

BC Parks Long Term Ecological Monitoring Program ~ Monitoring Protocols

Indicator	Grassland Protocol
Measure(s)	<ul style="list-style-type: none"> • Plant community structure • Invasive plants
Justification	<p>Native grasslands make up much of the dry, low elevation foothills below the montane zone including low elevation valleys where many interior cities and towns are located. The vegetation is adapted to long periods of drought, wide variation in temperature, and periodic grazing by ungulates such as deer and elk in the winter and early spring. Many seed eating birds frequent these habitats.</p> <p>Grasslands are home to deep, fertile soils, cryptogamic crust and low-growing plants. This type of community was historically perpetuated by fire and grazing, both of which decreased the abundance of woody plants.</p> <p>Climate Induced Changes:</p> <ul style="list-style-type: none"> • Changes in climate, combined with anthropogenic effects, are expected to alter the type (e.g., rain versus snow) and amount of precipitation and the seasonality of large precipitation events, with unknown implications for grassland systems. • Increased drought has the possibility of altering the seasonality, severity and frequency of fire as well as post-fire regeneration. • The anthropogenic effect of increased atmospheric carbon has been considered an enhancement to shrub encroachment into grasslands. • Range expansions of new plant species can be expected. • As temperatures warm, the boundary between grassland and shrubland or dry forest will respond – grasslands are expected to expand. • Increased abundance of invasive species
Description	This Grassland Protocol measures the species changes in grassland sites.
Measurement Frequency	<ul style="list-style-type: none"> • Monitor every 4th year • Monitoring should be repeated in the same, marked location and at the same time of year.
Biome(s)	Grassland
Sampling Strategy	<p>Select permanent monitoring sites in areas that are protected from domestic grazing either with fences or because of terrain.</p> <p>Lay out 60 m of transects (either one or 60 m transect or 2 - 30 m transects) keeping the transect(s) in the same community. Using a plot frame (50cm X 50 cm) laid down every 2 metres along the transects, estimate the foliar coverage of each species.</p> <p>When an invasive species is noted, enter the data into IAPP.</p>
Unit(s) of Measure	<p>% foliar cover</p> <p>Supplemental information includes:</p> <ul style="list-style-type: none"> • Invasive species • Photos
References	Delesalle, B.P., B.J. Coupe, B.M. Wikeem, S.J. Wikeem. 2009. <i>Grasslands Monitoring</i>

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	<p>Bakker, N. P. Jorgenson and T. Thomas. 2011. <i>Best Management Practices for Invasive Plants in Parks and Protected Areas of British Columbia</i>. Province of BC and Invasive Plant Council of BC. http://www.bcinvativeplants.com/iscbc/images/stories/documents/otherpublications/BC-Parks-IP-Guide_web_sm.pdf</p> <p>Cranston, R., D. Ralph, B. Wikeem, 2005. <i>Field Guide to Noxious and Other Selected Weeds of British Columbia</i>. Province of British Columbia. On website: www.agf.gov.bc.ca/cropprot/weedguid/weedguid.htm</p> <p>Grasslands Conservation Council of British Columbia Website: www.bcgrasslands.org</p> <p>IAPP: http://www.for.gov.bc.ca/hra/Plants/application.htm</p> <p><i>Manual for British Columbia: A Tool for Ranchers</i>. Grasslands Conservation Council of British Columbia. Available at: http://www.bcgrasslands.org/publications.htm</p> <p>MacKinnon, A., J. Pojar and R. Coupe. 2005. <i>Plants of Northern British Columbia, 2nd Edition</i>. Lone Pine Publishing.</p> <p>Parish, R., R. Coupe, D. Lloyd. 2006. <i>Plants of Southern Interior British Columbia</i>. Lone Pine Publishing.</p> <p>Pojar, J. and A. MacKinnon. 2004. <i>Plants of the Pacific Northwest Coast, 2nd Edition</i>. Lone Pine Publishing.</p>
<p>Comments /Questions</p>	<p>Site and plot selection and marking in the first year will add to the time commitment. Once established, repeat measures will be more efficient.</p>

Detailed Protocol

Equipment:

- iPad with LTEM app or grassland data file loaded (optional)
- Digital camera or iPad
- GPS or iPad
- Permanent pins (for initial set up) – rebar for the transect ends and long galvanized nails for the plot corners
- Plant identification guide for your area
- Tailored field guide for your site (after the first year)
- List/photos of potential invasive species – BC Parks Invasive Species Guide (2011)
- 30 – 60 metre tape(s)
- Compass
- Quadrat frame (50 cm X 50 cm with 5 cm markings along the side)
- Datasheets or iPad
- Small cards labeled with transect and plot number for picture id (or iPad with LTEM app)

Instructions:

Select sites for sampling that are not subject to many anthropogenic influences including livestock grazing. It may be necessary to locate transects within an established enclosure.

Lay out a 30 or a 60 m transect. Mark the beginning and end with a permanent pin and record the GPS location so that it can be found again. Leave the tape in place while you sample. Beginning at 0 and then again at every even number along the tape, place the plot frame on the ground with one side along the tape (see figure 1). If it is not possible to start at 0, 1 (and subsequent odd numbers) or 2 is fine. If the first plot is at 2, the final plot will be outside the transect. Mark two opposite corners of each plot with inconspicuous pegs so that the same spot is sampled in subsequent years. Note the location of the pegs and keep the same configuration throughout the transect if possible (upper right, lower left or the opposite). If it is not possible to place the pegs or nails, switch the location of the pegs and note that change. If it is still not possible, move the plot along the transect until the pegs will go in. Make a note of the position along the transect where the plot frame was positioned. Make sure all the plots are on the same side of the transect, preferably uphill to avoid standing in the plot. Record the side of the tape where the plots are located. Record the % foliar cover for each of the following:

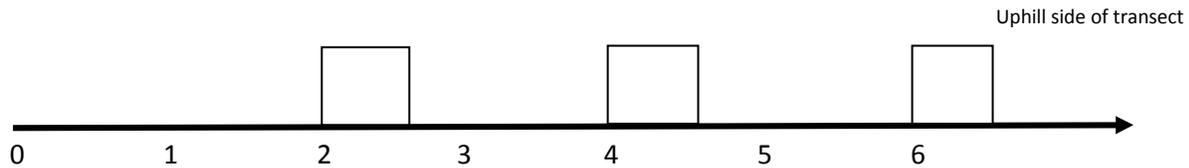
- Each plant species including identifiable mosses and lichens. Record the taxonomic level that is known. Species is ideal, but if necessary record the genus, family, class or even phylum. (See Appendix A)
- Biological crust
- Bare ground
- Litter
- Rock

- Scat

Foliar cover is defined as the area shaded by a species. Use the marks on the side of the plot frame to help estimate cover. One 5 cm X 5 cm square is 1% of the plot area. If the area covered by a species is less than 1%, choose the closest of 0.5%, 0.2% or 0.1%.

If two 30 m transects are used, make sure they are at least 10 m apart so that activity around the first transect does not interfere with the plants on the second.

Figure 1. Location of plot frames along the transect.



Photomonitoring

Standing at the beginning of the 2 transects, take a picture along each transect.

Take a picture of each plot. Stand on the transect for each picture so that they are always oriented in the same direction. Put a small numbered card just outside the corner of the frame to identify the transect number and the number of the plot (TxPx). If you are using the LTEM app, this is not necessary. Make sure the entire frame is in the picture and the camera is as close to directly above the plot as possible.

Appendix A.

Kingdom: Plantae

Ideally we identify the species (Genus species), but often that will not be possible. Identify as closely as possible. Use this chart to help.

Use the taxonomic label that is the most accurate you can figure out. I.E. If you know you have a moss but don't know the species, then put BRYOPHYTA (or moss) if it is a lichen put ASCOMYCOTA (or lichen).

Phylum	Class	Common Families (there are many others)	Common Genuses	
ANTHOPHYTA angiosperms <i>flowering plants including deciduous trees and shrubs, grasses and grass-like</i>	MONOCOTYLEDONEAE monocots <i>parallel veins in leaves; leaves tend to be long and thin</i>	POACEAE grasses	Poa	
		CYPERACEAE sedges	Carex	
		ORCHIDACEAE orchids		
		JUNCACEAE rushes		
		LILIACEAE lilies		
		<hr/>		
		DICOTYLEDONEAE dicots <i>branched veins in leaf; leaves are round, oval, lobed, compound, fern-like</i>	ASTERACEAE asters	
			ERICACEAE heathers, blueberries, etc.	Vaccinium
			ROSACEAE roses	Rosa
			RANUNCULACEAE buttercups	
	BRASSICACEAE rockcress			
	FABIACEAE pea, vetch			
	BETULACEAE birches	Betula		
	COMPANULACEAE bell flowers			
	SCROPHULARIACEAE paint brush, louseworts	Castilleja		
	SALICACEAE willows	Salix		
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CONIFEROPHYTA conifers	PINOPSIDA	TAXACEAE yew	Taxa	
		CUPRESSACEAE cedars, junipers	Juniperus, Thuya	
		PINACEAE everything else	Abies	
			Pinus	
			Larix	
		Tsuga		
		Pseudotsuga		
		Picea		
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FILICINOPHYTA ferns				

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ASCOMYCOTA lichens

BRYOPHYTA mosses

BRYOPSIDA most mosses

SPHAGNOPSIDA sphagnum mosses

ANDREAEOPSIDA

LYCOPHYTA quillworts,
clubmosses, spike mosses

Selaginellaceae
Isoetes
Selaginella

HEPATOPHYTA liverworts

SPHENOPHYTA horsetails

Equisetum
