Manitoba Range and Pasture Health Assessment Workshop

November 9 and 10, 2016
Brandon, Manitoba

Report on Presentations and Discussions
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### Attendance and Workshop Format

These people attended the workshop, hosted by Kerry LaForge and Mae Elsinger of Agriculture and Agri-Food Canada. Others had expressed interest in attending and are also interested in follow-up discussions and activity associated with developing a range and pasture health assessment method for Manitoba.

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<th>Name</th>
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<td>Manitoba Sustainable Development</td>
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<td>Rachel Whidden</td>
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<td>Terence McGonigle</td>
<td>Brandon University</td>
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The workshop lasted 1.5 days and the format was a mix of small group discussion (working through some key questions) and presentations followed with general discussion. Four groups of 4-5 people were formed (3 groups of 4 on the second day) and given flip charts for recording answers to several questions throughout the workshop. Presentations about the need for Range and Pasture Health assessments, and the various methods, are summarized in Appendix 1 & 2 – A thru G. As an auxiliary activity, an opportunity for individuals to review a draft of ecosite mapping products was also given, followed by a short general discussion (See Appendix 3).

At the last hour of the workshop, funding, manpower and scope of work under the present funding were discussed. The preferred baseline health assessment method was chosen to work on (Alberta), and an outcome was decided upon for the next year (Draft workbook of native and tame grassland health assessment). Attendees were asked to think about their level of time and resource contribution and make a commitment in the near future (See Appendix 4).
Personal Introductions and Their Descriptions of Healthy Rangeland

Attendees were asked to introduce themselves and why they attended. As part of the introduction they were given a moment to write on a sticky note what they think healthy range and pasture looks like and present it to the group. These are their submissions.

1. productive; palatable species; absence of non-desirable weedy species; soil health in good order (production based and indicator based

2. vegetative diversity/heights (grasses, legumes, woody species, forbs; resilience); natural waterbodies; ground cover; provides for both wildlife and livestock and insects, etc; appropriate use; varied use; soil quality

3. dominated by native species; mix of grasses and forbs; not dominated by “weedy” species; subject to “normal/natural” ecosystem processes (fire, grazing)

4. lots of diversity – both plants and animals; minimal to no bare ground; little to no invasive species; healthy soils – how to quantify; most important – healthy view of ruminants on the landscape; good water infiltration

5. healthy range for a diverse plant community with a plant species composition that are consistent with the associated soil and landscape

6. abundant and diversified vegetation; protected and well-aggregated soils; poplar under control; with livestock and wildlife; active soil biology

7. It has all niches filled. It has a look of vitality and smell of richness. Weedy plants are absent or limited to soil bared by rodents. It seems alive with plants, insects and animals. There is the absence of chaos.

8. Diversity – 15 to 20 species; warm and cool species; large growing season – 150 days green; palatable to livestock; grass and broadleafs; ... ; lots of insects, birds and ...; deep roots

9. Productive; by providing grazing, habitat, and EG&S with a balance of the 3

10. A diverse plant population with an abundance of decreaser species of grass. It sustainably supports livestock grazing while also supporting the native animal and bird species.

11. diverse forage and native plant population; flourishing plants of the season; wildlife

12. diverse mix of native species; very few or no non-native species; includes forbs, shrubs and grasses; has some litter; good root development; includes native legumes; able to withstand fluctuations in precipitation; good community of soil microorganisms and insects.

13. high diversity of grass and forb species; low amount of pug/hummocking in wet grassland habitats; few weedy species present; limited amount of bare soil; heterogeneity in habitat; minimal shrub encroachment
14. High biodiversity of plants and animals; native plants with few invaders; high grassland bird abundance

15. multi-benefits; provides habitat in the form of--; biostructure; tolerant/adaptable to changing environment (resilience); sustains/provides agricultural benefits; support livestock producers; sequestering carbon; filtering and infiltrating water; soil

16. is beautiful; contains native plant diversity and supports many different animal species; ideally it will have no invasive species; it shouldn’t be overgrazed and should have a litter layer and healthy soil

17. diverse, ecologically functional ecosystem, that supports a range of native plants, animals, fungal and microbial communities while supporting ecosystem services (pollination, hydrology)

18. productive; diversity (healthy diversity – indicators); aesthetic; wonder; beauty; quiet; peaceful; wildlife; soil is covered; litter

19. productive; diverse; retains water and nutrients
Small Group Exercise #1 – Goods & Services, Functions, and Indicators of Function

A. Three questions:

1. Goods and Services provided by Healthy Range and Pasture - What are they?
2. Function - What is happening in a healthy Range and Pasture to provide these Goods and Services?
3. Indicators – What can we measure in order to determine how well range and pasture are performing each of these Functions?

B. Answers (groups not necessarily in same order for each question):

1. Goods and Services

Pollination; drought resilience; flood mitigation; water recharge, retention, filtration; use by livestock and wildlife; SAR habitat; hunting, cultural use, traditional use, education; carbon capture and greenhouse gas capture; aesthetics; biodiversity (insects, soil microbes; plants, wildlife); soil formation

Forage; meat and fibre; C sequestration; Wildlife habitat (hunting, furs, birding, ecotourism); flood and drought mitigation and soil protection; soil protection and development; income generation

Primary production (grazing); water infiltration (quality of water); carbon sequestration (carbon cycle); habitat (pollinator, species diversity); recreation; healthy soil biology (N availability, nutrient cycling, reduce denitrification)

Water Storage capability (flood waters are slowed, potholes); Carbon sink; capacity for resilience (drought or flood); livestock productivity and profitability; production of wildlife biodiversity (inverts and verts); recreational benefits for human well-being; educational example/experience; nutrient storage (decreased runoff); pollinators

2. Function

Nutrient cycling; water cycling; vegetation in sync with landscape; grazing management is appropriate; good balance of use by wildlife and livestock; soil conservation in place (deep roots, soil microbes)

Large solar harvest; nutrient cycling; grazing by large herbivore; water storage-water cycle; vigorous plant growth (deep rooted plants)

Nutrient cycling; water quality and quantity; deposit carbon; pollination; disturbance

Water is being absorbed/stored in grassland (ephemeral wetlands are not destroyed); permanent vegetation cover stores carbon; lots of biodiversity (prevent extinction, buffer for climate change/extreme weather); higher grassland health means higher AUMs; high biodiversity/soil microbiome; higher diversity/landscape beauty; protecting habitat for future and aspiring young people to appreciate grassland; prairie root systems/reduced soil compaction; lower chemical use
3. Indicators

Healthy root system; species composition (increaser/decreasers) is good and diverse (forbs shrubs, grasses); minimal invasive species; successional stage of plant community; water quality; soil quality including water holding capacity; amount of litter/amount of bare ground; wildlife diversity; erosion; diversity of other users; good structure of plant community; uptake by other land managers; forage production and cattle gains

Forage production; pounds of meat/ac; high diversity; soils – OM; soil health (infiltration rates, litter, soil aggregation); erosion levels (% bareground); high seral species (decreaser species); plant community structure

Productivity and profitability of cattle producers; species composition (flora/fauna/SAR); invasives?; soil nutrients/biome; litter/bare soil; use of area by people (hunting, recreational, Ag uses); chemical inputs; wetland area; hummocks; aspen encroachment

Soil (N content, microbial activity, soil structure; SOC); Productivity (wt gain, AUM, etc.); Sp Composition (plants, animals, insects); soil water infiltration; litter and standing dead; connectivity vs fragmentation; organizational recognition??

C. Discussion and Summary

We discussed differences between Goods and Services and Functions, and differences between Functions and Indicators. Some overlap – in some perspective one might be a function while in another it might be an indicator or service – there could be several layers of function (processes) that lead to a good or service.

Common Goods and Services included those related to water, livestock and income, carbon and greenhouse gas, resilience, enjoyment and use of the land in various ways, and wildlife habitat and diversity. Other specific ones were education/experience, pollination, and nutrients.

Common Functions included nutrient and water cycling and storage, energy capture via primary production, harvest or other disturbance, balance of grazing and other uses, and growth of plants with deep roots and soil microbes. Others mentioned are permanent vegetation, compatibility of vegetation with the land, biodiversity, and protection of the land.

Some of the Indicators mentioned were broad, like productivity and soil health, and some very specific, like pounds of meat or nitrogen content. Common ones included those related to roots, species composition (plants, insects, wildlife), diversity, successional status, invasives, amount of products, profits, soil quality and biota, soil exposure and erosion, water infiltration, plant residue, wildlife and SAR, and people’s use or recognition of the value of the land. Others mentioned are area of wetlands, hummocks, continuity or fragmentation, capture of water, chemical input required, plant community structure, and brush encroachment.
Small Group Exercise #2 – Land Use objectives and Targeted Users of a Range and Pasture Health Assessment Method

A. Two questions:

1. What Land Management objectives could benefit from a Range and Pasture Health Assessment Method?
2. Who should be the targeted user or users for a Manitoba Range and Pasture Health Assessment Method?

B. Answers (groups not necessarily in same order for each question):

1. Land Management Objectives

   Improved forage production (native and tame); monitor and evaluate biodiversity management; wildlife; plant species; healthy grass in order to have healthy cows (livestock/Sheep/cows love grass); assess soil management (optime needed); climate change resiliency – to ID potential and target areas; identify water retention and quality projects

   Appropriate stocking rates; determine suitable grazing regimes (e.g. mob vs rotation vs continuous); guide management for other values (SAR, birds, wildlife, etc.); develop and target management activities for maximum benefits (cattle AND ecological); identify areas in greatest need of improved management (develop priorities); direct/guide government policy on use and management of land, especially co-management of crown land (e.g. timber harvest and grazing)

   Improve management for livestock and pasture (forage production, animal gain, reduce invasive spp, reduce erosion and increase ground cover, improve infiltration, increase biodiversity, improve resiliency); document land use and management (identify issues and make changes – Environmental Farm Plan idea, and land management monitoring); monitoring via ranking scale to be able to pinpoint specific issues; and education of landowners

   One group added to one of their sheets: How to tease out difference between degradation due to livestock use or lack of use

2. Users

   Us (the people in this room); pasture managers/beef (livestock) producers; organizations – to provide the common language; policymakers; conservation organizations (MHHC, NCC, etc…CD’s); land owners

   Producers, land managers/pasture managers, general public (education, ecological goods/services); conservation organizations, government policymakers

   Producer, agencies, university/college students, Ag in the Classroom; Sustainable Beef initiatives; Oil and Gas
C. Discussion and Summary

Commonly mentioned land management objectives include improving livestock production and health; balancing multiple land uses or benefits; managing towards non-Ag values (wildlife, plants diversity, SAR); monitoring and evaluating land use and land management practices; and identification of target areas for future work (projects, practice change, and education). Additional ones include directing or guiding government policy for land use and management, educating landowners, determining and improving level of resiliency, and documenting a landowner or user’s beneficial land use.

One group mentioned on their sheet a need to determine the difference of degradation due to over use vs lack of use. This isn’t directly a land management objective, but is related to balancing land management and use. Later in the day’s discussion we reinforced this concept in the way of indicators that could have both minimum and maximum thresholds or acceptable reference levels beyond which too much is cause for deduction of points (for example, litter abundance, structure, and brush encroachment).

Commonly mentioned targeted users include producers, agencies, organizations, government policymakers, and the public. Additional ones include land owners, energy sector, grade school students via Ag in the Classroom, university and college students, and those who certify and evaluate Sustainable Beef practices.

There was some discussion about making this method accessible to a wide range of users, in the types of indicators evaluated, the information held in the workbook, and in the use of common or non-technical language.

There was a suggested need to ask energy companies/consultants, and conservation districts to the table. It was mentioned that the Alberta Energy Regulator in the Alberta government has been actively using the Alberta Rangeland Health Assessment method in evaluating the quality of reclamation on their lands.
Small Group Exercise #3 – Land Use objectives and Targeted Users of a Range and Pasture Health Assessment Method

A. Three questions:

1. What did you like most about one or all of the methods presented yesterday
2. Which method is most similar to what you think a Manitoba Range and Pasture Health Assessment Method should be?
3. What changes must be made to that method if it were to be used as a basis for assessing health of Manitoba Range and Pasture?

B. Answers

1. What we liked about the methods

Inclusion of modified grasslands (AB); target-specific scoring question (NCC); simple questions (all); by plant cover instead of by weight (AB vs SK); litter assessment; brush encroachment in combination with composition (NCC)

Similar indicators (all); modified land assessment (AB) because MB has many modified grasslands; heterogeneity (NCC) – note that scale is important

Scores for final health and for each question (all); a place to put notes or comments; NCC has added their own to AB method

2. Which method as a basis?

There was really no answer recorded by any group, but at least two groups positively indicated the Alberta method for a basis, based on the need for multiple land types (including wetlands, forest) and the acceptance of a modified consideration.

3. What improvements [or considerations] should be made? Some of these are listed as needs for Manitoba. Some of these are oral from the sharing and discussion.

- Manitoba needs Tame, Forest, Range, Wetland (MWE)
- Need to add a list of Species at Risk (like how there is a list of Noxious Weeds in the workbook)
- All types of land should be included in the workbook that you would take out for the assessment
- Wet here – we need a wetland assessment
- Implications of positive and negative aspects of livestock; and positive and negative aspects of land being idle
- Q – do you have heterogeneity?
- A follow-up section – What tools could you use if you score low? – GRI, Distribution tools, stocking rates (ecosite/plant community guide), who you can call
- Add structure to tame
- Address lack of disturbance (..cont’d...)
• Add heterogeneity
• Level of disturbance should show up in species composition
• Do we need another for layers of (dead) undisturbed vegetation cover
• Add a section for general recommendations to address issues
• Encroachment
• Influence of adjacent properties
• Need to look at the thresholds of exotic for the range and forested pasture (70% exotic) or
  threshold of introduced forage in tame (50% introduced)
• Forest assessment should be included in MB (AB is simpler – is qualitative enough?)
• Brush encroachment is important here and should be incorporated into native
• Wetlands, sedge meadows, ridge and swale needs to be added (community pasture examples,
  possibly more ecosite heterogeneity in a smaller area (how do we choose the assessment site/)
• Consider adding a water presence indicator (ephemeral water)?

C. Discussion

There is a lot of support for the AB/SK way of assessing indicators, but with favoritism towards Alberta’s
method, mainly due to acceptance of modified forms. NCC’s method is viewed as the AB modified with
considerations added for targeted objectives, heterogeneity, and better inclusion of brush
encroachment.

Objectivity was viewed as important by many participants.

Wetness, ephemeral surface water, and more rapid brush encroachment are expressed as uniqueness in
Manitoba that need to be addressed in the assessment method.

Idleness (or lack of disturbance) of land (non-use by large herbivores) is a common concern. Indicators
will have to consider deductions for beyond-ideal abundance of brush, litter, certain plants, bare soil,
erosion.

Heterogeneity is valued for its diversity, but is a challenge for assessing a parcel or even a small area of
land. Ecosites and their resulting plant communities are heterogeneous at a scale as low as 10 to 100
meters (as in the case of ridge and swale or sand dune complexes) – how do we apply an assessment to
such land, how do we choose sites for sampling? [Editor’s note – this might apply also to spatial
heterogeneity of grazing – patch grazing would yield patches of undergrazed and patches of overgrazed
within 50 or 100 meters of one another]

Heterogeneity is valued on a wider (landscape) scale as well. The NCC method makes reference to the
quality of adjacent parcels of land. This led into a discussion of health versus risk of the parcel being
assessed. [Editor’s note – one can control the health of one’s parcel, but not the health on adjacent
properties – this is risk, but we can control how resilient our parcel is against that risk by making it
healthy.]
Follow-up recommendations were insufficient in the presented methods. Alberta makes a small ecological interpretation of the result, but is weak in the application of practices to follow (type of grazing method to try, livestock distribution methods, reference to proper stocking rates, and reference to methods of monitoring annual forage/grassland utilization. A MB method should be stronger in this. A contact list was also suggested for someone looking for more help.

There was some suggestion of being able to manage towards target objectives (for example Sprague’s pipit habitat) by accepting a lower score for certain indicators (e.g. species composition and litter). In that manner perhaps a common health assessment can be used but a lower health rating accepted (i.e. healthy with problems). [Editor’s note – maybe consider renaming the rating classes to remove the value-laden healthy vs unhealthy vs problems terminology].

Parking Lot Items

Who is going to write it? Look at Budget.

Shrub cover, encroachment – add Alberta’s tame brush question to native range

Questions which could be added; evaluation of brush encroachment; evaluation of ‘flooded” soils – amount of water impacting the land

Maximum level of litter?

Ask Oil and Gas to the table!

How to incorporate lack of disturbance

Range Health Indicators – upper thresholds

Conservation Districts as Users

Fine-ness of the rating scales for seeing improvements over a shorter term (5 years)

Need a field demonstration to fully understand all indicators and how to rate them
Concluding Discussion at End of Workshop

We want to move forward with developing a health assessment method for all 4 types of land – native grassland, tame pasture, forested range and pasture, and wetlands, based on the AB/SK methods, perhaps incorporating Managing the Water’s Edge for wetlands.

The scope of the presently funded Growing Forward project is to deliver a DRAFT Rangeland Health Assessment Method before October 31, 2017. It is not clearly stated whether or not this includes pasture as well. To deliver a method for all 4 types at this time will likely exceed our ability and timeframe. We set next spring as a target for developing the first draft of the range and pasture health assessment for native and tame grassland, so it can be tested in the field.

For simplicity in future development someone suggested keeping the other land types in mind while developing the range and pasture indicators, so that we can strive towards a parallel method for each type. Kerry LaForge will seek permission from AB and SK for us to use the written material in their health workbooks.

Funding was discussed as we want to go further than just developing the native and tame health assessment draft workbook. Obviously we want to finalize and publish it, and include forest and wetland in it. As well, we need to promote and demonstrate it widely. There are also the pre-requisite reference plant community guides to develop and deliver. Growing Forward 2 is being developed as we speak, and it is unknown if there will be a final flood of GF2 dollars to take advantage of. Past funding application efforts were reviewed. Habitat Stewardship funding is still available and is currently taking applications. There was no urgency to follow up on this.

A running document reviewing the overall project, the status of its activities, and the amount of funding needed and used already, should be kept on hand for communicating funding and participation needs within our own organizations or to other possible members. Kerry LaForge is going to dig out the expenditures for the Saskatchewan Range health project from SK PCAP.

Manpower is a great concern. Assembling and editing the workbook is expected to be a great time user. Kerry will also inquire with MFGA to see how much funding would be available (taken from the original amount for bringing speakers out from Alberta and Saskatchewan) for one contracted person to assemble and edit the draft workbook as it is developed. Note that we are not looking for a final perfect copy, or any printed workbooks.

Future meetings are planned, primarily by telephone. We have the email addresses of all attendees. There could be at least one more workshop before spring. A document requesting attendees’ commitment to the project and a list of possible tasks was passed around (see Appendix 4), with responses made to Kerry LaForge.
Appendix 1 – Need for a Range and Pasture Health Assessment

Notes from presentation and discussion:

Range Condition Assessment methodology was based on early successional theory. We developed an understanding of how most rangeland plants respond to grazing: increasers and decreasers (later, “invaders” came into the picture, which are exotics). We were also able to predict which plants go on which type of land (range site or ecosite). This methodology assumed that grazing pressure was eased or released, then a community dominated by early successional increasers would move back in linear fashion to a community dominated by late successional or climax species (decreasers).

Successional theory (and range condition assessment) worked until people realized in the later part of the 20th century that easing or releasing grazing pressure did not return the plant community back to late successional status. At very severe levels of disturbance or disruption, the plant community crossed a threshold (point of no return) or went down an unexpected pathway, as a result of very high disturbance, cultivation, soil degradation, mining, erosion, introduction of exotic species (invaders), brush invasion, etc. People were finding functional rangeland, but it scored very poorly under the Range Condition Assessment method, which relied solely on plant species composition (proportion or decreasers compared to increasers and exotics). The reverse was also true – plant communities with very high range condition score (dominated by decreaser or late climax species) were of poor functionality. The method worked poorly for woody and forested communities, and moister communities.

Rangeland professionals looked to a new way of rating the quality of rangeland, beyond just plant species – HEALTH. Rangeland Health Assessment was first developed in the United States in the mid 1990s, with a long list of indicators of soil, hydrologic and biotic function. Alberta based their producer-friendly health assessment method on this, while reducing the number of indicators by making broad indicators represent a number of more specific indicators. Saskatchewan followed suit with a similar producer-friendly set of indicators. Nature Conservancy of Canada – Manitoba Region has adapted the AB methodology with adding some considerations for brush encroachment and targeted conservation objectives (e.g. Species at Risk preferable habitat qualities).

Alberta and Saskatchewan are the first on the Prairies to take on rangeland health and develop the prerequisite understanding of ecological sites and plant communities, because of their larger rangeland base, and the greater susceptibility to impact of overgrazing to their dry and mesic rangelands and pastures (sometimes 25 years or more to recover to a productive state). Manitoba lags because of the relatively small native rangeland base, the limited number of rangeland workers, and because pastures are very forgiving in productivity after being damaged. A more regular and abundant precipitation regime, greater humidity, and close proximity of groundwater to the surface allow Manitoba range and pasture to recover forage productivity after drought, fire and overgrazing, regardless of plant species composition. Kentucky bluegrass and other ubiquitous exotics are highly grazing tolerant and respond well to returning moisture, though they do impose production risks when dryness and hot weather occur.
Part of developing a Range and Pasture Health Assessment method is to establish potential levels for each of the health indicators, for any given ecological site, according to its limits of moisture availability, soil texture, salinity, calcareousness, and topography. At that point, for any given ecosite, an existing range or pasture can be compared to its potential with regards to its ability to support a certain plant composition, structure, litter accumulation, soil cover, and other indicators of health. Jane used some good imagery to illustrate this comparison and the need to establish the true potential of a plant community on any ecological site:

Imagine an old Cadillac that you have always known as having a nice front seat, running engine, and 4 good tires. Over time the tires deflate and the seat gets dirty and the engine starts to knock. So you bring up the potential of the Cadillac back to a good running engine, clean front seat and fully inflated tires, and you think it is healthy again. And then you discover there are other Cadillacs out there that also have a comfortable back seat, shiny paint job, clear windshield and effective air conditioning. Then you discover a greater potential for your cadillac with some more positive changes.

Jane has been guessing for the last 15 to 20 years what the potential composition and production of native grassland should be, because there are no known references for Manitoba.

Range Health Indicators condense ecological processes and functions – we can ask a few questions that will answer 100 questions about the health of these functions and processes.

Who could use the product and why would it be important?

- Anyone using the land?
- Would one system work for everybody?
- Our assessments look at one point in time - we need a Standard for comparing evaluations of multiple people/organizations, or multiple periods of assessment, for measuring trends objectively.
- We can make a land use call and claim it to be sustainable – but for how long?
- We need to watch for measures that are deceptive – for example production varies in a wet versus dry year regardless of how well it is managed – we need indicators that overcome variation that is beyond our control.

How do we know at what point in succession we have approached the climax or ideal state? Usually this is done with exclosures. Alberta has a very extensive program. Saskatchewan had an abbreviated program at one time that faded with the last 3 exclosures monitored by PFRA until 2012 or so. Manitoba does not have exclosures other than those established at certain times for specific periods or intents, but not maintained for the long term. NCC for its health assessments has geographic locations of communities they think are ideal against which they assess other communities, but those are not yet linked to ecosites. [editor note: Wildlife Management Areas in Manitoba could provide some clues, although some non-disturbance considerations are required, and they should be evaluated as potential for late seral status.]
Appendix 2 – Currently Used Methods Related to Range and Pasture Health Assessment

A. Manitoba Conservation Data Center - Mixed Grass Prairie Inventory

The method originated in the search for Tallgrass Prairie sites in the Red River valley to target land securement and restoration. The method is qualitative and subjective and repeatability and consistency are suspect due to lack of numeric thresholds or measurements (e.g. difference between A,B or B,C or C,D). It is not meant for monitoring. Some changes in grades are being observed over time, and the general feeling among users is that the changes are true. It is a challenge not having a reference as to what an A community should look like – for example on a Sandy site it might rate as an A under the present indicators, but it may not be the appropriate or target community (i.e. you may want an earlier seral community to meet the needs of some rare species). Most assessments yield C or D. Few are A.

Indicators include:

- Abundance and diversity of native plant species
- Plant functional group diversity and community structure
- Presence and severity of human-caused negative impacts
- Presence and abundance of exotic species
- Risk of introduction of exotic species
- Shrub encroachment and abundance
- Reversibility (ability to improve to better quality)

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<td>- diverse mix of graminoid, forb and shrub species.</td>
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<td>- no evidence of negative human impacts (i.e. cultivation, herbicide or fertilizer application, unsound grazing or haying practices, long-term fire suppression).</td>
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<td>- few or no exotic species, with low risk of their introduction (i.e. if surrounded by a buffer of natural vegetation).</td>
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<th>B Grade:</th>
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</thead>
<tbody>
<tr>
<td>- some evidence of negative human impacts (i.e. cultivation, herbicide or fertilizer application, unsound grazing or haying practices, long-term fire suppression) but with relatively little effect on the community's overall structure and/or composition.</td>
</tr>
<tr>
<td>- increased abundance of shrubs and/or exotic species as well as decreased abundance of native species.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C Grade:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- evidence of moderate human impacts (i.e. cultivation, herbicide or fertilizer application, unsound grazing or haying practices, long-term fire suppression) which have affected the community's overall structure and/or composition.</td>
</tr>
<tr>
<td>- increased abundance of shrubs and/or exotic species, as well as decreased abundance of native species.</td>
</tr>
<tr>
<td>- the community has the potential to improve in quality to a B (or perhaps an A) grade occurrence over time, or with proper management.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D Grade:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- evidence of heavy human impacts (i.e. cultivation, herbicide or fertilizer application, unsound grazing or haying practices, long-term fire suppression) which have greatly affected the community's overall structure and/or composition.</td>
</tr>
<tr>
<td>- dominated by shrubs and exotic species, with low abundance of native species.</td>
</tr>
<tr>
<td>- community does not appear to be restorable to a higher quality.</td>
</tr>
</tbody>
</table>

J. Greenall, Manitoba Conservation Data Centre  Update: May 1, 1996
B. Nature Conservancy of Canada – Manitoba Region

Originally used an adaptation of the Mixedgrass Prairie Inventory (A,B,C,D ratings) but it brought up concerns about target appropriateness and subjectivity. So they reviewed a variety of other organizations’ assessments. A concern arose that Manitoba does not have reference sites required for many types of health assessment. There is also a requirement to know the needs for individual Conservation Targets and this may or may not be clearly and completely documented.

NCC created an assessment containing a number of quantitative indicators, but some are still subjective. This assessment acknowledges different objectives and types of possible grasslands. It is comparative both to target objectives and to known sites of high quality (although these sites are not linked yet to ecological site limitations – soil texture, chemistry, moisture, etc.).

A lot of weight is given to the indicators that address targeted objectives – even a pristine community can score low if its status does not support conservation targets, like certain species at risk or endangered species. Uncertain if multiple targets can be accommodated with such an assessment method. Negative values for this indicator are allowed for showing detrimental impacts on targets.

The evaluation can be made on different scales (i.e. size of area assessed), but that needs to be clearly documented for repeatability.

Rated or measured health indicators include:

- Percentage canopy cover of plant species listed in the reference community
- Cover and density-distribution classes of exotic invasive species
- Cover of uncharacteristic woody species (encroachment)
- Level of heterogeneity of habitat (biological and physical features, community structure, and patches of disturbance)
- Severity of human-caused negative impacts to plant species composition and structure
- Proportion of conservation targets supported or harmed by this grassland.

An additional Ecological Summary made as part of the pre-field visit preparation and on-site assessment includes:

- Ecological description
- Species Composition
- Openness
- Edge effects
- Successional State
- Topography
- Moisture regime
- Erosion
- Current/former land use
- Influence of adjacent land use
- Invasive species risk or potential
- Species at risk presence or potential
- Brush encroachment severity
- Other features requiring special management
- Visual Obstruction measurement (VO pole method in 2 directions at 5 or more representative points)
C. Ducks Unlimited – Planted Cover Inspections

DUC’s main objective is re-establishing habitat for waterfowl. They want something that is standardized (for habitat management decisions, long term monitoring, and learning from mistakes as they attempt to create habitat over many years). Their form starts with some background information such as whether or not a stand was seeded or native; and when and what it was seeded to; a quantitative evaluation of plant composition of the stand; what proportion of each population is producing seed; vegetative and seed culm height of stand at various positions in the landscape; amount of lodging; and accumulation of “duff” (the compacted accumulation of dead biomass that has started to decompose). Then they have commentary or binary (yes/no) observations of bare soil, aspen encroachment, and other stand comments. The nesting quality indicator portion of their evaluation includes:

- Horizontal and vertical concealment;
- Heterogeneity of live/dead cover;
- Heterogeneity of live/dead height;
- Presence/distribution of shrubby components for concealment (woody or coarse skeletal herbs)

At the end of their form they make specific management recommendations (what method, how much area to be treated; target date of implementation; and an accompanying description of the recommendation).
D. Brandon University – Soil Microbial Biomass Indicator

There are productivity indicators that respond to the outputs of healthy soil (forage yield, cattle weight gain)

But we could use a predictive or preventive indicator of these productivity results. Productivity links back to soil microbes and their processes – if we are aware of soil health status, perhaps we can modify it in order to affect productivity.

Microbes are expected to be a straightforward indicator of soil health. The measure is Soil Microbial Biomass Carbon.

Take a soil sample from a pasture or rangeland system, fumigate it with chloroform to release extractable carbon (via potassium sulfate), which can then be measured with an instrument that detects dissolved CO2. Compare the extracted carbon from a fumigated sample to that from a non-fumigated soil sample to get an amount of Microbial Biomass Carbon.

This indicator can be used to compare soils under different grazing systems, plant composition, biomass cover, apparent health, etc. It shows promising results for comparing the planned rotational vs continuous non-rotational system that was implemented at the MBFI Brookdale Farm in 2015.

E. United States (USDA, Forest Service, BLM, USGS) Interpreting Indicators of Rangeland Health

By the mid 1990s the United States had decided that the one-indicator method (comparing existing plant species composition to climax status) was deeply flawed. For example, a rangeland that doesn’t have the same species as a reference climax community can still function well. So they pursued a multi-indicator method of assessing a rangeland ecosystem. This method requires an understanding of what the site COULD LOOK LIKE, and thus requires a set of ecological site descriptions (ESD’s) which includes natural levels of processes like erosion, bare soil, vegetative cover, etc. ESD’s also have plant community information and state and transition diagrams (showing management and successional pathways among potential plant communities). The U.S. has been working diligently since the mid-1990s to develop ESDs and they are very complex and resource intensive.

There are a large number (close to 20) of very specific qualitative indicators, grouped into 3 general areas of soil/site stability, hydrologic function, and biological integrity. Some indicators overlap in these three general areas (e.g. compaction affects biological integrity, hydrologic function, and soil stability). There is a quantitative assessment alternative that addresses some of these indicators.

Their method is limited by the amount of skill and experience required to make the evaluations, as well as the time and complexity of the assessment. It is not meant to be used on-its-own in monitoring the land and making management decisions about it because it does not elucidate the causes of problems. It is good for prioritizing the extended assessment and monitoring of areas that are found to be of concern. The list of qualitative and quantitative indicators and some quantitative monitoring techniques is on the following page.
<table>
<thead>
<tr>
<th>Attribute</th>
<th>Qualitative Assessment Indicators</th>
<th>Key Quantitative Assessment Indicators</th>
<th>Selected Measurements and References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil/Site Stability</td>
<td>• Rills</td>
<td>Bare ground</td>
<td>Line point intercept (2, 3) Point frame (2)</td>
</tr>
<tr>
<td></td>
<td>• Water flow patterns</td>
<td>Proportion of soil surface covered by canopy gaps longer than a defined minimum</td>
<td>Canopy gap intercept (3) Continuous line intercept (2)</td>
</tr>
<tr>
<td></td>
<td>• Pedestals and/or terraces</td>
<td>Proportion of soil surface covered by basal gaps longer than a defined minimum</td>
<td>Basal gap intercept (3) Continuous line intercept (2)</td>
</tr>
<tr>
<td></td>
<td>• Bare ground</td>
<td>Soil macro-aggregate stability in water</td>
<td>Soil stability kit (3)</td>
</tr>
<tr>
<td></td>
<td>• Gullies</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wind-scoured, blowout, and/or depositional areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Litter movement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Soil surface resistance to erosion</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Soil surface loss or degradation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Compaction layer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrologic Function</td>
<td>• Rills</td>
<td>Bare ground</td>
<td>Line point intercept (2, 3) Point frame (2)</td>
</tr>
<tr>
<td></td>
<td>• Water flow patterns</td>
<td>Proportion of soil surface covered by canopy gaps longer than a defined minimum</td>
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</tr>
<tr>
<td></td>
<td>• Gullies</td>
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<tr>
<td></td>
<td>• Soil surface resistance to erosion</td>
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<td></td>
<td>• Soil surface loss or degradation</td>
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<td></td>
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<tr>
<td></td>
<td>• Compaction layer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Litter amount</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biotic Integrity</td>
<td>• Soil surface resistance to erosion</td>
<td>Soil macro-aggregate stability in water</td>
<td>Soil stability kit (3)</td>
</tr>
<tr>
<td></td>
<td>• Soil surface loss or degradation</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Compaction layer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Functional/structural groups</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Plant mortality/decadence</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Litter amount</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• Annual production</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Invasive plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Reproductive capability of perennial plants</td>
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<td></td>
</tr>
</tbody>
</table>
F. Alberta Rangeland Health Assessment for Grassland, Forest and Tame Pasture

The United States’ method for assessing rangeland health is very complex, and Alberta rangeland practitioners and stakeholders wanted something more accessible to land users (livestock producers). Their adaptation is significant, with fewer indicators but they are more encompassing. Alberta has summarized the numerous indicators of the U.S. method into 5 main indicators (some with 2 or 3 parts) plus an additional indicator for tame/modified tame:

- Plant species composition
- Plant structural and functional groups (merged into species composition for tame)
- Plant litter
- Bare soil (2 parts for all types)
- Noxious weeds (2 parts for all types)
- Brush regeneration (only in Tame/Modified Tame)

The greatest weight (almost 2/3) is put on the species composition and the litter indicators. Many users will accompany the assessment with a detailed quantification of the plant species proportions, bare soil exposure, and litter abundance from 5 or more subsampling frames. This helps them make a more objective assessment (a reconnaissance can be biased by the observer’s perception of tall or flowering species, discontent with any soil exposure or noxious weeds, preferred travelling path, etc.).

Alberta addresses up to 6 types of grazing lands, with slight differences in the method used to evaluate each type:

- native grassland and modified variant,
- seeded pasture and modified variant, and
- forested native pasture, and modified variant.

The modified variant is used to evaluate ONLY THE PLANT SPECIES COMPOSITION INDICATOR of 1) a native grassland or forest that is dominated (>70%) by exotic forages and herbs, or 2) a pasture dominated (>50%) by non-seeded species (native or tame). This is to recognize that plant communities containing exotic or unintended species may have other positive attributes that allow them to function effectively (i.e. abundant litter, complete soil protection, no noxious weeds, and/or a full complement of structural/functional groups). Thus, the other indicators are evaluated the same way whether a community is modified or not.

Alberta’s rangeland and pasture health assessments require a comparison of a community to a reference community. This is aided by Plant Community Guides that describe the potential climax and non-climax plant communities that could exist on a particular ecosite (soil type), in a particular ecoregion. These materials are developed for Alberta but they continue to update them.

A criticism of the Alberta method is that it does not have maximum acceptable limits of plant litter or brush on native grasslands. If too abundant, or on an increasing trend, these attributes can dramatically alter the integrity of the plant community (plant composition, structural layers, and nutrient cycling).
Too much litter could indicate inadequacy of recycling organic matter and nutrients, and could stifle productivity. Brush can impact shade intolerant species, redirect rainfall, affect livestock use patterns, and sometimes fix nitrogen (silver buffaloberry, Canada buffaloberry, wolf willow, and some exotics) which may improve abundance of some exotic forages or weeds that have entered the community.

The Alberta rating worksheets for native and tame grasslands are on the following pages. The forested one can be found with the rest of the Alberta Rangeland Health Assessment Workbook [http://aep.alberta.ca/lands-forests/grazing-range-management/documents/RangelandHealthAssessment-Revised-2009.pdf](http://aep.alberta.ca/lands-forests/grazing-range-management/documents/RangelandHealthAssessment-Revised-2009.pdf)

![Grassland Range Health Assessment - SCORE SHEET](image)
# Tame Pasture Health Assessment - SCORE SHEET

Site ______________________ Observer _______________ Date _______________

LSD ___ Quarter ___ Section ___ Township ___ Range ___ Meridian ___ Photo # __________

GPS Coord (NAD 83) Lat. _______________ Long. _______________ Est. usable forage prod’n __________

Special Observations (climate, changes in management) ____________________________________________________________________________________________

---

**SCORING** (circle appropriate values and add their sum to the Score box)

**Dominant Species**

<table>
<thead>
<tr>
<th>Grasses &amp; Grasslikes</th>
<th>Forbs</th>
<th>Shrubs</th>
<th>Trees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cover %</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Plant Community Name (code)**

1. Do introduced forage plants dominate the site?
   - 1A Tame Pasture: 12 0 5
   - 1B Modified Tame Pasture: 9 5 0

2. What kind of plants are on the site?  Shift in stand composition.
   - 2.1 Tame & desirable native: 14 7 0
   - 2.2 Woody & Disturbance: 14 7 0

3. Is the site covered by litter?
   - Litter cover & distribution: 25 16 8 0

4. Is there accelerated soil erosion? Site normally (circle) Stable / Unstable
   - 4.1 Erosion Evidence: 10 7 4 0
   - 4.2 Bare Soil: 5 3 1 0

5. Are noxious weeds present?
   - 5.1 Cover: 5 3 1 0
   - 5.2 Density Distribution: 5 3 1 0

6. Does the site have woody regrowth?
   - 6.1 Cover: 6 3 0
   - 6.2 Density Distribution: 4 2 0

**Grazing Intensity (est. Long Term (circle)): U U-L L-M M-M+ H**

Observed Utilization: __________ %  Vegetation Height: ______________ cm/in

Trend (apparent - circle): Upward  Downward  Stable  Unknown

---

| Site Score (total score) | Score | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 |
|--------------------------|-------|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Unhealthy               |       |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 0  |
| Healthy with problems   |       |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 50-74%|
| Healthy                 |       |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    | 75-100%|
G. Saskatchewan Native Grassland and Forest Rangeland Health Assessment

Saskatchewan followed from Alberta to create a simplified method of assessing rangeland and forested pasture health. Overall, it is a similar approach to Alberta’s method (5 indicators). Main differences would be not having a tame pasture assessment method, not having a modified variant of the native grassland and forest, tougher discounts for presence and abundance of exotic invasive forage species (not just noxious weeds), and presenting qualitative and quantitative alternatives for the forested health assessment.

Many users will accompany the assessment with their own version of a detailed quantification of the plant species proportions, bare soil exposure, and litter abundance from 5 or more subsampling frames. This helps them make a more objective assessment (a reconnaissance can be biased by the observer’s perception of tall or flowering species, discontent with any soil exposure or noxious weeds, preferred travelling path, etc.).

Similarly to Alberta, the Saskatchewan health assessment method puts the greatest emphasis (almost 2/3) on ratings of plant species composition and litter abundance. It also requires a comparison of a community to a reference community, aided by Plant Community Guides that describe the potential climax and non-climax plant communities that could exist on a particular ecosite (soil type), in a particular ecoregion. These community guides are fully developed, but background data is light for some of the ecosites in some of the ecoregions.

Similar criticisms apply as with the Alberta method: it does not have maximum acceptable limits of plant litter or brush on native grasslands. If too abundant, or on an increasing trend, these attributes can dramatically alter the integrity of the plant community (plant composition, structural layers, and nutrient cycling), or its vigour and productivity.

The 2-page Saskatchewan rating worksheets for native grasslands are on the following page. The 2 forested ones (indicator and quantitative method) can be found with the rest of the Saskatchewan Rangeland Health Assessment Workbook:

Field Worksheet: Grassland Range Health Assessment

<table>
<thead>
<tr>
<th>Plot</th>
<th>Observer</th>
<th>Date</th>
<th>Photo</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Legal Location

GPS Coordinates (NAD 83)

<table>
<thead>
<tr>
<th>Latitude</th>
<th>Longitude</th>
<th>Easting</th>
<th>Nothing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Diorient Plant Community Species

<table>
<thead>
<tr>
<th>Grasses &amp; Grasslikes</th>
<th>Dry Weight (%)</th>
<th>Fortes</th>
<th>Dry Weight (%)</th>
<th>Shrubs</th>
<th>Cover (%)</th>
<th>Trees</th>
<th>Cover (%)</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

Vegetation Status

Question 1. What is the plant community?

- Plant community composition closely resembles the reference plant community for the site and alteration of the plant community by disturbances is minimal. Example: Dry Mixed Prairie, Loam Ecosite, northern wheatgrass - needle-and-thread (Reference plant community).
- Compared to the reference plant community, the plant community shows minor alteration in plant species composition due to disturbances. Disturbance impact is light to moderate. Example: Dry Mixed Prairie, Loam Ecosite, Needle and thread - June Grass - Pasture Sage - blue grama.
- Compared to the reference plant community, the plant community shows moderate alteration due to disturbances. Disturbance impact on plant community composition is moderate to heavy. Example: Dry Mixed Prairie, Loam Ecosite, blue grama - needle-and-thread - sedge - western wheatgrass.
- Compared to the reference plant community, the plant community shows significant alterations due to disturbances. Disturbance impact is heavy to very heavy. Plants are mostly native. Some tall-growing, non-native plants may be present. Example: Dry Mixed Prairie, Loam Ecosite, blue grama - pasture sage - June grass Example 2: Kentucky bluegrass.
- Compared to the reference plant community, the plant community shows extreme to severe alterations due to disturbances. Disturbance impact is severe to very severe. Production is mostly from low-growing, non-native, disturbance induced plants. Example: Dandelion - Plantain.

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
</tr>
<tr>
<td>30</td>
</tr>
<tr>
<td>15</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

Question 2. Are the expected vegetation layers present?

- The life form layers closely resemble the reference plant community.
- Compared to the reference, 1 life form layer is absent or considerably reduced.
- Compared to the reference, 2 life form layers are absent or considerably reduced.
- Compared to the reference, 3 life form layers are absent or considerably reduced.

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

Question 3. Are Invasive/Noxious species present? Y or N

Which species?

Question 3.1 What is the cover of Invasive/Noxious species?

- No invasive/noxious species
- Invasive/noxious species present but less than 1% coverage
- Invasive/noxious weeds present with a total canopy cover over 1%

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

Question 3.2 What is the distribution of Invasive/Noxious species?

- No invasive/noxious species on the site
- Invasive/noxious species are present at a low level (density distribution class 1)
- Invasive/noxious species are present at a moderate to high level (density distribution classes 2 to 13)

<table>
<thead>
<tr>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

(A) Total Score for Vegetation Status
**Saskatchewan Grassland Range Health Assessment**

**HYDROLOGIC FUNCTION & SOIL PROTECTION**

**Question 4.1.** Is there more soil erosion than expected for this site? Y or N

- No signs of soil erosion or not beyond the natural extent for the site: 10
- Some evidence of soil erosion: 7
- Moderate amounts of soil erosion: 3
- Extreme amounts of soil erosion: 0

**Question 4.2.** Is there more bare soil than expected for this site? Y or N

- Less than 10% of exposed soil is human-caused: 10
- Greater than 10 and up to 20% of exposed soil is human-caused: 7
- Greater than 20 and up to 50% of exposed soil is human-caused: 3
- Greater than 50% of exposed soil is human-caused: 0

**Question 5.** Is the expected amount of litter present?

- Litter amounts are more or less uniform across the site: 5
- Litter standing crop (lbs/acre) is in the range of 68 to 100% of expected amounts under moderate disturbance: 10
- Litter amounts are somewhat patchy across the site: 3
- Litter standing crop (lbs/acre) is in the range of 30 to 65% of expected amounts under moderate disturbance: 0

**B) TOTAL SCORE FOR HYDROLOGIC FUNCTION & SOIL PROTECTION**

---

**Range Health Scores**

(A) Vegetation status (out of 60)

(B) Hydrologic function & soil protection (out of 40)

Overall score (out of 100)

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

<table>
<thead>
<tr>
<th>Class</th>
<th>Abundance of species in polygon</th>
<th>Distribution</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>None</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>Rare</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>A few sporadically occurring natural plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A single patch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>A single patch plus a few sporadically occurring plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Several sporadically occurring plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A single patch plus several sporadically occurring plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Several widely spaced patches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>A few patches plus several sporadically occurring plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Several widely spaced patches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Continuous uniform occurrences of well-spaced plants</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Continuous occurrence of plants with a few gaps in distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Continuous dense occurrence of plants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Continuous occurrence of plants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
Appendix 3 – Future Participation Questionnaire

Participation Questionnaire

Range and Pasture Health – Ongoing Participation

Name: Organization (if applicable):

Do you, or your organization, wish to continue participating in the development of a Manitoba Range and Pasture Health Method, from now until October of next year?

Please consider the following areas that will require participation...

- Attend one or more additional workshops (up to 20 hours of preparation and attendance per workshop)
- Monthly teleconference meetings in January, February, March, April (up to 12 hours of preparation and attendance per meeting)
- Active participation in discussion by email for voting, critiquing, new contributions, discussion, editing documents (variable time commitment)
- Technical committee lead for one indicator or other sections of the guide (variable commitment; maybe 50 to 75 hours)
- Key writer for the Draft Range and Pasture Health assessment workbook (variable, maybe 100 hours)
- Key editor for the Draft Range and Pasture Health assessment workbook (variable, up to 100 hours)
- Host a classroom workshop location (up to 20 hours participation and preparation)
- Host a field trial location (up to 30 hours participation and preparation)
- Contribute to the cost of a field or classroom workshop (venue rental, food/drinks)
- Contribute to the cost of publishing workbooks
- Other duties or contributions: Please Describe below

Please respond to Kerry LaForge with your type of commitment and time that you can spend on this project.

kerry.laforge@agr.gc.ca

phone 306-770-4495
Appendix 4 - Ecosite Mapping Critique

We had a trial and discussion of the draft Ecosite Maps that Jeff Thorpe is working on. The maps were printed in 11” x 17” and 8.5” x 11” for demonstration, and a questionnaire given out. The questions and answers follow this summary. One person even went home and used her software and data to make up an example of the kind of map and attributes that she uses, to demonstrate her needs.

One suggestion was made that a provincial overview map showing just the municipal boundaries would be useful (a separate page or file, or an inset map of the province with the municipality shaded out). Not everyone knows where the municipalities are, and their names.

There was a mixture of need for the mapping approach that targets remaining rangelands (as Jeff has done with masking out the crop and forage land) versus having ecosites on all land mapped regardless of land use (i.e. without masking the cropland and forage land). Some suggest the first approach is valuable for targeting programming or seeking quality prairie, and some suggest that what if someone proposed to change the land use to pasture or restore a grassland, what would be the expected ecological site conditions they (or their financial supporters) are dealing with? Some people even suggested that a dual set of maps - with and without ag land masked out - would be appropriate. This could result in a lot of extra effort and file space.

There was a wide range of suggestions and expectations, and it was evident that we are severely limited by a fixed, paper map. It was emphasized that there is also a GIS compatible dataset being formed as part of Jeff’s work and people sound excited about possibilities that this could entail (desktop GIS, AgriMaps, KMZ for use in google, etc). A lot of the limitations of PDF or paper maps could be remediated by this, as they can make their maps with whatever information they need or want, but people needed to be reminded of the need for on-site ground-truthing as instructed by the Manitoba ecosites classification.

Many of us agree that the ecosite dataset that is produced should be included in the new provincial Agri-Maps web application. However we are of the understanding that a consultant built that platform, and we may not be able to access the programming before Jeff’s mapping contract is done. Hopefully the dataset that Jeff produces will be so basic that it could be incorporated into a wide variety of mapping applications in the future.

Questionnaire and Answers

The Draft Ecosite maps for Two Borders Municipality (SW Manitoba) are based on the Manitoba Soil Survey, with cultivated and hay land shaded out according to the annual satellite crop inventory. Two maps of the dominant Ecosites in Two Borders Municipality are provided in two paper sizes each. Only 1 set has the legend but it would be the same for both.
Township lines are shown for both maps. Can you find any quarter section on these maps without the section lines being drawn?

- Yes, can find some
- Not easily.
- No.
- No, need to enhance – use 1:125,000 scale and put all grid roads in if possible
- Some townships are easier than others, might need section grid (depends on continuity of ecosite polygons, presence of shelterbelts, etc.)
- Labels of townships could be moved to edge of map (Twp on left or right; Rge on bottom or top) (2 people)
- Section lines preferred, in transparent black or grey, to help navigate within the township.

What is the smallest level of roadway that you would need to find a quarter section on these maps?

- One person did not respond.
- Seven preferred having grid/mile roads – depending on use and scale of map, useful for navigation and finding oneself.
- Two were satisfied with Provincial highways. One of them suggested a scale bar in miles to aid in navigation. Another thought that at this road level it should also have the legal land descriptions.

Would this map help you determine the 3 most likely Ecosites to be found on any of its quarter sections?

- Yes, with additional spatial information/shapefiles of sections
- Maybe.
- Probably not – however if someone needs this detail they can print a new map for something more specific.
- Kinda – larger scale is better
- I think so...
- Might be able to identify a couple, but very difficult to identify.
- Yes.
- Too many shades of grey
- Yes, but if needing to go to the actual location, this scale could be somewhat limiting

Would it be reasonable to put the map legend on a separate page if the space is needed for the map?

- Okay, but prefer if it is with the map – could remove ecosites from legend that do not show up on the map’s area.
- Yes (6)
- Yes, as long as they stay the same for all maps.
- No.
- No, especially with the large number of categories.
- Yes - a good opportunity to add more information, like definitions or brief descriptions of ecosites, disclaimers, etc.
- Add explanation for the legend
Would you sacrifice the ability to print a whole Rural Municipality on one sheet for being able to make the map a larger scale (i.e. each quarter section will be larger)? If so, what would be the greatest number of RM subdivisions that you would tolerate?

- Yes, with a maximum of 12 townships, and all maps in the set being either portrait or landscape orientation (not a mixture); 1:125,000 scale is sufficient.
- Two subdivisions would suffice
- Yes, one township preferred on a map
- Not an issue for me, maybe for the larger RMs like Westlake-Gladstone; I would not need larger scale maps than provided
- Yes – down to 4 townships, maybe?
- Single townships would be useful, or clusters of 4 or 6
- Yes (3 people).

Do you have access to a computer and printer that can print 11” x 17” colour copies of this map from a .PDF file (i.e. the larger size)?

- Yes but I think this is uncommon. You could go legal (8.5” x 14”) size if you want larger.
- No (3).
- No, not personally.
- Yes (3).
- Probably
- Yes – likely available for most professionals, not always possible

What is another format you would like to see for this map?

- .PDF is good – lower file size than JPG and everyone should be able to access
- .KMZ (3) – Digital is great, so you can zoom in and print a Section - google is more accessible
- .JPG
- Shapefile
- Web based GIS

What else would you do to improve the map?

- Need to differentiate between forage and annual crop land (3 people)
- Identify forage on the map (2) [editor: separate from annual crop] Forage parcels can be used as pasture – for anyone wanting to make land use changes, they may want the ecosite information
- A pair of maps or two types of maps (5 people) [ Editor: this means one with the crop/Forage land masked out, and one with ecosites for ALL land];
- Need clarification on how soil types translate to vegetation types
- Should not be so many shades of a certain colour (up to 6 shades for one colour [grey?])
- Colour scale is difficult to differentiate – scale too fine?
- Reduce some ecosites, or differentiate better (the colors are difficult to identify correctly on map)
• The colour scale can be confusing
• Colour of ag/forage land tough to discern from bedrock
• Would a printer potentially not be able to print all the colour variations
• Scale bar (2 people) – with miles on it (2 people)
• Town/city labels – use the towns shapefile
• Label main Hydrological features
• Include hydrological features
• Clip ecosites to provincial boundary (messy on the SK border)
• North Arrow
• Neatline around the map [instead of no outline]
• Multiple shades of green can show up well side-by-side on the legend, but it is hard to tell which green in on the map.
• Dotting [to differentiate saline wet meadow from wet meadow for example] doesn’t show up well at all.
• Even though it would be more work, how about limiting the colours to those found in that region, to narrow down colours from 27 down to 10 or 12 colours
• Instead of “legend” call it something more descriptive, like “Ecosites” or “land uses”, etc.
• An inset map showing where in Manitoba you are (2)
• Larger print (or bold/halo) for township label