres and the hectares conversion is auto-populated in the following column.

Plot Number – The unique alphanumeric assigned to the plot.

Decile (1,2,3) - Number from 1-10 to represent % of polygon that the decile occupies (i.e. 3 = 30 per cent of polygon). Maximum of 3 deciles per Polygon, deciles add up to 10 for a complete polygon description.

Range Use Category – Categorizes the polygon into the degree of use expected in relation to the rest of the DU. This is a drop-down list that contains; Primary (the area that animals prefer to graze when management is minimal), Secondary (range that is lightly used or unused by livestock under minimal management and will ordinarily not receive much use until primary range has been over-utilized), Tertiary (range that goes virtually unused by livestock, even when primary and secondary range are over-utilized), Special Use (rangeland that has been developed or modified for a specialized purpose) and Non-Use. If the range is Non-Use select the appropriate category in the following Plant Community code field. The Non-Use list provides alternatives if the polygon decile is not under perennial vegetation, such as Annual Crop, Alkaline Pond, Beach, Cliff, Exposed Sand, Gravel Bar, Gravel Pit, Oil/Gas/Industrial, Lake, Shallow Open Water, Pond, Reservoir, River, Railway Surface, Rock Outcrop, Rural, Road Surface and Talus.

Special Use Category – If Special Use is selected in the previous field, this field further describes the special use. The drop-down list contains: Associated Lands, Cropping, Cut-Block, Development, Haying, Road Allowance, Wildlife Use, Other.

Natural Subregion – The Natural Subregion the polygon decile is in. This is used for all types, whether it be Plant Community, Landform or Associated Lands.

Plant Community Code (1,2,3) – Code from the applicable plant community guides (e.g. UFA7). This will auto-populate the Plant Community Name and Ecosite Phase in the following columns.

Conditional Community (1,2,3) – The name given to the conditional plant community. If an acceptable community does not exist in the plant community guide within the Natural Subregion the polygon decile is in, a conditional plant community name is entered. If the conditional community is related to an established community, but either an earlier seral stage or more disturbed, it can be documented as the established community code with a '_D" or '_S' for disturbed or seral related respectively. If the conditional community is unrelated to an established community, then provide a listing of the top 2 or 3 species with "/" dividing life-forms, and "-"dividing species (e.g. Pl / rough fescue – Idaho fescue), and indicate the appropriate Ecosite Phase or Ecological Range Site. If a Conditional Plant Community is selected, an appropriate stocking rate is entered in the adjusted rate field.

Conditional Community Comments (1,2,3) – This field can be used to describe the conditional plant community beyond just the leading species, or code detailed above.

Conditional or Tertiary Community Ecosite Phase – Appropriate ecosite phase of the conditional or established tertiary plant community.

Adjusted Stocking Rate (1,2,3) - The surveyor can adjust the stocking rate based on professional judgment or forage production clippings. Stocking rates are entered here for conditional and tertiary plant communities.

Adjustment Reason (1,2,3) - When an adjusted stocking rate is given for a community, an adjustment reason is provided.

Access Factor (1,2,3) - This identifies accessibility to a plant community under practical range management. Based on a scale of 0 (no access) to 10 (full access) and is measured for every decile in a polygon.

Range Health Estimate (1,2,3) – Indicates range health for the polygon decile. The broad health rankings are unhealthy, healthy with problems, and healthy.

Health Trend (1,2,3) - Indicate the current trend of the plant community for each polygon decile. To determine trend, previous knowledge of the decile health would be known. If trend is unknown then select 'Unknown'.

Grazing Intensity (1,2,3) - Measured at each polygon decile, this categorizes the grazing intensity of the plant communities that was derived during the field work.

Current Utilization (1,2,3) - Measured at each polygon decile to estimate the current utilization at the time of the survey. Record a value between 0 and 100%.

Poisonous Species – To flag as a problem, enter up to 3 poisonous species using the ECOSYS species code.

Weeds – To flag as a problem, enter up to 3 species using the ECOSYS species code. Includes noxious and escalated species.

Woody Regrowth – To flag as a problem, enter 1 species using the ECOSYS species code.

Riparian Percent – Record the percentage of active flood plain (Figure 1) within the polygon. If the polygon does not have any active flood plain within it, the value for this field is 0. If the entire polygon is riparian, then the value is 100.

Riparian Health Estimate – Either estimated or calculated through a riparian health assessment, a ranking of the current health of the active flood plain referred to in the previous field. If the value of polygon riparian health is 0 then this field should be left blank.

2.3.3 Contract Summary Meeting

It is recommended the surveyor arranges a contract summary meeting with the leaseholders or allotment permit holders and the representing Rangeland Agrologist. The meeting provides an opportunity to go over the assembled GIS spatial dataset and inventory findings. The GIS spatial datasets, forms, and inventory report are updated accordingly.

2.3.4 GIS Spatial Dataset and Form Finalization

The finalized map contains a topologically correct feature class in the GIS spatial database of the project area with each polygon uniquely identified and its area calculated. The surveyor ensures the map is free of errors and representative of the field work completed. All inventory forms and spreadsheets are finalized.

2.3.5 Inventory Report

Once the map is completed the management unit summaries can be developed. These summaries as well as all other inventory findings are detailed in a report. The following is a list of recommended sections to include in a summary report:

1. Abstract:
    - Present the most important information of the report in a succinct form. Summarize the background, objectives, results and conclusions of the report.
2. Introduction:
    - Provide the background and general information necessary to establish the report context. For technical reports this will include the objectives, technical background and the problem or question being answered.
3. Methods:
    - Describe assumptions and procedures used in the work accurately and clearly. This manual is the primary source for methods and are typically followed unless modifications have been discussed with the Rangeland Specialist.
4. Results and discussion:
    - Describe the plant community findings of each management unit and include:
        - An overview of the Natural Subregions represented on the inventoried area using the Natural Regions Committee (2006) report as the primary reference. Refer to Appendix 1 for access to this resource.
        - Community type descriptions organized into categories of coniferous, deciduous, shrubland, and grassland. Community type descriptions will include: community name, number of plots, general soils information, moisture regime, elevation (m), aspect (o), slope (%), drainage, and parent material. Average forage production of trees, shrubs, forbs, grasses, and the total production from the inventory survey clips should be presented along with production values from plant community guides if available. The scientific name, common name (as per ECOSYS Plant Species List) and cover (%) of the dominant graminoids, forbs, shrubs and trees should also be listed. An example of this format can be found in Appendix 3.
        - A discussion which includes an ecological description, description of grazing and disturbance impact, the reasoning behind assigning a particular community name, unique and identifying features of the community, and a description of where it was found in the allotment.
    - Range management considerations: This section typically includes the following (generally, on a management unit basis):
        - Landscape features that limit areas suitable for grazing (e.g. topography where cattle are limited to valleys or drainage)
        - Current range and riparian health with a focus on any trend information or any issues that were discovered
        - Successional information - outline the successional situation of individual units, including a discussion on disturbance impacts as well as the effect that exclusion of natural disturbance factors (e.g. fire) is having
        - Management Unit boundary issues
        - Lightly or heavily used areas - discussed in terms of patterns of cattle use rather than a reiteration of which range types are over or under used (this is obtainable from the inventory forms)
        - Any ungrazed sites which are too small to be recognized as separate map units but which are surveyed because of their role as comparative sites for determining range health
        - Poisonous plants, weed infestations
        - Eroded water courses or trails
        - Impacts of other resource uses on livestock management
        - Current management practices
            - » salting
            - » livestock distribution - pattern of use
            - » fencing - general state of repair and type of fencing
            - » access problems
            - » wildlife use
            - » inclusions - any areas of significant cattle grazing but too small to be included on the map

    - » discussion about any associated lands outside the allotment but grazed with the allotment
- Overall management summary: This section should identify existing conflicts that are influencing management or affecting rangeland health, as well as discuss any potential future conflicts. This section also includes any discussion about resource integration issues or other resource or land use impacts. Consideration should be given to resolution or follow-up on the issues where possible.

5. Recommendations:

    - Course of action based on the results of the work
    - Where and how use could be improved – e.g. additional salt locations (in specific treed areas or drainages away from primary ranges), better livestock distribution, drift fences or improved fencing, water development, trail upgrading, changes to cattle management
        - Seasonal grazing and grazing management system recommendations
    - Resource integration recommendations that focus on promoting successful resource integration
    - Recommendations on controlling weeds, reducing resource conflicts, etc.

6. Literature cited
7. Appendices

    - Characteristics of map polygons and area (suggest that this appendix be done as an excel table)
    - Species list

3.0 Range Survey Methodologies

3.1 Describing the Site through the Site Description Form (RDB 2002-1)

Environmental and broad vegetation characteristics of a site are collected for Detailed and Reconnaissance plots during range inventories. This information can be captured by completing the Site Description form. If a Detailed plot is being sampled, the details of the site description form is directly linked to the vegetation transect being sampled to help complement the vegetative attributes. If a Reconnaissance plot is being assessed, the plot size can be less specific but is centered in a representative area in the polygon or polygon decile being sampled.

The Site Description form's origin is from a previous public lands department tasked with the collection of ecological data. The site form is one of four forms created for plot data collection. It was designed to be employed in three ways (Resource Data Branch 2003):

1. to record, completely and accurately, location, date and plot identification data which makes each sample plot a distinct plot and spatial entity in an electronic database,
2. to record landscape features associated with the sample plot, and
3. to summarize general vegetation and soil features

This form has been adopted by Rangeland Resource Stewardship Section along with a database (ECOSYS) to help collect and organize data for analysis of communities within Range Plant Community guides. It is still the original form but some of the data fields have either been adapted or are not used for range management purposes. As the ECOSYS database was developed along with this form, the data fields are directly transferable. ECOSYS has been further developed to encompass other projects since its inception, so there may be some new fields in the database that do not relate to the Site Description form.

The following lists the information items on the Site Description form as well as hints for filling them out. These definitions are taken directly from the "Ecological Land Survey Site Manual (Resource Data Branch 2003) except where rangeland inventory procedures deviate from the original definitions. It is recommended to refer to the cited manual for complete definitions.

Project Identification – Used historically to name the study area, can be used to indicate the allotment or grazing lease or inventory area being sampled. Write the appropriate GRL/ PNT number, allotment/lease name or name of project.

Surveyor(s) – This field is used to identify the organization or company collecting the field data.

Agency – Enter the name of the agency (department, branch, etc.) for whom the data is being collected in this field.

Level of Assessment – The appropriate level of assessment should be indicated in this field.

Three levels of assessment, with increasingly higher levels of information or data collection, are recognized for conducting range inventories: visual, reconnaissance and detailed (refer to Section 2.2.2).

Visual Assessment

Limited information is collected and recorded on the Site Description Form during this assessment. Data is recorded at the discretion of the surveyor. The collected information is used for mapping and RMF purposes. Collected data is not entered into ECOSYS.

Reconnaissance Assessment

This level of assessment includes the completion of a Site Description Form and Vegetation Inventory Form (MF5-PL, Prairie MF5, or Prairie/Rocky Mountain MF5).

Detailed Assessment

A detailed assessment involves the completion of a Site Description Form and Vegetation Inventory Form. It is recommended that each form is filled out in its entirety, with any exceptions detailed in this manual.

Forms – This field identifies the forms filled out for a specific sample plot within the identified study area. A check mark is placed in the box adjacent to those forms that have been filled or partially filled out. If other forms have been used, they are identified.

Date – Record the day of month first, then the month, both with leading zeros if necessary, followed by the complete 4 digit number of the year (e.g., 05/12/2001). Months are numbered sequentially from 01 (January) to 12 (December).

Project Code – A code unique to the project is entered in this field. This code can be obtained from a local Rangeland Specialist prior to the initiation of data entry. It consists of a 2 digit number followed by a 3 letter acronym, which identifies the geographic location of the study area.

Plot # – The site or plot number being sampled, related to a specific point. This 4 character alphanumeric is commonly a letter denoting the allotment/lease name and a sequential number uniquely identifying the plot in the grazing lease, allotment, or project being sampled. Do not duplicate this number within the project, regardless of the type of plot (detailed, reconnaissance, or visual). If a vegetation inventory or other form is being completed, this plot number is recorded on them as well to link the forms together.

Plot Area – For range inventories, the plot area is not recorded on the Site Description Form. The polygon area is determined during the mapping phase.

Plot Shape – For range inventories, the plot shape is not needed.

Legal Land Description (LSD / SEC / TWP/ RGE / MER) – Describes the legal location of the plot. These fields are not needed but can be recorded if known to supplement the obtained GPS location.

Global Positioning System (GPS) – This field is not used for range inventories. All locations are acquired using an accurate GPS.

Latitude / Longitude – Enter the GPS location here. Latitude and Longitude location information are recorded for each Detailed and Reconnaissance plot. GPS locations are formatted in decimal degrees with 5 decimals. Datum is either NAD83 or WGS84. Projections such as UTM or TTM are not used on this form.

The following is an example of the recommended format:

Decimal Degrees (DD) – Degrees are recorded to 5 decimal places (i.e. 49.69500, -112.77778)

Site Photos – Digital plot photographs are documented by recording the photo number(s) in this field. Digital image files are named with project name and plot number and placed in a project specific directory.

Aerial Photography – Historically used to capture x-y coordinates of a plot from a specific aerial photograph. If aerial photography was used to identify the plot, record the aerial survey roll number (the letters followed by the four or five digits number, (e.g. AS1514) and the photo number (e.g. 170) of the air photo on which the sampled plot is located. Refer to the original manual for further details.

Map Sheet – 1:50,000 National Topographic System (NTS) or 1:20,000 Base Map – Not needed for range inventory data collection

Natural Region/Subregion – Natural Regions are recognized on the basis of broad variations in landscape features. There are 6 natural regions within Alberta. Each region is further divided into two or more subregions based on distinctive subregional landscape patterns. The appropriate numeric code for the subregion is recorded (Table 2). Further information on natural regions and subregions may be found in Natural Regions and Subregions of Alberta (Natural Regions Committee 2006).

Table 2. Natural Subregion Codes

Boreal Forest Natural Region	
1	Central Mixwood
2	Dry Mixwood
3	Wetland Mixwood
4	Sub-Arctic
5	Peace River Lowlands
6	Boreal Highlands
Rocky Mountain Natural Region	
7	Alpine
8	Subalpine
9	Montane
Foothills Natural Region	
10	Upper Foothills
11	Lower Foothills
Canadian Shield Natural Region	
12	Athabasca Plain
13	Kazan Upland
Parkland Natural Region	
14	Foothills Parkland
15	Peace River Parkland
16	Central Parkland
Grasslands Natural Region	
17	Dry Mixedgrass
18	Foothills Fescue
19	Northern Fescue
20	Mixedgrass

(from Resource Data Branch 2003)

Ecodistrict – Record if known. A three-letter code defines each ecodistrict. For the three letter allowable codes, a map of the ecodistricts and further descriptive information see Ecodistricts of Alberta (Strong and Thompson 1995).

Elevation – Record in meters using height above ellipsoid calculations on GPS if available. Indicate on form if attaining from a source other than GPS such as an altimeter or topographic map (indicate scale).

Aspect – Record in degrees. Aspect is a measure of the orientation of the slope, using a compass reading. It is used to indicate the direction of exposure of a slope. This information is valuable, when combined with a measure of slope, for predicting the amount of incident solar radiation.

Level ground has no aspect. For slopes of less than one percent, enter a zero in the aspect field. On sites with a slope of one percent or more, enter a numeric value for aspect. A value of 360° is due north, 90° is due east, 180° is due south, and 270° is due west. Enter the compass bearing of the estimated aspect of the slope to the nearest degree. Ensure the compass is set to the current proper declination. Current declination information may be obtained from recent NTS or Access maps, or from web sites, which provide the calculations to determine the current declination of a specific location (e.g. Natural Resources Canada, Centre for Topographic Information). The current declination reflects any annual changes in declination and local magnetic variations.

Slope – Record in percent slope. This can be attained through the use of a clinometer. A slope of 0 is recorded for those sites which have no slope (a level site). If degree slope is attained, convert to percent using a conversion table. Refer to the original manual for further details.

Regen 1,2,3 – Average height and % cover of deciduous and coniferous regenerating tree species are recorded here. Use Alberta Vegetation Inventory mapping species codes (See Table 3).

Table 3. Tree species names and codes for describing regeneration.

Code	Common Name	Scientific Name
Sw	White Spruce	*Picea glauca*
Se	Engelmann spruce	*Picea engelmannii*
Sb	Black spruce	*Picea mariana*
Pl	Lodgepole pine	*Pinus contorta*
Pj	Jack pine	*Pinus banksiana*
Pa	Whitebark pine	*Pinus albicaulus*
Pf	Limber pine	*Pinus flexilis*
Fb	Balsam fir	*Abies balsamea*
Fa	Alpine (subalpine) fir	*Abies lasiocarpa*
Fd	Douglas fir	*Pseudotsuga menziesii*
La	Alpine larch	*Larix lyallii*
Lt	Tamarack	*Larix laricina*
Lw	Western larch	*Larix occidentalis*
Aw	Trembling aspen	*Populus tremuloides*
Pb	Balsam poplar	*Populus balsamifera*
Bw	Paper (white) birch	*Betula papyrifera*

Data Categories (Exposure – Factor 2) – Valid codes for the following data categories are numeric. Most are shown along with a brief description of each numeric code, on the bottom half of the Site Description Form. Record the number in the field that best corresponds with the sites description.

Exposure - If the site is influenced by the following atmospheric or climatic related exposure factors that deviate from the typical (zonal) climate, enter that value, otherwise choose 1 (Not Applicable).

1. Not Applicable
2. Wind – This category is used if the site is directly influenced by strong winds. This commonly occurs on ridges, mountain tops, or in areas where wind funneling occurs due to the convergence of valleys in the direction of wind flow. Common vegetation indicators are plant of reduced height or gnarled growth form, tree tops and branches oriented downward, and vegetation reflecting a drier environment.
3. Insolation – Sites that are influenced by solar radiation far greater than level ground. Generally applies to south facing slopes between 20 and 100%. Common vegetation indicators are vegetation from drier more heat tolerant environments (often grass dominated) and reduced tree growth.
4. Frost – Refers to areas of cold air accumulation in valley bottoms and depressions in the landscape. Vegetation indicators include tree, shrub and forb species more indigenous to cooler areas. Frost cracks on the trunks of trees may also be present.

5. Cold air drainage – This applies to areas where cold air passes, such as mountain gullies. This is separate from the frost category and cold air does not accumulate. Commonly, the vegetation in these areas is usually from somewhat moister than the zonal climates.
6. Atmospheric toxicity – Applies to areas influenced by acidic or basic rainfall. Also areas that are exposed to toxic fumes from industrial plants. This toxicity affects the type and growth form of the vegetation, as well as causes defoliation, disease and dead standing species.

Flood Hazard - Describe the frequency in which the site if prone to flooding. This refers to overland flooding associated with rivers, creeks and streams. The following table itemizes the indictors of the various levels of flood hazard.

Table 4. Flood hazard characteristics

1. No Hazard	
Litter cover	Thick litter cover, lower layer completely decomposed. Soil profile development is evident
Overbank deposits	No evidence of recent overbank deposits
Fluvially transported debris	Not present
Vegetation	Mature stands of upland vegetation
Terrain height	Areas of higher elevation
Terrain unit	Areas of higher terraces, fluvial fans, colluvial deposits, etc… Unusually adjacent to valley walls.
Estimated flood frequency	This unit is unlikely to be flooded under the present hydrological conditions.
Soil classification	Usually no Regosolic; will depend on area surveyed
2. Rare	
Litter cover	Thick litter cover, lower layer completely decomposed
Overbank deposits	No evidence of recent overbank deposits
Fluvially transported debris	Not present
Vegetation	Mature stands of upland vegetation
Terrain height	Areas of higher elevation
Terrain unit	Areas of lower terraces, fluvial fans or colluvial deposits
Estimated flood frequency	In the range of 50 to greater than 200 years return interval
Soil classification	CumulicRegosols; Brunisolics
3. May Be Expected	
Litter cover	Thin litter cover present ranging from recent to partly or completely decomposed material
Overbank deposits	Silt and/or fine sand deposits inter-bedded with organic litter
Fluvially transported debris	Fluvially deposited logs and organic debris may be present on the ground and in lower branches of trees.
Vegetation	Mostly mature vegetation stands, but with some species typical of primary colonization
Terrain height	Areas of moderate elevation
Terrain unit	Areas of valley floor dissected by drainage channels
Estimated flood frequency	Less than 50 year return interval
Soil classification	CumulicRegosols
4. Frequent	
Litter cover	No litter to a thin layer of non-decomposed material
Overbank deposits	Presence of recent silt or sand depositions. Occasional scour holes
Fluvially transported debris	Fluvially deposited logs and organic debris on channel banks Occasional debris in lower branches of trees.
Vegetation	None, or species typical of primary colonization; or species typical of wetlands
Terrain height	Low lying areas
Terrain unit	Active floodplain or fans. Includes active channels, side channels, drainage channels and areas of march or swamps adjacent to valley walls
Estimated flood frequency	1-3 year return interval
Soil classification	Orthic and CumulicRegosols

(adapted from Resource Data Branch 2003).

Soil Drainage - The official soil drainage classes of the Canada Soil Survey Committee are used for this category. These have been defined by the Land Resource Research Institute (Day 1982). These classes are defined in terms of actual moisture content in excess of field capacity, and the extent of the period during which such excess water is present in the plant – root zone. This measure incorporates other soil characteristics such as permeability, level of groundwater, and seepage. The soil drainage classes are as follows:

1. Very rapidly drained – The soil moisture contents seldom exceeds field capacity in any horizon except immediately after water additions. Water is removed from the soil very rapidly in relation to supply. Excess water flows downward very rapidly if underlying material is pervious. There may be very rapid subsurface flow during heavy rainfall provided there is a steep gradient. Soils have very limited water storage capacity (Usually less than 2.5 cm) within the control section and are usually coarse textured, or shallow, or both. Water source is precipitation.
2. Rapidly drained – The soil moisture contents seldom exceeds field capacity in any horizon except immediately after water additions. Soils are free from any evidence of gleying or mottling throughout the profile. Rapidly drained soils often occur on steep slopes.
3. Well drained – The soil moisture content does not normally exceed field capacity in any horizon (except possibly the C) for a significant part of the year. Soils are usually free from mottling in the upper 1m, but may be mottled below this depth.
4. Moderately well drained – The soils moisture in excess of field capacity remains for a small but significant period of the year. Soils are often faintly mottled in the fine-textures soils and in medium texture soils that have a slowly permeable layer below the A and B horizons. In grassland soils the B and C horizons may be only faintly mottled and the A horizon may be relatively thick and dark.
5. Imperfectly drained – The soil moisture in excess of field capacity remains in the subsurface horizons for moderately long periods during the year. Soils are often distinctly mottled in the B and C horizons; the Ae horizon, if present may be mottled. The matrix generally has a lower chroma than in the well-drained soils on similar parent materials. Soils are generally gleyed subgroups of mineral soils orders.
6. Poorly drained – The soil moisture in excess of field capacity remains in all horizons for a large part of the year. The soils are usually strongly gleyed. Except in high chroma parent materials, the B if present and upper C horizons usually have matrix chromas of three or fewer. Prominent mottling may occur throughout. Soils are generally in the Gleysolic and Organic order.
7. Very poorly drained – Free water remains at or within 30 cm of the surface most of the year. The soils are usually strongly gleyed. Subsurface horizons usually are of low chroma and yellowish to bluish hues. Mottling may be present within 30cm or at depth in the profile. Soils are generally in the Gleysolic or Organic order, mineral soils are usually a peaty phase.

Perviousness - The ability of the soil to allow free movement of water through its substrate. These classes refer soil characteristics such as structure, texture, porosity, cracks, organic matter content and shrink-swell properties. These are closely related to measures of permeability, percolation rate, and infiltration rate, but the use of these terms are reserved for the actual measurements of these. Perviousness categories apply to the entire soil profile, thus the least permeable layer will be the layer the limiting factor that defines it. The categories are:

1. Rapidly pervious – the capacity to transmit water vertically is so great that the soil will remain wet for no more than a few hours after thorough wetting. The horizons and soils have large and continuous or connected pores and cracks that do not close with wetting.
2. Moderately pervious – the capacity to transmit water vertically is great enough that the soil will remain saturated for no more than a few days after thorough saturation. Most moderately pervious soils hold relatively large amounts of water against the force of gravity, and are considered good, physically, for rooting and supplying water to plants. Soil horizons may be granular, blocky, weakly platy or massive (but porous) if continuous conducting pores or cracks are present which do not close with wetting.
3. Slowly pervious – the potential to transmit water vertically is so slow that the horizon or the soil will remain saturated for periods of a week or more after thorough wetting. The soil may be massive, blocky or platy, but connecting pores that conduct water when the soil is wet are few, and cracks or spaces among peds that may be present when the soil is dry, close with wetting. Roots are usually few or absent, even in positions accessible to plant roots. Roots are localized along cracks when they are present.

Regional Landform – This attribute provides a general description of the landscape in the region of the sample plot. This level of terrain assessment is based on the ecodistrict scale. The terms used to describe regional landform are defined in Table 5. These definitions have been extracted with minor revisions from Shields et al. (1991) unless indicated otherwise.

Table 5. Regional landform codes and descriptions.

Code	Landform	Description
1	Tableland (or plateau) dominated	Comparatively flat areas of great extent commonly bounded on at least one side by an abrupt escarpment, or may be terminated by mountains; may be dissected by deep valleys and deeply incised rivers; may be tectonic, erosional or volcanic in origin; slopes generally < 10%, in some places 10 to 15%; relief generally < 50m.
2	Hilland dominated	Natural elevations rising prominently above the surrounding plain and having a recognizably denser pattern of generally higher knolls or crest lines with irregular or chaotic surface form composed of upper surface convexity and lower concavity; includes hummocky morainal material, volcanic cones, and conical hills of lava; slopes generally 10 to 30%; relief generally 30 to 300m.
3	Mountain dominated	Tectonic (erosional and volcanic) landscapes with relief (vertical distance between higher and lower parts) > 300m with most of the area comprising valley to summit terrain; slopes generally > 30%. In general the terrain has a restricted summit area and steep sides, irregular shape and considerable bare rock surface or very thin soil cover.
4	Organic wetland dominated	Areas dominated by organic material > 40cm thick; contains > 30% organic matter by weight; occurs in a variety of wetland surface forms.
5	Plain dominated	Flat to very gently undulating areas having few or no prominent irregularities; formed by erosional or depositional (constructional) processes; include broad, continuous, gently sloping morainal, lacustrine, alluvial and piedmont plains; slopes generally 0 to 15%; relief generally 3 to 30m; extent generally > 5km in one direction.
6	Scarp dominated	Escarpments, cliffs or steep slopes of some extent along the margin of terrace, bench, plateau, hill, or mesa; a scarp may be of any height.
7	Valley dominated	Terrain dominated by major spillways, drainage ways or mountain trenches separated from surrounding landforms by a significant and abrupt break in slope; the valley profile may be V- or U- shaped with an extensive valley floor and flood plain up to 5km wide; valley profile may also include eroded terraces and their irregular slope segments.
8	Dune dominated	Mounds, hills or ridges of windblown sand, either bare or variously covered by vegetation and capable of further movement, but retaining their characteristic shape for extended periods of time (adapted from David 1977).
9	Delta (deltaic plain)	A relatively extensive (several square km), level to sloping plain composed of sediments ranging from gravel (top set) to sand (middle set) to clay (bottom set) occurring between diverging branches at the mouth of a river, e.g. Peace-Athabasca delta (adapted from Bates and Jackson 1984).

(from Resource Data Branch 2003).

Site Position – Meso – This is the position at the local scale, usually within one of the major positions under Site Position - Macro. In some areas of low topography this measure may be identical to the Macro position. The vertical distance between high and low in this scale is usually between 3 to 300m. The positions are defined below and illustrated in Figure 2.

1. **Crest** – the generally convex uppermost portion of a hill, it is usually convex in all directions with no distinct aspect.
2. **Upper slope** – the generally convex upper portion of the slope of a hill immediately below the crest. It has a convex surface profile with a specific aspect.
3. **Middle slope** – the area of the slope of a hill between the upper slope and the lower slope where the slope profile is neither concave nor convex. These slopes have a specific aspect.
4. **Lower slope** – the area toward the base of the slope of the hill. It generally has a concave surface profile with a specific aspect.
5. **Toe** – defined by a clear demarcation by an abrupt decrease in the slope below and adjacent to the lower slope. These profiles have low slope.
6. **Depression** – any area that is concave in all directions; generally at the foot of a meso scale hill or a generally level area.
7. **Level** – any level meso scale areas not immediately adjacent to a hill. The surface profile is generally horizontal with no significant aspect.

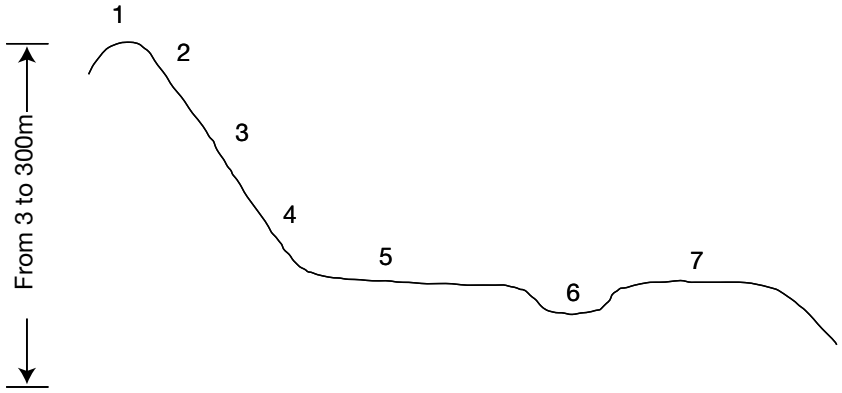

Figure 2. Illustration of terms used in Site Position.

Site Surface Shape – Record whether the surface shape is concave (predominately hollow), convex (steepening), or straight (Figure 3).

Figure 3. Illustration of terms used in Site Surface Shape.

Site Microtopography – This field is typically not completed for range inventories. Microtopography refers to the characteristics of the ground surface in the immediate vicinity of the plot. The elevation and spacing of mounds is utilized to determine the pattern which best describes the landscape at this very large scale. The microtopography classes and definitions provided in Table 6 have been taken from Resource Data Branch 2003.

Table 6. Site microtopography codes and definitions.

Code	Micro Relief Class	Mound Height (m)	Spacing Between (m)
1	level	Few	None
2	micro mounded	< .3	-
3	slightly mounded	.3 - 1	> 7
4	moderately mounded	.3 - 1	3 – 7
5	strongly mounded	.3 - 1	1 – 3
6	severely mounded	.3 - 1	.3 – 1
7	extremely mounded	> 1	> 3
8	ultra mounded	> 1	< 3

(from Resource Data Branch 2003)

Ecological Moisture Regime - Ecological moisture regime (hygrotope), relative to certain macroclimatic conditions represented by Natural Region, Ecoregion or any other bioclimatic unit, signifies on a relative scale the available moisture supply to plant growth. At present, there has been little quantitative investigation of the classes described here. Assuming that within a given Natural Region, climatic variables such as temperature and precipitation are essentially constant (or vary within narrow ranges), the within-region variation of available moisture results from the redistribution of precipitation by edaphic factors. Sites which have an amount of available moisture that reflect the given climate, and have average conditions of slope, moisture translocations, and texture have a mesic moisture regime, while those with less than normal available moisture grade to xeric, and those with more than normal available moisture grade to hydric (see Table 7). The ecological moisture regime is a relative ranking of sites based on their available moisture supplies (available moisture is that which is held between 1/3 bar and 15 bars matric potential). The moisture regime is assessed regardless of osmotic potential (i.e. salt content is not considered). Because available moisture is a dynamic property which varies throughout the year, the intent of the assessment is to evaluate available moisture on the basis of the growing season as a whole, not at any particular time.

The ecological moisture regime integrates many interrelated environmental and biotic parameters which in combination determine the actual amount of available moisture. The field assessment is ideally completed by evaluating the combination of environmental factors, soil properties, and indicator plants. However, the assessment can be made on the basis of plant indicators or environmental factors and soil properties alone. A schematic illustration of the influence of these factors is given in Figure 4.

Ecological moisture regime is correlated with the following factors: micro-variations in the topo-climatic slope positions (macro and meso relief), slope gradient, soil drainage, depth of surface humus layers, soil texture (including the content of coarse fragments), soil depth, and the presence of an impermeable layer. Factors related to internal soil properties can be

evaluated in a soil pit, on road cuts, or in disturbed spots. In general, the most influential factor is the position on the slope. On ridges, and upper slopes, precipitation is the main source of water since moisture passes quickly downslope and little if any moisture is retained. Middle slopes receive, in addition to precipitation, some seepage from up-slope, but this seepage flow moves further down slope and is usually discontinued during the summer. The lower slopes, flats, and depressions are usually enriched by a temporary or permanent seepage water flow. The other factors can be considered as compensating this general pattern, (i.e. affecting the variable degree the ultimate ecological moisture regime). The amount of available moisture often increases with decreasing slope gradient, decreasing soil particle size (i.e. from coarse to fine textured soils), decreasing content of coarse fragments, increasing soil depth, and increasing thickness of humus layers (in particular with the thickness of colloidal and humified H-layer).

The presence of an impermeable layer (i.e. bedrock, compacted till, cemented layer) may inhibit soil water storage or create conditions for temporary or permanent seepage if subsurface water flow seepage is present. This can also result in the increase of available moisture. The ecological moisture regime classes and potentially identifying characteristics are given in Tables 7 and 8.

The use of plant indicators for assessing ecological moisture regime requires an existing classification scheme for the natural region under consideration or the reconnaissance of the area sufficient to establish relationships between vegetation indicators and the range of edaphic conditions. When assessing sites near Natural Region boundaries, care must be taken to differentiate between seepage inputs, and increases in precipitation or decreases in evapotranspiration demands. For example, plants which are normally found on mesic sites in one natural region can occur on subhygric sites in an adjacent Natural Region with lower precipitation or higher temperatures. Care must also be taken to assess the plant community as a whole. Some species may have a limited rooting depth and do not reflect the presence of deeper seepage waters, while other species may reflect changes in nutrient availability rather than available moisture. Even when extensive vegetation information is available, it is always best to consider the environmental factors as well. If the intent is to develop a classification scheme that defines plant indicators, then only environmental factors should be considered to avoid circular reasoning.

Table 7. Soil moisture regime classes and descriptions.

Moisture Regime	Primary Water Source	Description
Very Xeric (0)	Precipitation	Water removed extremely rapidly in relation to supply; soil is moist for a negligible time after precipitation
Xeric (1)	Precipitation	Water removed very rapidly in relation to supply; soil is moist for brief periods following precipitation
Subxeric (2)	Precipitation	Water removed rapidly in relation to supply; soil is moist for short periods following precipitation
Submesic (3)	Precipitation	Water removed rapidly in relation to supply; water available for moderately short periods following precipitation
Mesic (4)	Precipitation in moderately to fine - textured soils and limited seepage in coarse texture soils	Water removed somewhat slowly in relation to supply; soil may remain moist for a significant, but sometimes short period of the year. Available soil moisture reflects climatic inputs
Subhygric (5)	Precipitation and seepage	Water removed slowly enough to keep the soil wet for a significant part of the growing season; some temporary seepage and possibly mottling below 20 cm
Hygric (6)	Seepage	Water removed slowly enough to keep the soil wet for most of the growing season; permanent seepage and mottling present; possible weak gleying
Subhydric (7)	Seepage or permanent water table	Water removed slowly enough to keep the water table at or near the surface for most of the year; gleyed mineral or organic soils; permanent seepage less than 30 cm below the surface
Hydric (8)	Permanent water table	Water removed so slowly that the water table is at or above the soil surface all year; gleyed mineral or organic soils

(adapted from Resource Data Branch 2003).

Table 8. Soil moisture regime classes, slope, and soil properties.

<table>
<tr><th rowspan="2">Moisture Regime</th><th colspan="2">Slope</th><th colspan="5">Soil Properties</th></tr>
<tr><th>Position</th><th>Gradient</th><th>Texture</th><th>Drainage</th><th>Depth to Impermeable Layer</th><th>Humus Form Depth</th><th>Available Water Storage Capacity</th></tr>
<tr><td>Very Xeric (0)</td><td rowspan="2">ridge crests, shedding</td><td>very steep</td><td rowspan="2">very coarse (gravelly S), abundant coarse fragments</td><td>very rapid</td><td rowspan="2">very shallow (<0.5m)</td><td rowspan="2">very shallow</td><td rowspan="2">extremely low</td></tr>
<tr><td>Xeric (1)</td><td rowspan="2">steep</td><td>rapid</td></tr>
<tr><td>Subxeric (2)</td><td rowspan="2">upper slopes, shedding</td><td rowspan="3">coarse to moderate coarse (LS-SL), moderate coarse fragments</td><td rowspan="2">rapid to well</td><td rowspan="2">shallow(<1m)</td><td rowspan="2">shallow</td><td>very low</td></tr>
<tr><td>Submesic (3)</td><td rowspan="2">moderate</td><td>low</td></tr>
<tr><td>Mesic (4)</td><td>mid slope, normal, rolling to level</td><td>moderate to fine (L-SiL), few coarse fragments</td><td>well to moderately well</td><td>moderately deep (1-2m)</td><td>moderately deep</td><td>moderate</td></tr>
<tr><td>Subhygric (5)</td><td rowspan="2">lower slopes, receiving</td><td rowspan="2">slight</td><td rowspan="2">variable depending on seepage</td><td>moderately well to imperfect</td><td>deep (>2m)</td><td rowspan="2">deep</td><td>high</td></tr>
<tr><td>Hygric (6)</td><td>imperfect to poor</td><td rowspan="3">variable, depending on seepage</td><td rowspan="3">variable, depending on seepage</td></tr>
<tr><td>Subhydric (7)</td><td rowspan="2">depressions, receiving</td><td rowspan="2">flat</td><td rowspan="2">variable depending on seepage</td><td>poor to very poor</td><td rowspan="2">very deep</td></tr>
<tr><td>Hydric (8)</td><td>very poor</td></tr>
</table>

(adapted from Resource Data Branch)

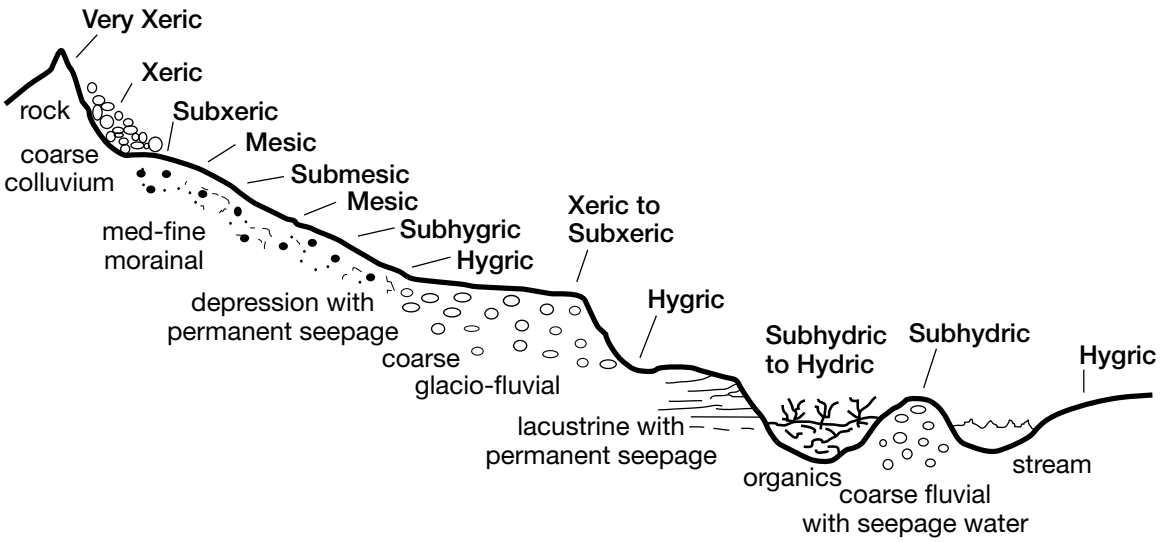

Figure 4. Ecological moisture regime in relation to landscape position and geological material. (adapted from Resource Data Branch 2003).

Nutrient Regime - Soil nutrient regime (trophotope), relative to climatic conditions represented by an Ecoregion or any other bioclimatic unit, signifies on a relative scale the available nutrient supply to plant growth (with emphasis on soil pH and exchangeable cations; Ca, Mg, Na, and K). The soil's nutrient regime integrates many environmental and biotic parameters which in combination determine the actual amounts of available nutrients. It is a dynamic property, characterized by inputs and losses, with seasonal variations. The aim of the assessment is to derive an estimate of the available nutrient supply for a site which will characterize it relative to all other sites occurring within the respective Natural Region, Ecoregion or other bioclimatic unit.

At present, the assessment of soil nutrient regimes is strictly qualitative for a number of reasons, including a lack of understanding of the role played by soil weathering and forest humus layers in the supply of nutrients, and a lack of information on the required nutrient levels for optimum growth of various species (particularly trees.) At present, the application of soil nutrient regimes does not directly take into account the availability of nutrients other than cations, which may be limiting on any particular site. In general however, biomass production is expected to increase from oligotrophic to eutrophic nutrient regimes for a given hygrotope under particular climatic conditions (i.e. Ecoregion). Exceptions may occur with limiting nutrients such as phosphorus, which is often unavailable (and limiting) at a high pH were it is fixed by calcium compounds; nitrogen, which occurs in various forms and can be limiting to the production of some species; or sulphur, which may be absent in some parent materials. Eutrophic and hypereutrophic nutrient regimes may contain excess salts which limit the availability of water to most plant species.

Ecotypic variations within species (i.e. elevation) might also produce unusual trends.

Major factors influencing nutrient regimes are described in the following paragraphs, and Table 9 provides information on the use of soil parent materials, humus layers, seepage water and analytical data to aid in assessing soil nutrient regime.

a. Soil parent materials (bedrock and landforms) – the kind of bedrock from which the soil parent materials were derived can be a useful guide to assessing the nutrient regime. Identification of coarse fragments from the soil is preferable, although local outcrops or information from a geologic map may be used. During the last major glaciation in Alberta, glacial materials were derived both from local bedrock sources (the Rockies) and from the Canadian Shield, producing soil parent materials which often reflect the bedrock types they were derived from. This is particularly true in small valley systems where the bedrock is uniform and materials have moved only short distances. The larger valleys and the foothills and plain areas of Alberta are more likely to have mixed parent materials of intermediate nutrient regimes. Wherever bedrock is used as a primary differentiating criterion, the rock types which occur as coarse fragments should be compared to those indicated on geologic maps or in adjacent outcrops.

   Soils derived from basic igneous rocks (i.e. basalt, gabbro) basic metamorphic rocks (i.e. argillite, biotite, schist, gabbro, gneiss), and rich sedimentary rocks (i.e. limestone, dolomite) may be expected to be mesotrophic to eutrophic because of the abundance of basic elements found in the minerals of these rocks. These

rock types also generally result in finer textured materials than the more resistant, acid metamorphic rocks (i.e. granite, gneiss, quartzite), and some sedimentary rocks (i.e. conglomerate, and marine shales) may be expected to be oligotrophic to mesotrophic. Some soils may be hypereutrophic as a consequence of groundwater flow through saline bedrock (i.e. marine shales and evaporates).

Soil texture, as it affects cation exchange capacity, may also be used to assist in the assessment of soil nutrient regime. Landform and terrain characteristics may be used in a general way, since they often determine soil texture. Coarse – textured materials (usually glaciofluvial, fluvial, colluvial, and some morainal materials) generally have a low cation exchange capacity, and therefore tend to fall into the oligotrophic to mesotrophic nutrient regimes. Finer-textures materials (lacustrine and some morainal, fluvial and colluvial materials) have higher cation exchange capacities and generally fall into the mesotrophic to eutrophic nutrient regimes. The texture relationships, however, must always be considered in relation to the mineralogy (or bedrock source) of the parent materials, and the presence or absence of seepage water and incorporated organic matter.

b. Soil Organic Layers – soil organic layers may be classified into three major humus forms: mor, moder and mull. The humus form, reflecting the mode of decomposition, is related to many environmental factors (i.e. Microclimate) and biotic factors (i.e. Activity of flora and fauna). It is identified by the relative proportions of the three layers (L – fresh litter, F – felty, partially decomposed litter with observable structure, and H – humified amorphous and colloidal material), the total thickness of all layers, an estimate of soil, animal or fungi activity, and by analytical parameters such as pH and C/N ratio. In general, the humus form reflects the kind and degree of decomposition of organic matter, and hence is a good indicator of the intensity of biogeochemical cycling.

c. Free Water – temporary or permanent subsurface water flow within the rooting zone usually enriches a site with nutrients. Seepage water emanating from acid bogs is an obvious exception. Alluvial fans with moving underground water and floodplains are usually enriched.

d. Soil Analytical Data – the most readily available chemical soil characteristic is pH. Within the range of soil pH values (with emphasis on soil B horizons) found in an Ecoregion, the sites with lower pH values will tend to be oligotrophic and those with higher pH values will tend towards being eutrophic. In addition to pH, measured values of base saturation, and cation exchange capacity are also useful criteria. With increasing base saturation and cation exchange capacity, the nutrient regime grades from oligotrophic to eutrophic. The calculation of available nutrients in Kg/ha is probably the most useful criterion, although influences from seepage water must also be considered.

Successional Status – These fields were originally used to categorize the current state of succession at a site. Currently, succession is modelled and interpreted within the plant community and range health guidebooks so these categories are not utilized.

Factors Influencing Stand Establishment

Historical events relevant to the appearance of present vegetative cover and soil characteristics, insofar as these differ from the characteristic soil and climax vegetation of the site, are recorded. It is impossible to compile a complete list of potential influences affecting the soils and vegetation, and additional categories may need to be described in the "Comments" portion of the Site Description Form. However, wherever possible the investigator should use one or several of the indicated categories located on the backside of the Site Description Form (see Table 10). For easier consultation of the list, the various factors are grouped into general categories or broad factors. Specific factors within each broad factor are then identified. The factor code includes the combination of a broad and specific factor and consists of 2 numbers: the first number representing the broad factor and the second number providing more specific detail (e.g. 1.2 – atmosphere - climatic extremes). A single number code is not acceptable. If the specific factor is not listed enter a "0" for the second number and provide additional information in the "Comments" section. If further elaboration of any parameter is required, additional notes can be made in the "Comments" portion of the Site Description Form. If more than one factor applies, an additional factor (factor with a lesser impact) can be inserted by filling in a code for the field under Factor 2.

Table 9. Nutrient regime characteristics.

Class	1. Oligotrophic	2. Sub-mesotrophic	3. Mesotrophic	4. Permesotrophic	5. Eutrophic	6. Hypereutrophic
Nutrient Status	Very poor; very small supply of available nutrients	Poor; low supply of available nutrients	Medium; medium supply of available nutrients	Rich; plentiful supply of available nutrients	Very rich; abundant supply of available nutrients	Saline; excess salt creates high moisture tension in soil
Bedrock Source	Granite, Rhyolite, Quartzite, Quartz sandstone	Granodiorite, Dacite, Quartz Gneiss, Conglomerate	Diorite, Andesite, Garnet schist, Graywacke	Gabbro, Basalt, Biotite schist, Argillite Shale	Peridotite, Dunite, Basalt, Slate, Dolomite, Phyllite, Limestone	Dunite, Serpentine, Marble, Phyllite, Limestone, Gypsum Halite, other evaporites
Texture	Very coarse	Coarse	Medium	Fine	Very fine	Variable
Organic Matter Content	Low	Moderate	Moderate	High	High	Variable
Humus form	Acid mors	Mors and Moders	Mors and Moders	Moders and mulls		
Soil reaction	Extremely acid to medium acid	Medium acidic to neutral	Medium acidic to neutral	Slightly acid to mildly alkaline	Neutral to moderately alkaline	Moderately to strongly alkaline
Cation Exchange Capacity	Low	Moderate	Moderate	High	High	Variable
Base saturation	Low	Moderate	Moderate	High	High	Variable
Carbon: Nitrogen ratio	High	Moderate	Moderate	Low	Low	Variable

Adapted from Resource Data Branch (2003)

Table 10. Broad and specific factors that influence stand establishment.

Broad Factor Categories	Specific Factors
1. Atmosphere-related effects	1.1 Atmospheric pollution (specify type) 1.2 Climate extremes (specify type) 1.3 Windthrow
2. Cutting and soil disturbances	2.1 Abandoned construction sites (road-bed, railway, etc.) 2.2 Clearcut logging (no slash burn unless indicated) 2.3 Cultivation (continued disturbance of the vegetation and/or the soil, excluding harvesting of native crop) 2.4 Excavation 2.5 Harvesting of native crop (haying, berry picking, etc.) 2.6 Land clearing (includes grubbing and/or other forms of disturbance of the natural soil as for pipeline construction etc.) 2.7 Scarification 2.8 Selective logging (including shelter cut) 2.9 Soil compaction (including effects from foot traffic and animal traffic)
3. Dumping, disposal and spills	3.1 Chemical spill or disposal (specify type) 3.2 Effluent disposal 3.3 Mine spoils 3.4 Oil spill or disposal 3.5 Radioactive waste disposal or exposure
4. Fires	4.1 Intensive fires (consuming trees and larger shrubs) 4.2 Light fire (primarily ground fire) 4.3 Repeated intensive fire 4.4 Repeated light fire 4.5 Slash burn (following logging)
5. Plant and animal-related effects	5.1 Beaver tree cutting 5.2 Disease (excluding insects: specify type) 5.3 Domestic grazing/browsing (specify animal) 5.4 Excrement accumulation (other than that normally associated with grazing or browsing) 5.5 Insect kill (specify insect) 5.6 Succession (gene ration of vegetation including climax stands) 5.7 Wildlife grazing/browsing (specify animals)
6. Terrain-related effects	6.1 Avalanching 6.2 Eolian 6.3 Recent deglaciation 6.4 Rock quarrying (including open mine pits) 6.5 Terrain failures (active or recent slumps, slides, solifluction etc.) 6.6 Volcanic activity
7. Vegetation and site improvement-related effects	7.1 Fertilization (specify fertilizer) 7.2 Irrigation 7.3 Planted trees or shrubs 7.4 Seeded or planted to grass or herbs 7.5 Seeded to trees or shrubs
8. Water-related effects	8.1 Inundation (including temporary inundation resulting from beaver activity) 8.2 Temporary seepage (usually man-induced seepage; this excludes intermittent seepage resulting from climate patterns). 8.3 Water table control (diking, damming) 8.4 Water table depression (associated with extensive water extraction from wells.
9. Not evident	9.0 Not evident

Surface Substrate – Quantify the ground surface into broad categories. The value is recorded as the percentage of the ground covered by each category type. Values should sum up to 100%.

- **Decaying Wood**: standing or fallen wood actively decaying. Does not include freshly fallen materials not yet decomposing. The decaying wood must exceed 10 cm in thickness, or the wood is classed as part of the organic matter type.
- **Bedrock**: exposed consolidated mineral material, not covered by mineral soil or organic matter
- **Cobbles and Stones**: exposed unconsolidated rock fragments greater than 7.5 cm in diameter. These are still included in this category if covered by organic layer is less than 2 cm
- **Mineral Soil**: any exposed unconsolidated mineral material of variable texture.
- **Organic matter**: sum of all organic layers which have accumulated on the soil surfaces, ranging from easily recognized undecomposed vegetation to humified organic material. Areas covered by grasses are classed within this group due to their underlying L horizons. Ah, Ap, and areas with living grass or forbs, where mineral soil is visibly between stems are classed as mineral soil.
- **Water**: All areas with standing or moving water

Additional Landform Classification – A number of classification systems are in use for the identification of landforms. There are indications that more will be coming into use in the near future. Often this type of classification combines various landscape attributes to provide a more specific image of the site.

Classification System – Enter the name of the specific classification system being utilized in this field.

Classification Code – Enter the correct code that describes the site. Ensure all parts of the code are recorded. In many cases classification codes consist of a combination of several codes. Many of these sub codes are meaningless unless presented in combination with other sub codes to identify unique classes.

Additional Vegetation Classification – This field is provided for the surveyor to record information pertaining to the vegetation classification of the site. The use of this type of classification enables the surveyor to identify the vegetation community based on the existing vegetation. For example:

- Range Plant Communities and Carrying Capacity for the Montane Subregion of Alberta – Seventh Approximation (Willoughby et al. 2008)
- Field Guide to Ecosites of Southwestern Alberta (Archibald et al 1996)

Classification Code – Enter the complete code required to identify the vegetation community, based on the range plant community guide, field guide or classification system being used.

Ensure you provide all pertinent codes or any specific information that is required to identify the code as unique.

Back Page of Site Description Form

Landscape Profile Diagram – This space is used to draw a freehand sketch of the landscape that the site being described is located on. The intent is to draw a cross-sectional diagram which can aid in explaining items such as:

1. Location of the site sits with respect to other sites and to the topography.
2. Physical features of the surrounding landscape such as landforms, forest zones, etc.
3. Communicating why this particular site was chosen.
4. Identifiable landmarks, which will assist with plot relocation at a future date.

The landscape profile diagram should have the plot location clearly marked as well as an indication for direction. This is usually accomplished by indicating north. The distance and bearing to any distinct land marks could also be noted.

Site Location – This space was used previously to provide a free hand sketch of a map showing the particular plot location. This space does not need to be filled out for a range inventory if accurate geographic coordinates are documented. It can be used if sketching landmarks will make future plot relocation easier.

Location – As with site location, this space is available for documenting the site location. This item is unnecessary if accurate geographic coordinates are documented.

General Comments on Site Characteristics – Several lines are provided here for elaboration of any information reported on the form or for additional site features of interest to the recorder.

3.2 Collecting Vegetation Data with the Vegetation Inventory Form (MF5)

Detailed vegetation data are collected where Detailed and Reconnaissance plots are completed. This information can be captured by completing a version of the Vegetation Inventory form (MF5). These forms are based on a plot within a uniform area with similar slope and aspect and entirely in one singular plant community. For Detailed Plots, a 30 meter transect is established within this community and micro-plots are surveyed. In hilly terrain it is preferred if the transect is orientated across slope along a consistent elevation, without any draws included unless of course, the draw is the area being sampled.

The Range Inventory form (Prairie/Rocky Mountain MF5) in Appendix 2 has been constructed to collect vegetation information for ecological and range management descriptions. This form facilitates the collection of plant species data using multiple nested plots along a transect, rather than estimates of a single larger plot. The Range Inventory form is a revised version of the previous Vegetation Inventory forms. There are two versions of the Vegetation Inventory form, the MF5-PL and Prairie MF5, which still exist and provide the same function as the Range Inventory form. The Prairie MF5 was based on the MF5-PL but adapted to collect vegetation data in the Grassland Natural Region where GVI, AGRASID soil descriptions, and range site relationships are referenced for the basis of ecological classification. The ECOSYS database has been developed along with these forms so that all data collected has entry locations into the database.

Some methodologies entail completion of the Site Description form as well as the Vegetation Inventory form. There is duplicate information on the two forms. It is best to fully complete all forms, but if not it is recommended the Site Description form is filled out entirely and duplicate information left off of the Vegetation Inventory form. Listed below are the recommended items collected on the Range Inventory form and the description or methodology associated with each:

Disposition/ Allotment – Grazing dispositions and allotments usually have a common name but also a six or seven digit number with a three letter prefix abbreviating whether the land is an Allotment (PNT), Grazing Lease (GRL) or other type. Either the common name or code can be entered here, although the code is preferred as all information collected for the inventoried area is ultimately linked to it (e.g. Grazing lease identified as GRL 000000).

Field/ Distribution Unit (DU) – Write in an appropriate common name, abbreviation, or number specific to the field, distribution unit, or management unit.

Plot – The name of the site or plot being sampled, it should relate to a specific point. The plot name is commonly a sequential alphanumeric uniquely identifying the plot in the grazing lease, allotment, or project being sampled (e.g. AH01, AH02, AH…). Do not duplicate this identifier within the inventoried area regardless of the type of plot (Detailed, Reconnaissance, or Visual). If other forms are being completed, this plot name is used on them as well to link the forms together.

Polygon No. – This number is not used until the mapping has been finished. This will reference the survey form to the final map product.

Date – Enter as year, month, day (e.g. 98 08 03) when the plot was surveyed.

Surveyor – Last name of the individual(s) doing the vegetation survey.

Vegetation Type – record appropriate type (e.g. Forested, Shrubland, Grassland, Riparian (Lentic or Lotic)).

Legal Description (LS, SEC, TWP, RGE, M) – Describe the legal location of the plot. Use these fields only if an accurate GPS location cannot be obtained. If no GPS available, describe to the Quarter Section or LSD level to increase the accuracy of the plot. This information can be left blank if the same information has already been entered on a Site Description form.

Slope (%) – Record in percent slope. This can be attained through the use of a clinometer. If degree slope is attained, convert to percent using a table of conversions. This item can be left blank if slope information has already been entered on the Site Description form.

Aspect – Aspect is a measure of the orientation of the slope using a compass reading. Record in degrees, and ensure angle of declination is incorporated. Slopes less than 1° have no aspect; do not enter any value for these. This item can be left blank if aspect information has already been entered on the Site Description form.

Elevation (m) – Record in meters using height above ellipsoid (HAE) calculations on GPS if available. Indicate on form if attaining from a source other than GPS such as an altimeter or topographic map (indicate scale). This item can be left blank if elevation information has already been recorded on the Site Description form.

Soils Description – this section is used to accommodate the collection of information regarding AGRASID, range site, and landform features common on the prairies. Along with the prairies, these forms can be used in areas where transition between forested areas and prairies occur.

SCA: Soil Correlation Area the plot is in.

AGRASID SLM Code: this column provides details from the AGRASID polygon. Refer to AGRASID User's Manual (Brierly et. al. 2001).

Soil Series 1: Dominant or Co-dominant soil series derived from the AGRASID polygon.

Soil Series 2: Co-dominant or Sub-dominant soil series derived from the AGRASID polygon. Other Sign SS: Other significant soil series derived from the AGRASID polygon.

Surface Form: Derived from the AGRASID polygon. Slope Class: Derived from the AGRASID polygon.

Surface Modifier: Derived from the AGRASID polygon.

Field verified: this column is used to select AGRASID attributes that are specific to the field site.

Terrain Profile and Notes – Used previously to draw a diagram of the general area (e.g. valley) where the sampling occurred. Currently this item can be used to enter plant community information such as estimated plant community, subdominant decile information, and any other remarks that may be pertinent to the ecological classification of the plot. Photo numbers are also commonly entered here. Two photographs per site are taken. One close up of a micro- plot directly toward the ground and another from the end of the transect looking back on the transect line capturing a little bit of the horizon to help assess structure. Record photo numbers and ensure plot or site names are identified in the photos.

Site Description – Circle the appropriate description from each list. Refer to Section 3.1 Site Description Form in this manual regarding this section. This information can be left blank if the same information has already been entered on the Site Description form.

PC-ORD – Enter the ordinated plant community.

Ecodistricts – If applicable, enter the appropriate Ecodistrict for the Natural Subregion.

GPS Unit # – Identification number on GPS unit.

Waypoint # – The number of the waypoint as recorded on the map and within the GPS Unit.

Start – GPS location of the beginning point of the transect (decimal degrees).

End – GPS location of the end point of the transect (decimal degrees).

Est. Production – Estimation in lbs/ac or kg/ha. With a Detailed or Reconnaissance plot, production is assessed through a 0.5 m^2 clipped plot. Refer to section 3.3 for forage production clipping methodology for inventories. This field can be used if the surveyor has experience estimating production, otherwise it can be left blank.

Est. Litter – Estimation in lbs/ac or kg/ha of litter as hand raked from a ¼ m2 plot. This field can be used if the surveyor has experience estimating production, otherwise it can be left blank.

Collecting Micro Plot Data (Species, Plot Number)

A transect is placed within the most representative part of the area declared as a site. This is a uniform area with similar slope and aspect and entirely in one singular plant community. Each transect is 30 m long with 15 micro-plots placed uniformly along its length. If the transect is located on a slope, it should run parallel with the contour of that slope avoiding any swales.

Grasslands, shrublands, and forests have slightly different nested micro plot sizes for data collection. These are used to accommodate the various vegetation stratums (Stratum definitions are listed in Table 11).

In grasslands (including tame pasture) and shrublands whose dominant layer is less than (<) 2 m (Figure 5a):

- A 1 m^2 (1x1 m) micro-plot is used to estimate the cover of shrubs (S1 and S2) and all trees less than (<) 5 m.
- A 0.1 m^2 (20x50 cm) nested plot within the 1 m^2 plot is used to estimate the cover of forbs, grasses, and S3 shrubs.
- Ground cover estimates (Litter/Total Vegetation, Exposed Soil, Moss & Lichen, rock, etc.) are also measured in the 0.1 m^2 nested plot.

In forests and shrublands whose dominant layer is greater than (>) 2 m (Figure 5b):

- A 4 m^2 (2x2m) micro-plot is used to estimate the cover of S2 shrubs and trees less than (<) 2 m
- A 0.25 m^2 (50x50 cm) nested plot within the 4 m^2 plot is used to estimate cover of S3 shrubs, forbs, and grasses.
- Ground cover estimates (Litter/Total Vegetation, Exposed Soil, Moss & Lichen, rock, etc.) are also measured in the 0.25 m^2 nested plot.
- One 100 m^2 macro-plot (10x10 m), located in the middle of the transect, is used to estimate the cover of trees and tall shrubs (> 2 m in height) within the macro-plot area. These are measured in their appropriate S1, T1, and T2 stratums. These data are directly associated with the transect and separate from the woody species information on the back of the form which is collected at the polygon level.

Species: Foliar cover estimates are recorded at each micro-plot on the MF5 form. All of the plant species (trees, shrubs, graminoids, and forbs) are recorded using a seven letter code for identification. The code is the first 4 letters of the genus name followed by the first 3 letters of the species name. The species are named according to the currently accepted names used by AEP (ECOSYS species list). Foliar

cover estimates for all species are recorded in the appropriate micro-plot number to the nearest 5% except below 10% and above 90% which are estimated to the nearest 1%.

The following are generalized plot characteristics that are filled out for each micro-plot. Do not include these items with the cover estimates in the species portion of the form.

Litter/Total Vegetation: Check off the appropriate box whether total vegetation or litter is being assessed and give the cover estimate for each micro-plot. The recommended choice for these inventory procedures is to provide a litter estimate.

Exposed Soil: Estimate the cover rating for exposed mineral soil in each plot. This is NOT a measurement of rocks or decayed organic material. The cover of debris (sticks, etc.) and rocks are recorded separately. If no exposed soil is encountered, a tick is marked in that box for that plot.

Moss & Lichen: Estimate the cover of moss and lichen in each plot. If no moss or lichen is encountered, a tick is marked in the box for that plot. Where there are a variety of species of moss and/or lichen (e.g. within a Sw/ Moss community) the species should be summed up.

Vegetation Notes – Provide any information that pertains to plot vegetation in this section.

Table 11. Stratum codes and definitions for vegetation sampling.

Code	Name	Description
T1	Overstory Tree	Any woody species growing to a height of greater than 5m occupying the tallest canopy; it's crown is open to full sunlight
T2	Understory Tree	Any woody species growing to a height of greater than 5m and occupying the secondary canopy below T1; it's crown is mostly subjected to filtered sunlight
S1	Tall Shrubs	All woody species at least 2.0m but less than 5.0 m tall.
S2	Medium Shrubs	All woody species at least 0.5m but less than 2.0 m tall.
S3	Low Shrubs	All woody species less than 0.5 m tall.
E	Epiphyte	Mosses or lichens growing on other plants (usually trees / shrubs)
F1	Tall Forbs	All forb species 30 cm tall or greater
F2	Low Forbs	All forb species less than 30 cm tall
G1	Graminoid	All graminoid species

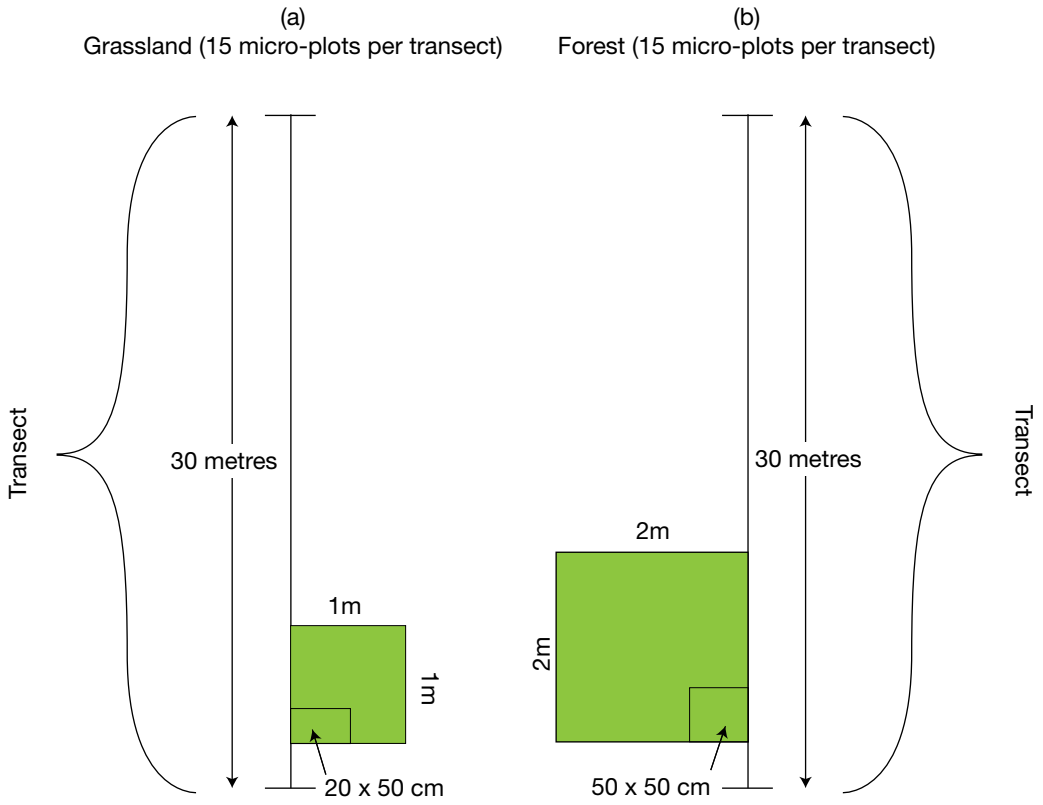

Figure 5. Schematic and dimensions of a transect, micro-plot and nested plot within the micro-plot.

Range Health Estimate – Check the appropriate range health category for the entire polygon as depicted by the transect. Refer to Section 3.4 for Range Health Methodology.

Macroplot (List species, stratum, and cover) – Record species, stratum, and cover for species (>) 2 m in height in the 100 m2 macro-plot (e.g. Aw, 20%, T1 & Aw, 5%, S1).

Back Page of Range Inventory Form

Range Use Category – Indicate whether the plot is considered primary, secondary, or non- use range within the grazing unit. Primary ranges are areas that livestock prefer to use when management is limited. Secondary ranges are lightly used or unused by livestock under minimal management and will not ordinarily be fully used until the primary range has been overused. Non-use (tertiary) areas are not used by the livestock for grazing due to a lack of forage (e.g. thick coniferous forest) or inaccessibility (e.g. bogs). These categories are relative to one another and are conditional to the makeup of the grazing unit. For example, a deciduous forest may be considered secondary range if plenty of accessible grasslands exist. However, if the deciduous forest in the grazing unit is the most accessible and highest producing rangeland it should be considered as primary range.

Grazing Intensity – Check off the appropriate box: unused (U), unused-low (U-L), low (L), low-moderate (L-M), moderate (M), moderate-high (M-H), or high (H) as an estimate of the level of past utilization. Indicators to aid with assessing past utilization can be the amount of litter, quantity of cattle droppings and seed heads remaining from the previous year.

Current Utilization – Give an estimate of the proportion of the current year's growth grazed by livestock. This is determined by measuring the proportion of new growth that has been utilized. The number of livestock in the area and amount of cattle droppings can be good indicators as well.

Vigour – This does not have to be filled out for inventories.

Woody Species – The measurements in this section are performed at the polygon decile level. Woody species along the transect are evaluated in the micro and macro-plots sections on the front page of the form. This measure is intended to describe the woody species coverage and distribution of the entire polygon decile, and by the height stratum. This is filled out as completely as possible.

Woody Species: All woody species except for S3 shrubs are measured. Regrowth and mature stands of the same species are individually measured within stratum locations (e.g. if aspen (Populus tremuloides) regrowth is in the S2 stratum and the T1 overstory trees are also aspen, there should be an Aspen S2 stratum measure separate from the T1 measure).

Density Distribution Class: Refers to how the species being observed are patterned spatially throughout the polygon. The classes range from rare individuals to continuous dense occurrences. These ratings as well as diagrams are found directly on the field sheet. The density distribution table on the original MF5-PL form is antiquated so please disregard and use the Range Health Assessment density distribution table. The Range Inventory and Prairie MF5 density distribution tables have been updated and therefore can be used.

Median Height: The median height is the middle height of all the occurrences of the observed species in the polygon. This is measured in meters and can be rounded to the nearest one-tenth.

Height Range: Measured in meters, list the lowest and the highest height observed for that species.

Percent Area Cover: Estimate the percent canopy cover within the polygon decile for the observed species. Total coverage of species can be greater than 100% because of the different strata of vegetation.

Basal Diameter (mm): Estimate the average basal diameter of each species (choose one stem / species which appear representative).

Total Shrub Cover – Record the height class and density distribution class of the dominant and subdominant strata (all shrub species). The height classes are coded on the form.

Forest Cover – Use available cover specifications (Phase III Forest Cover Type or Alberta Vegetation Inventory Type maps) or assess forest cover according to the Alberta Vegetation Inventory specifications (Forestry, Lands and Wildlife 1989). Dominant/ subdominant applies only where there is an overstory / understory designation.

Comments – Comments here should refer to the shrub, tree or other vegetative properties within the polygon.

Poisonous Plants / Weeds – In this section provide a brief description on some commonly encountered poisonous plants and noxious weeds.

- Species: List the plant codes of the three most common species.
- GPS Location: For significant infestations, enter GPS coordinates (decimal degrees) and notify AEP personnel.
- % Area Cover: Estimate percent area covered by the observed weed or poisonous plant within the polygon decile.
- Density Distribution Class: Record appropriate class utilizing the density distribution classes that are located on the form

Water source – In this section fill out the appropriate blanks to aid in establishing water locations in the grazing units.

- Water Source: Check source of nearest water, if other is selected then specify the source.
- GPS Location: Enter GPS coordinates (decimal degrees) of the water source.
- Required / Not Required: This selection is not used for these inventories.
- Distance (km): Estimate the distance the polygon is from water to the nearest kilometre. If less than 500 m then enter 0.
- Water Quality / Access (specify): Comment on the quality of the water and the access. For example, comments may indicate that the water is stagnant and that access to water is down a steep, eroding bank. This field can also be used to document the percent riparian area and estimated riparian health of the polygon.

Salt Source – Check the appropriate box and enter GPS coordinates (decimal degrees) of the salt source.

Access (Cattle) – Designate the quality of the access to the site being surveyed (good, fair, poor) and the type of access (truck trail, road, etc.). If other is selected then specify the source. This field can also be used to note the Access Factor (0-10) for the polygon deciles. Access factors provide an overview measure of how well livestock are able to access the polygon due to water and landscape constraints. The ratings are from 0 to 10, zero being no access to 10 being full access. This information will be used to fill out the Range Management Form (Section 2.3.2).

Comments – Discuss conflicts that may arise with other users and resources of the area and their impact on the range, and make recommendations on integrating them with livestock grazing. Other users and resources would include equestrian, off-highway vehicles, recreationalists, wildlife, fisheries, riparian areas, timber harvesting, reforestation, and oil and gas activities. Any other comments specific to the livestock distribution and management of the area are included here. These comments are for reference when completing the Range Management Form and inventory report.

3.3 Forage Production Clipping

Forage production clipping is an analytical method to assess the amount of dry matter available to grazing animals of a given area. The process involves clipping a measured area and sorting the contents into forage categories. Commonly the current year's growth is separated into grass / grass-like, forb, and shrub categories. These forage categories are then dried of their water content and weighed to the nearest 0.1 of a gram. These weights can then be associated with the measured area to come up with a weight / unit area measure. Commonly, multiple clippings are averaged together from a specific area or community to derive a common production value.

Litter production is another measure taken at grassland clipped sites. Litter is the slightly or un-decomposed plant residue left on a site from previous year's carryover. Litter production is a good indicator of hydrologic function and nutrient cycling on a site (Adams et al. 2016). With proper amounts of litter a site can capture, store, and beneficially release moisture associated from normal precipitation events. Usually before the plot is clipped, the litter in the measured area is removed, dried, and weighed just like the forage. To assess the site's ability to achieve proper hydrologic functioning, the amount of litter is compared to litter thresholds representative to the site being evaluated.

The following methodology is recommended when clipping is stipulated within the project requirements. Once a site has been surveyed, a single plot clip is performed directly in the plot area. Clip in an area best representing the production of the site. If portions of the site are grazed, clip in an area not grazed that current year. If the entire site is grazed, clip in an area where the amount of utilization can be measured with some confidence and record this estimated percent utilization on the clipped sample bag.

Clip a 0.5 m^2 quadrat to a two-cm stubble height at each plot. A common practice to achieve this is to clip two 0.25 m^2 frames side by side. If a grassland site, litter is raked out of the plot before clipping, and then the current year's growth removed. The clip is separated into trees and shrubs (foliage at below 2 m), forbs, and grasses. Only current annual growth of trees and shrubs is clipped (this year's twigs and leaves). These separate forage samples are bagged into standardized paper bags clearly labelled with the plot name, date, and contents. These bags are then stored in a dry, open area to keep them free of mould and to promote drying. Arrangements can be made to deliver samples to an AEP Rangeland Specialist throughout the year for proper storage.

At the end of the inventory year an AEP Rangeland Specialist will dry and weigh all forage samples. The forage production values are then given back to the surveyor for report purposes. The samples are also used to increase confidence of the average production of the plant communities they were sampled from. These average productions provide insight of the forage produced by the plant communities and the amount of grazing pressure they can sustain.

3.4 Collecting the Range Health Assessment

Range Health Assessments are completed for Detailed and Reconnaissance plots. These assessments are completed at the site the plot is associated to, and is usually included in the same geographic location (i.e. GPS point). The range health assessment however is designed to be representative of the polygon decile being assessed. For instance, if within the decile being assessed there are factors that affect the range health score that are not immediately represented on the transect, they should be documented on the assessment. An estimate of the range health ranking is used for visual plots.

Range health methodology is detailed in the "Rangeland Health Assessment for Grassland, Forest, & Tame Pasture" Field Workbook (Adams et al. 2016). Current methodology incorporates the 3rd edition (2009) of the manual, which had significant changes to the scoring from the 2nd edition. Therefore, it is recommended to refer to the 3rd edition and on. Contact Rangeland Resource Stewardship Section staff if 5th edition (2016) copies are needed.

The Range Health Assessment forms have also been updated to incorporate the new scoring. These three forms are available in Appendix 2, but can also be made available through the AEP Rangeland Specialist. Grasslands and shrublands should be assessed using the grassland health form. Forests and disturbed forests (fires, cutblocks, bug kills, etc.) should be assessed using the forest health form. Areas that have been seeded with non-native species, and are actively being managed as a tame pasture should be assessed with a tame pasture form. Historically there were some initiatives to 'improve the range' by seeding meadows to domestic species. These however were never managed as a tame pasture and should be considered as disturbed or modified grasslands and measured with the grassland health assessment.

3.5 Performing the Riparian Health Assessment

As described in section 2.2.3, riparian zones can be separated into two broad areas (Figure 1). The upper terraces can be assessed using the vegetation mapping portion of the inventory, but the active floodplain is measured with a Riparian Health Assessment (Fitch et al. 2009, Ambrose et al. 2009). The active floodplains are commonly multiple bands of vegetation from obligate species to facultative wetland species. These areas are susceptible to degradation and can directly affect the proper functioning of the stream or river.

The Alberta Riparian Habitat Management Society (Cows and Fish) have created the guidebooks that are used provincially for assessment riparian health. There are two Field Workbooks and three User Manuals that are required for completing the assessments necessary. The majority of riparian health will generally be for streams and small rivers, so the "Riparian Health Assessment for Streams and Small Rivers" (Fitch et al. 2009) field workbook is used. Occasionally important lakeshores and wetlands will be flagged for an assessment. In these cases the "Riparian Health Assessment for Lakes, Sloughs, and Wetlands (Ambrose et al. 2009) field workbook is used. Lastly, there are occasions where large river systems are flagged for assessment. There is no field workbook for these but there is a user manual that along with the above guides can be used to complete the assessment. A good knowledge of both field workbooks is needed to complete the riparian assessments on the selected key riparian sites, as well as to estimate the riparian health ranking of the active floodplain that occurs within polygons.

AEP forms for these three types of riparian assessments are available in Appendix 2 of this manual or copies can be obtained from the Rangeland Specialist. These forms are for entry into the AEP Rangeland Geomatics data set, and based upon the user manuals from Cows and Fish. However these manuals are created to be standalone documents that can be used for many purposes. Since they are being used to complement an entire range inventory, the AEP forms are adapted for this purpose. Focus should be placed on completing the riparian health assessment score sheet.

In total, a Riparian Health Assessment consists of:

1. GPS location of the upper and lower boundaries of the plot
2. A riparian plant community classification linked to a Range Plant Community Guide or the "Classification and Management of Riparian and Wetland Sites of Alberta's Grassland Natural Region" (Thompson and Hansen 2002). If a plant community is not found in either guide book, then a conditional plant association can be described, usually the top two or three species.
3. A Cows and Fish Riparian Health Assessment for lotic, lentic or large river systems, depending on the type of riparian, on the AEP riparian form.
4. At least 3 pictures, one from the upper end of the reach looking down stream, one from the bottom end of the reach looking upstream and a landscape picture if possible. Supporting pictures of other important riparian features or issues within the reach are valuable and recommended.

4.0 Literature Cited

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Appendices

The vegetation information form (MF5) and Prairie MF5 were previous versions of the Prairie / Rocky Mountain MF5. Although the forms may differ slightly the key fields required in this document are still contained.

Appendix 1. Links to reports and manuals that can help complete a range inventory

- Range Plant Community Guides: Range plant community guides area available at the link below. These are the published documents and may not have the most current plant communities available. If required, contact the local Range Agrologist or Area Rangeland Specialist for the most up-to-date guide: www.alberta.ca/range-classification-and-survey-tools.aspx
- Range Health Assessment Guide and Score Sheets: www.alberta.ca/range-health.aspx
- Alberta Riparian Habitat Management Society (Cows and Fish) website. Contains guidebooks and forms: www.cowsandfish.org/
- Natural Regions and Subregions of Alberta: https://www.albertaparks.ca/media/2942026/nrsrcomplete_may_06.pdf
- Agricultural Region of Alberta Soil Inventory Database (AGRASID): https://soil.agric.gov.ab.ca/agrasidviewer
- Grazing Lease Stewardship Code of Practice: www.alberta.ca/grazing-lease-stewardship-code-of-practice.aspx
- Grazing Management Adjustments for Healthy Rangelands https://open.alberta.ca/dataset/88781d33-3869-46eb-9b7c-87ae86ce02af/resource/1fb7fdfe-2ea3-4ecc-a447-106da8aa822d/download/2008-grazingmanagementhealthyrangelands-2008.pdf
- Ecological Land Survey Site Description Manual (Resource Data Branch 2003): https://open.alberta.ca/publications/5902534

Appendix 2. Range Inventory Forms

Alberta Government

SITE DESCRIPTION FORM

2016

Project Identification	Level of Assessment	Forms
	☐ Visual	☐ Soils
Surveyor(s)	☐ Recon	☐ Vegetation
	☐ Detailed	☐ Supp Soils
Agency		☐ Other_____
		_____

Date (D/M/Y)	Project Code	Plot #	Plot Area	Plot Shape

LSD	SEC	TWP	RGE	Mer	GPS	Latitude	Longitude

Site Photos (roll, no.)	Air Photos (roll, no.)	Map Sheet	Nat Subregion	Eco District

ELEVATION	ASPECT	SLOPE	Regen 1			Regen 2			Regen 3		
(m)	(°)	(%)	SP	%	HT(m)	SP	%	HT(m)	SP	%	HT(m)

EXPOSURE 1	EXPOSURE 2	FLOOD	DRAINAGE	PERVIOUSNESS	REGIONAL LANDFORM	SITE - MESO	SITE - SHAPE	SITE - MICRO	E. MOISTURE	NUTRIENTS	SUCC. STATUS 1	SUCC. STATUS 2	Factor 1	Factor 2	SURFACE SUBSTRATE (% Cover)					
															Decaying Wood	Bedrock	Cobbles and Stones	Mineral Soil	Organic Matter	Water
													.	.						

Landform	Vegetation
Classification System -	Classification System -
Code -	Code -

EXPOSURE TYPE
1. Not applicable
2. Wind
3. Insolation
4. Frost
5. Cold air drainage
6. Atmospheric toxicity

FLOOD HAZARD
1. No hazard
2. Rare
3. May be expected
4. Frequent

SOIL DRAINAGE
1. Very rapidly
2. Rapidly
3. Well
4. Moderately well
5. Imperfectly
6 Poorly
7. Very poorly

PERVIOUSNESS
1. Rapidly
2. Moderately
3. Slowly

REGIONAL LANDFORM
1. Tableland (plateau) dominated
2. Hill land dominated
3. Mountain dominated
4. Organic wetland dominated
5. Plain dominated
6. Scarp dominated
7. Valley dominated
8. Dune dominated
9. Delta (deltaic plain)

SITE POSITION - MESO
1. Crest
2. Upper Slope
3. Middle Slope
4. Lower Slope
5. Toe
6. Depression
7. Level

SITE SURFACE SHAPE
1. Straight
2. Concave
3. Convex

SITE MICROTOPOGRAPHY

Micro Relief Class	Mount ht. (m)	Spacing Between (m)
1. Level	few	none
2. Micro mounded	<0.3	-
3. Slightly mounded	0.3 - 1	>7
4. Moderately mounded	0.3 - 1	3 - 7
5. Strongly mounded	0.3 - 1	1 - 3
6. Severely mounded	0.3 - 1	0.3 - 1
7. Extremely mounded	>1	>3
8. Ultra mounded	>1	<3

ECOLOGICAL MOISTURE REGIME
1. Very xeric (very dry)
2. Xeric (dry)
3. Subxeric (moderately dry)
4. Submesic (moderately fresh)
5. Mesic (fresh)
6. Subhygric (moderately moist)
7. Hygric (moist)
8. Subhydric (moderately wet)
9. Hydric (wet)

NUTRIENT REGIME
1. Oligotrophic (very poor)
2. Submesotrophic (poor)
3. Mesotrophic (medium)
4. Permesotrophic (rich)
5. Eutrophic (very rich)
6. Hypereutrophic (e.g. saline)

SUCCESSIONAL STATUS
1. Pioneer seral
2. Young seral
3. Mature seral
4. Old seral
5. Young edaphic climax
6. Mature edaphic climax
7. Young climatic climax
8. Mature climatic climax
9. Disclimax
10. Non vegetated

DISTURBANCE FACTORS
See over page for listing.

Landscape Profile Diagram

Site Location
Location Description

Comments

Broad Factor Categories	**Specific Factors** (Note specific details in "Comments" area)
1. Atmospheric-related effects	1. Atmospheric pollution (specify type) 2. Climate extremes (specify type) 3. Windthrow
2. Cutting and soil disturbances:	1. Abandoned construction sites (road-bed, railway, etc.) 2. Clearcut logging (no slash burn unless indicated) 3. Cultivation (continued disturbance of the vegetation and/or the soil, excluding harvesting of native crop) 4. Excavation 5. Harvesting of native crop (haying, berry picking, etc.) 6. Land clearing (includes grubbing and/or other forms of disturbance of the natural soil as for pipeline construction etc.) 7. Scarification 8. Selective logging (including shelter cut) 9. Soil compaction (including effects from foot traffic, machinery traffic and animal traffic)
3. Dumping, disposal and spills	1. Chemical spill or disposal (specify type) 2. Effluent disposal 3. Mine spoils 4. Oil spill or disposal 5. Radioactive waste disposal or exposure
4. Fires	1. Intensive fires (consuming trees and larger shrubs) 2. Light fire (primarily ground fire) 3. Repeated intensive fire 4. Repeated light fire 5. Slash burn (following logging)
5. Plant and animal-related effects:	1. Beaver tree cutting 2. Disease (excluding insects: specify type) 3. Domestic grazing/browsing (specify animal) 4. Excrement accumulation (other than that normally associated with grazing or browsing) 5. Insect kill (specify insect) 6. Succession (generation of vegetation including climax stands) 7. Wildlife grazing/browsing (specify animals)
6. Terrain-related effects	1. Avalanching 2. Eolian (active deflation or deposition) 3. Recent deglaciation 4. Rock quarrying (including open mine pits) 5. Terrain failures (active or recent slumps, slides, solifluction, etc.) 6. Volcanic activity
7. Vegetation and site improvement-related effects	1. Fertilization (specify fertilizer) 2. Irrigation 3. Planted trees or shrubs 4. Seeded or planted to grass or herbs 5. Seeded to trees or shrubs
8. Water-related effects:	1. Inundation (including temporary inundation resulting from beaver activity) 2. Temporary seepage (usually man-induced seepage; this excludes intermittent seepage resulting from climate patterns.) 3. Water table control (diking, damming) 4. Water table depression (associated with extensive water extraction from wells.
9. Not evident	0. Not evident

Alberta Government

RANGE INVENTORY FORM

DISPOSITION/ALLOTMENT	FIELD/DU	PLOT	POLYGON NO.	YR MO DAY	SURVEYOR

Vegetation Type	LS SEC TWP RGE M	SLOPE (%)	ASPECT	ELEVATION (m)

SOILS DESCRIPTION

SCA _____ Field Verified

AGRASID SLM code		Transect Range Site
Soil Series 1		
Soil Series 2		
Other signif SS		
Surface Form		
Slope Class		
Surface Modifier		

PC-ORD:
Ecodistricts:

TERRAIN, PROFILE AND NOTES

GPS Unit # WPT #
Start

End

SITE DESCRIPTION (Circle one in each column)

REGIONAL LANDFORM	LOCAL LANDFORM	LANDFORM ELEMENT
Mountains	Steep Slopes	Crest
Hills	Hilly	Upper Slope
Plateau	Rolly	Mid-Slope
Organic Wetland	Hummocky	Lower Slope
Plain	Undulating	Toe
Valleys	Ridged	Level
Scarp	Plain	Depression
Dunes		

Est. Production _____ kg/ha lb/ac

Est. Litter _____ kg/ha lb/ac

SPECIES	PLOT NUMBER 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	AVERAGE COVER	VEGETATION NOTES
1		•	
2		•	
3		•	
4		•	
5		•	
6		•	
7		•	
8		•	
9		•	
10		•	
11		•	
12		•	
13		•	
14		•	
15		•	
16		•	
17		•	
18		•	
19		•	
20		•	
LITTER ☐ TOTAL VEGETATION ☐		•	
EXPOSED SOIL		•	
MOSS & LICHEN		•	

Range Health Estimate
_____ Healthy
_____ Healthy w/Problems
_____ Unhealthy

Macroplot (List species, stratum, and cover):

Suggested Cover Percentages: 1-10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90-100

pg. 1 of _____

RANGE USE CATEGORY ☐ Primary ☐ Secondary ☐ Non Use

GRAZING INTENSITY (EST. LONG TERM) ☐ U ☐ U-L ☐ L-M ☐ M ☐ M-H ☐ H

CURRENT UTILIZATION (EST) ____ %

VIGOUR ☐ E ☐ G ☐ F ☐ P

	WOODY SPECIES	DENSITY DIST. CLASS	MEDIAN HEIGHT (m)	HEIGHT RANGE (m)	% AREA COVER	BASAL DIAMETER (mm)
1			.	. – .		
2			.	. – .		
3			.	. – .		
4			.	. – .		
5			.	. – .		
6			.	. – .		
7			.	. – .		
8			.	. – .		

	TOTAL SHRUB COVER		FOREST COVER
	HEIGHT CLASS	DENSITY DIST. CLASS	
DOMINANT			
SUB DOMINANT			

HEIGHT CLASS DISTRIBUTION CODE (m)
91 = 0 - 0.5
92 = 0.5 - 1
93 = 1 - 3
94 = 3 - 6

COMMENTS

Density Distribution

Class	Description of abundance in polygon	Distribution
0	None	
1	Rare	
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 occurrences 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 with a distinct linear edge in the polygon	

POISONOUS PLANTS			% AREA COVER	DENSITY DIST. CLASS	WEEDS			% AREA COVER	DENSITY DIST. CLASS
	SPECIES	GPS LOCATION				SPECIES	GPS LOCATION		
1					1				
2					2				
3					3				

WATER SOURCE
☐ creek ☐ dugout ☐ trough ☐ slough ☐ lake / pond ☐ other (specify)_____

GPS LOCATION _____ ☐ Required ☐ Not Required Distance (km)_____

Water Quality / Access (specify) _____

SALT SOURCE
☐ Natural ☐ Block ☐ Bag ☐ Other (specify) _____

GPS LOCATION _____

ACCESS (CATTLE)
☐ G ☐ F ☐ P ☐ truck trail ☐ road ☐ seismic ☐ game trail ☐ valley bottom ☐ other (specify) _____

COMMENTS: CONCERNS / RECOMMENDATIONS / RESOURCE INTEGRATION

VEGETATION INVENTORY FORM CONTINUATION

DISPOSITION/ALLOTMENT	FIELD/DU	PLOT NO.	YR	MO	DAY	

SPECIES	PLOT NUMBER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	AVERAGE COVER	VEGETATION NOTES
21																	
22																	
23																	
24																	
25																	
26																	
27																	
28																	
29																	
30																	
31																	
32																	
33																	
34																	
35																	
36																	
37																	
38																	
39																	
40																	
41																	
42																	
43																	
44																	
45																	
46																	
47																	
48																	
49																	
50																	
LITTER ☐ TOTAL VEGETATION ☐																	
EXPOSED SOIL																	
MOSS & LICHEN																	

Suggested Cover Percentages: 1-10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90-100

pg. _____ of _____

Forest Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M:	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species **Cutblock site (circle): yes** or **no; if yes,** was a level 1 assessment completed? **yes** or **no**

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name (code) _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC?

25 20 15 10 5 0	Comments	**Score**

2. Are there any changes in forest plant community structure?

35 27 18 9 0	Comments	**Score**

3. Are there changes to the surface organic layer (LFH thickness and compaction)?

20 14 8 0	Comments	**Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence 5 3 1 0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil 5 3 1 0	Site is normally stable / unstable (circle) Human-caused bare soil (%) _____ Moss and lichen cover (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m²	UNK, no, yes	
					ha, ac, m²	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m²	UNK, no, yes	
5 3 1 0	Comments						

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____**%** **Trend** (apparent; circle): Upward Downward Stable Unknown	**Total**

0%----------50% ----------75% ----------100%

<50% Unhealthy 50% - 74% Healthy with Problems 75% - 100% Healthy

Grassland Range Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M:	Photo #:

Special Observations (e.g., climate, management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Does the PC resemble the reference PC? Circle the appropriate score, and answer 1A (native) **OR** 1B (modified)

						Comments	**Score (1A or 1B)**
1A	40	27	20	15	0		
1B			15	8	0		

2. Are the expected plant layers present?

					Comments	**Score**
	10	7	3	0		

3. Does the site retain moisture? Is the expected amount of plant litter present?

				Comments	**Score**
	25	13	0		

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2

	Comments	**Score (4.1+4.2)**
4.1 Erosion Evidence 10 7 3 0		
4.2 Bare Soil 5 3 1 0	Site is normally stable / unstable (circle) Human-caused bare soil (%) _____ Moss and lichen (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m²	UNK, no, yes	
					ha, ac, m²	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m²	UNK, no, yes	
5 3 1 0	Comments						

	Total
Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H **Observed Utilization** _____**%** **Trend** (apparent; circle): Upward Downward Stable Unknown	

0%----------**50%** ----------**75%** ----------**100%**

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy

Tame Pasture Health Assessment - SCORE SHEET

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude:		Longitude:	Elevation:

LSD:	QS:	SEC:	TWP:	RGE:	M:	Photo #:

Special Observations (e.g., climate, weed or brush control, grazing management) _____

_____

Dominant Species

Grass and grass - like	Cover %	Forbs	Cover %	Shrubs	Cover %	Trees	Cover %

Subregion/Plant Community (PC) or Conditional PC Name _____

_____

Scoring: circle appropriate value(s) and add to the score box

1. Do introduced forage plants dominate the site? Answer 1A (tame) OR 1B (modified tame)

1A Tame Pasture	12	9	5	Comments		**Score (1A or 1B)**
1B Modified Tame Pasture	9	5	0			

2. What kind of plants are on the site? Shift in stand composition. Answer both 2.1 and 2.2.

2.1 Tame & desirable native	14	7	0	Comments		**Score (2.1+2.2)**
2.2 Weedy & disturbance	14	7	0			

3. Is the site covered by litter?

Cover & distribution	25	16	8	0	Comments	**Score**

4. Is there accelerated soil erosion? Answer both 4.1 and 4.2.

4.1 Erosion Evidence	10	7	4	0	Comments	**Score (4.1+4.2)**
4.2 Bare Soil	5	3	1	0	Site is normally stable / unstable (circle); Human-caused bare soil (%) _____	

5. Are prohibited noxious and/or noxious weeds present? Answer both 5.1 and 5.2.

5.1 Cover (%)	Species	%	DD	Infestation			**Score (5.1+5.2)**
				Size	Unit	Treated	
5 3 1 0					ha, ac, m^2	UNK, no, yes	
					ha, ac, m^2	UNK, no, yes	
5.2 Density Distribution (DD)					ha, ac, m^2	UNK, no, yes	
5 3 1 0	Comments						

6. Does this site have woody re-growth? Answer both 6.1 and 6.2.

6.1 Cover (%)	Dominant species	Cover %	Density Dist.	**Score (6.1+6.2)**
6 3 0 N/A				
6.2 Density Distribution				
4 2 0 N/A	Comments			

Grazing Intensity (estimated long term; circle) U U-L L-M M M-H H	**Total**
Observed Utilization _____%	_____**of** _____
Trend (apparent; circle): Upward Downward Stable Unknown	**=** _____%

0%----------**50%**----------**75%**----------**100%**

<50% Unhealthy | 50% - 74% Healthy with Problems | 75% - 100% Healthy

Riparian Health Assessment SCORE SHEET - Streams and Small Rivers

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude (lower reach/upper reach)		Longitude (lower reach/upper reach)	
LSD:	QS:	Section:	Township:	Range:	Meridian:
Photo #:					

Riparian Information

Waterbody Name: _____

Lotic Type (circle one):

Stream (perennial; intermittent; ephemeral; subterranean; pooled channel) river beaver dam wet meadow spring/seep irrigation canal other non-riparian

Define Channel (circle one): yes no not collected Riparian Length (km) _____ Average Riparian Width (m) _____

Ecological Information

Natural Subregion _____ Ecosection _____

Dominant Plant Communities: _____

Conditional Plant Community: _____

Management Information

Current Utilization:	None	Light	Moderate	High	Very High
Polygon Trend:	Unknown	Static	Improving	Degrading	

% Accessible: _____

1. Vegetative Cover of Floodplain and Streambanks

		Scores or N/A Actual/Possible
6 4 2 0	Comments	____ / ____

2. Invasive Plant Species (Prohibited Noxious and Noxious Weeds) Answer both 2.1 and 2.2

2.1 Canopy Cover	Species	%	DD	Infestation			
				Size	Unit	Treated	
3 2 1 0					ha, ac, m^2	UNK, no, yes	____ / ____
					ha, ac, m^2	UNK, no, yes	
2.2 Density Distribution					ha, ac, m^2	UNK, no, yes	
3 2 1 0	Comments						

3. Disturbance-caused Undesirable Herbaceous Species

3 2 1 0	Comments	____ / ____

4. Preferred Tree and Shrub Establishment and Regeneration

6 4 2 0 N/A	Comments	____ / ____

5. Use of Trees and Shrubs Answer both 5.1 and 5.2

5.1 Preferred Trees and Shrubs - Browse 3 2 1 0 N/A	Comments	____ / ____
5.2 All Trees and Shrubs - Use other than browse 3 2 1 0 N/A		

6. Standing Decadent and Dead Woody Material

3 2 1 0 N/A	Comments	____ / ____

7. Streambank Root Mass Protection

6 4 2 0	Comments	____ / ____

8. Human-Caused Bare Ground

6 4 2 0	Comments	____ / ____

9. Streambank Structurally Altered by Human Activity

6 4 2 0	Comments	____ / ____

10. Reach Structurally Altered by Human Activity (excl. banks)

3 2 1 0	Comments	____ / ____

11. Stream Channel Incisement (vertical stability)

9 6 3 0	Comments	____ / ____

Vegetation Score (1 to 7) _____ / _____ = _____% Physical Score (8 to 11) _____ / _____ = _____% TOTAL SCORE = _____ / _____ = _____%

PTS	18/60	26/60	30/60	33/60	36/60	39/60	42/60	48/60	54/60
%	**30**	**40**	**50**	**55**	**60**	**65**	**70**	**80**	**90**

0% ..... 60% ..... 80% 100%

<60% Unhealthy | 60% - 79% Healthy with Problems | 80% - 100% Healthy

Site Comments _____

_____

_____

_____

_____

_____

Sketch of Riparian Reach (show plot and photo locations)

Credit: Based on Riparian Health Assessment for Streams & Small Rivers, by Cows and Fish, 2009

Riparian Health Assessment SCORE SHEET - Lakes, Sloughs and Wetlands

Alberta Government

Date:	Observer:	Disposition/Project:	Plot:
Field Unit:		Polygon:	Decile:
Latitude (lower reach/upper reach)		Longitude (lower reach/upper reach)	
LSD:	QS:	Section:	Township:	Range:	Meridian:
Photo #:					

Riparian Information

Waterbody Name: _____

Lentic Type (circle one): wet meadow; spring/seep; reservoir; stock pond; pothole/slough; other; or non-wetland

Ponded Surface Water: yes no not collected Riparian Length (km) _____ Average Riparian Width (m) _____

Ecological Information

Natural Subregion _____ Ecosection _____

Dominant Plant Communities: _____

Conditional Plant Community: _____

Management Information

Current Utilization:	None	Light	Moderate	High	Very High
Polygon Trend:	Unknown	Static	Improving	Degrading	

% Accessible: _____

1. Vegetative Cover of Riparian Area

		Scores or N/A Actual/Possible
6 4 2 0	Comments	____ / ____

2. Invasive Plant Species (Prohibited Noxious and Noxious Weeds) Answer both 2.1 and 2.2

2.1 Canopy Cover	Species	%	DD	Infestation			
				Size	Unit	Treated	
3 2 1 0					ha, ac, m²	UNK, no, yes	____ / ____
					ha, ac, m²	UNK, no, yes	
2.2 Density Distribution					ha, ac, m²	UNK, no, yes	
3 2 1 0	Comments						

3. Disturbance-caused Undesirable Herbaceous Species

3 2 1 0	Comments	____ / ____

4. Preferred Tree and Shrub Establishment and Regeneration

6 4 2 0 N/A	Comments	____ / ____

5. Use of Trees and Shrubs Answer both 5.1 and 5.2

5.1 Preferred Trees and Shrubs - Browse 3 2 1 0 N/A	Comments	____ / ____
5.2 All Trees and Shrubs - Use other than browse 3 2 1 0 N/A		

6. Human Alteration of Riparian Area (Vegetation)

6 4 2 0	Comments	____ / ____

7. Human Alteration of Riparian Area (Physical) Answer both 7.1 and 7.2

7.1 Alteration of Area 12 8 4 0	Comments	_____ / _____
7.2 Severity 3 2 1 0		

8. Human-caused Bare Ground

6 4 2 0	Comments	_____ / _____

9. Artificial Modification of Water Levels

9 6 3 0 UNK	Comments	_____ / _____

Vegetation Score (1 to 6) _____ **/** _____ **=** _____**%** **Physical Score (7 to 9)** _____ **/** _____ **=** _____**%** **TOTAL SCORE =** _____ **/** _____ **=** _____**%**

PTS	19/63	25/63	31/63	35/63	38/63	41/63	44/63	50/63	57/63
%	**30**	**40**	**50**	**55**	**60**	**65**	**70**	**80**	**90**

0% ..... 60% ..... 80% 100%

<60% Unhealthy | 60% - 79% Healthy with Problems | 80% - 100% Healthy

Site Comments _____

Sketch of Riparian Reach (show plot and photo locations)

Credit: Based on Riparian Health Assessments for Lakes, Sloughs and Wetlands by Cows and Fish, 2009

Riparian Health Assessment SCORE SHEET - Large Rivers

Alberta Government

Date:	Observer:	Disposition/Project:		Plot:	
Field Unit:		Polygon:		Decile:	
Latitude (lower reach/upper reach)			Longitude (lower reach/upper reach)		
LSD:	QS:	Section:	Township:	Range:	Meridian:
Photo #:					

Riparian Information

Waterbody Name: _____; Side _____; Riparian Length (km) _____ Average Width (m) _____

Ecological Information

Natural Subregion _____ Ecosection _____

Dominant Plant Communities: _____

Conditional Plant Community: _____

Management Information

Current Utilization:	None	Light	Moderate	High	Very High
Polygon Trend:	Unknown	Static	Improving	Degrading	

% Accessible: _____

1. Cottonwood and Balsam Poplar Regeneration

		Scores or N/A Actual/Possible
6 4 2 0 N/A	Comments	____ / ____

2. Regeneration of Other Native Tree Species

3 2 1 0 N/A	Comments	____ / ____

3. Regeneration of Preferred Shrub Species

6 4 2 0 N/A	Comments	____ / ____

4. Standing Decadent and Dead Woody Material

3 2 1 0 N/A	Comments	____ / ____

5. Use of Trees and Shrubs Answer both 5.1 and 5.2

5.1 Preferred Trees and Shrubs - Browse 3 2 1 0 N/A	Comments	____ / ____
5.2 All Trees and Shrubs - Use other than browse 3 2 1 0 N/A		

6. Total Canopy Cover of Woody Species

3 2 1 0 N/A	Comments	____ / ____

7. Invasive Plant Species (Prohibited Noxious and Noxious Weeds) Answer both 7.1 and 7.2

7.1 Canopy Cover	Species	%	DD	Infestation			
				Size	Unit	Treated	
6 4 2 0					ha, ac, m^2	UNK, no, yes	____ / ____
					ha, ac, m^2	UNK, no, yes	
7.2 Density Distribution					ha, ac, m^2	UNK, no, yes	
3 2 1 0	Comments						

8. Disturbance-caused Undesirable Herbaceous Species

3 2 1 0	Comments	____ / ____

9. Riverbank Root Mass Protection

6 4 2 0	Comments	____ / ____

10. Human-caused Bare Ground

6 4 2 0	Comments	____ / ____

11. Removal/Addition of Water from/to the River System

9 6 3 0 UNK	Comments	____ / ____

12. Control of Flood Peak and Timing by Upstream Dam(s)

9 6 3 0 UNK	Comments	____ / ____

13. Riverbanks Structurally Altered by Human Activity

6 4 2 0	Comments	____ / ____

14. Human Physical Alteration to the Rest of the Polygon

6 4 2 0	Comments	____ / ____

15. Floodplain Accessibility Within the Polygon

6 4 2 0	Comments	____ / ____

Vegetation Score (1 to 8) _____ **/** _____ **=** _____**%** **Physical Score (9 to 15)** _____ **/** _____ **=** _____**%** **TOTAL SCORE =** _____ **/** _____ **=** _____**%**

PTS	26/87	35/87	44/87	48/87	52/87	57/87	61/87	70/87	78/87
%	**30**	**40**	**50**	**55**	**60**	**65**	**70**	**80**	**90**

0% ..... 60% ..... 80% 100%

<60% Unhealthy | 60% - 79% Healthy with Problems | 80% - 100% Healthy

Site Comments _____

_____

_____

_____

_____

_____

Sketch of Riparian Reach (show plot and photo locations)

Credit: Based on Large River Health Survey Manual, by Cows and Fish, 2014.

Invasive Plants Form

Date	Observer
Activity #	Land Type

Comments

GPS Coordinates (NAD 83)	Lat.	Long.

LSD:	QS:	SEC:	TWP:	RGE:	M:

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Invasive Plant	
Cover %	Distribution
Treatment	
Area (m^2, acres, or ha)	

Appendix 3. Example format for vegetation type descriptions

Community: Rough fescue-Bluebunch fescue No. of sites: 1 (Carbondale River) Soil: Orthic Dark Grey Chernozem Slope: 5% Aspect: S Moisture: Mesic to submesic Elevation: 1370 m Parent Material: Morainal Production: Grass (kg/ha) 422

Forb 788

Total 1210

Stocking rate 0.20 (AUM/ac) or 0.50 (AUM/ha)

Moisture Regime	Primary Water Source	Common Name	Description
Graminoid			
	Festuca campestris	Rough Fescue	1
	Danthonia californica	California oatgrass	6
	Koeleria macrantha	Junegrass	6
	Stipa richardsonii	Richardson needlegrass	2
	Festuca idahoensis	Idaho fescue	14
	Poa pratensis	Kentucky bluegrass	26
	Carex obtusata	Blunt sedge	6
Forbs			
	Lithosperma ruderale	Woolly gromwell	T
	Geum triflorum	Old Man's whiskers	8
	Achillea millefolium	Common yarrow	11
	Selaginella densa	Little clubmoss	T
	Anemone multifida	Cut leaved anemone	1

This plant community appears to be representative of low and midslope positions in the Castle area south of Blairmore. Moving upslope from the rough fescue community, Idaho fescue becomes co-dominant with rough fescue. The slightly drier site conditions appear to favour the growth of Idaho fescue. In Montana, Mueggler and Stewart (1980) described a Rough fescue-Idaho fescue habitat type on mountain slopes on both sides of the divide. Looman (1969) described similar vegetation that occurs on warm slopes and stony soils at higher elevations in the southern foothills as the Rough fescue-Intermediate oatgrass association.

Grazing pressure on this site causes rough fescue to decline and Idaho fescue, Kentucky bluegrass and sedge species tend to increase. Continued grazing pressure causes forage productivity to decline or it could be the result of drier site conditions. The original clippings occurred on a drier portion of the site than inside the exclosure.

Appendix 4. Recommendations for Capturing Infrastructure Features

Use letters g, n, or p to provide information on feature condition: g = good, n = needs improvement, p = poor

General Feature Type	Feature Name	Code	Comments
Water Feature			
	Dugout	Dgt + g, n or p	
	Spring -Developed	Spd + g, n or p	
	Spring - Undeveloped	Spu + g, n or p	
	Water Troughs	Wtr + g, n or p	
	Creek Watering	Ckw + g, n or p	Important creek watering sites only
	Water Tank	Wtk + g, n or p	
	Water Line	Wln + g, n or p	
	Water Well	Wwl + g, n or p	
	Creek Crossing	Crs + g, n, or p	Important creek crossings only
Structure			
	Cabin	Cbn + g, n or p	
	Corral	Crl + g, n or p	
	Loading Chutes	Lch + g, n or p	
	Gates	Gt + g, n or p	
	Cattleguard - gated	Cgg + g, n or p	
	Cattleguard - ungated	Cgu + g, n or p	
	OHV fence crossing	Qfc + g, n or p	
	Culvert	Clv + g, n or p	
	Permanent Salting Structure	Pss + g, n or p	Permanent salting structures – for salting sites with no structure use Ss
	Storage Shed	Ssh + g, n or p	
	Bridge	Bdg + g, n or p	
	Oiler	Oil + g, n or p	
	Barn	Brn + g, n or p	
	Rider's Camp	Rcp + g, n or p	Important camping area with no permanent cabin or structures – may contain outhouse
Fence			
	Fence point	F + g, n or p	Use when capturing fences as waypoints – although it is MUCH preferred that fences are captured as tracks
	Fence	F + g, n or p	Use when fences are collected as tracks
	Fence – corner post	c	Capture a waypoint at each fence corner post (whether tracks or waypoints for fence capture)
	Fence to be cont. (stop)	w	Use when capturing fence as a track when it becomes impossible to continue along the fence line due to topography or barriers – this is a stop point
	Fence restart point	z	Use this restart point to signify the continuation of a fence line track (when this is used a fenceline will be drawn straight between the stop (to be cont.) and restart point
	Fence End	x	Use where fence stops (an end point)
	Fence down	Fd	Use in addition to a fence track or fence waypoints to denote a fence is down

General Feature Type	Feature Name	Code	Comments
Other			
	Trail - built	Trl + g, n or p	Use only for built trails which have had funding put into them
	Trail - important	Tri + g, n, or p	Use for trails important to your operation which have not had funding put into them
	Salting site	Ss + g, n or p	For salting sites w/ no permanent structure
	Biocontrol site	Bio	Biocontrol release