Developing a Qualitative Approach for Assessing Grassland Ecological Condition:

A Tool for BC Ranchers

Annual Report

Hamilton Commonage Grassland Monitoring Project

March 2004

Grasslands Conservation Council of British Columbia

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I. INTRODUCTION

The *Hamilton Commonage Demonstration Project* was initiated in 1998 in cooperation with Gerard Guichon Ranch Ltd. to develop a range management strategy for the northwest quarter of the Hamilton Commonage that would maintain or enhance biological diversity, and improve grassland and riparian condition. Early in the project, it became clear that ongoing monitoring was an essential part of managing the range resource. Building on the experience gained from this project and a growing recognition that British Columbia needs a consistent, practical and easy to use tool for ranchers to assess grassland ecological condition, the Grasslands Conservation Council of British Columbia (GCC) initiated *the Hamilton Commonage Grassland Monitoring Project – Developing a Qualitative Approach for Assessing Grassland Ecological Condition.*

II. RATIONALE

While many techniques have been used for research, inventory and monitoring of rangelands in British Columbia, none have gained universal acceptance as a monitoring tool for range condition and trend. In addition, virtually all of the monitoring methods used previously in BC were considered unsuitable for operational monitoring because they were complicated, time consuming and not accessible to ranchers.

From a grassland stewardship perspective, this presents a significant problem. British Columbia needs an appropriate, standardized qualitative monitoring procedure for ranchers to practically and willingly assess range condition. In recognition of these problems, the GCC initiated a process to bring stakeholders together to develop, or adopt, a qualitative method for assessing grassland ecological condition, or grassland health, that will be appropriate for ranchers and consistent with government standards and requirements.

III. GOAL

The goal of the Hamilton Commonage Grassland Monitoring Project is to develop and test and a qualitative approach for monitoring ecological condition and trend on grasslands.

IV. OBJECTIVES

The objectives of the project are to:

1) Establish a technical advisory committee that will guide the testing and refining of a qualitative method for grassland monitoring.
2) Develop and test a method for grassland monitoring that is suitable and practical for the ranching community, and consistent and acceptable to government standards.
3) Select two or three pilot project sites in other regions of the province to test and refine the methodology further with ranchers. This will ensure that the methodology is applicable and tested in other grassland types.
4) Develop a qualitative grassland-monitoring manual for BC.
5) Develop materials for training workshops.
6) Organize a training workshop for ranchers and range managers on the qualitative approach to assessing grassland health and application of the monitoring tools.

V. DESCRIPTION OF THE STUDY AREA

The project area is located approximately 22 km north of Merritt, BC and comprises the northwest quarter of Hamilton Commonage managed by Gerard Guichon Ranch Ltd. The commonage contains about 6,475 ha of "upper grasslands" at elevations ranging from 1150 to 1250 metres. Annual precipitation varies from 375-510 mm and averages about 440 mm (Lloyd et al. 1990).

The grasslands within this area are interspersed with wetland, riparian areas, aspen copses, coniferous forest groves and rocky outcrops. This diversity of vegetation provides a wide range of habitats for plants and animals, and a variety of opportunities for cattle grazing. It also provides opportunity to develop and test a monitoring system in a variety of plant communities in an efficient and cost-effective manner.

VI. AGREEING ON A QUALITATIVE APPROACH

There is broad agreement that BC needs a qualitative approach for grassland monitoring that encompasses key features. The method should:

- Be practical, simple and easy to use in the field by ranchers and range managers.
- Be adopted or built from existing science, knowledge and methodologies from BC and other jurisdictions.
- Be rigorous enough to evaluate environmental change at an acceptable level of accuracy and be repeatable over time.
- Be based on indicators relevant to BC's grasslands that enable assessment of condition and trend.
- Be consistent with government standards and requirements.

VII. ESTABLISHING A TECHNICAL ADVISORY COMMITTEE

Although the Grasslands Conservation Council has taken the lead role in developing and delivering this project, the GCC has established a Technical Advisory Committee to draw on the expertise and experience of user groups and government agencies with an interest in monitoring and maintaining grassland resources in British Columbia. The following committee was established to guide the collaborative process to develop and test a qualitative approach for assessing grassland ecological condition in BC.

GCC Committee (Executive Committee)

- Bruno Delesalle, GCC Executive Director (Chair)
- Judy Guichon, Gerard Guichon Ranch Ltd./ GCC Director
- Cindy Haddow, Ministry of Water, Land and Air Protection / GCC Director
- Kristi Iverson, Registered Professional Biologist / GCC Director
- Dennis Lloyd, BC Ministry of Forests / GCC Director
- Ordell Steen, Consulting Ecologist / GCC Director
- Jim White, Range Consultant / GCC Director
- Wendy Gardner, UCC NRS Program / GCC Director

Technical Advisory Committee

- Nicole Brand, Consulting Ecologist
- Michael Pitt, Retired – UBC Faculty of Agricultural Sciences
- Darren Bruhjell, Ministry of Agriculture, Food, and Fisheries
- Greg Tegart, Ministry of Agriculture, Food, and Fisheries
- Mike Dedels, Society for Range Management – BC Chapter
- Don Thompson, Agriculture & Agri-Food Canada
- Rick Tucker, Ministry of Forests, Southern Interior Region
- Phil Youwe, Ministry of Forest, Kamloops Forest District
- Dave Haywood Farmer, BC Cattlemen's Association
- Frances Njenga, Ministry of Forests, Southern Interior Region
- Perry Grilz, Ministry of Forest, Prince George Forest Region
- Don Gayton, Forest Research Extension Partnership (FORREX)
- Darren Dempsey, Frolek Ranch
- Felix Schellenburg, Rafter 25 Ranch
- Joyce Holmes, Empire Valley Ranch
- Duncan Barnett, BC Cattlemen's Association

VIII. PROPOSED PROCESS

The Project Team proposes a four-phased process to develop a qualitative approach for assessing grassland ecological condition (see Figure 1):

Phase 1: Conceptual Development

Phase 1 will examine and analyze current approaches to qualitative monitoring, identify strengths and weaknesses, and determine which approaches are most appropriate for British Columbia. The preliminary examination will result in selection of biotic, soil and hydrological indicators that relevant to local ecological conditions (the project site is the starting point).

Phase 2: Development and Field-Testing

Phase 2 builds on the Phase 1 analysis to collect information in the field using the selected biotic, soil and hydrological indicators (the qualitative approach) and compare this information against the data collected using the canopy coverage method (the quantitative approach) to evaluate relative accuracy in assessing each indicator.

The qualitative method will be evaluated to determine its ability to describe overall ecological condition. This methodology will be refined based on the knowledge gained in first year of field data collection and development.

Once appropriate indicators have been selected for the monitoring procedure, thresholds and benchmarks will be defined and refined, as required and a scoring procedure will be developed.

Phase 2 will develop and produce pilot forms and a draft manual that describes basic terminology and methods for conducting qualitative assessments. The anticipated format for the

forms and manual will be similar to the *Rangeland Health Assessment for Grassland, Forest and Tame Pasture Field Workbook* produced in Alberta.

Phase 3: Operational Testing

Operational testing of the forms and the manual is a critical step that must be conducted by ranchers and other user groups. Pilot project sites will be selected with ranchers in the Thompson – Nicola Region, and potentially other regions, to test and refine the methodology. Feedback from these pilot projects will be used to evaluate and adjust the methodology, including indicators, scoring procedures and format and usability of the manual and forms.

Phase 4: Re-Evaluation & Adjustment

A final manual will be produced upon completion of operational testing. This phase of the project will include:

- Production of manual and forms.
- Workshop training materials.
- A workshops for ranchers.
- Further testing of the qualitative methodology in other regions of BC.
- Assimilate feedback from continued field-testing by broader group of users.
- Adjust methods, indicators and scoring procedures as required.

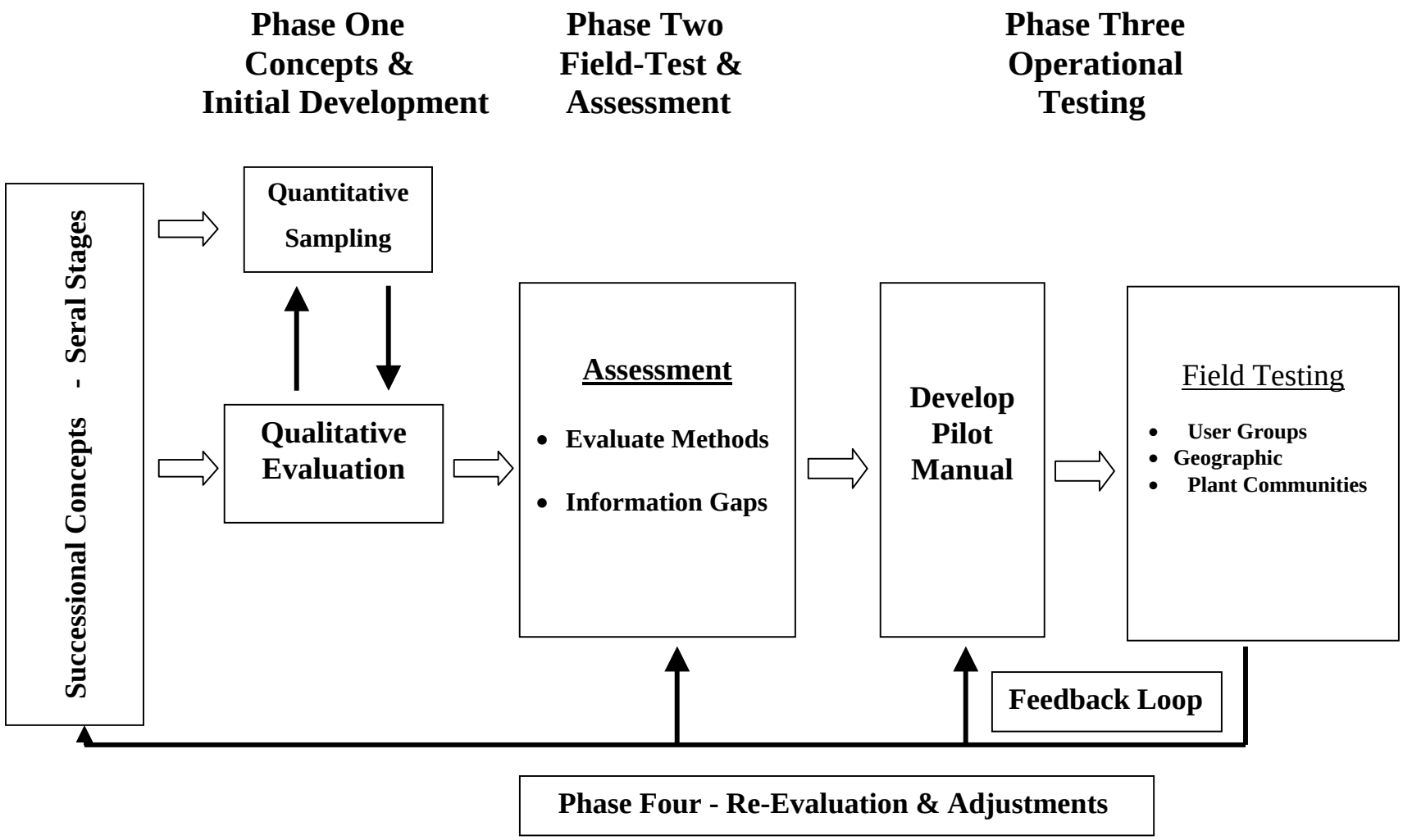

Figure 1. Flow chart demonstrating phases in project development.

IX. SUMMARY OF PROJECT TASKS

1. **Tasks 2002-2003**
   a) Establish project committee.
   b) Complete a comparison of qualitative methods to evaluate grassland ecological status, including methods from BC, Alberta and USA.
   c) Produce draft monitoring plan for developing a qualitative approach for assessing grassland ecological condition.

2. **Tasks 2003-2004**
   a) Finalize monitoring plan.
   b) Monitor selected sites and collect detailed baseline information.
   c) Develop and/or adopt qualitative grassland monitoring methodology.
   d) Compare selected indicators that are commonly used in qualitative assessments and compare with quantitative assessments.
   e) Field test:
      - Rangeland Health Assessment (Adams et al. 2003).
      - Rangeland Health Attributes and Indicators for Qualitative Assessment (Pyke et al. 2002).

3. **Tasks 2004-2005**
   a) Complete year-two monitoring and further test methods, as required.
   b) Develop and/or adopt draft grassland monitoring manual and forms.
   c) Establish pilot project test sites.
   d) Develop monitoring and assessment plan.

4. **Tasks 2005-2007**
   a) Initiate monitoring on pilot project sites.
   b) Develop grassland monitoring manual for BC.
   c) Organize grassland monitoring workshop.

X. PROGRESS AND WORK COMPLETED

1) Work completed 2002-2003

- Established GCC Project Committee (Project Team).
- Completed a comparison of qualitative methods to evaluate grassland ecological status (Wikeem 2003).
- Developed a draft monitoring plan to complete baseline monitoring and to initiate process for developing qualitative approach for assessing grassland ecological condition.

2) **Review Of Qualitative Methods – A Synopsis**

A qualitative approach for monitoring should draw on the experience and knowledge acquired elsewhere to provide the basic framework for qualitative monitoring in BC. The proposed approach combines aspects of qualitative sampling developed for uplands (Pyke et al. 2002; Adams et al. 2002), proper functioning condition (PFC) assessments for stream and wetland (Fitch et al. 2001;Thompson and Hansen 2002) photo-point monitoring (Hall 1977) and the proper functioning condition (PFC) assessments utilized by the BC Ministry of Forests.

The GCC Project Team spent one year reviewing all of the aforementioned methodologies to build a solid foundation for the upcoming process. The following is a brief synopsis of the outcome:

- All methods reviewed have been developed to provide land managers with tools to assess the status or condition of an ecosystem at a particular point in time. These methods are not intended to identify the "cause" of resource problems (Pyke et al. 2002).
- Ecological Condition is defined as "the degree to which the integrity of the soil, vegetation, water and air as well as the ecological processes of the rangeland ecosystems are balanced and sustained" (Pyke et al. 2002). Most assessments of ecological condition focus on comparing the present ecological status to some benchmark.
- A benchmark is defined as a " standard or point of reference for measuring or evaluating other things." In range management, "benchmarks" are used as reference points to evaluate changes in vegetation over time (Kothmann 1974).
- Benchmarks and thresholds are essential components to all the methods reviewed. Assessments for each parameter are scored relative to departure from known benchmarks, such as the Potential Natural Community (PNC), Desired Plant Community (DPC), or soil factors.
- Although PNC is often used as a benchmark, other seral stages can serve as benchmarks, depending on the monitoring objectives.
- Where climax and seral stages have not been explicitly defined, general characteristics of seral stages can be used as a guide to assess condition and trend, but the final interpretations should be based on the collective assessment of all the attributes evaluated.
- The reviewed methods focus on three main ecosystem attributes: soil and site stability, hydrologic function, and biotic integrity but the relative importance of each attribute varies among methods.
    - Vegetation is often considered most sensitive to change for riparian and wetland procedures but soil and hydrological factors are emphasized for grassland/upland procedures in the United States.
    - Alberta procedures have included all three attribute groups in their assessments.
- These same attributes can be used to evaluate trend provided that repeated

observations are taken on the same site, using the same method.

- Benchmarks, thresholds and the criteria to assess specific grassland ecosystem indicators have not been developed for most landscape units in BC and will require research and professional judgment for each ecological site.
- All methods provide worksheets with descriptions of characteristics for evaluating each parameter. Most parameters are ocularly estimated and the data are analysed using a scoring procedure. Scores for each indicator are tallied within attribute groups, and a final score is compared to an overall "health" rating.
- All of the protocols or processes emphasized the importance of an iterative approach to developing the methods, training and re-evaluation to enhance the product.
- Many qualitative methods commonly use categories such as Slight, Slight to Moderate, Moderate, Moderate to Extreme, Extreme to help document changes in the environment. While these categories aim to provide the evaluator with guidelines to rate a particular indicator (e.g. litter cover), it is often difficult for one or more people in the field to decide which category best represents the cover (or other measure) of an indicator. Similarly, evaluators often disagree on how to rate indicators in the field.

The potential inability to produce consistent assessments raises two important features of any monitoring method for assessing ecological condition or trend called accuracy and precision. Accuracy is defined as the ability to estimate the true value of a quantity, while precision refers to the repeatability of obtaining the same value over a number of samples or sampling periods (Freese 1976). Failure to consider these factors can result in faulty conclusions that undermine the credibility and usefulness of the monitoring procedure. Part of the function of testing and developing is to minimize sources of error that will lead to incorrect conclusions while still maintaining a simple and practical tool that acheives the monitoring goals.

Regardless of whether quantitative or qualitative data are collected, however, the following questions need to be asked:

- What level of accuracy is required to gain adequate information to make management decisions?
- How will the accuracy of independent measurements in time be maintained and repeated with equal accuracy in subsequent sampling periods?

Part of the answer lies in the rigor and consistency in which monitoring data are collected. Indeed, it is essential that repeated measures are made with equal accuracy to ensure that comparisons between sampling periods are consistent.

All of the methods reviewed offer valuable methodology and approaches that can be modified to assess ecological condition and trend in British Columbia. Most of the

protocols reviewed by the project team could be used to evaluate range trend with permanent transects, repeat observations over time, and by modifying indicator descriptors to explicitly describe trend.

3) Work Completed 2003-2004

The monitoring plan was completed and implemented for the 2003 field season and the following progress was made:

Established New Technical Advisory Committee

A new Technical Advisory Committee was established to draw on the expertise and experience of user groups and government agencies with an interest in monitoring and maintaining grassland resources in British Columbia. This committee is guiding the collaborative process and will assist the GCC in developing and testing a qualitative approach for assessing grassland ecological condition in BC (See list on page 2).

Reached Consensus on Key Features of Qualitative Methodology

The Technical Advisory Committee reached agreement that BC needs a qualitative approach for grassland monitoring and that it must address the following key features:

- Be practical, simple and easy to use in the field by ranchers and range managers.
- Be adopted or built from existing science, knowledge and methodologies from BC and other jurisdictions.
- Be rigorous enough to evaluate environmental change at an acceptable level of accuracy and be repeatable over time.
- Be based on indicators relevant to BC's grasslands that enable assessment of condition and trend.
- Be consistent with government standards and requirements.

Selected Monitoring Sites

Previous work by the Grasslands Conservation Council mapped dominant vegetation, water courses, and locations of exclosures on the HCDP area. This information provided valuable background to evaluate existing exclosures and pastures. Although the entire study area comprises 11 pastures and approximately 1250 ha, most of the monitoring sites were located using the existing exclosures that were constructed for the project in 1999 (Table 1). Of the 40 sites that were screened for the project, 15 upland sites were selected to represent a variety of aspects and slope positions. Five additional riparian sites were chosen to provide baseline data for possible monitoring in the future (Table 1).

Completed Quantitative Monitoring

Previous vegetation monitoring on the HCDP area used modifications of the canopy-coverage (Daubenmire 1959) and macroplot methods (Poulton and Tisdale 1961) to document existing plant communities, compare grazed and ungrazed communities, and

to provide information for establishing the potential natural community. These methods were also used for the present monitoring program to ensure that the new data collected are comparable to previous data.

Canopy cover and frequency data were collected for each plant species and selected indicators in July 2003, slightly after the peak cover for most plant species (Table 2). More than 90 species were present over the 20 sites sampled but the total number of species encountered on upland sites was slightly higher than in riparian communities. Species composition varied considerably among sites reflecting the different plant communities selected for long-term evaluation. These data serve as baseline information for future sampling and were also used as a comparison for other data collected on the same sites using a qualitative approach.

TABLE 1. Location and description of monitoring sites at the Hamilton Commonage Project area.

Location	Existing Plant Community	Grazing
Goose Lake (Ag Canada)	Rough fescue/Short-beaked agoseris	Ungrazed
Goose Lake Dam	Rough fescue – Pussytoes	Grazed
Goose Lake Dam	Bluebunch wheatgrass - Timber milk-vetch - Rough fescue	Ungrazed
Rush Lake 20% Use Area	Riparian - Single Band	Grazed
Rush Lake 20% Use Area	Riparian - Single Band	Ungrazed
Rush Lake 20% Use Area	Needlegrass - Pussytoes - Bluebunch wheatgrass	Grazed (20% Use)
Rush Lake 20% Use Area	Kentucky bluegrass	Grazed (20% Use)
Steer West Pasture	Needle-and-thread – Pussytoes	Grazed
Steer West Pasture	Kentucky bluegrass	Grazed
Ball Lake Pasture	Kentucky bluegrass	Grazed
Ball Lake Pasture	Rough fescue – Needlegrass	Grazed
Ball Lake Pasture	Pussytoes - Bluebunch wheatgrass	Grazed
Ball Lake Pasture	Pussytoes - Bluebunch wheatgrass	Grazed
Ball Lake Pasture	Rough fescue - Kentucky bluegrass	Grazed
Bat Lake	Riparian Band	Ungrazed
Bat Lake	Riparian Band	Grazed
Staple Lake	Riparian Band	Ungrazed
Staple Lake	Pussytoes - Bluebunch wheatgrass	Ungrazed
Frog Lake	Kentucky bluegrass – Yarrow - Needlegrass	Ungrazed
Frog Lake	Kentucky bluegrass – Yarrow - Needlegrass	Grazed

Table 2. Attributes and indicators for quantitative evaluation of upland grassland ecosystems.

Attribute/Indicator
Biotic/Vegetation
Plant species
Noxious weeds
Cryptogam (lichen & moss)
Plant mortality/decadence
Plant recruitment
Soils/ Erosion
Bare soil
Rills
Soil surface loss
Pedestalling and erosion pavement
Hydrology
Litter cover
Litter depth and mass
Total cover(including rock & feces)

Tested Specific Qualitative Indicators

Data were collected by ocularly estimating cover for each indicator on the site (Table 2) using seven cover classes: 0, >0-10, 11-30, 31-50, 51-70, 71-90, and 91-100. These data were compared to the similar data derived from sampling with the canopy-coverage method to infer relative accuracy and precision of the two methods. Specifically, the following questions were asked:

1) **Are estimates of cover derived from a single ocular estimate of the macroplot comparable to those collected using canopy coverage sampling?**
   Quantitative and qualitative estimates of the same indicators were highly correlated (nearly 85%) indicating ocular estimates produced similar conclusion as canopy cover sampling over all sites, and both samplers produced similar results.

2) **Are qualitative estimates of cover derived from each indicator collected with the same degree of accuracy and precision?**
   Soil stability indicators were most accurately assessed compared to hydrologic and biotic factors. Accuracy and precision varied among soil indicators ranging from 60% for pedestalled plants to 100% for rills. Total accuracy in estimating hydrologic indicators averaged only 36%. Accuracy of litter estimates was particularly low and

there was little agreement between samplers.

Nearly 40% of the qualitative estimates for biotic factors were identical with canopy cover estimates and overall precision was slightly higher than for hydrologic indicators. Samplers agreed on 93% of their estimates of noxious weed cover and 87% for recruitment. Only 40% of the qualitative estimates of plant mortality coincided with canopy cover values and agreement between samplers was low.

3) **Does the number of cover classes selected for making qualitative assessment affect overall accuracy?**
Qualitative estimates were made in seven cover classes: 0, >0-10, 11-30, 31-50, 51-70, 71-90, 91-100. Almost 75% of the total cover estimates were recorded in the first three cover classes. About 50% of all qualitative estimates agreed with canopy cover estimates and more than 90% were contained were within one cover class deviation.

Correct estimates were most commonly made for those indicators with either very low (or zero) or very high cover. Estimates for indicators falling within intermediate cover classes were lower, and for the middle two classes they fell below 50% accuracy. Errors most commonly occurred when the absolute cover for an indicator was close to a cover class boundary.

The proportion of correct cover estimates declined as the number of cover classes used for estimation increased. More than 98% of the estimates for all indicators were completely contained within the cover class limits using only two classes, 82% when six cover classes were used, and 92-96% of the estimates were accurately contained with cover class series using three to five cover classes. Adding a cover class separating "0" cover from the lowest cover class had no effect on the accuracy.

Completed Qualitative Monitoring

Three monitoring protocols for assessing "range health" or "ecological condition" were conducted concurrently on 15 sites at the HCDP area (Table 1). The first two methods were developed recently in Alberta (Adams et al. 2003) and in the United States (US Protocol) (Pyke et al. 2002). Photo-point monitoring (Hall 1977) also was conducted to provide visual documentation of site conditions as a third alternative to gaining insight into plant community change over time. Range condition was also classified using the canopy coverage data and the protocol for range condition assessment developed by McLean and Marchand (1968).

Considerable background information was required before either the Alberta or US protocol could be applied because both methods rely on reference area benchmarks. Three long-term exclosures on the Hamilton Commonage were inspected and two were sampled to acquire baseline information.

All of the 15 sites at the HCDP area could not be perfectly matched with existing

exclosures in the immediate area. Therefore, additional sites were inspected that were protected from grazing, or lightly grazed, to provide information. Supplemental information was garnered from grazing guidelines for similar grasslands (McLean and Marchand 1968, or comparable "PNC" and seral stages were constructed based upon published literature, unpublished data from similar environments, and from professional judgment and experience.

Qualitative monitoring was conducted at the same time the macroplots were quantitatively sampled or soon after. The data collected for each method used the exact procedures outlined by the authors as best as practically possible.

The time required to conduct field sampling ranged 20 and 45 minutes and was generally longer for the US protocol compared to the Alberta protocol. The Alberta method was easy to conduct and score, but we found making assessments of existing field conditions "compared to the reference plant community" difficult. We believe that direct assessments of the existing conditions based on specific criteria can be done more accurately and precisely. Adjustments for the position of the plant community relative to the climax can then be built into a scoring procedure.

Assessment for litter was cumbersome and time consuming. Benchmark data had to be collected and photographs were taken depicting thresholds for Hamilton Commonage. Even after these data were collected, this evaluation was the most time consuming indicator assessed. Litter cover and depth may be adequate indices to evaluate soils protection and are considerably easier to estimate.

Although soil stability indicators were usually easily identified, we found difficulty in separating "natural" bare soil from "human-caused" bare soil. From a site integrity perspective, the "cause" of bare soil may be less important than the absolute exposure that exists on the site, which ultimately defines its susceptibility to erosion.

The scoring procedures were easy to apply. The rational for scoring is not outlined in the field guide and apparent small changes in biotic and hydrological attribute can result in large changes in the score. It may be more valuable to develop a scoring procedure that produces an index coinciding with seral states, or that closely links ecological conditions to seral stages.

The US protocol was more complex and difficult to use in the field than the procedures developed in Alberta because it requires considerably more fieldwork, data collection, and analyses to provide baseline information.

Assessments of the deviation from PNC were difficult and the narrative descriptions used to score indicator were sometimes convoluted and confusing. Numerous indicators occur in more than one attribute category but there is no clear explanation of how this affects the overall health rating of a site since some indicators are scored more than

once.
The final assessment of ecological condition combines "the attribute ratings for the site" with "the evaluator's judgment regarding the overall rating for each attribute". Although professional judgment is a valuable tool, there is a risk that this judgment could override the objectivity of the procedure, especially with inexperienced evaluators. The authors state, "only experienced and knowledgeable people should conduct this technique". Consequently, this protocol may be too complicated for rancher use in its present form.

Assessments of "ecological condition" using the Alberta, US, and the range condition classification protocol developed in British Columbia produced strikingly different conclusions on most of the sites sampled (Table 3). All but one of the sites (93.3%) was rated as Healthy with the US protocol while 86.6% of the sites were rated in Fair or Poor condition using the range condition classification. The Alberta protocol produced intermediary assessments with 26.6% rated Healthy, 53.3% Healthy With Problems, and 20.1% as Unhealthy.

Numerous factors likely contribute to the discrepancies in the results. Both the range condition approach and the Alberta protocol, focuses on biotic indicators and especially on changes in vascular plant response to cattle grazing. Whereas the range condition classification approach relies 100% on vegetation to assess ecological condition, the Alberta protocol combines all three attribute-groups on a weighted scale to produce its final rating.

The US protocol also uses soil, hydrologic and biotic factors in their assessments where each attribute contributes approximately equally to the assessment. The biotic component, however, focuses largely on the plant community in relation to its ability protect soils and enhance hydrological processes rather than on abundance of key species in relation to grazing.

Compared Methods for Assessing Trend in Ecological Condition
Range trend was recorded on the 15 upland macroplots used for qualitative sampling at the HCDP area. All assessments were confined to the area defined by the macroplot and where qualitative evaluations had been conducted.

Two "methods" of range trend or, "apparent trend", were evaluated. The Alberta protocol consisted of simply answering a single question following the qualitative evaluation of the site for range health. Observers were asked to circle the response best fitting the site of "Upward, / Downward / Stable / Unknown". No criteria are provided in the present manual to assist in making this determination.

A second assessment of apparent trend was conducted using the "Utilization and Apparent Trend Score Card" evidently developed at the University of Montana. Presumably, this score card was extracted from a larger guidebook where there may be more details describing the method.

The one page form provides seven questions regarding soils, hydrological and biotic components of the site. Observers are asked to rate each question on a scale ranging from –10 to +10 with the following interpretation: 0 = Stable; 1 to 10 = Improving; -1 to –10 = Declining. Additional space is provided on the form for general observations. Like the method used in Alberta, this appears to be a one-time assessment. No information is provided on the form suggesting that the process can be repeated over time.

Table 3. Ecological condition assessments at Hamilton Commonage using three methods in 2003.

Site Name	Vegetation Type	Condition Assessment		
		McLean & Marchand 1968	Adams et al. 2003	Pyke et al. 2002
Ball Lake 1	Kentucky Bluegrass/Needlegrass/Aster	Poor	Unhealthy	Healthy
Ball Lake 2	Pussytoes/Rough Fescue/Needlegrass	Poor	Unhealthy	Healthy
Ball Lake 3	Pussytoes/Sandberg's Bluegrass/Bluebunch Wheatgrass	Poor	Healthy	Healthy
Ball Lake 4	Pussytoes/Sandberg's Bluegrass/Mixed Medium Bunchgrasses	Poor	Unhealthy	Healthy/Problems
Ball Lake 5	Needlegrass/Kentucky Bluegrass/Rough Fescue	Fair	Healthy	Healthy
Frog Lake 1	Kentucky Bluegrass/Yarrow/Needlegrass	Poor	Healthy	Healthy
Frog Lake 2	Kentucky Bluegrass/Bluebunch Wheatgrass	Poor	Unhealthy	Healthy
Goose Lake Dam 1	Rough Fescue/Bluebunch Wheatgrass	Excellent	Healthy/Problems	Healthy
Goose Lake Dam 2	Bluebunch Wheatgrass/Rough Fescue	Fair	Healthy/Problems	Healthy
Goose Lake Exclosure	Rough Fescue/Short-beaked Agoseris	Excellent	Healthy	Healthy
Rush Lake 3	Pussytoes/Sandberg's Bluegrass/Bluebunch Wheatgrass	Poor	Unhealthy	Healthy
Rush Lake 4	Kentucky Bluegrass/Aster/Sedge	Poor	Healthy/Problems	Healthy
Staple Lake 2	Needlegrass/Pussytoes	Poor	Unhealthy	Healthy
Steer West 1	Needlegrass/Kentucky Bluegrass/Pussytoes	Poor	Unhealthy	Healthy
Steer West 2	Kentucky Bluegrass/Aster/Rush	Poor	Unhealthy	Healthy

Table 4. Relative emphasis (%) of three attributes for determining upland ecological condition in Alberta, British Columbia and the western United States.

Location\Attribute	Soil/Site Stability	Hydrologic Function	Biotic Integrity
Alberta [1]	10.5	26.3	63.2
British Columbia [2]	Nominal	0.0	100.0
United States [3]	31.0	37.9	31.0

[1] Adams et al. (2003)
[2] McLean and Marchand (1968)
[3] Pyke et al. (2002)

Comparison between the two protocols can only be made at a gross level because the methods, criteria for assessment, and "scoring procedures" varied between methods. The two procedures produced similar ratings for range trend on only 40% of the sites evaluated (Table 5).

The assessment of apparent trend using the Montana procedure was easy to perform and took about 10 minutes per site. We completed the form after our qualitative assessment of the site, which likely helped in the trend evaluation because of the knowledge we had gained in evaluating the soil, hydrologic and biotic indicators previously. The survey form, however, did not distinguish between active and past soil losses, which influenced the results in that category.

Apparent trend assessment using the Alberta protocol also was easy to complete. The present guidebook, however, does not provide instructions to assist the user in determining which "apparent trend class" is appropriate for the site. Moreover, it does not explicitly refer to using other indicators assessed in the qualitative assessment as criteria for making this determination. Consequently, the judgment recorded depends largely on the experience and knowledge of the observer. Under the present conditions, this may be the best that can be done, especially since the Range Health Assessment booklet is still in a formative stage. In the long-term, however, trend assessments should be linked specifically to soil stability, hydrologic and biotic factors. In particular, guidelines relating trend to response of key species to grazing, or descriptions of successional stages, would greatly assist in making these interpretations.

Although the Montana system includes a small section to record general observations regarding weather, growing season conditions, and unusual ecological events, no provision is made to describe current floristic information. Floristic information for range trend is contained in Question 1 in the Alberta manual regarding "What kind of plants are on the site? and What is the plant community?" This information is valuable for future trend assessments because, it provides the first "benchmark" description of range condition at a specific point in time.

Completed Photo-point Monitoring

Photo-monitoring was conducted on the most representative transect on all 20 sites. Usually photographic information was gathered on the center transect, irrespective of whether the transects were laid out parallel to each other, or in a linear manner. Supplemental information was recorded on a data sheet for physical information, documentation of photographic details, plot descriptions, and listing of dominant species.

Depending on light conditions, photos were taken with 200 or 400 ASA film using a 35 mm camera and a 50 mm lens. Landscape level photos were taken from each end of each transect at eye level to document plant community conditions in both directions. Four additional exposures were taken by locating a 1 m^2 plot frame, which bisected the transect line at equal intervals along the line.

The photo at each location contained the plot frame, the vegetation in the area contained by the frame, and a white board sign. The white board was placed in one corner of the photo where it was conspicuous and the information on the board was not obscured by vegetation. The following information was included on the white board: pasture, site number, photo number, and date.

Table 5. Comparison of apparent ecological trend at the Hamilton Commonage Demonstration area in 2003.

Site Name	Alberta	Montana[1]	
		Trend	Score
Ball Lake 1 (Toe Slope)	Stable	Upward	2
Ball Lake 2 (Mid-Slope)	Upward	Upward	6
Ball Lake 3 (West)	Stable	Stable	0
Ball Lake 4 (Crest)	Upward	Downward	-2
Ball Lake 5 (East)	Upward	Upward	9
Frog Lake 1 (In)	Upward	Upward	4
Frog Lake 2 (Out)	Stable	Downward	-2
Goose Lake Dam 1 (Inside)	Stable	Upward	10
Goose Lake Dam 2 (Out)	Upward	Upward	8
Goose Lake Exclosure	Stable	Upward (Stable)	1
Rush Lake 3 (20% Use)	Upward	Downward	-2
Rush Lake 4 (Toe Slope)	Stable	Upward	3
Staple Lake 2 (Upland)	Stable	Downward	-7
Steer West 1	Stable	Stable	0
Steer West 2	Stable	Upward (Stable)	1

[1.] Apparent trend legend: 0 = Stable; 1 – 10 = Improving (Upward); -1 to –10 = Declining (Downward).

Plant species information was recorded on each of the four plots photographed. Up to five of the most dominant species were recorded on each plot. Other species that were obscured by vegetation were also recorded to document their presence, including non-native species and noxious weeds.

Mail labels were attached to the reverse side of the photos and marked with the plot number, date, and location of the photograph. Photos were mounted in plastic pocket envelopes and stored in a photo album. Prints were arranged by site with a photo description table following each set of photos and the negatives were stored in labeled envelopes that are also located after the photos for each site in the photo album.

Ecological condition and trend can be inferred from repeat photographs by specifically comparing the before and after photos for changes in species composition. Additional information also could be collected on the four plots coinciding with other monitoring such as bare soil, litter, noxious weed presence/absence, and plant community structure. The photos and this information could provide an important complement to other monitoring information.

Reviewed Government Objectives for Range Management

The Technical Advisory Committee agreed that the methodology should be consistent with government standards and requirements. Consequently, ministry objectives, standards and requirements were reviewed to determine how those relevant to monitoring ecological condition and trend for upland grassland communities could best be achieved. The following ministries were reviewed (see discussion paper: *A Review of Government Objectives for Range Management*):

- Ministry of Forests.
- Ministry of Water, Land and Air Protection.
- Ministry of Agriculture, Food and Fisheries.

The objectives and ecological indicators from the aforementioned ministries were cross-referenced with those used in Alberta and various parts of the United States (we focused on objectives and indicators to evaluate ecological condition and trend for grassland communities). A brief analysis of the objectives and indicators was completed to assist the committee to work through an objective and indicator selection process.

The selection process will:

- Ensure consistency with government objectives, standards and requirements,
- Used the Alberta protocol, or methodology, as an appropriate and desirable starting point (a methodology based on five questions),
- Ensure that the methodology is practical, simple and easy to use in the field by ranchers.

In addition, the analysis provided the following key questions to assist the Committee in reviewing objectives and indicators:

1) Are there other objectives beyond those listed in Table 1? Have we missed any?
2) Can the objective be measured (estimated) under field conditions? Can it be measured in a practical way?
3) Do the objectives overlap? Can some indicators be lumped or pooled together?
4) What indicator(s) are required to assess if the objective is being met?
5) Are more (or less) indicators required?
6) What is the minimum standard required for monitoring (by the rancher) that will satisfy or be consistent with government objectives?

XI. WORK PLAN 2004-2005

1. Plan and organize technical advisory meeting (workshop) to select key soil, Hydrologic and biotic objectives and identify key indicators.
2. Revise Alberta protocol for British Columbia - produce revised questions and instructions to develop and complete score sheets. Produce field sheets and rancher instruction package, including photo-point monitoring.
3. Complete year-two monitoring plan to test methodology. Plan must be completed by May 15, 2004.
4. Review and revise benchmark information for testing of methodology on the Hamilton Commonage grasslands.
5. Establish small workgroup with ranchers and other individuals to test methodology.
6. Plan and deliver two field days to test methodology in the field with workgroup, including training for workgroup.
7. Summarize and analyze data from field testing.
8. Revise field manual and produce prototype for testing with pilot projects (Phase three operational testing).
9. Initiate planning for establishment of pilot project test sites and develop appropriate monitoring and assessment plan (2005-2006).

XII. SUMMARY

The past year (2003-2004) was a very successful year for the grassland monitoring project. We made tremendous progress and set the stage for an eventful and productive year developing and testing a qualitative methodology for ranchers.

XIII. FINANCIAL REPORT

Please find attached a financial report for 2003-2004.

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