PRRIP GRASSLAND VEGETATION MONITORING PROTOCOL

I. INTRODUCTION

The Platte River Recovery Implementation Program (Program) has acquired or secured management agreements for parcels of grassland along the Platte River Valley between Lexington and Chapman, Nebraska with the long-term goal of improvement and maintenance of migration and reproductive habitat for least terns, piping plovers, and whopping cranes. Vegetation surveys on native and restored grassland areas are necessary to monitor potential shifts in vegetation communities and/or plant species composition over time.

II. PURPOSE

The grassland vegetation monitoring protocol describes the design, concepts and methods which can be used as repeatable measures to monitor potential changes in vegetation communities and/or plant species composition over time. Program grassland vegetation monitoring objectives include:

1) Provide an inventory of vegetation communities and plant species composition on Program owned or managed grassland, wet meadow habitat and cropland areas that have been converted to grassland. Systematic ground surveys and plot data will be used to map vegetation communities and plant species density, respectively.
2) Identify and locate invasive and noxious plant species and program species of concern. Noxious plant species will be located in order to help with eradication and control. The locations of other species of concern including invasive species and rare or threatened and endangered species will be recorded to inform future management decisions.
3) Determine species composition in each sample area in order to track potential shifts in dominant species. Data collected will be used in comparative analyses in future years to determine changes in vegetative communities and dominant species.

III. DESIGN CONSIDERATIONS

III.A. Area of Interest

The area of interest consists of Program owned or managed grassland areas along the Platte River beginning at the junction of U.S. Highway 283 and Interstate 80 near Lexington, Nebraska and extending eastward to Chapman, Nebraska.

III.B. Project Design

Vegetation mapping will be conducted using a GPS-tracking devise. Community size will be determined during field evaluations. Data plots will be used to collect density data. This protocol is designed to use subsamples of the vegetation population as a whole to make inferences about the density of desirable and undesirable species.

III.C. Timing

Surveys will be conducted between June 25 and July 15. A minimum of one plot will be placed for every 30 acres of sampled grassland. To a large degree, the overall diversity of the site will determine whether additional plots should be placed and whether additional effort is needed to map the vegetative communities.

IV. METHODS

IV.A. Definitions

Canopy Cover – Area covered by a plant species as one looks down upon an area of specified size.

Cool-season Species – Plant species characterized by flowering early in the season and sometimes additionally later in the fall. Many of the invasive and non-native species are cool season species.

Daubenmire Frame – 20 x 50 centimeter frame placed on the ground to delineate the sampling area. Daubenmire frames are most often used to sample vegetative cover of vegetation or frequency of plant species.

Dominant Species – Most abundant species in a given geographic area.

Introduced Species – Plant species found outside their native range. Synonymous with Non-indigenous.

Macroplot – Large plot within a study area which may or may not include additional smaller plots. In this study the macroplot is 300 meters^2 and includes smaller plots.

Microplot – Small plot usually included within a larger macroplot. In this study the microplots are 100 cm^2 and are delineated using a Daubenmire frame.

Native Species – Plants species which are in a certain range as a result of natural processes excluding human introduction.

Parcel – Segment of sampled grasslands delineated by fence lines and/or property boundaries

Rare Species – Less abundant species as compared to other species in a particular area.

Species of Concern – Plant species which are of conservation interest to the Program that include the following rare and/or threatened plant species:

Scientific Name	Common Name
Cypripedium candidum	Small white lady's slipper
Platanthera praeclara	Western prairie fringed orchid
Salicornia rubra	Saltwort

Species of Interest – Plant species which may be indigenous or introduced and which may become invasive to the extent of limiting native species diversity. Species of interest include, but are not limited to the following invasive species:

Scientific Name	Common Name
Elaeagnus angustifolia L.	Russian olive
Juniperus virginiana L.	Eastern red cedar
Phalaris arundinacea L.	Reed canarygrass

And the following noxious weeds:

Scientific Name	Common Name
Carduus acanthoides L.	Plumeless thistle
Carduus nutans L.	Musk thistle
Centaurea diffusa Lam.	Diffuse knapweed
Centaurea stoebe L. ssp. *micranthos* (Gugler) Hayek	Spotted knapweed
Cirsium arvense (L.) Scop.	Canada thistle
Euphorbia esula L.	Leafy spurge
Fallopia japonica (Houtt.) Ronse Decr.	Japanese knotweed
Lespedeza cuneata G. Don	Sericea lespedeza
Lythrum salicaria L.	Purple loosestrife
Phragmites australis (Cav.) Trin. Ex Steud.	Common reed
Tamarix ramosissima Ledeb.	Saltcedar

Transect – A line following the UTM northing location along which macroplot centerlines will be located.

Vegetation Communities – Relatively uniform patch of plant species distinguishable from adjacent patches and influenced by soil type, climate, animals, climate and human intervention. These communities can be defined to encompass vast areas or very small

areas, for instance a temperate community versus a rainforest; an entire grassland versus a woodland; or a stand of a particular set of grass within a grassland as a whole. This protocol will use dominant grass species within the overall parcel to determine community boundaries

Vegetative Cover – Percent canopy cover within a plot area.

Warm-season Species – Plant species characterized by flowering in summer and fall. Many, though not all, native species are warm-season species.

IV.B. Mapping Vegetative Communities

The Program's aerial photos will be compared to soil maps from NRCS in order to visually locate potential changes in vegetation communities. Vegetation communities for each pasture will be hand drawn on aerial photos prior to field excursions and these "community estimates" will be fine-tuned in the field. Each parcel will be systematically covered east to west along easting lines to find changes in community boundaries which will then be traversed by tracking the edges with a WAAS enabled GPS unit. Vegetation communities will be identified according to the community type Terrestrial Ecological Systems and Natural Communities of Nebraska (Version IV – March 9, 2010) and the three or four most dominant species. All species found while mapping will be included in a complete species list. The boundary of areas dominated by reed canarygrass will be delineated and other species of interest and species of concern will be marked with GPS waypoints as they are located.

IV.C. Vegetation Sampling

The goal is to sample a minimum of one macroplot per 30 acres and each parcel will have no fewer than 3 macroplots. Macroplots will be located from south to north along easting lines for consistency, ease of relocation and to cover as many soil types as possible. If possible, macroplots will be located within each soil type of each parcel, but if not, the soil types with the largest area in the parcel will be sampled. Prior to field excursions, approximate locations of transects and macroplots will be marked on aerial maps in locations that appear to cover potential differences in vegetation communities within each parcel. Biologists will make visual judgments when placing and orienting transects and macroplots in the field to ensure sampling captures the vegetative diversity within each parcel. Each macroplot will be located by using the midline transect within the macroplot. Each end of the transect will be marked with a 24 inch long rebar and GPS locations will be recorded at both ends of the transect using a survey-grade RTK GPS unit. The "starting end" of the transect for sampling purposes should be the southern/eastern end of the transect, and the "far end" of the transect should be the northern or western end, to ensure consistency in future resampling.

The midline of each macroplot will be located along a 30 meter (approx. 100 ft.) transect running north to south. The four corners of the macroplot will be located by following the easting line perpendicular to the centerline and measuring 5 meters to each corner. A total of

ten microplots will be located lengthwise along the transect beginning 1 meter from the start of each transect in order to ensure consistency among plots. Microplots will be spaced at 3 meter intervals. Vegetative cover will be estimated using canopy cover for all species within each microplot.

IV.D. Data Collection

The following information will be recorded at each microplot:

Surveyor(s) Name – Name or initials of the surveyor(s) who collect data within the macroplot.

Date (Month/Day/Year) – Date of the observations, e.g. 06/24/2013.

GPS Waypoint – Geographical location of the point of interest. UTMs are preferred (record easting and northing – e.g. 0309161 and 5226923). Points will be located in UTM Zone 14.

Parcel Id – Name of the parcel in which the plot is located.

Plot # – Number of plot in the parcel

Transect Heading – The compass direction that the transect is oriented. Transects will all be oriented north to south unless conditions on the ground indicate that an east to west orientation is more appropriate.

Soil Type – Soil type where the plot is located

Forb Species Markers – Location of the base of 3 perennial shrubs or forbs along the centerline (preferably touching the centerline) of the plot and indicate their exact location. For example *Amorpha canescens* located at the 9 meter mark touching centerline on the west side, *Vernonia baldwinii* touching centerline on the east side at 20.5 meters and *Solidago missouriensis* located 0.5 meters east of centerline at the 21.5 meter mark.

Location of Plots

Run the line transect so that it traverses through the stand and follows these guidelines, listed in priority order.

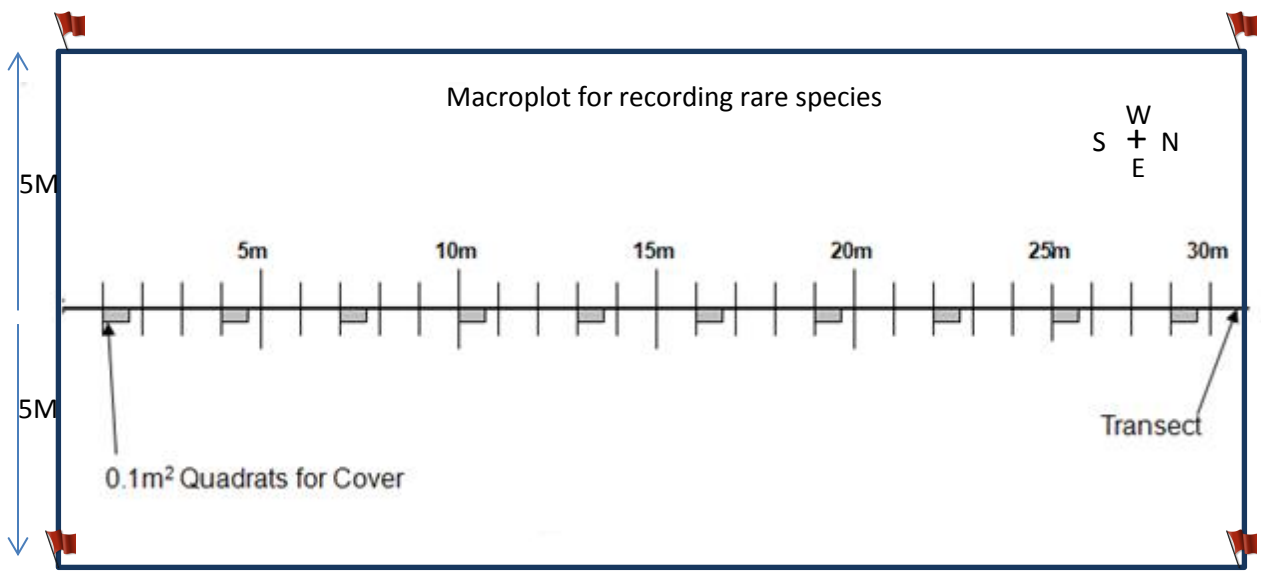
Orient the midline transects along Northing lines unless soil maps and vegetation indicate an east to west orientation may better represent the vegetative diversity present in the area. Note the orientation as indicated on the data form.

- Both ends of the transect should be marked with a waypoint and 24 inch long rebar marker. In order to relocate plots as closely as possible, locate the base of 3 perennial shrubs or forbs along the centerline (preferably touching the centerline) of the plot and indicate their exact location. For example *Amorpha canescens* located at the 9 meter mark touching centerline on the west side, *Vernonia baldwinii* touching centerline on the east side at 20.5 meters and *Solidago missouriensis* located 0.5 meters east of

centerline at the 21.5 meter mark. The location of shrubs and forbs will serve as markers to relocate plots since permanent markers will not be placed.

Plot Layout

- Locate the midline of the macroplot first by laying out a 30 meter tape from south to north along an easting line. This will be the centerline of the sampling area, bisecting the macroplot.
- Stake the ends of the tape firmly in the ground and do not allow vegetation to deflect the alignment of the tape. The tape should be aligned as close to the ground as possible.
- After setting up the transect, use a second tape to establish the macroplot by temporarily flagging the corners 5 meters perpendicular from the transect centerline on either side.

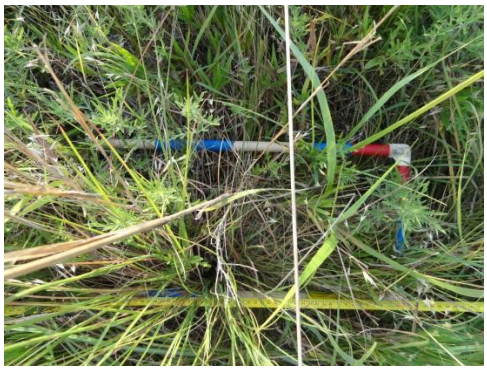


Photographs

Before sampling begins, take 2 photographs, minimum, at each sample location, using the following criteria:

- One photograph should be taken looking in the direction of the transect line showing the starting-point marker and the tape.
- The second photograph should be taken looking down on a representative quadrat from above.
- When the photographs are downloaded, label them with parcel, date, and transect or quadrat. If sampling plot 1, the photos would be labeled (ParcelName13_001_T; ParcelName13_001_Q) 13=year, T=Transect, Q=Quadrat

Example Transect Photo

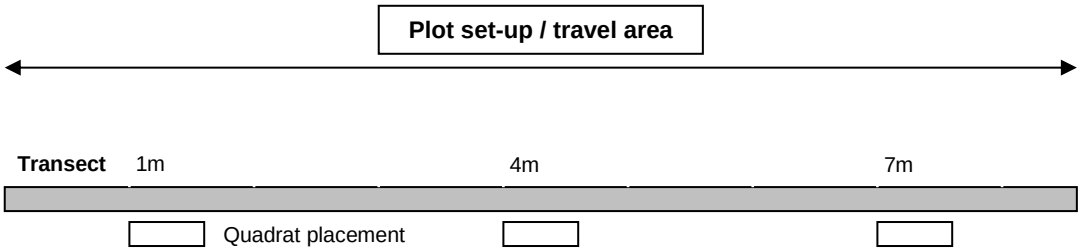


Example Quadrat or Microplot Photo

*Take additional photographs of the site or site conditions if you believe the photograph will add valuable information. Label additional photos by parcel, year and plot number (e.g. ParcelName_13_001).

Sampling Along Transects

- Beginning at 1 m from the start of the transect, place 0.1m^2 quadrats (20 cm x 50 cm) every 3 m (i.e., 1m, 4m, 7m, etc.) along the transect for a total of 10 samples. Reduce disturbance (i.e., trampling) to the area that you are going sample by walking along one side of the transect when setting up the initial plot and placing quadrats on the opposite side (see below).



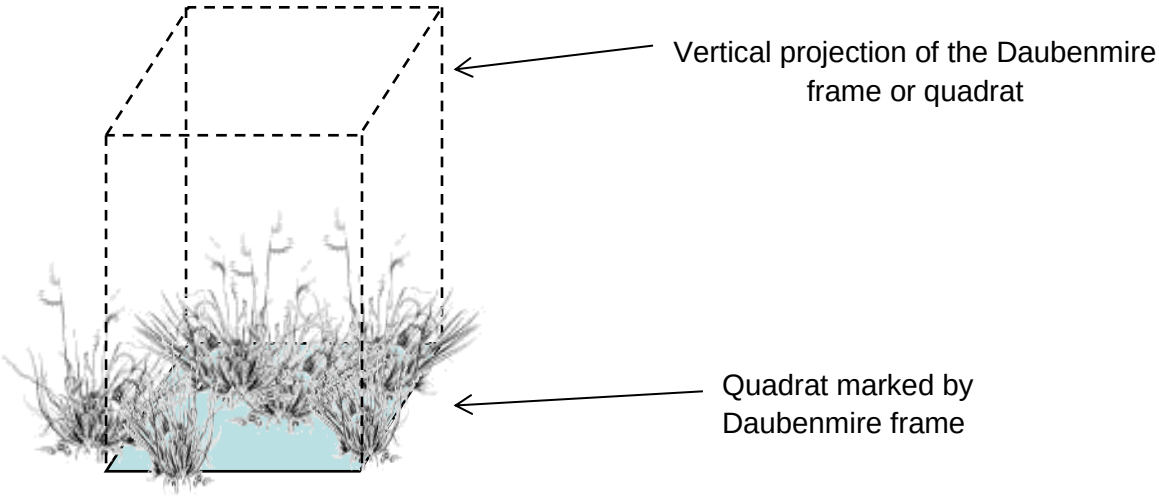
Canopy Cover (Daubenmire Method) Microplot Sampling Protocol

As the Daubenmire frame is placed along the tape at the specified intervals, estimate the canopy coverage of each plant species. Record the data by microplot and species using the cover classes listed below.

- Observe the microplot frame from directly above and estimate the cover class for all individuals of a plant species in the microplot as a unit. All other kinds of plants are ignored as each plant species is considered separately.
- Imagine a line drawn about the leaf tips of undisturbed canopies and project these polygonal images onto the ground. This projection is considered “canopy coverage”. Decide which Cover Class the species falls into and record it on the form.

- Canopies extending over the microplot are estimated even if the plants are not rooted in the microplot.
- Overlapping canopy cover is included in the cover estimates by species therefore, total cover may exceed 100 percent. Total cover will not reflect actual ground cover.

Cover Class	Cover Range	Cover Midpoint
1	<5%	2.5%
2	5-25%	15%
3	25-50%	37.5%
4	50-75%	62.5%
5	75-95%	85%
6	95-100%	97.5%



Other Cover Estimates (to include when measuring Daubenmire plots)
As the microplot frame is placed along the tape at the specified intervals, estimate the ground coverage of bare ground, litter, rocks, woody debris (dead), lichen, and moss. Bare ground and litter are often difficult to estimate because they are generally interspersed with live vegetation. With all cover estimates, be as consistent as possible.

Rare Species – Microplot Sampling
Using a 300 m^2 rectangular macroplot (10 x 30 m), record the presence of additional species and cover not identified in the microplots. Find and estimate the cover of additional plant species by systematically proceeding through the macroplot in 1 meter wide swaths looking for species not identified in the microplots. For each species found, estimate how much cover it occupies in the macroplot: <1%, 1-5%, or >5%.

IV.E. ANALYSIS

Basic data analysis will be performed and reported for data collected. A summary of the Daubenmire cover data will include percent cover by species for each parcel and the percent frequency for each plant species.

V. QUALTITY ASSUARANCE

All observers will be trained in identification of species expected within the sampling areas and in the sampling procedures prior to beginning sampling. Data forms will be completed and inspected by the recorder and the location team leader each day. The team leader will insure completeness and consistency among forms.

VI. REPORTS

Deliverables for this project include:

- Data sheets (see appendix A)
- Data analysis
- Plant species list
- Table of plot locations
- Table of waypoints
- Shapefiles of plot locations and vegetation communities
- Summary report

VII. DATA SHEETS

Data sheets will include the following: (See Appendix A for data sheets)

- Aerial Photos (provided by PRRIP)
- Macroplot cover
- Microplot cover

Appendix A

Macroplot sheet

Date: _____ **Plot #:** ___-___ **Observers:** ___-_____-___

GIS ID: _____ **Parcel Name:** _____ **County:** _____

Easting: _____ **Soil Type:** _____ **Transect Heading:** _____

Northing: _____ **Shrub/Forb 1:** _____ **S/F 1 location:** _____

_____ **Shrub/Forb 2:** _____ **S/F 2 location:** _____

_____ **Shrub/Forb 3:** _____ **S/F 3 location:** _____

Macroplot Cover Class	Species Codes
<1%	
1-5%	
>5%	

Cover Classes: 1 (0-5%), **2** (6-25%), **3** (26-50%), **4** (51-75%), **5** (76-95%), **6** (96-100%)

	Quadrat Number									
SPECIES CODE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Litter										
Bare Ground										
Other										