



## PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM (PRRIP -or- Program)

**TO:** PRRIP Governance Committee (GC)  
**FROM:** Executive Director's Office (EDO)  
**RE:** Continuation of Grassland Vegetation Monitoring Surveys  
**DATE:** February 25, 2022

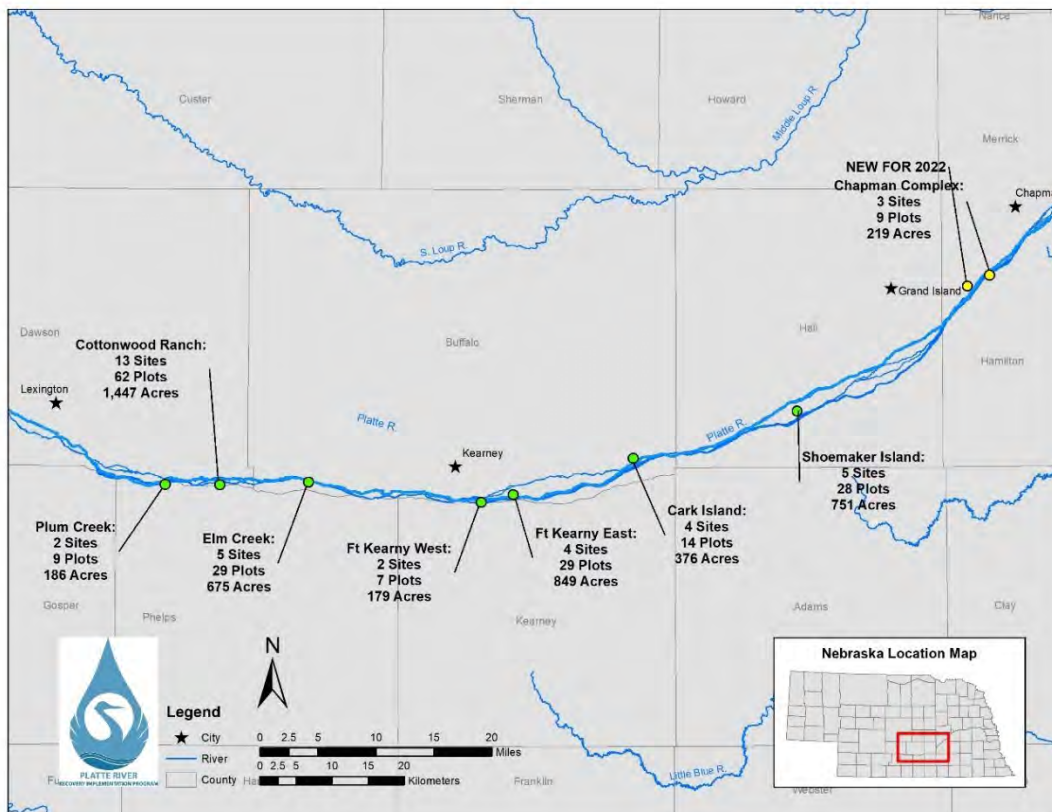
### Requested GC Action (March 2022 Quarterly Meeting):

*Provide guidance on continuation of grassland vegetation monitoring surveys on Program grasslands during remainder of First Increment Extension.*

### Program Grassland Background and Context

The Program's long-term goal is to improve and maintain the associated habitats. This goal includes: 1) improving and maintaining habitat for whooping cranes during migration and reproductive habitat for least terns and piping plovers; 2) reducing the likelihood of future listings of other species found in this area; and 3) testing the assumption that managing flow in the central Platte River for the benefit of whooping cranes, least terns, and piping plovers also improves the pallid sturgeon's lower Platte River habitat. The DOI and states committed to achieving the following objectives by the end of the First Increment of the Program: protecting, restoring where appropriate, and maintaining at least 10,000 acres of habitat in the central Platte River area between Lexington and Chapman, Nebraska. To date, the Program has acquired 15,221 acres of which approximately 4,518 acres are grassland owned/managed by the Program and distributed across the AHR (Figure 1).

**Figure 1.** Program managed grassland habitat and distribution across the AHR.





As outlined in the Program's Land Plan, the initial focus of the acquisition process has been on obtaining interests in and protecting wet meadow and channel habitat between Lexington and Chapman, Nebraska which are suitable for development into "habitat complexes." A "habitat complex" consists of wet meadows, channel areas, and buffers. "Channel area" is the portion of the river that conducts flow and is bound on either side by stable banks or permanent islands with vegetation that obstructs view. At low flows it includes interconnected small channels and exposed sand or gravel bars and non-permanent islands. "Wet meadows" are areas with a generally level or low-lying undulating surface consisting of a mosaic of swales with wetland soils and vegetation and ridges with upland native or restored grasslands. "Buffer" is used to shield wet meadow or channel habitat areas from potential disturbances and may include an extended wet meadow or channel area, upland grassland, pasture, hay land, cropland, palustrine wetland, woodland, managed sandpits, or a combination of these and other compatible land features. In developing parcel-specific management plans, the Program selects restoration, maintenance and other management measures believed to provide benefit to the target species or that do not harm or may benefit other Program "species of concern," when such activities are consistent with the needs of the target species. Management activities conducted on Program owned or managed grassland or wet meadow habitat areas generally include, but are not limited to grazing, haying, prescribed burns, and tree and noxious weed removal. The investment by the Program in the acquisition and restoration costs, approximate annual management costs and agricultural lease income by property is summarized in Table 1.

**Table 1.** First Increment acquisition and restoration costs and approximate annual management costs and agricultural lease income by property.

Property	Grassland Acres	Acquisition Cost	Habitat Restoration and Grazing Infrastructure Cost	Approx. Annual Management and Property Tax Cost	Approx. Annual Lease Income
2008001	118	N/A	\$93,665	\$6,639	\$5,362
2008002	907	Sponsorship	\$396,625	NA	NA
2009001	181	\$582,443	\$523,530	\$7,055	\$5,318
2009003	125	\$1,200,000	\$134,962	\$12,287	\$1,163
2009004	222	\$696,920	\$98,170	\$9,232	\$9,689
2009005	76	\$530,000	\$205,762	\$4,266	\$2,362
2009007	61	\$890,000	\$92,579	\$6,033	1,350
2010001	540	\$1,272,000	\$173,184	\$15,829	\$15,707
2010004	751	\$917,760	\$384,053	\$30,353	\$32,714
2012001	36	\$697,650	\$63,036	\$6,154	\$1,439
2012002	381	\$1,674,338	\$145,533	\$25,367	\$8,180
2012003	68	\$181,353	\$61,603	\$3,819	\$3,944
2015001	446	\$1,496,136	\$379,585	\$26,838	\$15,148
2015003	11	\$313,355	\$3,255	\$2,368	\$532
2018001	376	\$2,201,957	\$53,624	\$17,009	\$14,153
2019001	133	\$680,600	\$148,053	\$5,334	\$3,640
2021001	86	\$3,200,000	NA	NA	NA
<b>TOTAL</b>	<b>4,518</b>	<b>\$16,534,512</b>	<b>\$2,957,219</b>	<b>\$178,583</b>	<b>\$120,701</b>



## Program Grassland Management Objectives and Practices

In 2007, the Program began acquiring land along the central Platte River. Most of the 4,518 acres of grassland or wet meadow that have been monitored were grassland when acquired; however, some parcels have recently been converted from agricultural cropland to grassland. Program owned and managed grasslands were acquired or secured to provide benefits to whooping cranes and increase whooping crane use along the central Platte River and as such, are managed to ensure a portion of these properties provide short- structured grassland vegetation during the spring (March-April) and fall (October-November) whooping crane migration seasons. Management strategies pertaining to prescribed fire and grazing are adjusted annually and according to meeting the structural habitat goals of benefiting whooping cranes. Most grasslands have the infrastructure for grazing (i.e. fence and water). Trees and brush within grassland areas have been removed to enhance the wider unobstructed views for WC and provide opportunities for loafing and feeding within secondary roost areas adjacent to the river. Management objectives also include aggressively controlling noxious and invasive species to the extent possible and enhancing vegetative species diversity as appropriate. Additional objectives or opportunities are to avoid harm, provide benefits, avoid further listings to non-target listed and non-listed species of concern and exhibit good stewardship of Central Nebraska grasslands to neighbors, tenants, Platte River Recreation Access users and the public. Maps of all Program managed grasslands an associated transects can be found in **Appendix I**.

## Program Grassland Vegetation Monitoring Objectives

Program owned and managed grasslands were acquired or secured to provide benefits to whooping cranes and increase whooping crane use along the central Platte River and as such, are managed to ensure a portion of these properties provide short- structured grassland vegetation during the spring (March-April) and fall (October-November) whooping crane migration seasons. After several years of implementing early spring prescribed fires and moderate to heavy grazing to most Program grasslands, the EDO became concerned that these strategies may have the potential to result in a shift in vegetation communities and/or plant species composition over time. In 2013, the Program issued an RFP to identify contractors interested in developing and implementing a Grassland Vegetation Monitoring Protocol. Seven proposals were received and evaluated by the selection committee and Prairie Legacy was selected due to qualifications, an understanding of Program needs, and the fact their proposal was over \$100,000 less than other proposals received. Prairie Legacy was contracted in 2013 to develop and implement the Program's current Grassland Vegetation Monitoring protocol (**Appendix II**) on most grasslands owned or managed by the Program. In 2014, Prairie Legacy also implemented the protocol on a few additional properties that were not surveyed in 2013. In 2016 and 2019, sole source memos were provided to the GC by the EDO to continue this monitoring effort with Prairie Legacy to maintain continuity in this effort through the First increment to monitor potential shifts in vegetation communities and/or plant species composition over time. The third cycle of vegetation surveys was completed in 2019. Grassland vegetation survey cost summary can be found in Table 2.

**Table 2.** First Increment Grassland survey cost summary

YEAR	GRASSLAND ACRES	MONITORING SITES	TRANSECTS	COST
2013	3,629	30	149	\$43,310
2014	350	4	16	\$11,155
2016	4,400	35	182	\$67,907
2019	3,491	23*	133	\$62,123
<b>TOTAL</b>	<b>11,870</b>	<b>92</b>	<b>480</b>	<b>\$184,495</b>
<b>AVG COST</b>	<b>\$15.54/acre</b>	<b>\$2,005.38 / site</b>	<b>\$384.36/ transect</b>	<b>\$46,123/ year</b>

\* Plots on the Cottonwood Ranch Broad-scale Recharge Project area were not surveyed in 2019 due to construction.

The original, intended purpose of the grassland vegetation monitoring survey is to:

- 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. Established plots will be assessed for changes in vegetation composition and density.
- 2) Monitor sites for problem areas or colonies of invasive and noxious plant species and program species of concern. Plant species of concern such as reed canary grass, leafy spurge, purple loosestrife, Canada thistle, and musk thistle or other noxious and invasive species are noted and reported.
- 3) Identify any rare or threatened plant species which may appear. Threatened or endangered plant species are to be reported and documented if encountered within surveys. To date there has been no documentation of T & E species.
- 4) Determine species composition in each sample area to track potential shifts in dominant species. Data collected will be used in comparative analyses in future years to determine changes from previous surveys in vegetative composition and dominance.

The methods of the grassland vegetation monitoring surveys are:

Data were collected during the three weeks beginning the last full week of June in 2013, 2014, 2016 and again in 2019. The survey protocol is attached as **Appendix II**. Scientific nomenclature for species was taken from the Natural Heritage Database (Steinauer and Rolfsmeier, 2013). The identification key was *Flora of Nebraska* Vol. 2 (Kaul et.al., 2012). Cover data were collected in microplots along a transect within a larger macroplot. These transect locations were marked by GPS using UTM NAD 83. New sites were marked by Program staff with rebar stakes and flags. Macroplot locations were compared with soil maps and moved if necessary to provide an appropriate number of sites distributed among these soil types to provide sampling locations from most potential community types.

Plant species, dominance and abundance are assessed by percent cover at each site. Cover is a measure of the visual obstruction of each plant species in a 20x50 cm frame. Absolute cover can exceed 100 percent for the frame as some species overlap each other.



Evaluations based on plant species richness and diversity can be supplemented by weighting or rating species based on their tolerance of disturbance beyond historically normal natural disturbances. This is the idea on which Swink and Wilhelm based their Floristic Quality Index (FQI) (Swink and Wilhelm, 1979, 1994). Sites with Native average C values above 3 and Native FQI above 30 have been considered desirable from a conservation standpoint (Swink and Wilhelm, 1979, 1994).

First increment grassland management strategies were targeted towards managing for short vegetative structure for whooping crane habitat. Vegetation monitoring surveys are primarily used for:

1. Baseline documentation of native and exotic species on each site to aid in decisions concerning grazing and Rx fire management.
2. Identification of areas to target herbicide application for noxious weed, cool-season, exotic dominated grasslands on each site.
3. Identification of areas for invasive control on each site.
4. Measurement of success (or failure) of cropland conversion seedings.
5. Measurement of floristic quality and diversity on each site to assess habitat quality and effects of PRRIP management over time on native grassland vegetation.
6. Baseline vegetation community monitoring aids in documentation for future ESA compliance issues.
7. Provides long-term dataset to document Good Stewardship of central Platte grasslands through PRRIP management practices.

The 2019 PRRIP Grassland Vegetation Assessment Final Report (**Appendix III**) is important because it not only provides vegetation composition data for 2019, but also includes figures at each site that compare values from 2013 and 2016 that help to identify trends. Trends over time in response to Program management can help inform decisions on whether management should focus on structure or enhancement of diversity; how to best maintain native species and eliminate cool season grasses; and alter grazing, haying, and prescribed fire regimes to best manage vegetative composition on Program grasslands.

### Preliminary Options for Grassland Vegetation Monitoring

The EDO has developed a preliminary outline of potential options for Grassland Vegetation Monitoring for GC consideration. This discussion centers around the value gained through implementation of these surveys in terms of informing land management decisions and meeting Program objectives.

#### 1) Discontinue Grassland Vegetation Monitoring

Rely upon land manager site visits to “keep tabs” on community diversity, structure, and health.

#### 2) Continue Current Protocol for Grassland Vegetation Monitoring throughout First Increment Extension

Implement Grassland Vegetation Surveys every 3 years, beginning in 2022, throughout the First Increment Extension following the survey protocol included in **Appendix II** to provide a general overview of grassland health on Program managed grasslands. This will include adding 9 new



transects on 3 new sites to monitor for baseline data on new tracts in the Chapman Complex.  
Estimated \$3,460 to cover cost of additional transects.

3) Continue Grassland Vegetation Monitoring throughout First Increment Extension

Develop a modified Survey Protocol that is more robust and provides sufficient data to detect changes in species composition, cover, FQI etc. and could be statistically tested.

Develop a modified Survey Protocol as necessary to address GC approved actions for non-target listed and non-listed species of concern (e.g., added microscale plots to monitor violet planting success in support of Regal fritillary butterflies)

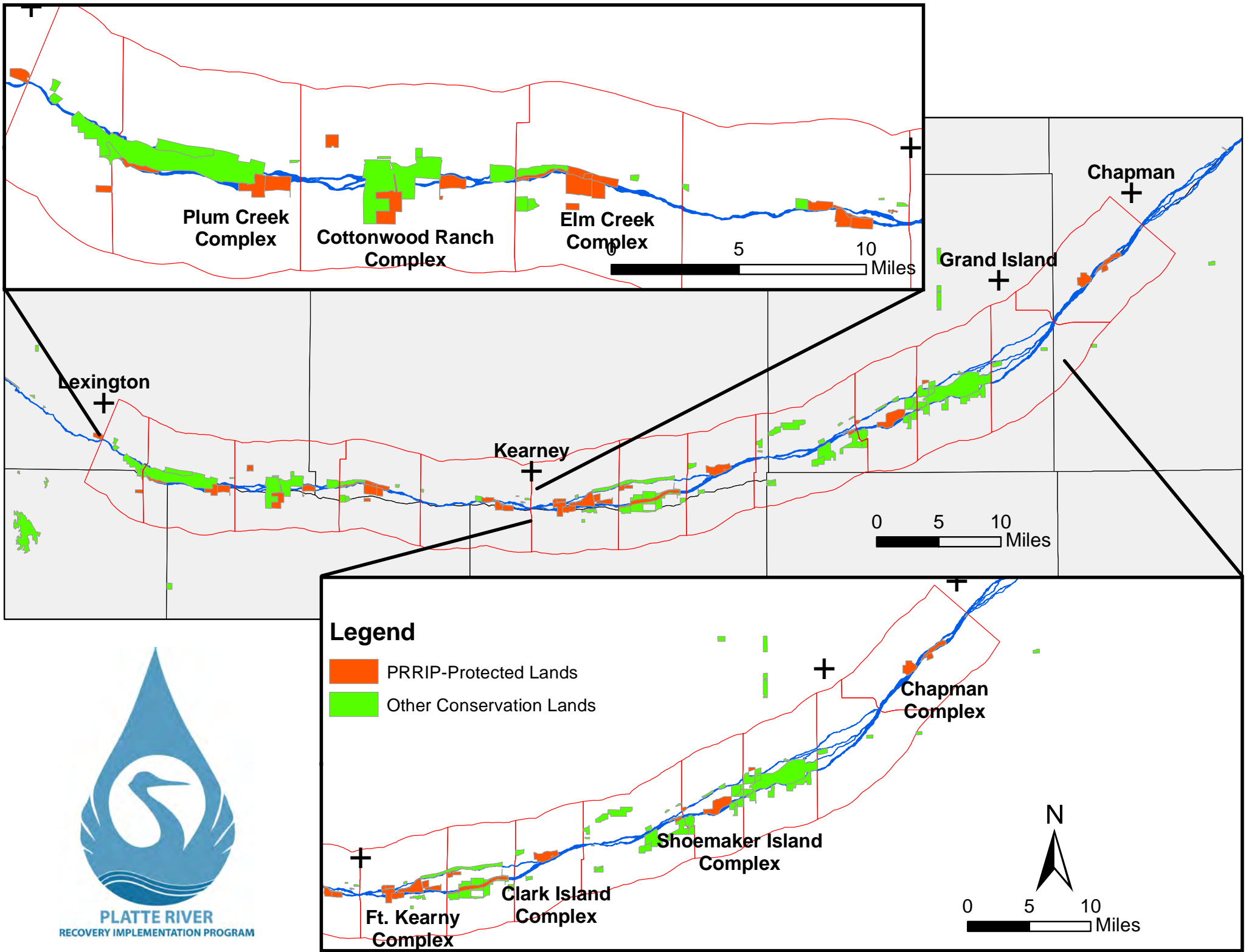
Appendices

- I. Maps of all Program managed grasslands an associated transects
- II. PRRIP Grassland Vegetation Monitoring Protocol-2016
- III. 2019 Final Report (comparing results across years)



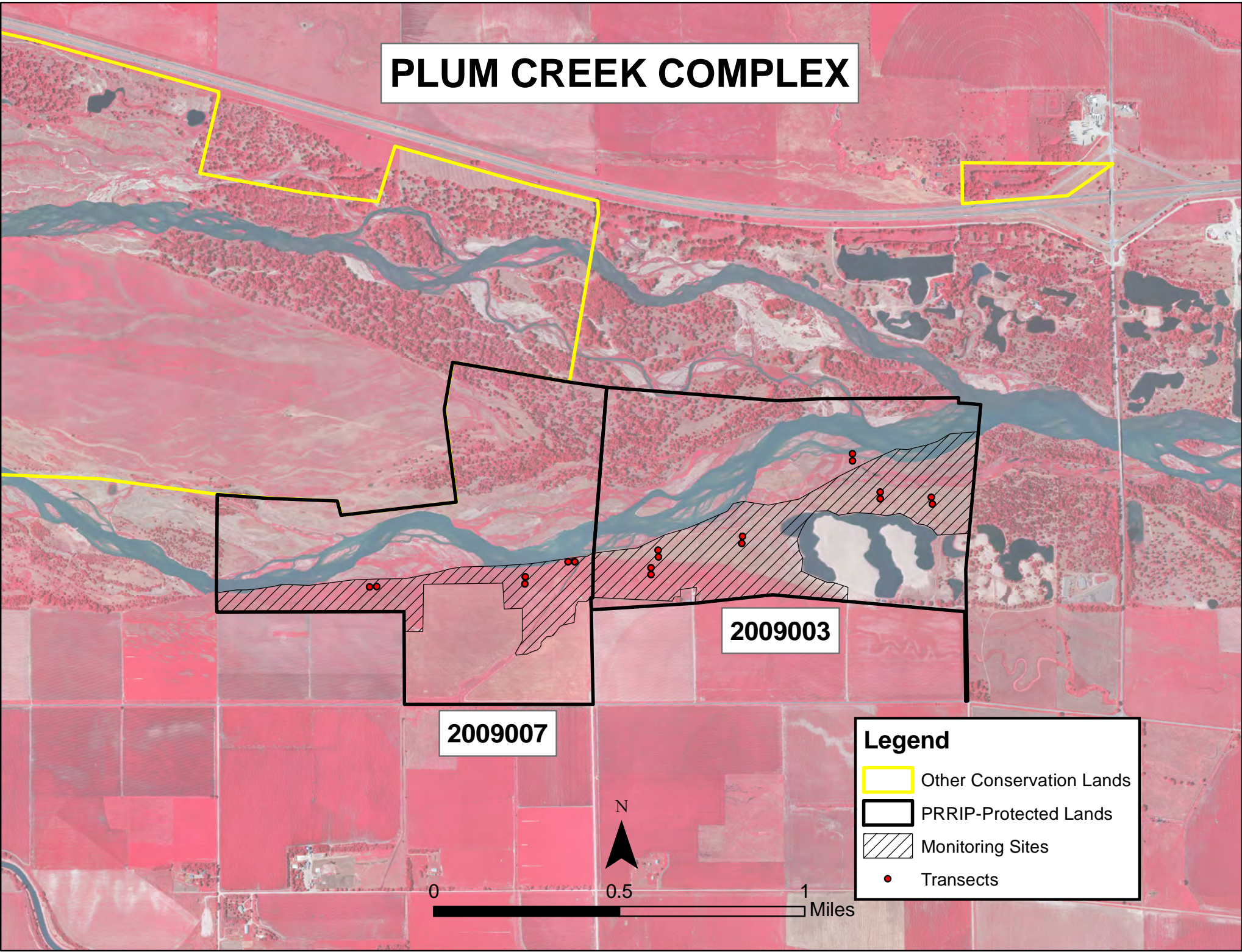
- 178 I. Maps of all Program managed grasslands an associated transects  
179







# PLUM CREEK COMPLEX



2009003

2009007

**Legend**

Other Conservation Lands

PRRIP-Protected Lands

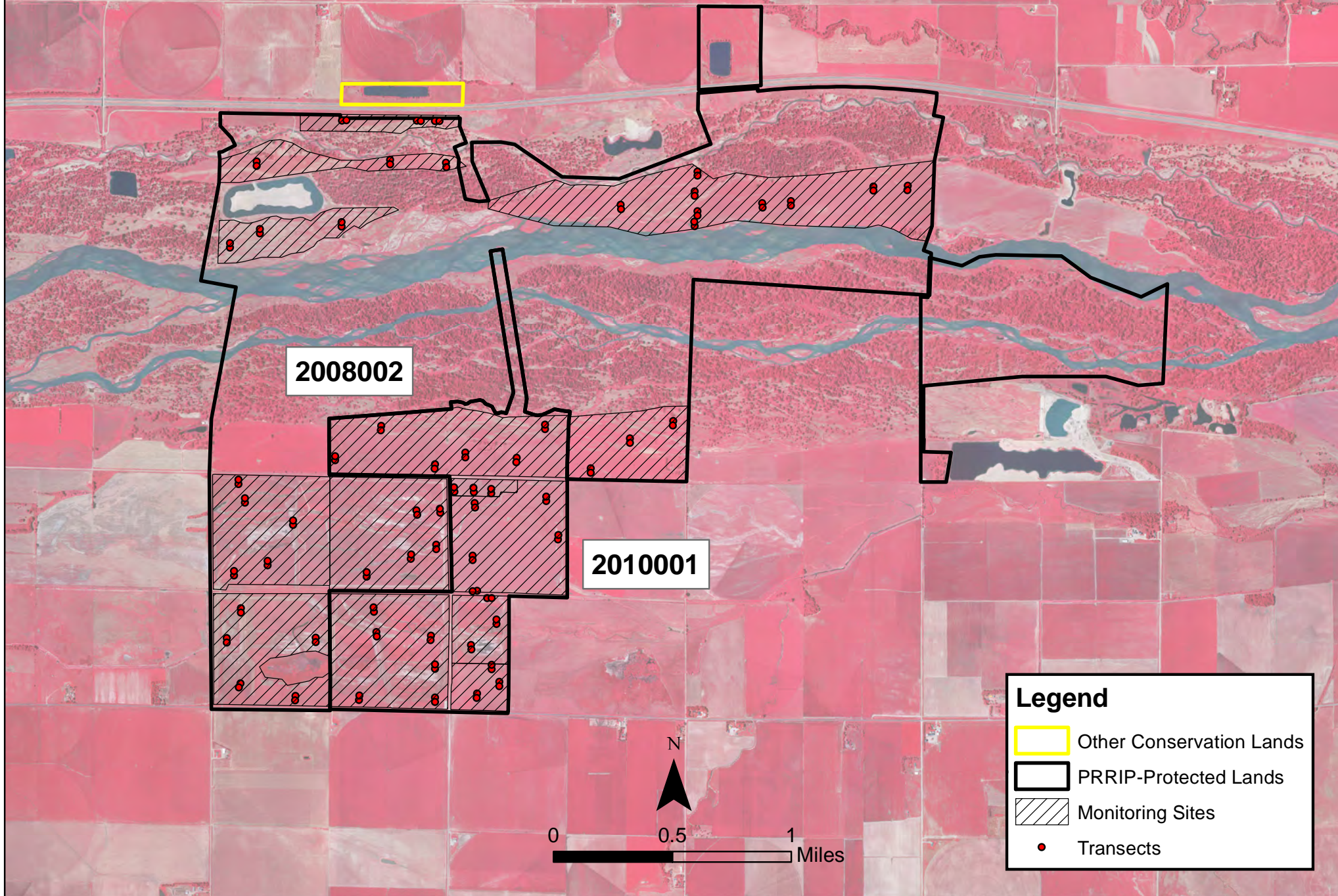
Monitoring Sites

Transects



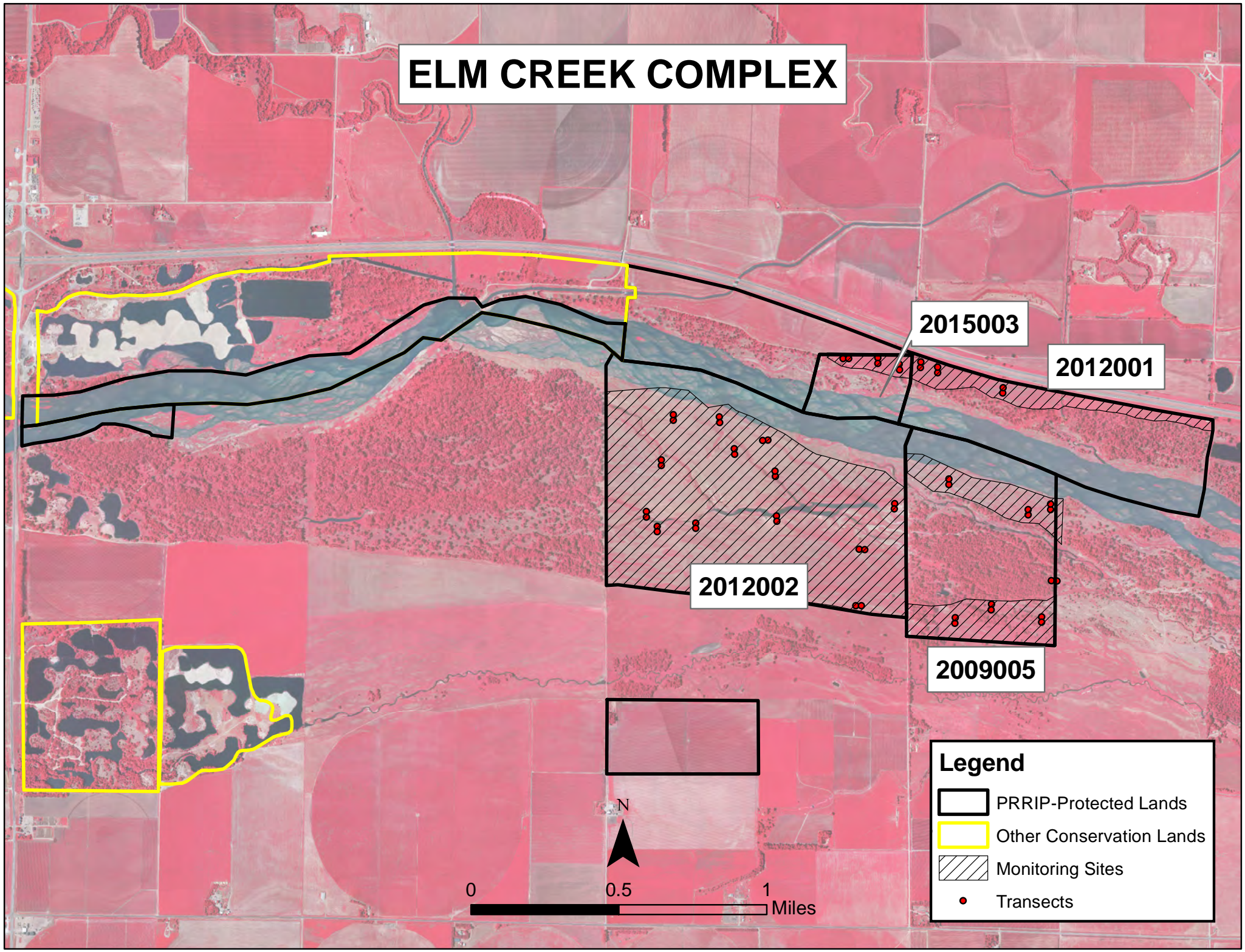


# COTTONWOOD RANCH COMPLEX





# ELM CREEK COMPLEX



**Legend**

- PRRIP-Protected Lands
- Other Conservation Lands
- Monitoring Sites
- Transects



# FORT KEARNY COMPLEX

2012003

2009001





2009004

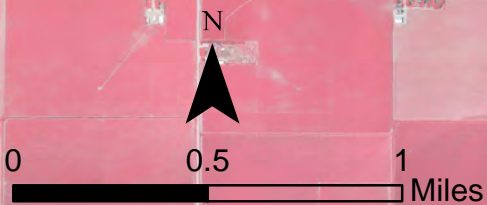
2015001

2010003

2008001

**Legend**

-  PRRIP-Protected Lands
-  Other Conservation Lands
-  Monitoring Sites
-  Transects







# CLARK ISLAND COMPLEX

2018001

## Legend

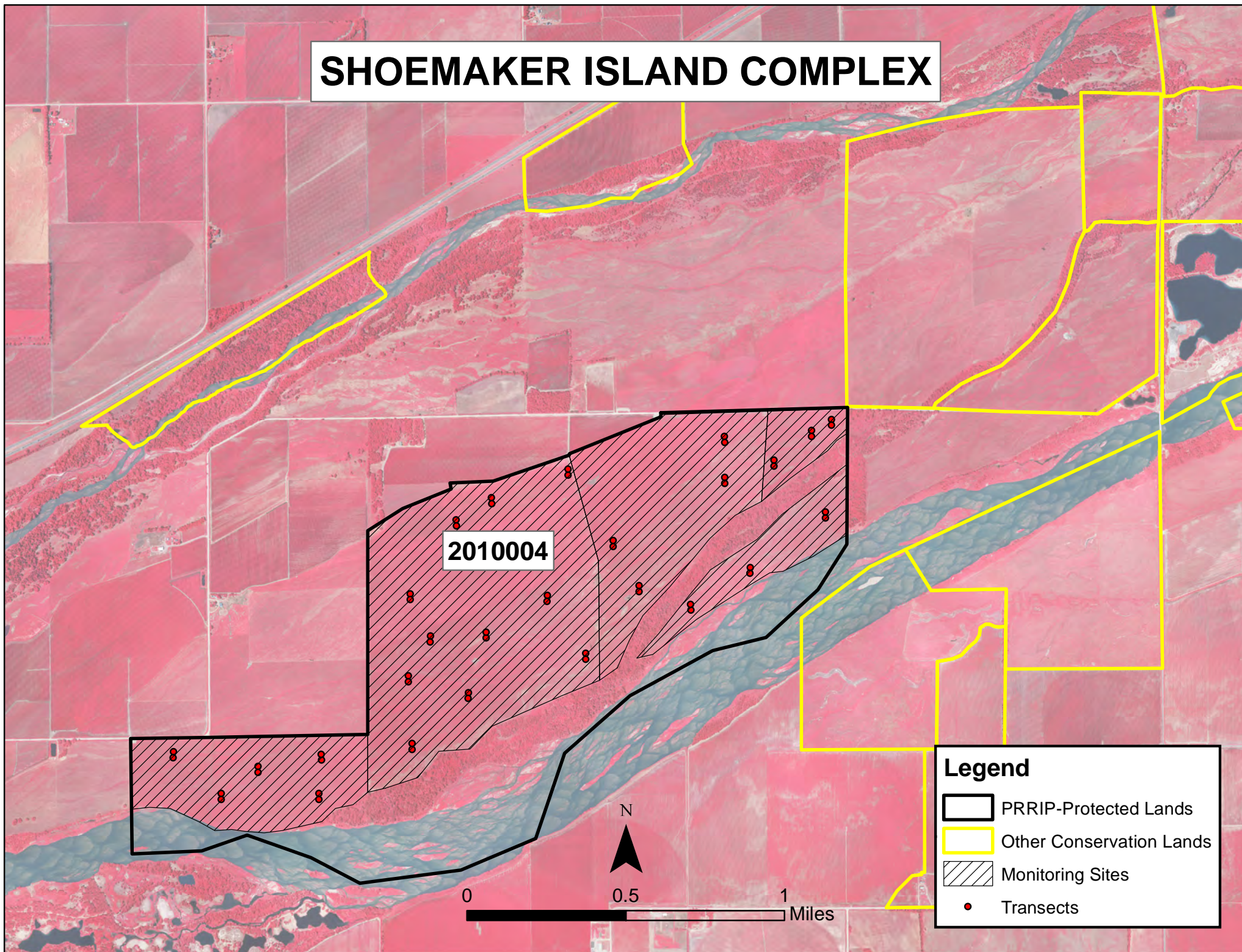
-  PRRIP-Protected Lands
-  Other Conservation Lands
-  Monitoring Sites
-  Transects



0 0.5 1 Miles



# SHOEMAKER ISLAND COMPLEX








# CHAPMAN COMPLEX

2021001

2019001

## Legend

-  PRRIP-Protected Lands
-  Other Conservation Lands
-  Monitoring Sites
-  Transects

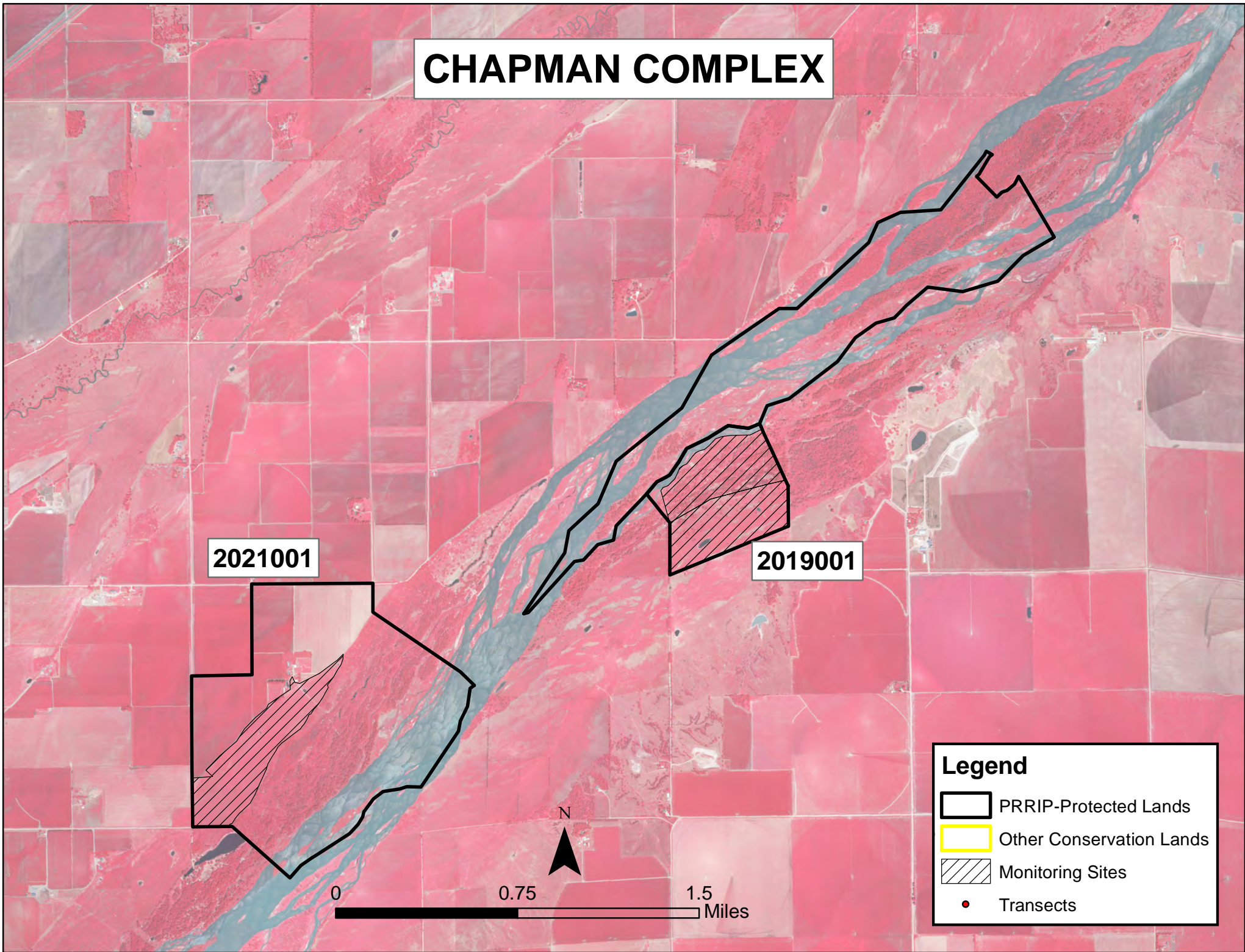
N

0

0.75

1.5

Miles







180 II. PRRIP Grassland Vegetation Monitoring Protocol-2016  
181

## **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 whooping 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 device. 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<sup>2</sup> and includes smaller plots.

Microplot – Small plot usually included within a larger macroplot. In this study the microplots are 100 cm<sup>2</sup> 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
<u>Cypripedium candidum</u>	Small white lady's slipper
<u>Platanthera praeclara</u>	Western prairie fringed orchid
<u>Salicornia rubra</u>	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
<u>Elaeagnus angustifolia L.</u>	Russian olive
<u>Juniperus virginiana L.</u>	Eastern red cedar
<u>Phalaris arundinacea L.</u>	Reed canarygrass

And the following noxious weeds:

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

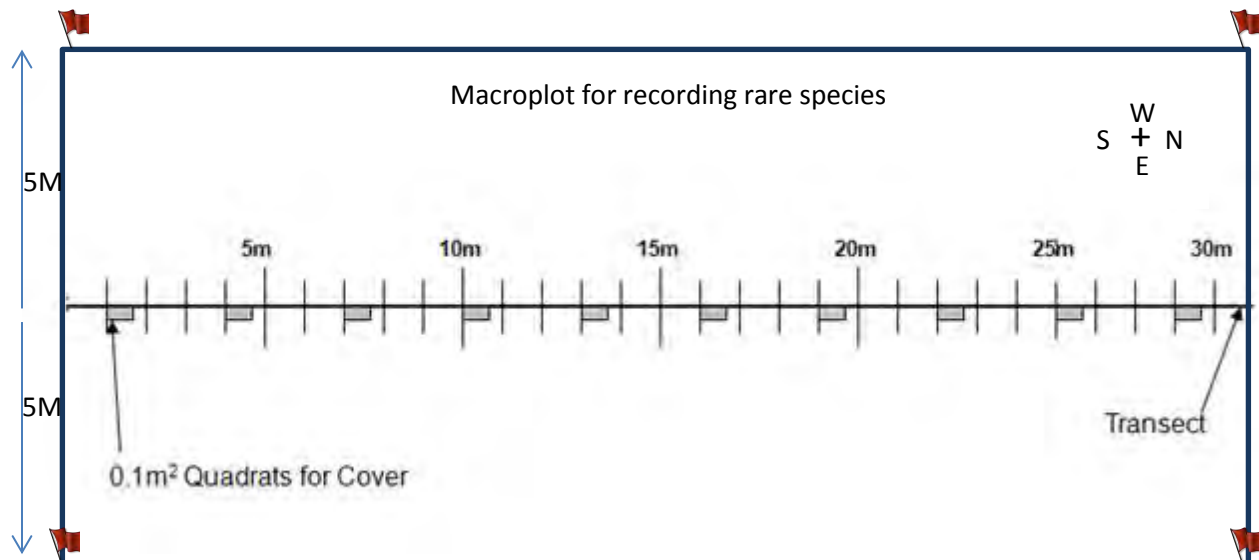
Orient the midline transects along Northing lines unless soil maps and vegetation indicate an east to west orientation may better represent the vegetative diversity present in the area. Note the orientation as indicated on the data form.

- 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

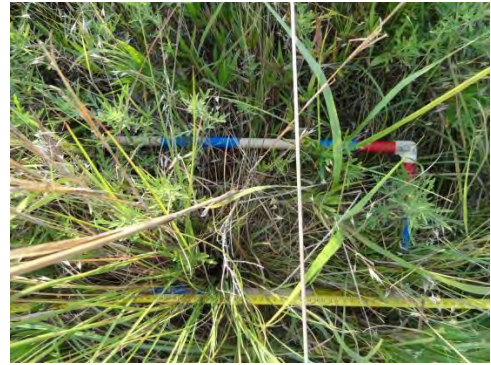
Before sampling begins, take 2 photographs, minimum, at each sample location, using the following criteria:

- 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

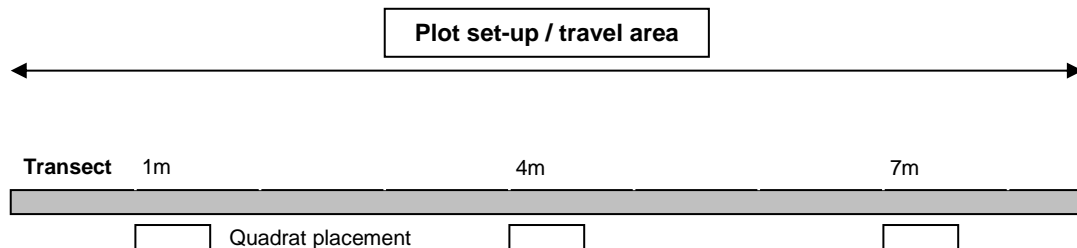


Example Quadrat or Microplot Photo

\*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<sup>2</sup> 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).



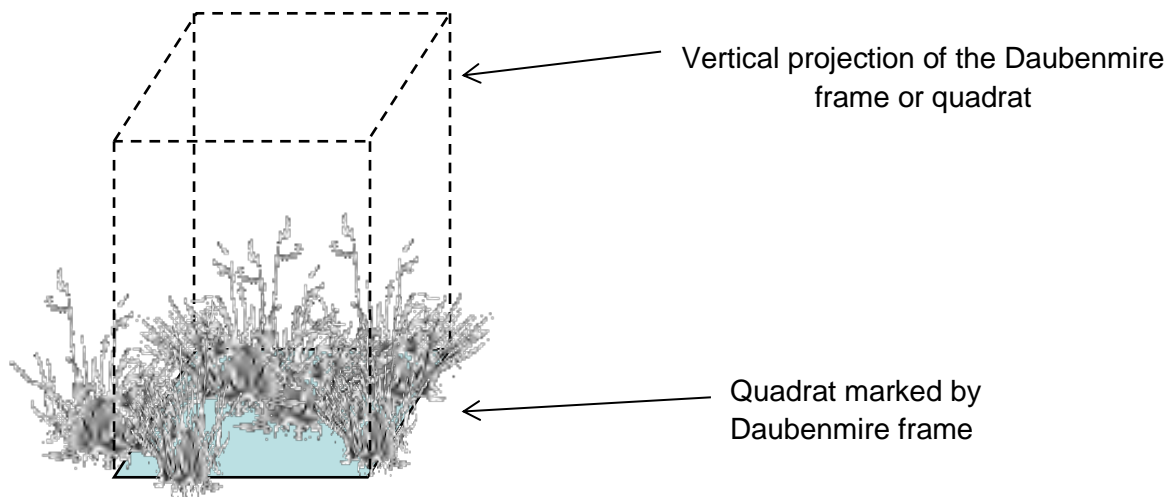
### Canopy Cover (Daubenmire Method) Microplot Sampling Protocol

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<sup>2</sup> 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. QUALITY ASSURANCE**

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%)**

[illegible]



182 III. 2019 Final Report (comparing results across years)

# **2019 PRRIP GRASSLAND VEGETATION ASSESSMENT FINAL REPORT**

**Buffalo, Dawson, Hall, Kearney, and Phelps  
Counties in Nebraska**



**Prepared for Platte River Recovery Implementation Program**



**GRASSLAND VEGETATION ASSESSMENT**



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## **1.0 INTRODUCTION AND BACKGROUND**

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 whooping cranes. This is the third cycle of vegetation surveys on native and restored grassland areas used to monitor potential shifts in vegetation communities and/or plant species composition over time.

### **PURPOSE**

- 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. Established plots will be assessed for changes in vegetation composition and density.
- 2) Monitor sites for problem areas or colonies of invasive and noxious plant species and program species of concern. Identify any rare or threatened plant species which may appear.
- 3) Determine species composition in each sample area in order to track potential shifts in dominant species and changes in cool and warm season cover. Data collected will be used in comparative analyses in future years to determine changes from previous surveys in vegetative composition and dominance.

### **LOCATIONS**

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. This survey includes sites first analyzed in 2013 and 2014, with additional sites in 2016. Several areas which had been followed over the last two cycles have been removed from management and one new site has been added in the 2019 survey.

A total of nearly 3,491 grassland acres on 23 sites, serving as buffer and habitat between agricultural land and built infrastructure and the Platte River were surveyed. These sites are managed in a variety of ways, including grazing, burning, and haying. Some sites had multiple management practices applied in the same year. A few of the sites were formerly in agricultural production or were disturbed in other ways and were thus replanted to a native seed mix prior to the 2016 and 2019 surveys. All sites and their acreage are listed in Tables 1A and 1B along with the date of seeding, number of plots that were placed at each site and the management from the time of

the first survey in June of 2013 through 2016. The management and acreage of these sites from 2017 through 2019 are listed in Tables 1C and 1D.

## **METHODS**

Data were collected during the three weeks beginning the last full week of June in 2013 and again in 2016. Two sites, Fox and Blessing were surveyed for the first time in 2014 and four other sites, CWR North 3, NGPC, Speidell North and Speidell South were surveyed for the first time in 2016. Dippel was added for survey in 2019. The 2019 data were collected during the last week of June and the first week of July. The survey protocol is attached as Appendix A. Scientific nomenclature for species was taken from the Natural Heritage Database (Steinauer and Rolfsmeier, 2013). The identification key was *Flora of Nebraska* Vol. 2 (Kaul et.al., 2012)

## **PLOTS & TRANSECTS**

Cover data were collected in microplots along a transect within a larger macroplot. These transect locations were marked by GPS using UTM NAD 83. New sites were marked by Program staff with rebar stakes and flags. Macroplot locations were compared with soil maps and moved if necessary to provide an appropriate number of sites distributed among these soil types in order to provide sampling locations from a majority of potential community types. Final locations are listed in Appendix B. Transect endpoints were marked with rebar. Program staff buried these rebar in 2013 and 2014 after data were taken. Plots were relocated for the 2016 and 2019 surveys and additional plots were located in the Dippel site in 2019. Transect endpoint locations for each macroplot within each site are shown in Figures 1 through 9.

## **FINDINGS**

### **PLANT SPECIES OF CONCERN**

No threatened or endangered plant species were encountered during the 2019 surveys. There were a few instances of reed canarygrass, leafy spurge, Canada thistle and musk thistle. The plots in which these species were located are listed in Table 2. East Lloyd Island had a higher incidence of musk thistle than in the past. Purple loosestrife is increasing at McCormick North Island and was found in plots at Binfield East, West, West Hay and Dippel. Canada thistle was found at Dippel as well.

### **PLANT SPECIES, DOMINANCE AND ABUNDANCE**

All scientific and common names of plant species found within the plots are listed in Appendix C along with their value of conservatism and wetness indicator status as assigned by Nebraska Natural Heritage Program and the national wetland plant list (Steinhauer and Rolfsmeier, 2013; Lichvar, 2013). This list also includes the plant symbol (P-Symbol) assigned by the Natural Resource Conservation Service (NRCS National Plant Database, 2013). Plant community classification follows Steinauer and Rolfsmeier (2010).

Plant species were assessed by percent cover at each site. Cover is a measure of the visual obstruction of each plant species in a 20x50 cm frame. Absolute cover can exceed 100 percent for the frame as some species overlap each other. Tables 3 through 7 summarize the percent cover of each species by site. The tables are separated by west (A) and east regions (B). The species are categorized as cool and warm season grasses (Tables 3A-B and 4A-B), grass-like species (Tables 5A-B), exotic and native forb species (Tables 6A-B & 7A-B). Absolute coverage of cool season species and warm season species also are depicted graphically in Figures 10 and 11. Percent cover for litter and bare ground are also presented (Tables 8A-B). Trees are included with forb species as these were rarely more than seedlings in the plots. These percentages are a summary of the conditions found in 2019, which can be compared to similar measures from 2013, 2016 and in subsequent years.

## **FQI**

Evaluations based on plant species richness and diversity can be supplemented by weighting or rating species based on their tolerance of disturbance beyond historically normal natural disturbances. This is the idea on which Swink and Wilhelm based their Floristic Quality Index (FQI) (Swink and Wilhelm, 1979, 1994). Plant species are assigned a coefficient of conservatism (C) by experts in each state. C is a value from 0 to 10 placed on native plant species, which describes adaptations of each plant species to disturbance. Exotic plant species are not assigned a value. A value of 0-3 indicates the species are adapted to disturbance and can be found in a wide variety of conditions. Plants which are consistently found in the native community matrix are given a value of 4-6. Values of 7-10 are reserved for late seral species which are less adapted to disturbance, have a high degree of preference for specific ecological conditions and as such are usually found in intact plant communities. These values are listed in Appendix A for all species found at those PRRIP sites which have been sampled.

An average C value can be calculated to get a quick idea of the vegetative condition of an area. It is calculated by taking the average of all the C values for a list of species within an area. It can be calculated using only native species or with both native and exotic (introduced) species. The latter is a more accurate look at the conditions at a site. The former, however, allows one to judge the condition of the native component. The floristic quality index (FQI) is calculated by the following formula:  $FQI = (C/N) * (\sqrt{N})$ , where C is the coefficient of conservatism and N is the total number of species found in an area. Using  $(\sqrt{N})$  adjusts for differences in the area being evaluated. These FQI values were calculated for each site. Taft et al. (1997) promote the use of both exotic and native species in the index computations in order to provide a measure of structural integrity (the self-correcting potential) of a native area. Non-native species are assigned a value of 0 for computational purposes.

The cover percentages of plants found among the sampled plots was used to weight the C values to provide an additional dimension of floristic quality (FQIw), that of overall dominance or abundance of the plant. The cover of each species multiplied by its C value gives greater weight to abundant species and less weight to the less abundant species. Non-natives are included in the number of species present. Since they are not given C values, those weights are not included. A discussion of how these may be weighted is included in the summary section.

The average C value and the FQI were calculated for each site using only native species first, then using both native and exotic species, and finally for the weighted average of both native and exotic species. These are presented in Figure 12 and Table 9. When exotic species are added to the FQI calculation we see a more complete picture of the overall condition of a prairie. The best use of these results is as a comparison of species richness and abundance in successive years.

The best measure of overall change in warm season and native abundance is weighted floristic quality. However, it should be emphasized that each measure of floristic quality provides insight into the potential causes for the change. Each of the parameters of the floristic quality index should be examined as they each account for a different perspective on quality. The number of species detected (N) will affect all calculations of floristic quality. In sites with higher average C values, it is not unusual for average C values to decrease in subsequent years as more species are added to the total. A decrease of 0.2 or 0.3 in the average C value over 3 to 5 years can indicate detrimental effects and suggest a change is needed in management regimen, while a stable or increasing average C value can be a measure of effective management (Wilhelm and Masters 1995).

Changes in weighted FQI show changes in the abundance of higher or lower value species. Each of these measures applied to this second set of data will be used to compare with previous years, allowing analysis of changes in vegetation diversity and dominance. Baseline values collected in 2013 are presented and compared with 2016 and 2019 values in Figure 13 and Table 10.

At each sampling date, floristic quality analysis (FQA) indicated that some sites remained at levels of disturbance for which native species may not be able to adapt or compete (Table 9). A measure of such an instance would be an FQI below 20 with very little diversity and very little or no warm season grass components. Other sites may have many native species at the site, but these may not have been abundant. Weighted FQI will help us determine the impact of changes in the abundance of native taxa.

Non-native taxa can reduce the restoration potential and integrity of the natural community (Taft et al., 1997). Changes in the presence or absence of non-native taxa influence floristic quality measures, however, since they are not given a numeric value, changes in the abundance of these species are less apparent than that of native taxa. All FQI values in 2019 will help us to speculate if over the last 6 years, some change has taken place and whether that change may have been influenced by further invasion of non-native taxa or an increase in the abundance of native taxa.

## **CONDITION ASSESSMENT**

Sites with Native average C values above 3 and Native FQI above 30 have been considered desirable from a conservation standpoint (Swink and Wilhelm, 1979, 1994). Twenty sites were surveyed this year for the third time. Two were surveyed for the second time and one (Dippel) was surveyed for the first time. Binfield South Hay has the greatest percentage by count of native species (86%) Blessing had the highest percentage of exotic species (41%). The top three in terms of percent native are Binfield South Hay Meadow, Binfield West hay meadow, and Sullwald. The importance of



abundance as a parameter is evident in Sullwald where one of the only four exotic species covers 77% of the area. Total species number (N) at Sullwald is only 24.

About half of the sites increase in average C value. The Binfield sites are the only sites with average C values above 3. Binfield West Meadow has reached an FQI above 30 (Figure 12; Tables 9 and 10). FQI was designed to allow comparison or ranking among sites.

Weighted FQI ( $FQI_w$ ) will vary considerably from site to site. It is important to note that these changes in weighted FQI should be used to assess one site against itself and should also be analyzed against other FQA parameters and against the species abundance data to determine the potential causes for the change. Comparing the weighted  $FQI_w$  of individual sites over time can show increasing or decreasing native species abundance. These measures across all sites over the two survey dates indicate improvement in about half of the sites (Figure 13; Table 10). However, it is important to note that these improvements reflect changes in absolute cover which are also affected by management in the year of each survey. So a site that was rested in one survey year, but grazed for two months prior to the next sampling may show a marked decrease in weighted FQI and visa versa. In addition, a marked increase in rainfall over the last couple of years will have a large effect on cover. Factors such as the amount of cool vs warm season cover, non-weighted FQI, C values and abundance of species have to be taken into account as well. This year Dyer showed improvement in all categories of floristic quality. Native species are becoming more dominant and have increased in cover. Binfield West Meadow has doubled in weighted FQI but also has become more shrubby in the south. Hostettler also continues to increase in floristic quality. Its FQI is only 15.9 but the increase in average C means that new native species continue to appear. CWR East Lloyd Island and Morse North also had improvements in all parameters. Figures 14A-D show relative coverage of cool and warm season species, respectively, for each of the sites across all three sampling years. Figures 15A-B show absolute cover for 2019. It is important to note that sedges are included in cool season species and these are all native and desirable in this case. While warm season graphs include exotic warm season species, these are not abundant in most cases and therefore do not present a problem when looking at warm season species as desirable overall.

Sites with FQI below 20 require intervention. For simplicity, further references to FQI for each of these sites will mean FQI using native and exotic species combined. All sites with FQI scores below 20 in 2013 remained below 20 in 2019. Speidell South FQI fell to 20.28 in 2019. Sullwald Hay Meadow, Wyoming South Meadow, Fox, and Dippel have the lowest weighted FQI. Blessing has the lowest FQI. These sites need revitalization.

## **SITE ASSESSMENTS**

Locations of transects are shown in Figures 1 through 9. At a few sites different areas of the site exhibited different coverage of warm or cool season species. Cool and warm season grass data at each transect is shown in Table 11 and compared with the same data from 2013, 2016 and 2019. Absolute coverage of cool and warm season grass species is indicated under the name of each site below, as is the current dominant species. Floristic quality is presented for each site and is shown

in comparison in Figures 13 and 14 and Tables 9 and 10. Total cool and warm season comparisons can be found in Figures 10 through 12.

### PLUM CREEK COMPLEX SITES

This complex is on the western edge of the properties. References in the following discussion for coverages at these sites can be found in Figures 10 through 12 and Tables 3A through 8A. Floristic quality values are shown in Figures 13 and 14 and Tables 9 and 10.

#### COOK

Absolute Coverage: cool 89%, warm 33%; Dominants: smooth brome and big bluestem

Cook Hay Meadow has been hayed yearly in mid July and was burned in the spring of 2019. This year, dominants are smooth brome (22%) and big bluestem (17%). Plot 3 showed a decrease in cool season grass cover. Plots 1 and 3 had a good increase in native grass cover. The recent burn may be responsible for some of this change. Burning in 2015 did not provide improvement in the dominant species in 2016, so the improvement we see in 2010, if from the prescribed fire, may be short-lived without subsequent treatment in addition to the burns. Overall the cool season coverage has not changed from 2016. Warm season coverage has increased from 20 to 33%. The number of species recorded has varied across sampling years. The average C value has decreased slightly from 2016 but the FQI and weighted FQI have increased, indicating the abundance of higher valued native species has increased. Warm season grasses are present, although less common than cool season grasses. More frequent spring burns with heavy grazing after growth resume and or haying in June to prevent seed set on smooth brome may be helpful to encourage the warm season grasses to dominate. Hitting the brome hard in early spring and again in fall are the most likely ways to improve this habitat. Encouraging warm season grasses necessitates creating conditions unfavorable to smooth brome. This might include intensive grazing for a couple of weeks after growth resumes from an early spring burn, haying in June to prevent seed set, or herbicide applied after growth resumes or in the fall. More frequent burning in early spring may be an option if herbicide and grazing are not viable options. Mowing earlier to prevent brome from seeding may be helpful in preventing sexual reproduction but will not discourage tillering. Frequent mowing beginning in late May has also been shown to be effective in reducing brome coverage (Lawrence and Ashford, 1964).

#### DYER

Absolute Cover: cool 63%, warm 99%; Dominant: Tall dropseed, Downy brome, foxtail

Dyer had early season grazing in the last 3 years and was also burned in the spring of 2019. At the time of survey in 2013, Dyer grassland was characterized by weedy forb species and both annual and smooth brome. Cover of all species increased in 2019. Available moisture may be responsible. The dominant species is now tall dropseed (37% cover), even though annual brome coverage has also increased. The coverage of cool season species increased from 29% to 63%, however, native cool season species (Canada wild-rye and western wheatgrass) now account for more than one-third of the coverage (24 of 63%). Downy brome (28%), foxtail (22%) are also dominants. Foxtail and downy brome are species that are likely to increase after flooding or in the event of other

disturbances to the soil profile. Dyer was planted prior to the 2016 sampling. Ten (compared with 11 in 2016) of the (167) species in the upland seed mix were found in the sampled areas. Only two of the eighty (80) species from the slough mix were found within the plots. Seventy-one percent of the 69 species found within the sampling areas are native. Sedge species have increased to 32% in 2019 compared with 22% in 2016 and 19% in 2013. Cover of warm season and sedge species increased dramatically over every plot but one. Plot 8 had an increase in cool-season species.

## COTTONWOOD RANCH (CWR) COMPLEX SITES

This complex is on the west side of the properties. References in the following discussion for coverages at these sites can be found in Figures 10, 11 and 14B and Tables 3A through 8A. Floristic quality values are shown in Figures 12 and 13 and Tables 9 and 10.

### CWR NORTH 1

Absolute Cover: cool 52%, warm 25%; Dominant: Smooth brome, bluegrass, saltgrass and Carex

Cover of cool season exotic species was just under 50% in 2013 and just over 50% in 2016 and 2019. Smooth brome, bluegrass, saltgrass and Carex were the dominant species. Warm season cover was 16% in 2013, 13% in 2016 and 25% in 2019. Saltgrass was the most dominant warm season grass. Cover of native species increased in every plot overall. Native forb cover remained steady in 2019. The number of species encountered increased in CWR N1 in 2019. Conservation value and FQI dropped in 2019. Weighted FQI increased as a reflection of the increase in native cover. So the increase in the abundance of natives can be attributed to lower value natives.

### CWR NORTH 2

Absolute Cover: cool 100%, warm 17%; Dominant: Kentucky bluegrass, ragweed, and black medic

Kentucky bluegrass, ragweed and black medic were the dominant species in CWR N2. Big bluestem, which was present in 2013, was not recorded in the plots in 2016 and was less than 1% in 2019. There was 30% cover of exotic forbs (led by black medic). Native forb cover increased from 40% to 58% in 2019. There was a slight increase in the number of species recorded (70% native and 30% exotic) and the weighted FQI, but neither are up to 2013 values.

### CWR NORTH 3

Absolute Cover: cool 25%, warm 33%; Dominant: Black medic, horseweed, tall dropseed

This site was first sampled in 2016. It differs from North 1 and 2 in that it is a more mesic site. Swales run east and west through this site. CWR N1 and CWR N2 have increased in FQI while N3 has decreased. Black medic and horseweed replaced native forb species as the dominants. Dominant grasses are tall dropseed and cordgrass. Weighted FQI indicates that native species are more abundant here than in either CWR N1 or CWR N2. Black medic, horseweed, tall dropseed are the most dominant species with prairie cordgrass a close fourth. Dominant grasses are tall dropseed and cordgrass. Cover of native vs exotic forbs were 50% and 60% respectively. There was no information provided for management at this site. Flooding is a potential cause of the change in dominant species.

#### CWR EAST LLOYD ISLAND

Absolute Cover: cool 93%, warm 40%; Dominant: Kentucky bluegrass, tall dropseed and big bluestem

This site was grazed all season long in 2013, 2014 and 2015. In 2016 it was burned in the spring and there was a decrease in cover of warm season grasses along with a decrease in cover of sedges which resulted in a drop in the weighted floristic quality. Management after 2016 was rotational grazing May to October. There were increases in every parameter of floristic quality (diversity, average C, FQI and Weighted FQI), but not quite to 2013 levels. Despite these increases in floristic quality, the quantity of cool season exotics vs. warm natives is clearly increasing as one can see in the relative cover changes over the last three sampling years (Figure 14B). There was a large increase in exotic cool season grasses in every plot as well as a smaller overall increase in absolute cover of native warm season grasses. The cover of musk thistle equaled that of big blue in some of the plots. FQI is still under 20, in spite of the increase in value. These data suggest that some change in management is warranted in order to decrease the amount of cool season grass cover.

#### MORSE NORTH

Absolute Cover: cool 13%, warm 57%; Dominant: Big bluestem, smooth brome

Morse North showed a decrease in cool season cover and an even larger increase in warm season cover as big bluestem replaced brome as the most dominant species. The middle four plots were responsible for the increase in warm season grasses. This parcel has two major community types with annual bromes and ragweed dominating much of the northern section. Plot 28, which represents the northern community type, had no change in exotic cool or warm season species, but both native cool season and sedge species decreased. Big bluestem is now dominant in the southern section. Overall, the exotic cool season grasses (mainly smooth brome) have decreased from nearly 60% cover in 2013 to 23% in 2016 to 13% in 2019. Native warm season grass cover is now 57% as compared with 31% in 2016 and 33% cover in 2013. However, exotic forb cover increased dramatically from 10% in 2016 to 60% in 2019. Black medic is the dominant exotic forb species, which has seen a dramatic increase across most sites. It is an annual adventive species that spreads quickly in disturbed areas and does well with wet spring weather and on nutrient poor soils. It is also a nitrogen fixer. Native forb cover is now 49% down from 62% in 2016. There was little change in species diversity, but native wet meadow species and big bluestem increased in cover enough to increase the FQI and weighted FQI.

#### ELM CREEK COMPLEX SITES

This complex is included in the western section of the properties. References in the following discussion for coverages at these sites can be found in Figures 10 through 12 and Tables 3A through 8A. Floristic quality values are shown in Figures 13 and 14 and Tables 9 and 10.

#### JOHNS NORTH

Absolute Cover: cool 63%, warm 26.6%; Dominant: Annual brome, bluegrass

Species diversity declined by 30% in 2019. Flooding may well be the reason for this decline. High value species remained thereby increasing the average C value. The FQI decreased slightly and weighted FQI remains at half the 2013 value. This is an indication that while high value species were found at this site, the less desirable species covered more area. Annual forbs and grasses are adventive species which can be expected to increase after disturbances such as flooding. Cover of cool season grasses is 63%. Exotic cool season grass cover was 41%, the highest in 6 years. Cover of native cool season grasses also increased. Annual brome and Kentucky bluegrass are dominants. Spring burning in the southern half did not appear to reduce the cover of exotic cool-season grasses from 2016. That said, we had no measure of cover just prior to the burn. Plots 78 and 79 (located in the south side) had large increases in exotic cool season grasses. Plot 78 had increased native warm season grasses as well.

#### SULLWALD

Absolute Cover: cool 91% (all exotic), warm 5%; Dominant: smooth brome, Canada bluegrass

Sullwald meadow has been rested for the last two years. It has been dominated by smooth brome and bluegrass in all surveys. With a weighted FQI of less than 11, this site needs remediation. Species diversity continues to decline with each survey. While 83% of the 27 remaining species are native, smooth brome appears to be out competing them. Warm season grasses still have cover of less than 5%. The more drastic approach of vegetation removal and reseeding may be necessary if improved habitat is desired here.

#### MCCORMICK NORTH ISLAND

Absolute Cover: cool 17%, warm 42%; Dominant: cordgrass, reed canary and little bluestem

McCormick North has been rested since 2016. The warm season grass component is up 75% from 2016 due to an increase in tall and sand dropseed. Absolute cover is now at 42%. Cool season exotic grasses are 6% again just slightly less than the previous survey. Cool season native grasses in sampled areas had a cover of 11%, similar to 2016. Native forbs have over 30% cover, still lower than 60% in 2013. Cover of exotic forbs declined again to 4% (8% in 2016 and 15% in 2013). Species diversity also continues to decline from 83 in 2013 to 57 in 2016 and now 48 in 2019. The overall reduction in cover and species is most likely due to continued flooding. Weighted FQI has increased each year, meaning overall more desirable native species have the greatest percent cover. Dominants were prairie cordgrass and reed canarygrass. Purple loosestrife also has a large presence here.

#### MCCORMICK SOUTH MEADOW

Absolute Cover: cool 17%, warm 40%; Dominant: three-awn, Scribner's panicum, switchgrass and ragweed

This parcel still has several areas dominated by woody species. These contain chiefly cottonwood and green ash. Warm and cool season grass cover remain virtually unchanged. Western ragweed has been the dominant forb species since 2013. Species diversity is the lowest in 6 years. All measures of floristic quality have decreased except weighted FQI, which increased slightly. That increase can be explained by the fact that all dominant species are natives.

## FORT KEARNEY COMPLEX SITES

This complex is listed with the eastern section of the properties. References in the following discussion for coverages at these sites can be found in Figures 10 through 12 and Tables 3B through 8B. Floristic quality values are shown in Figures 13 and 14 and Tables 9 and 10.

### BLESSING

Absolute Coverage: cool 53%, warm 44%; Dominant: big bluestem, Kentucky bluegrass, smooth brome

Cedars had been cleared from this former CRP land just prior to survey in 2014. Rotational grazing alternating with spring burns has been the management practice at Blessing. In 2019 a spring burn was conducted and the site was rested after that. Cool season exotic grasses doubled in 2 of 3 plots and warm season increased in the other (plot 181). Average C and FQI decreased slightly while weighted FQI remained the same. To find the reason for an increase in cool season grasses in 2019 under the same treatment as 2016, one could look at the fire behavior, flooding or other factors at the specific plot locations. It is difficult to tell which plot or plots are indicative of the site as a whole. Cover of native forb species remains low at 24%.

### WYOMING SOUTH

Absolute Coverage: cool 62%, warm 4%, 11% open water; Dominant: fescue, annual brome, smooth brome

Data were collected at only 3 of the original 4 plots. There was only very slight change overall. This site was grazed in 2019 reducing cover of all species. Over the entire site, the cover of cool season exotics increased. The fescues and brome are dominant species. The fescues increased from 28% to nearly 40% in 2016 and to 49% in 2019. Average C value and FQI increased very slightly. Diversity was down from 57 to 43 species. All floristic quality indexes were lower. Weighted FQI is the lowest it has ever been at 5.23. Although the decrease in diversity is likely due to removal of one of the plots from sampling, this site appears to be responding poorly to current management.

### SPEIDELL NORTH

Absolute Coverage: cool 44%, warm 65%; Dominant: Big bluestem, Kentucky bluegrass, and cordgrass

Speidell North has had two spring burns since it was last surveyed. Dominant species are Big bluestem (43%), Kentucky bluegrass 22%, and cordgrass. It has 35% cover of exotic cool season grass species and 9% cool season native cover. It has 1% exotic cover and 65% cover of native warm season species. It has 7% cover of native sedge species. There is 34% cover of exotic forbs dominated by velvet leaf and cannabis. Species diversity was down slightly. Changes in FQI were small despite the decrease in cool season and increase in warm season cover. The dominance of big bluestem was a likely contributor to the small increase in weighted FQI.

### SPEIDELL SOUTH

Absolute Coverage: cool 7%, warm 41%; Dominant: Kentucky bluegrass, big bluestem, annual brome

Speidell South was grazed in 2016 and 2017, then burned in the spring of 2018 and grazed. It was grazed again in 2019. This site, first sampled in 2016, had a slight decrease in all floristic quality values including diversity, average C value and FQI in 2019. There was a very slight increase in weighted FQI. There was an increase in cover of exotic cool season grasses and a large decrease in native cover from 46% to 9%. Speidell South also had an increase in weighted FQI most likely due to the large amount of cover from native forbs.

#### FOX

Absolute Coverage: cool 23%, warm 30%; Dominant: Big bluestem, annual brome, tall dropseed

This is one of two sites which were first sampled in 2014 and again in 2016. It was seeded in 2012 and the seed mix included yellow sweet clover which remains the dominant exotic forb species. Fox has 39% exotic forbs. Three mixes were planted here in 2012. In 2014 and 2016, 13 of 18 sandy upland species; 12 of 20 mesic species and 16 of 28 planted wet-meadow species were recorded. It was grazed in 2017 then given a fall burn and was overseeded with a high diversity seed mix. It was grazed in 2018 then rested in 2019. If cattle are allowed to graze immediately following seeding, they will often push the seed in too deep, particularly on wet sites. Of the newly seeded species, we found 18: There were 8 warm season grasses, 5 native cool-season grasses, 3 native forbs and 2 native sedges. Some of these may not be new species. The newly seeded species are still becoming established, so more may become evident in the next few years. Two of the original six transects were not sampled in 2016 due to flooding. Five of six were sampled in 2019. Despite including one of two plots omitted in 2016, and reseeding in 2017, the 2019 diversity remains at only half the species found in 2014. There was some decrease but no significant change in any of the floristic quality values. Cover of exotic cool season grasses decreased but so did warm season grass cover. Exotic forb species still outpaced natives 3 to 1 in cover.

#### HOSTETLER

Absolute Coverage: cool 45%, warm 34%; Dominant: Western wheatgrass, Indiangrass, annual brome

This site was seeded in 2011 and was dramatically different in appearance in 2016 than in 2013 (Figure 16). Twelve of 16 originally seeded species were recorded in the sampled plots. Species diversity increased in 2019 to 70 species (up from 64 in 2016). Seventy percent of those were native. Western wheatgrass (a desirable native) was the dominant species accounting for 32% of the 45% cool season coverage. We found 17% cover of exotic forbs and 49% cover of native forbs. There had been 82% cover of native forbs in 2013; many of those annuals, which positively influenced weighted floristic quality. Spring burns had been conducted on the western one-third in 2017, the eastern 1/3 in 2018 and in the middle one-third in 2019. Cattle were allowed to graze after the burns in each of those years. One of the two western plots had an increase in warm and decrease in cool season grasses. The other had no change. In the four plots in the east, there was a net increase in both warm and cool season species with the largest increase in cool native (western wheatgrass) species. In the middle third, which was burned this year, both plots increased greatly in native warm season species and decreased in native cool season species. There was no change in exotic cool season species.

## DIPPEL

Absolute Coverage: cool 57%, warm 9%, Sedges 18%; Dominant: Smooth brome, Reed canarygrass, Indiangrass, cordgrass

This is the first year of sampling at Dippel. Dominant species are Smooth brome (21% cover), Reed canarygrass (15%), Indiangrass, and cordgrass. Sedge species and Canada goldenrod are dominant in the accretion area. The remaining area was dominated by smooth brome and ragweed. Plot 263 in the center of the upland area is dominated by big bluestem with a large component of smooth brome as well. Dippel is one of the more diverse sites with 95 different species present. Average C value 2.33 and FQI is 22.67, both under the desired quality ratings. Weighted FQI is one of the 3 lowest ratings of all the properties, indicating that low quality species are more abundant than those of higher value. Cover of exotic forbs is 29%. Purple loosestrife is found at this site as well

## SHOEMAKER ISLAND COMPLEX SITES

These grassland sites range from frequently and occasionally flooded Northern Cordgrass Wet Prairie plant community on Binfield East and West Meadow, South Hay and West Hay sites with some inclusions of Western Alkali Meadow plant community characterized by saltgrass, alkali arrowgrass and foxtail barley in Binfield West Meadow.

This complex is on the eastern edge of the properties. References in the following discussion for coverages at these sites can be found in Figures 10 through 12 and Tables 3C through 8C. Floristic quality values are shown in Figures 13 and 14 and Tables 9 and 10.

### BINFIELD SOUTH HAY

Absolute Coverage: cool 31%, warm 57%; Dominant: Big bluestem (28%) Smooth brome (20%), Indiangrass (12%) and Carex spp (10%)

This site was hayed in 2016 and 2017 then rested in 2018. In 2019 it was rested after a spring burn. Warm season grass coverage is now at 57%. An error in row assignment was discovered in the 2016 data calculations for FQI. The corrected FQI values are presented blue in table 9. Cool season cover was over 100% in 2016 and is now one-third what it was in 2016. There was an increase in every value of floristic quality from 2016 except for the weighted FQI, which was half what it was in 2016. This is caused by the grazing in 2019 vs sampling just before haying in 2016. Native grasslike species had 20% cover. Exotic forbs had only 2% cover. Native forb cover was 38% in 2019.

### BINFIELD EAST MEADOW

Absolute Coverage: cool 16%, warm 15% grasslikes 24%; Dominant: Clustered field sedge, Switchgrass, straw flatsedge, smooth brome, Redtop

The 2016 spring burn was followed by season long grazing. In 2017 the area was grazed again May 1 to Sept. In 2018 the northeast 41 acres was rested while the remaining 138 acres were grazed. A spring burn was conducted on the north half in 2019 and 87 acres on the southeast were rested.



When there are multiple treatments it is not possible to make a blanket assessment of an entire site. The native warm season grasses decreased in the two southern most plots over the last 3 years. Northern areas are dominated by sedges and bulrush transitioning in the south half to switchgrass, bluegrass, bluestem and smooth brome. Both cool and warm season grass cover decreased again at this site overall. There was an increase in diversity that brought the average C value down just slightly, indicating there were more adventive species. The weighted floristic quality decreased substantially from 2016.

#### BINFIELD SOUTH MEADOW

Absolute Coverage: cool 10%, warm 28% sedges 18%; Dominant: Big bluestem, Indiangrass, Clustered field sedge

There was a decrease in cover of both cool and warm species in 2019. In 2016 this site was burned and rested, then burned and grazed in 2017, grazed in 2018, and then burned and grazed in 2019. We sampled after it had been grazed for 2 months. Diversity is down since the previous survey from 71 to 64 species. Average C value is up to 3.34, which is very good. This means that the species that have dropped out were more adventive species. The FQI has also increased. The decrease in weighted FQI can be attributed to the fact that the site had been grazed for two months prior to sampling, which led to less cover of all species as compared with the burned and rested state of the 2016 sampling.

#### BINFIELD WEST MEADOW

Absolute Coverage: cool 99%, warm 91%, Sedges 106%; Dominant: Sedges, switchgrass, Redtop and cordgrass.

Dominant species across this site are sedges (48% cover), switchgrass (42%), redtop (40%) and cordgrass. In 2016 this meadow was burned on the south half and grazed with a 37 pair stocking rate. It was then grazed in 2017 and 2018 at a 70 pair stocking rate, however, in 2018 the northwest 95 acres was rested. A spring burn was conducted on the north half in 2019 and grazed by 38 pair while resting the southeast 42 acres. It can be difficult and misleading to group results at one site with different moisture regimes and different treatments. In this meadow, which is wetter in the north, cool season grasses decreased. Spring burns typically favor this type of response. In the south, exotic cool season cover increased, while native warm season cover decreased; opposite of the results for the site overall. One exception is plot 138 where both cool and warm season cover increased. This year has also had above average rainfall and a lower stocking rate. Redtop has increased from 3% in 2013 to 20% in 2016 and to 40% in 2019. Desirable cool season species such as the sedges increased from 23% cover to 40% cover in 2016 and to 106% in 2019. Cover of warm season grasses increased at this site as well from 32% to 40% in 2016 to 91% in 2019. Exotic forb species are at 18%. Cover of native forbs doubled since the last sampling season. Dominant forbs are western wild rose (in the south) and shore arrowgrass (in the north). Species diversity at this site has increased. The average C value remains at 3.09 and FQI has increased. Weighted FQI has doubled as can be expected from a year of above average rainfall after a burn.

## BINFIELD WEST HAY MEADOW

Absolute Coverage: cool 28%, warm 16%, Sedges 13%; Dominant: Smooth brome, Clustered field sedge, Indiangrass, cordgrass

Smooth brome has taken over as the dominant species. Cover of all grass and grass-like species decreased. Binfield West hay meadow was hayed after the 2016 survey, and again in 2017 and 2018. It was burned in the spring of 2019 and rested. If this area had been flooded in the early season before our sampling in late June, these species could have been behind in growth and would have had less cover than in the 2016 sampling effort. This could also explain the increase in black medic as a dominant forb. Maximilian sunflower was the dominant native forb.

Species diversity is up but average C value is down; meaning the additional species are adventive species. A disturbance such as flooding could also explain this effect. The floristic quality index is up slightly, but because of the decrease in overall cover, the weighted FQI is also down.

## SUMMARY AND GENERAL RECOMMENDATIONS

This is the third assessment of most of these sites on a three-year sampling cycle. In some sites there are evident trends. At other sites the vegetation has varied between sampling years for many reasons and the trend is less evident. All measures of vegetation analysis carry limitations, particularly when analyzing a large area. Some of the limitations in this project have been discussed in the body of this report. In summary, those limitations include a relatively low number of sampling units for the amount of acres involved, large differences in soil type and soil moisture within sites, fluctuations in weather, flooding, and different management practices within individual sites. We have tried to account for most of those issues in the description of each of the sites involved. Flooding locations and frequency should be taken into account when increases in exotic adventive (mostly annual) species are found. In addition, it is wise to use multiple measures, rather than just one in order to explain changes and inform management practices.

Measurements also have limitations. Average C value tells you something about the diversity of species and their value. FQI gives a means to compare one site with another. Weighted FQI will indicate changes in desirable species very well, but may completely miss expansion of exotic species unless that expansion has reached a level that excludes native taxa. Therefore, it is important to take all of these measures into consideration when analyzing changes at a site.

Several sites have very low floristic quality and present a challenge in order to shift the community back into warm season dominance. When a plant community has shifted substantially so that the composition is almost completely cool season exotics, it may require multiple prescribed burns to make an effect or it may be beyond recovery with burning alone (Wilson and Stubbendieck, 2000). When fire is not possible at the correct stage or when community structure has shifted too far from warm season grasses, other treatments such as mowing, may be necessary. Mowing brome 3 or 4 times per year at certain stages in its growth cycle, beginning in late May have been used

successfully (Lawrence and Ashford, 1964). Sullwald and Cook are examples of this type of challenge.

#### PLUM CREEK COMPLEX

Prescribed fire was some help in 2019 at Cook but any improvement in 2015 under the same circumstances may have been short-lived, as there were no improvements in 2016. Continual management will be necessary at this site. There was improved coverage of warm season grasses at Dyer, however, it is in the floodplain where adventive annual species can be abundant. More native annual species would be desirable.

#### CWR COMPLEX

CWR North 1 also had an increase in adventive species. Exotic cool season species dominated in CWR North 2, but there was improvement over 2016. Quality was better in 2013. Adventive annuals also took over as dominants in CWR North 3. East Lloyd Island had a minimal increase in all floristic quality parameters. None of these measures gave away the increase in exotic cool season grasses. In spite of the FQI increases, this site requires management intervention. Morse North had improved cover of warm and cool species. Black medic increased under moist conditions as a dominant forb in this site as well as several others.

#### ELM CREEK COMPLEX

Johns North had a decline in species diversity. Adventive, exotic, cool season species were the highest in 6 years. All of these western sites were likely affected by flooding. Diversity continues to decline at Sullwald; another site in need of intervention. Warm season grass cover increased at McCormick North Island. Fewer undesirable species lead to a decline in diversity but an increase in weighted floristic quality. All dominant species at McCormick South Meadow are native.

#### FORT KEARNEY COMPLEX

At Blessing plots had varied results. Despite a spring burn, two of three plots had an increase in cool season exotic species. Other factors that might influence that outcome, including weather or fire behavior, should be examined. We had fewer plots to examine at Wyoming South, which likely influenced the decrease in diversity there. Aside from that, change is not happening at this site so an adjustment in management might be considered. Speidell North had small changes for the better, but Speidell South showed less desirable change. Despite two seedings at Fox, diversity remains low. If excessive soil moisture or flooding were an issue here, some seed may have been destroyed or when cattle grazed there in the same year as seeding, they may have pressed the seed in too deep. Additionally, it is early to see many results of the second seeding. Also floristic quality remains compromised by the dominance of yellow sweet clover from the first seeding. Hostetler,

another site that was seeded, is showing continued improvement. It continues to show increased diversity and improvements in all measures of floristic quality.

The new site, Dippel, is one of the more diverse sites with 95 different species, however, it has one of the three lowest weighted FQI, indicating that low quality species are more abundant than those of higher value.

## SHOEMAKER ISLAND

Each of the Binfield sites showed some improvement in FQI. Most are just short of the desired FQI of 30. Binfield West is the only site with an FQI above 30. The highest quality natives are found in Binfield South and Binfield South Hay. The native average C value in these two sites is above 4.

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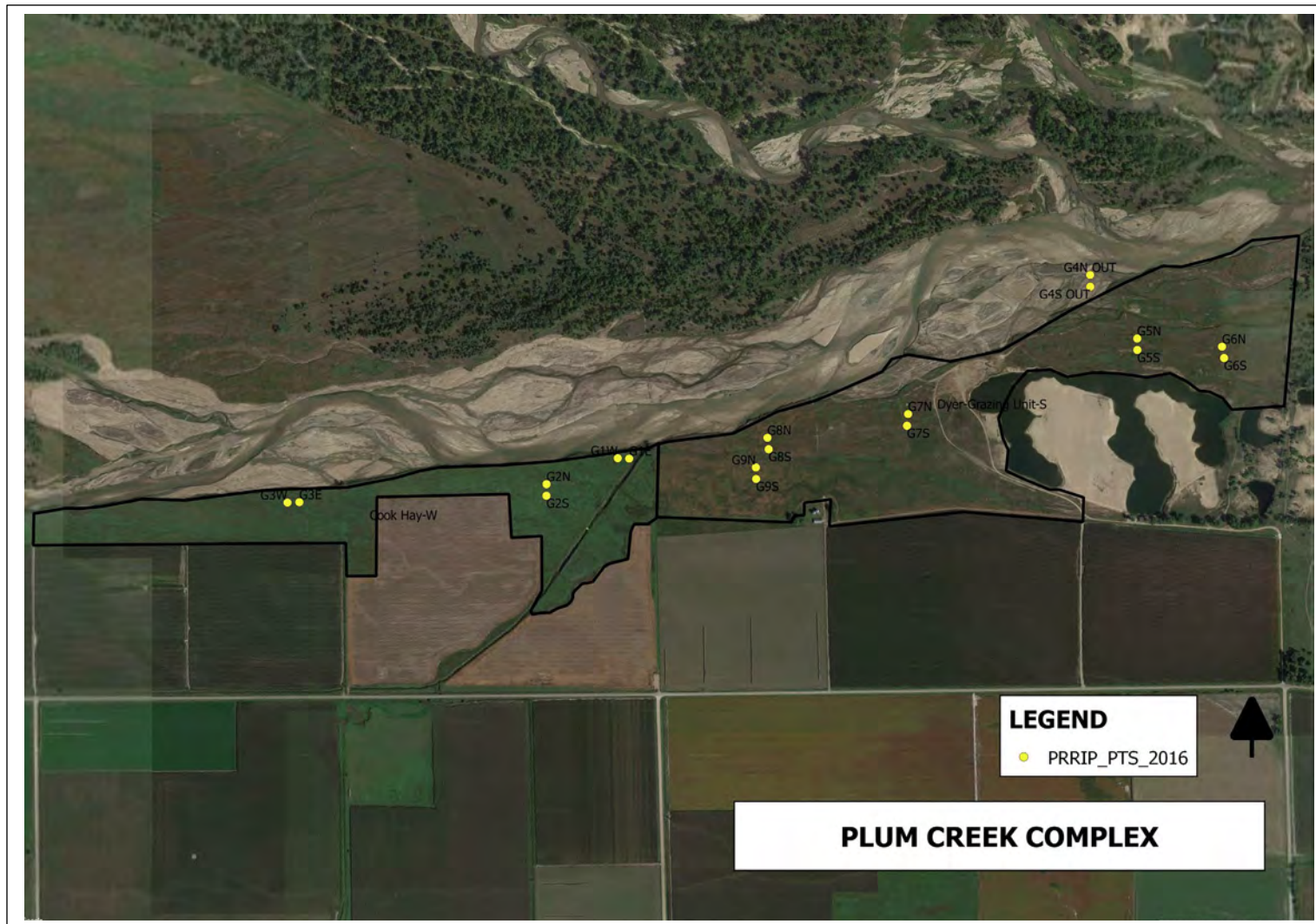
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## FIGURES

Figure 1. Plum Creek Complex Transects





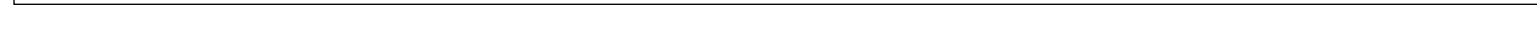
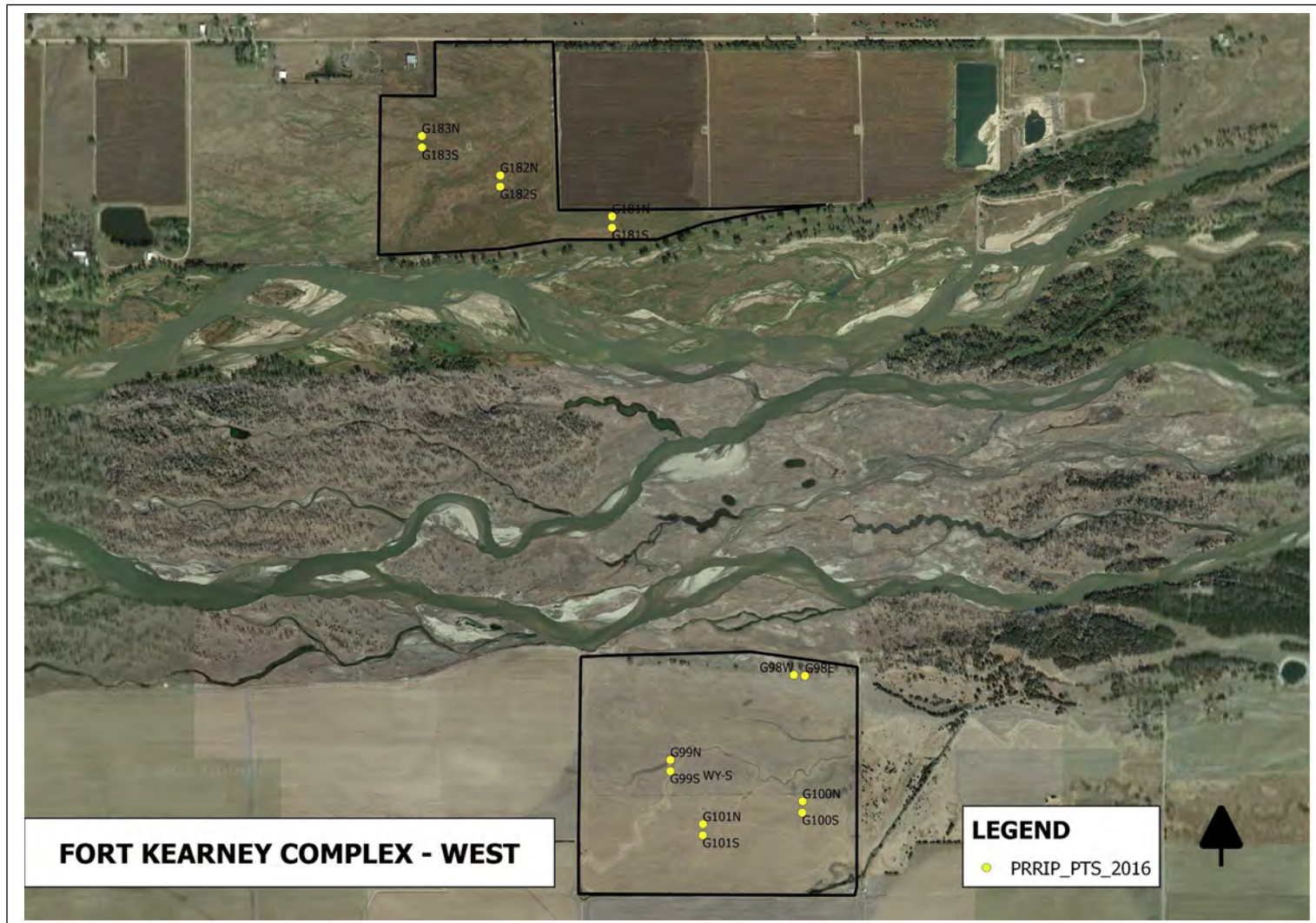


Figure 3. Fort Kearney Complex – West Transects





**LEGEND**

● PRRIP\_PTS\_2016

**FORT KEARNEY COMPLEX - EAST**

Figure 5. Cottonwood Ranch Complex – North Transects

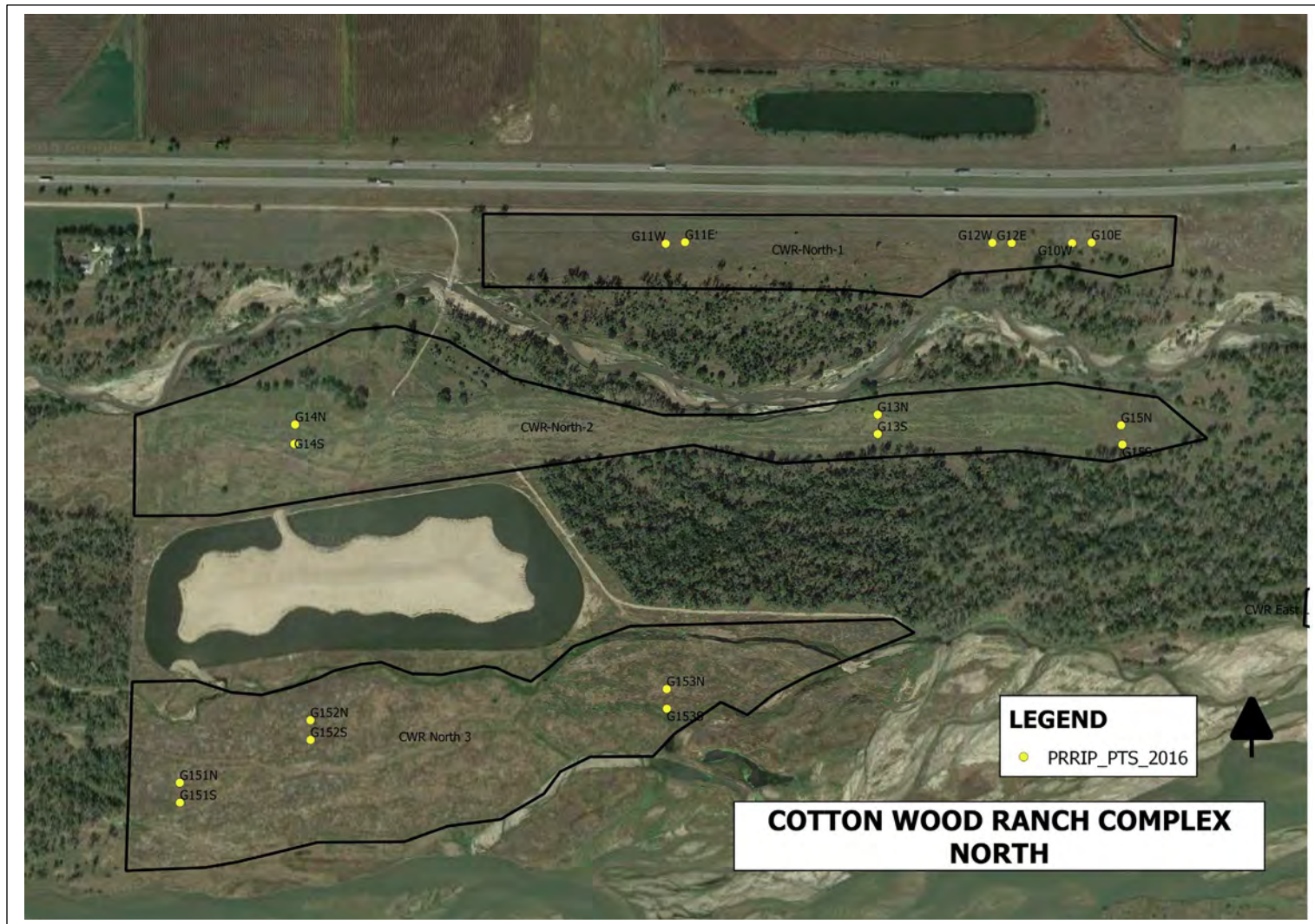




Figure 6. Cottonwood Ranch Complex – East Lloyd Island Transects

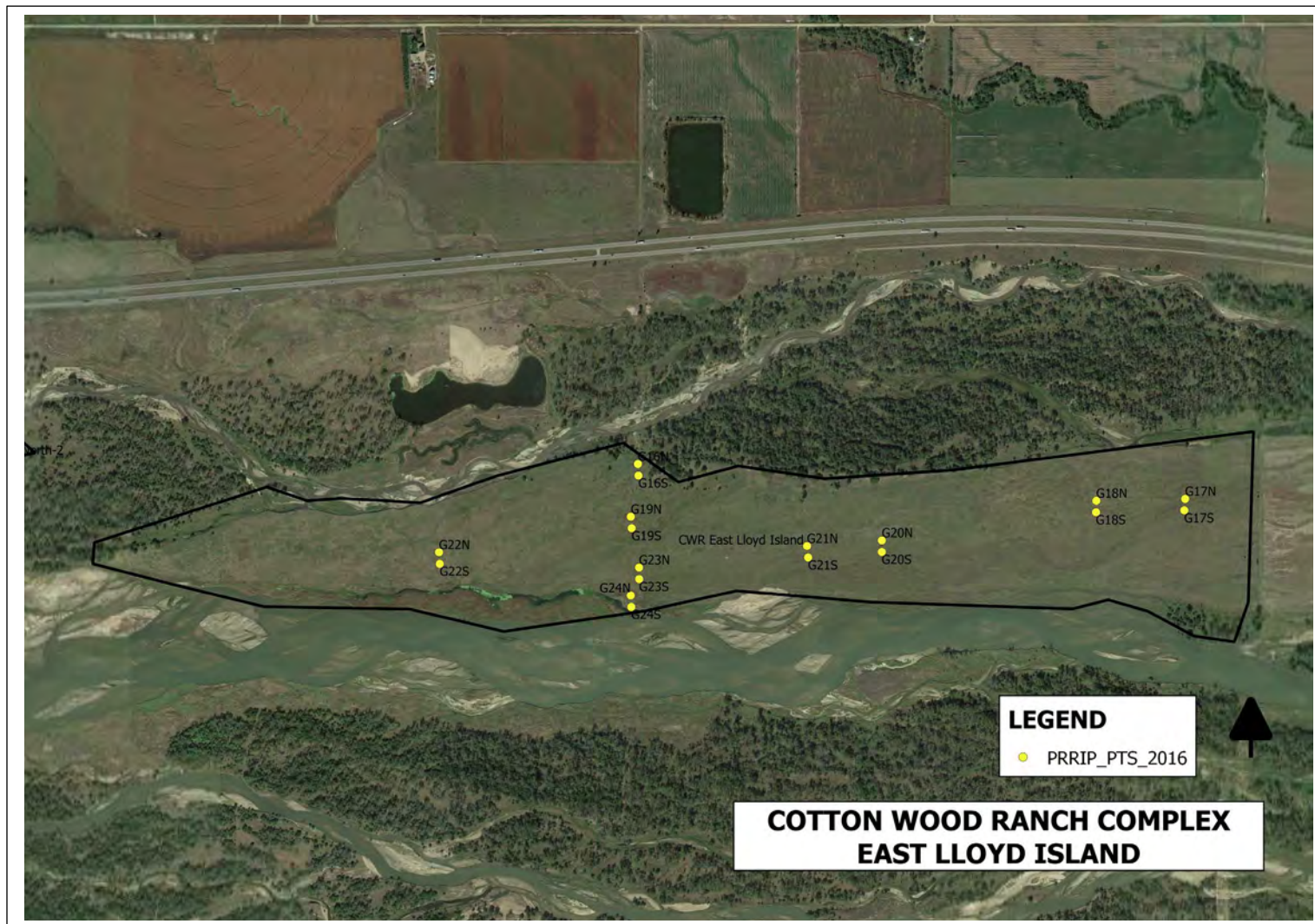


Figure 7. Cottonwood Ranch Complex – South Transects

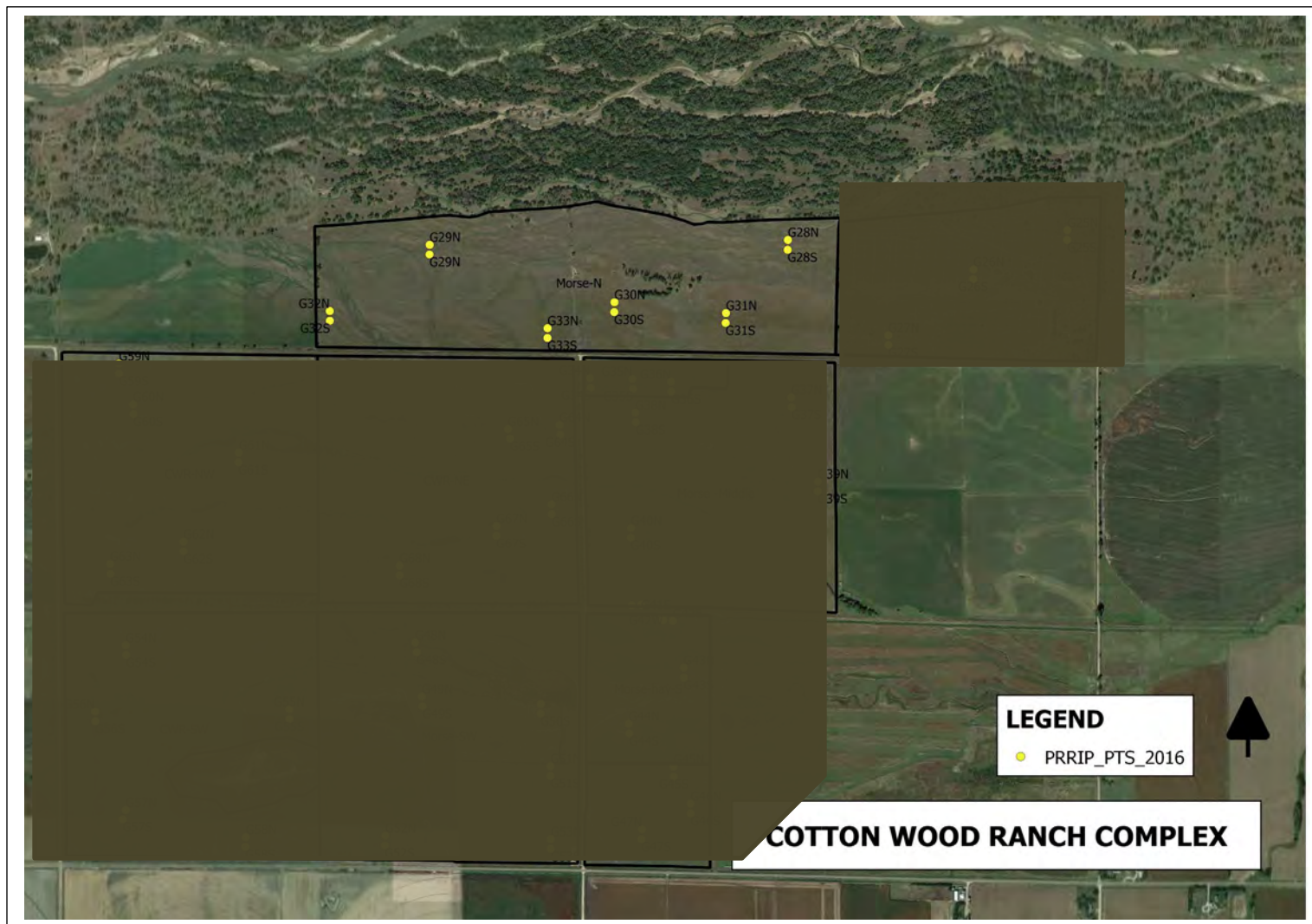




Figure 8. Shoemaker Island Complex – Transects

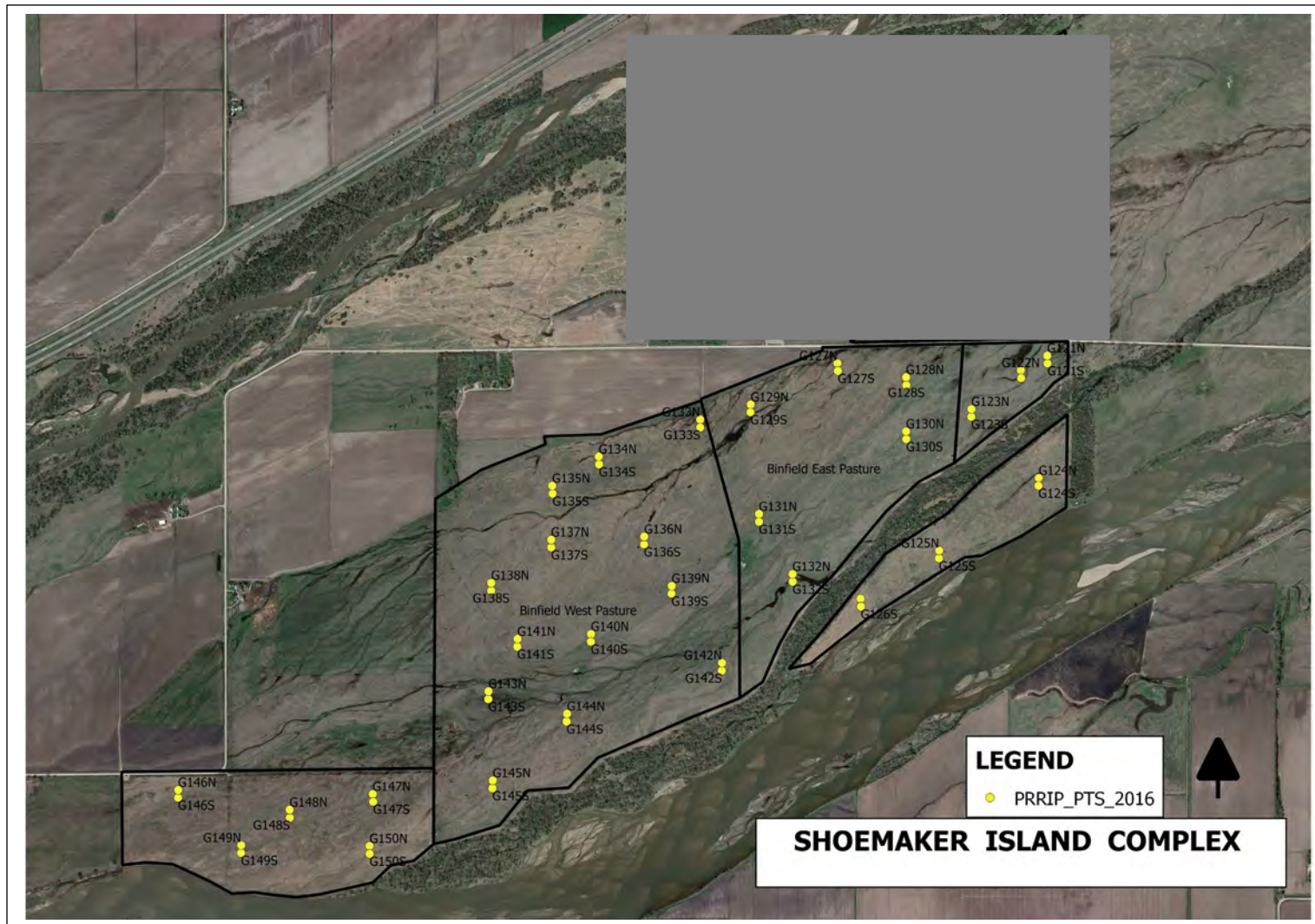
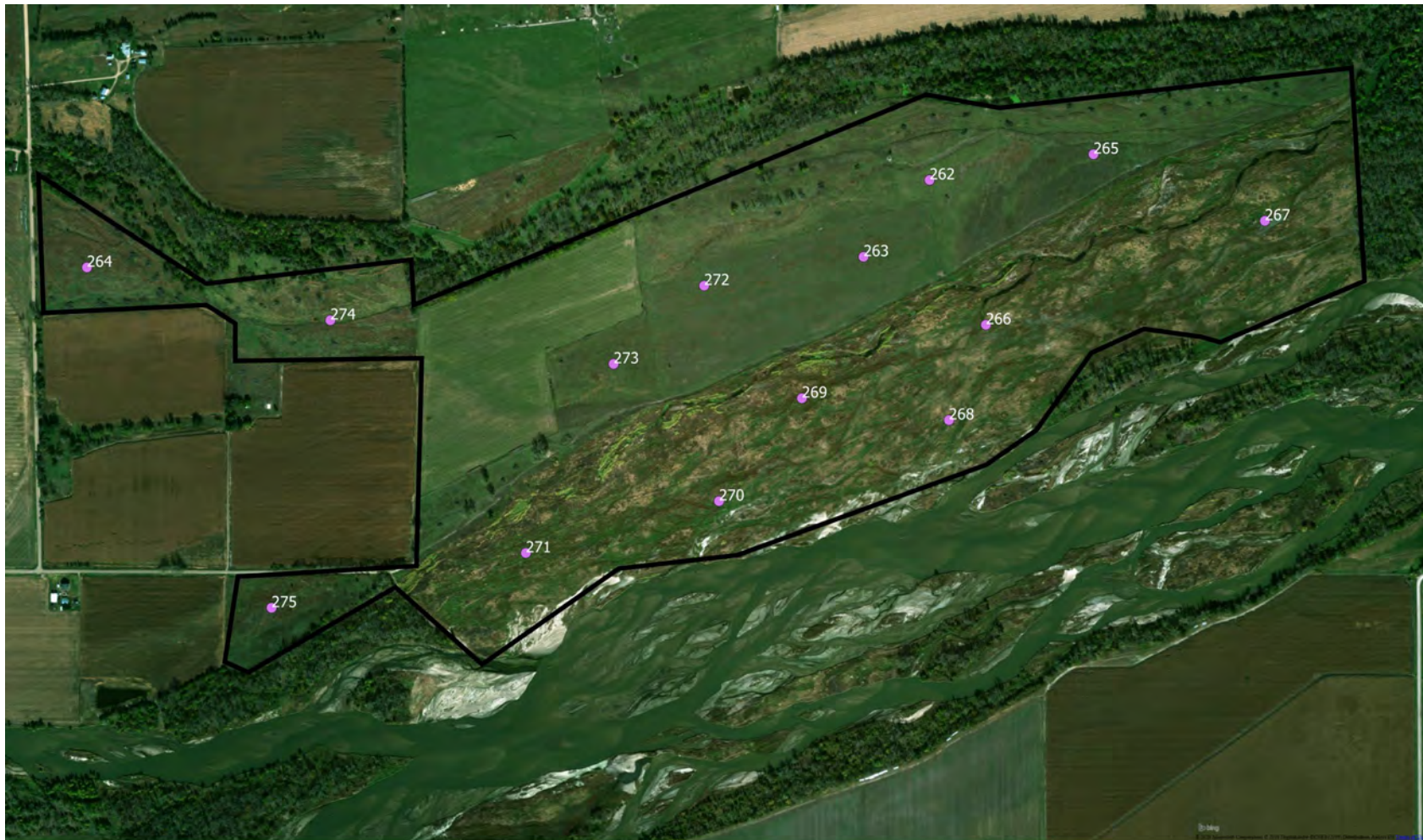


Figure 9. Dippel – Transects



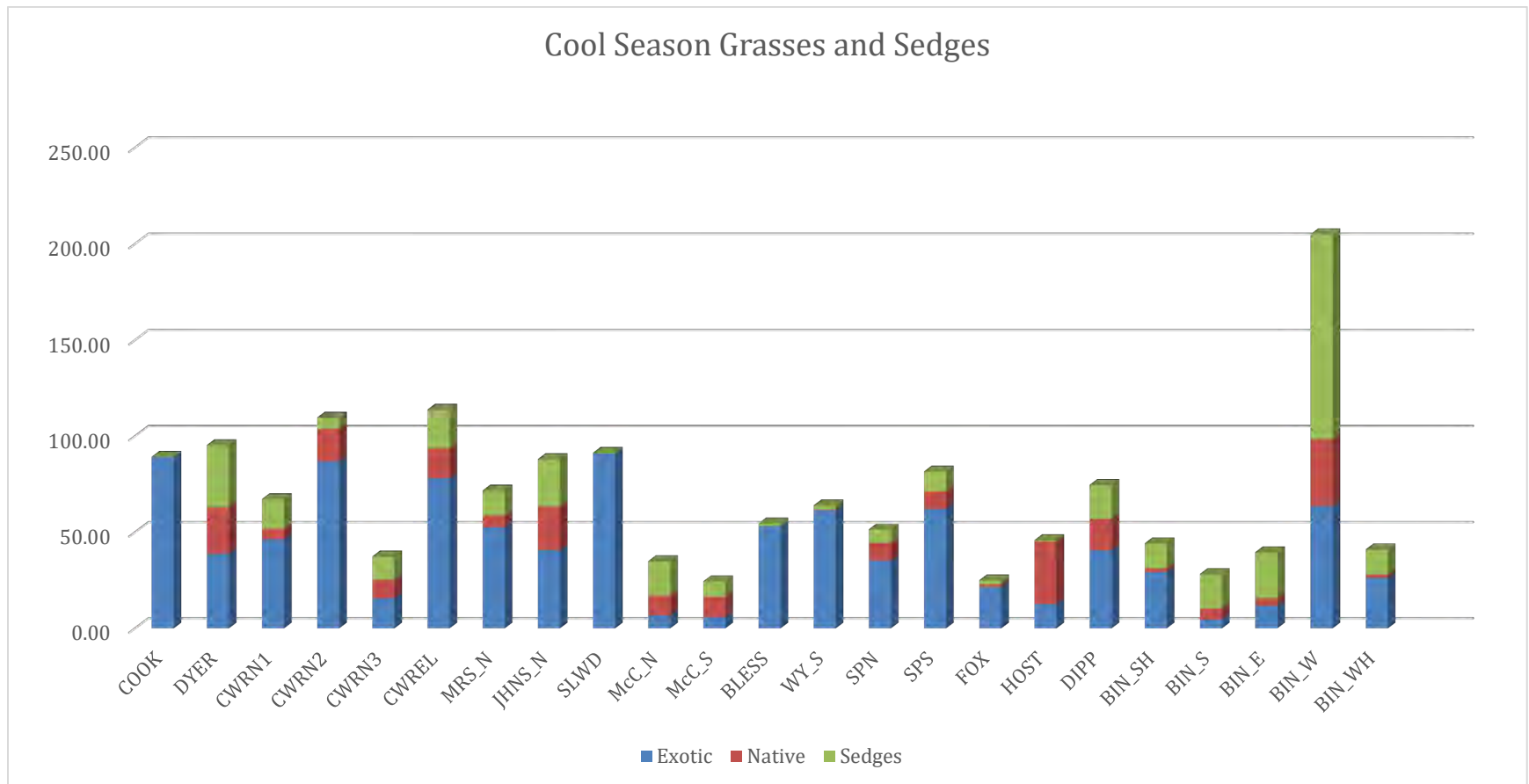
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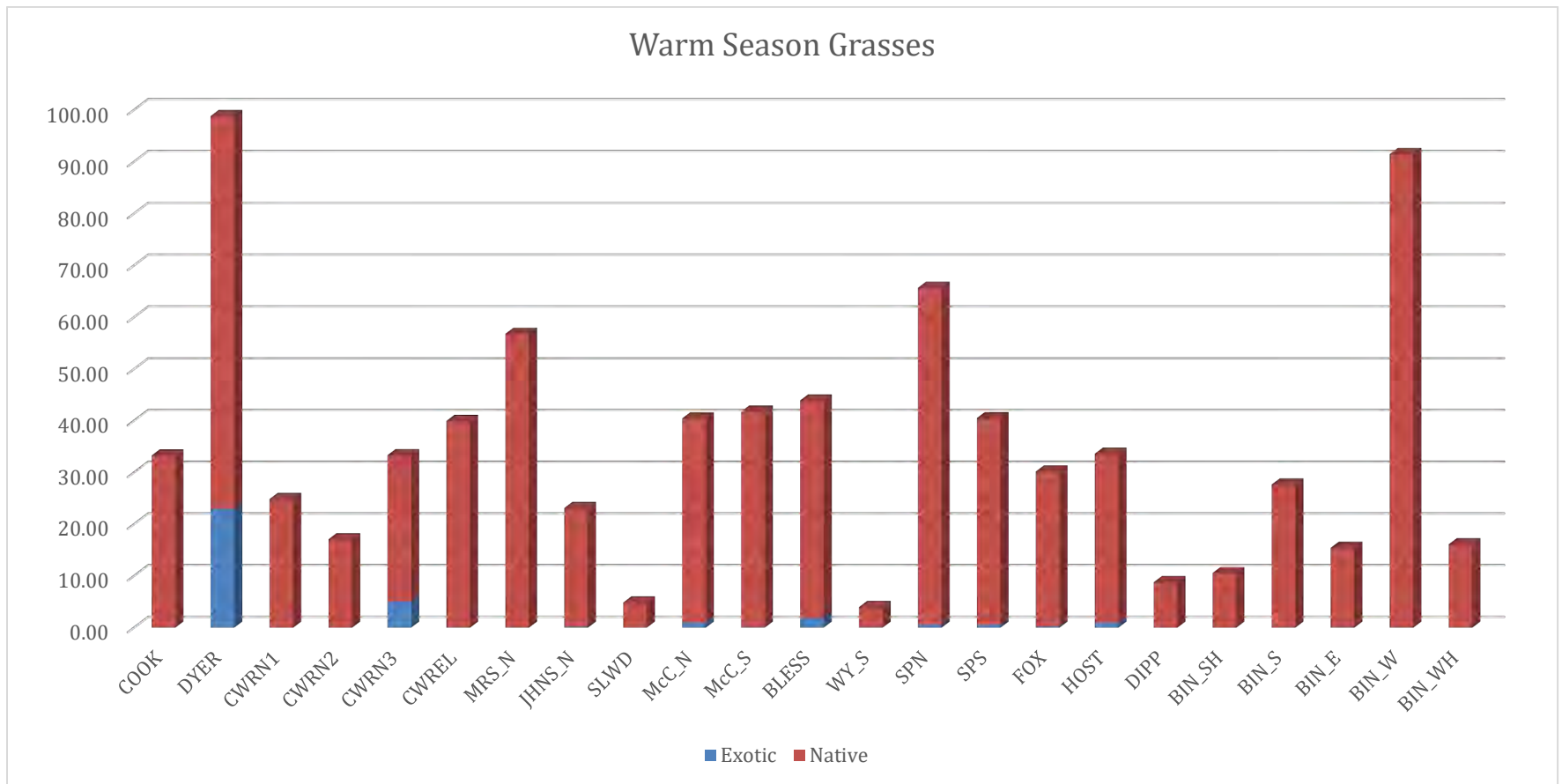
**DIPPEL**



**Figure 10: Absolute cover of cool season species for 2019.** These charts each combine exotic cool season grasses, native cool season grasses and grasslike coverage in stacks to show total absolute cool season coverage. All sedges found are native.

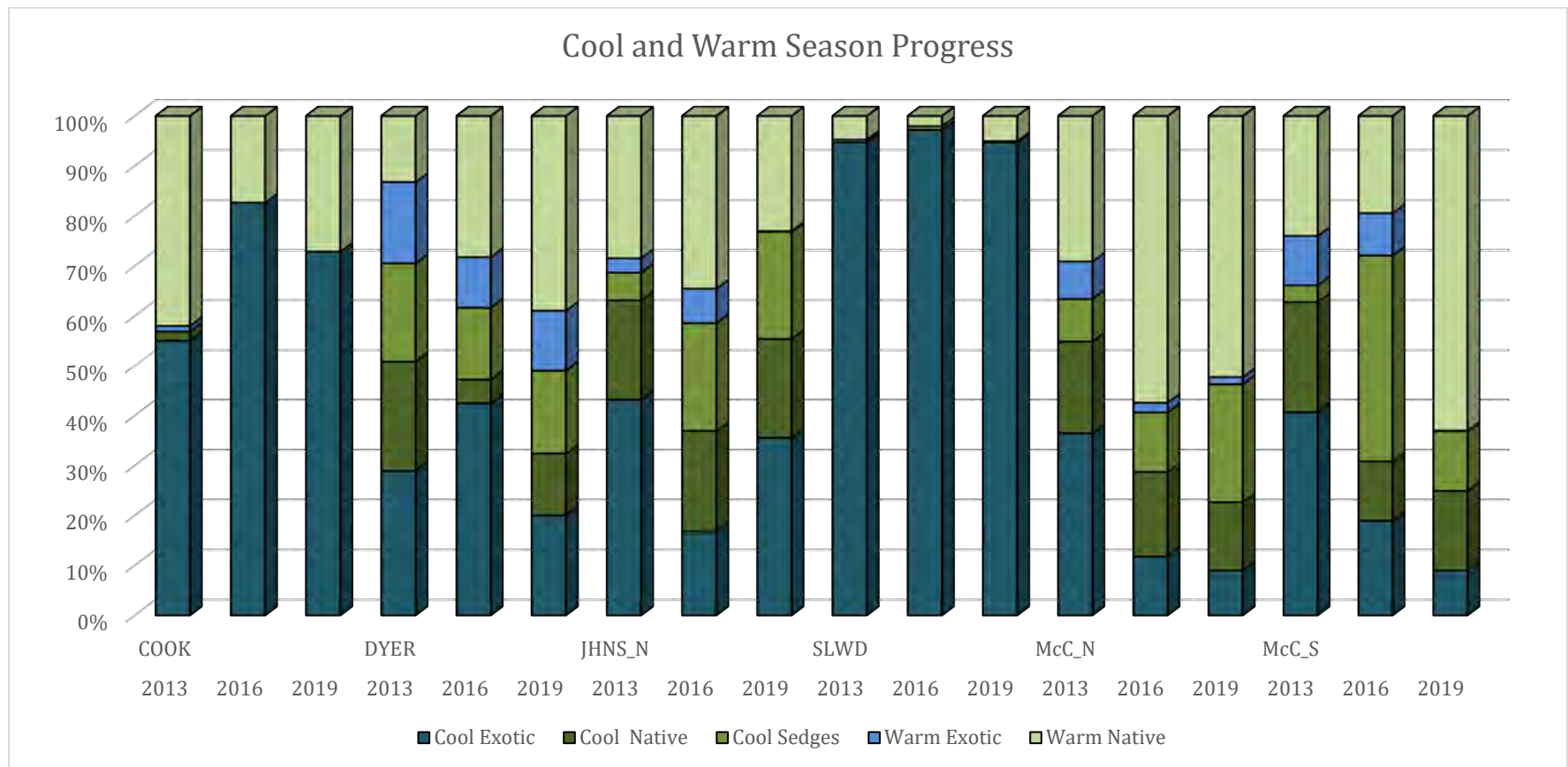


**Figure 11: Absolute cover of warm season species in 2019.** This chart combines exotic warm season grasses and native warm season grasses in stacks to show total warm season coverage.

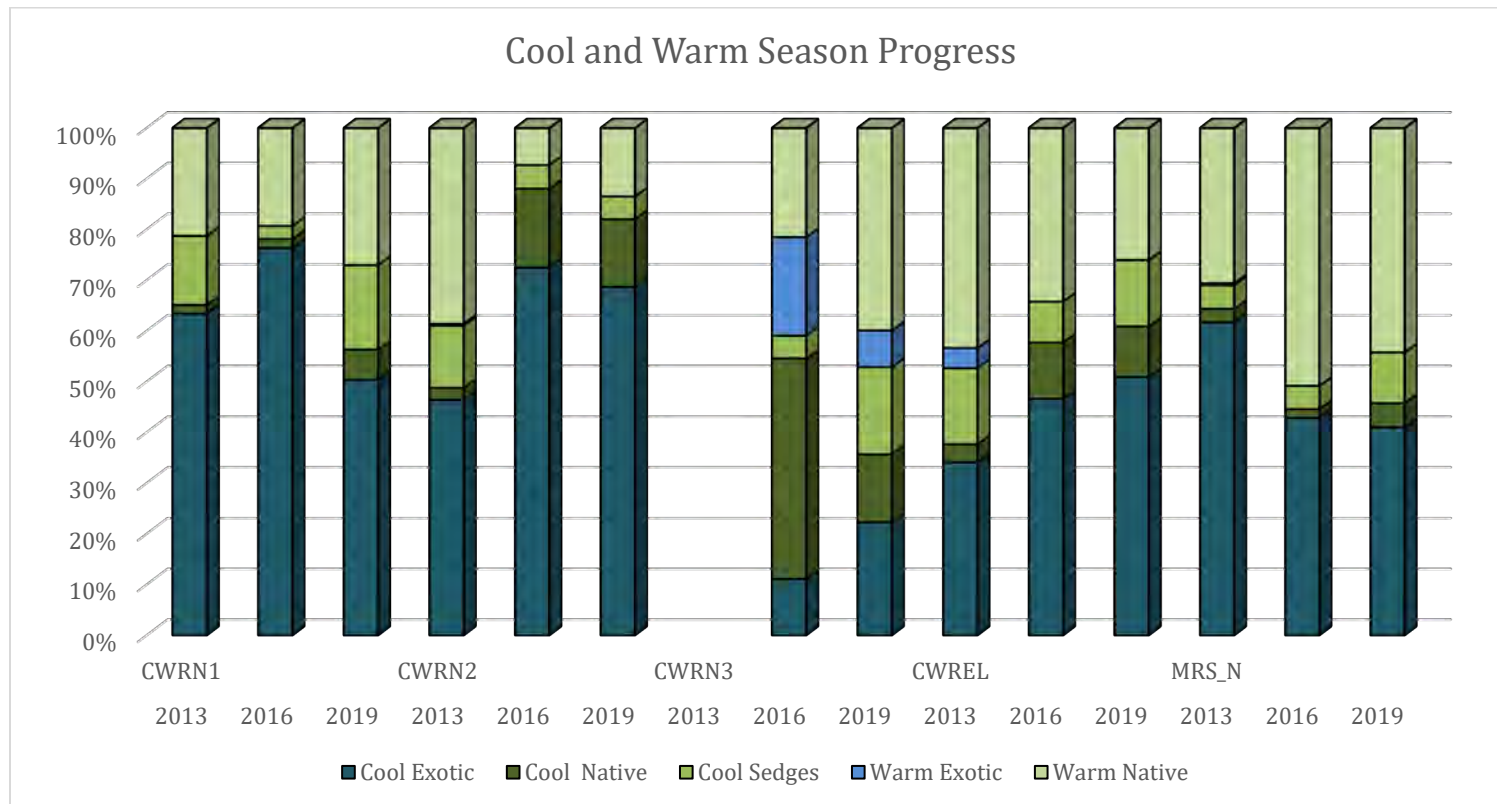




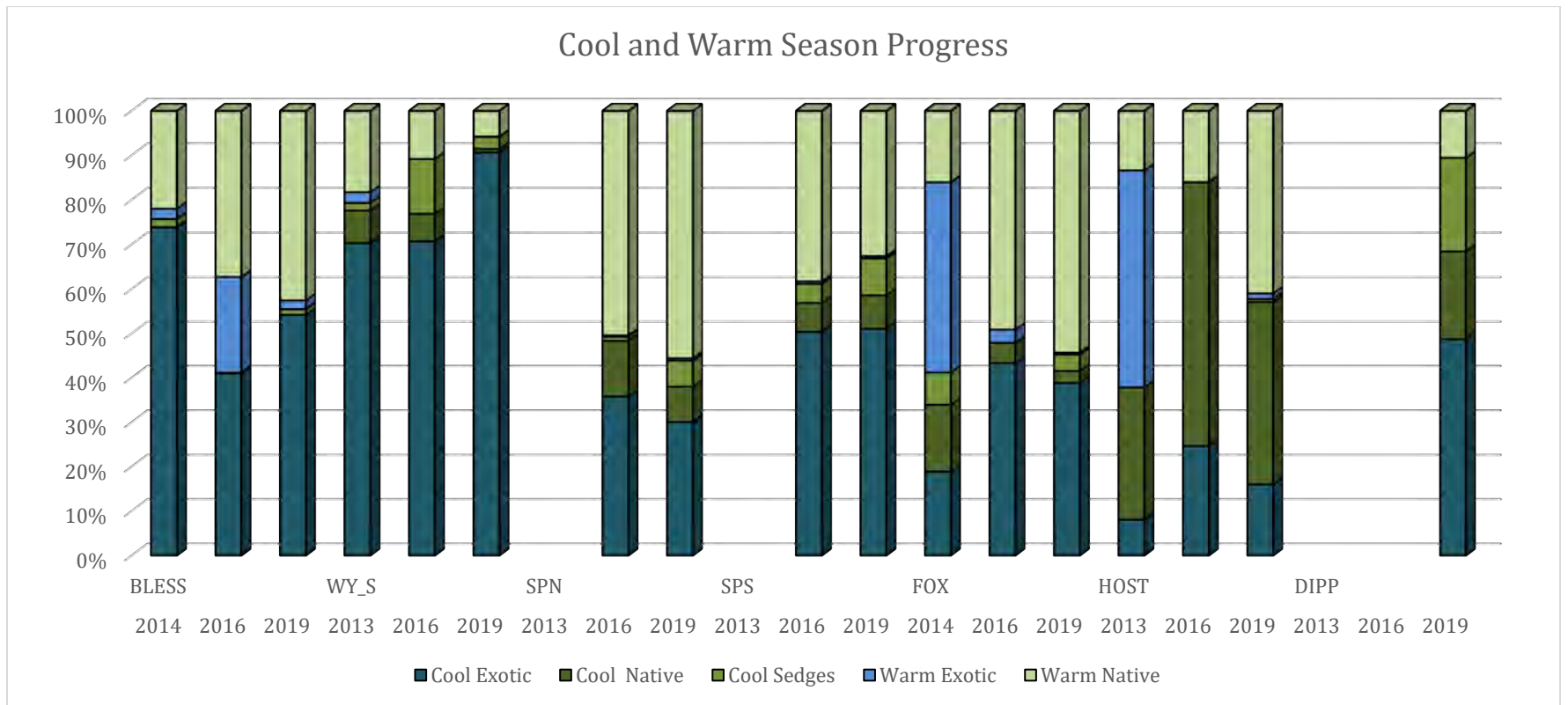
**Figure 12A: Comparison of Relative cover at Plum and Elm Creek complexes.** This chart compares all cool and warm season native and exotic grasses and sedges against each other as if they represented 100 percent of cover for each site and across all sampling years. This chart is not a reflection of true (absolute) cover. Use this chart to compare cover of species types to each other and across sampling dates. Increases or decreases represent proportional changes to other species types, not actual changes in cover. Natives are in shades of green and exotics are in shades of blue. Warm season species are at the top of the column and cool season species are on the bottom of the column.



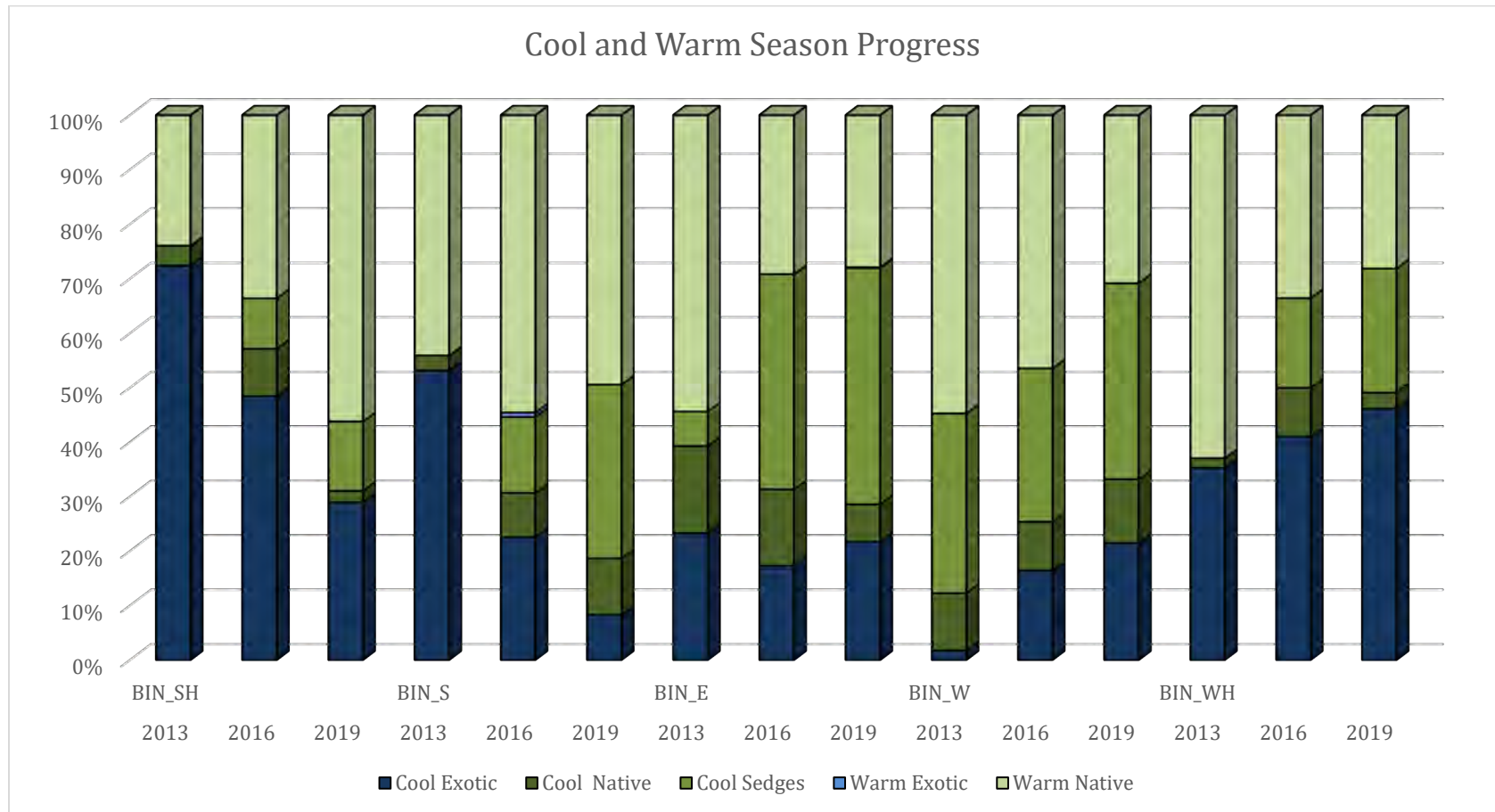
**Figure 12B: Comparison of relative cover at Cottonwood Creek Complex.** This chart compares all cool and warm season native and exotic grasses and sedges against each other as if they represented 100 percent of cover for each site and across all sampling years.. This chart is not a reflection of true (absolute) cover. Use this chart to compare cover of species types to each other and across sampling dates. Increases or decreases represent proportional changes to other species types, not actual changes in cover. Natives are in shades of green and exotics are in shades of blue. Warm season species are at the top of the column and cool season species are on the bottom of the column.



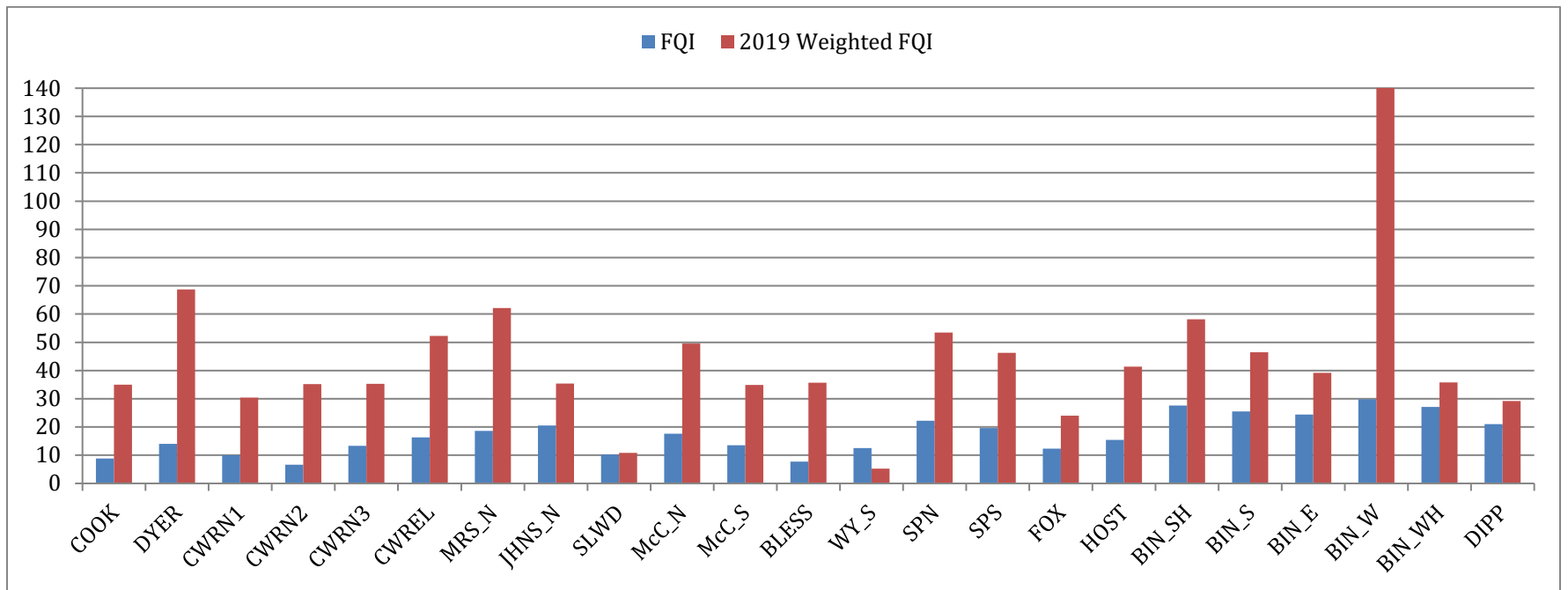
**Figure 12C: Comparison of relative cover at Fort Kearney Complex.** This chart compares all cool and warm season native and exotic grasses and sedges against each other as if they represented 100 percent of cover for each site and across all sampling years.. This chart is not a reflection of true (absolute) cover. Use this chart to compare cover of species types to each other and across sampling dates. Increases or decreases represent proportional changes to other species types, not actual changes in cover. Natives are in shades of green and exotics are in shades of blue. Warm season species are at the top of the column and cool season species are on the bottom of the column.



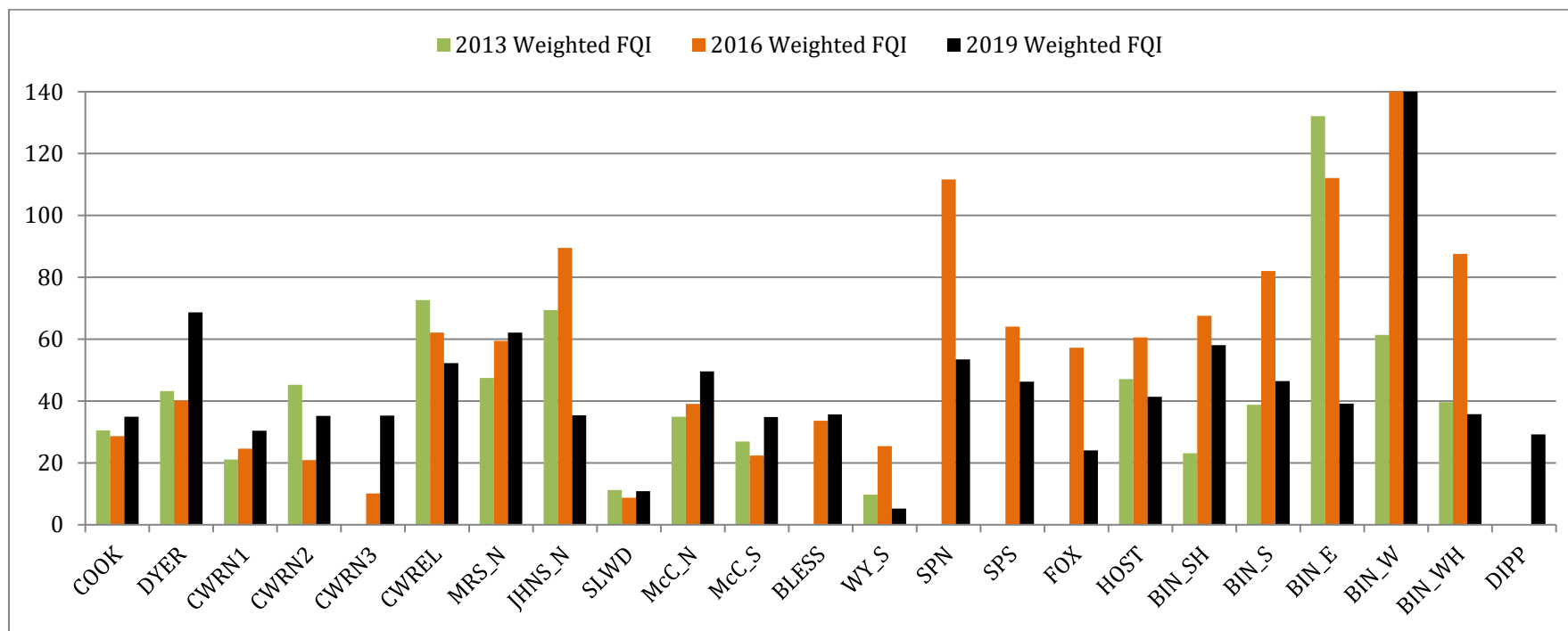
**Figure 12D: Comparison of relative cover at Shoemaker Island Complex and Dippel.** This chart compares all cool and warm season native and exotic grasses and sedges against each other as if they represented 100 percent of cover for each site and across all sampling years. This chart is not a reflection of true (absolute) cover. Use this chart to compare cover of species types to each other and across sampling dates. Increases or decreases represent proportional changes to other species types, not actual changes in cover. Natives are in shades of green and exotics are in shades of blue. Warm season species are at the top of the column and cool season species are on the bottom of the column.



**Figure 13: Comparison of FQI and weighted FQI values for 2019.** This chart compares floristic quality and weighted floristic quality of each site.



**Figure 14: Comparison of weighted FQI values.** This chart compares weighted Floristic Quality Index values for 2013, 2016, and 2019. Fox and Blessing sites were first surveyed in 2014 and those values are included in the 2013 data on this graph. Higher values indicate greater cover of higher quality native species or reduced cover of lower quality species or a combination of both.





**Figure 15: Hostetler crop site in 2013, 2016 and 2019 at the same transect.** These photos clearly show the transition from a dominance of annual adventive species to dominance by more permanent perennial species.



# TABLES

**Table 1A. Site names west of Kearney.** Acres, seeding and management since the date of the 2013 survey through 2016 and the number of plots placed at each location.

SITE NAME	ACRES	MGMT 2013 Survey <July15	MGMT 2014	MGMT 2015	MGMT 2016	# PLOTS
Cook Hay Meadow	61	Hay	Rest	Burn/Rest	Hay	3
Dyer Grassland	125	Seeded 2010	Graze May 1-July 31 38 pair & 1 bull (1 AU/4 acres)	Spring burn Graze May 1-July 31 38 pair & 1 bull (1 AU/4 acres)	Grazed May 1-July 31 38 pair & 1 bull (1 AU/4 acres)	6
		Grazed Grazed	Graze 75 pair May-Oct July 1 rest ELI	Graze 100 pair May-Oct July 1 rest ELI	Grazed	
CWR North 1 & 2	81				Grazed	6
CWR East Lloyd Island	252				Spr Burn/Rest	9
CWR North 3			N/A	N/A	Rest	
Morse North	166	Hay	Graze 100 pair 4/15 to 5/15 & 7/1 to 8/1	Spr Burn/Graze 109 pair first 2 wks June, Aug, Oct	Graze 85 pair First 2 wks June, Aug, Oct	6
Johns North Wet Meadow	381	Grazed	Graze May 1-July 15 with 40 pair	Graze May 15-June 15, Aug 1- Sep 1, Sep 15- Oct 15 w/ 40 pair	Spring burn North 1/2 & Graze May 1-Oct 15 with 36 pair	13
Sullwald Hay Meadow	36	Hay July 15	Spr burn/ Rest	Hay July 15	Hay	3
McCormick North Island	34	Grazed	Graze April 1-May 1	Burned	Rest	3
McCormick South Meadow	42	Grazed	188 pair (1 AU/.56 acres)	Graze April 1-May 1 with 101 pair (1 AU/1.1 acres)	Spring burned & Rested & Grazed	4



**Table 1B. Site names east of Kearney.** Acres and management since the date of the 2013 survey through 2016 and the number of plots placed at each location.

SITE NAME	ACRES	MGMT 2013 Survey <July15	MGMT 2014	MGMT 2015	MGMT 2016	# PLOTS
Blessing	68	Former CRP	Cedars Cleared/Graze May 1-15, June 1-15, July 1-15, & Aug 1-15 with 10 pair	Graze May 1-15, June 1-15, July 1-15, & Aug 1-15 with 9 pair	Spr Burn/Rest	4
WY South Meadow	118	Grazed	Graze May 1-Sept 30 with 15 pair (1 AU/8 acres) & hay S. 1/2 after July 15	Burned south 1/2 in spring & Graze May 1-Sept 30 with 15 pair (1 AU/8 acres)	Graze May 1-Sept 30 with 15 pair (1 AU/8 acres) & hay NE 1/4 & S 1/2 after July 15	4
Speidell North	298		N/A	Graze April 1-Sept 30 with 70 pair (1 AU/4.3 acres)	Rested & hayed south 1/3 after July 15	5
Speidell South	148		N/A	Rest	Graze May 1-Sept 30 with 70 pair (1 AU/3 acres)	5
Fox	181	Seeded 2012	Hayed after July 15	Hayed after July 15	Graze May 1-Sept 30 with 26 pair & 1 bull (1 AU/6.4 acres)	5
Hostetler Crop	222	Seeded	Hayed July 15	Burned whole tract & hayed east 1/2 after July 15	Graze May 1-Sept 30 with 22 pair & 1 bull (1 AU/9.6 acres)	8
Binfield South Hay Meadow	30	Hay	Rest	Burned & Hayed after July 15	Hay July 15	3
Binfield South Meadow	57	Grazed	Graze May 1- Sep 12 26 pair (1 AU/5 acres)	Graze May 1- Sep 12 with 26 pair (1 AU/5 acres)	Spring Burn/ Rest	3
Binfield East Meadow	179	Grazed	Graze May 1- Sep 30 23 pair (1 AU/8 acres)	Spring burn North 1/2 & Graze May 1- Sep 30 with 31 pair (1 AU/6 acres)	Spring burn south 1/3 & Graze May 1- Sep 30 with 23 pair (1 AU/8 acres)	6
Binfield West Meadow	361	Grazed	Graze May 1- Sep 30 with 26 pair (1 AU/9 acres)	Spring burn North 1/2 & Graze May 1- Sep 30 with 47 pair (1 AU/8 acres)	Spring burn South 1/2 & Graze May 1- Sep 30 with 37 pair (1 AU/ 10 acres)	13
Binfield West Hay Meadow	124	Hay	Hay July 15	Spr Burn/Rest	Hay July 15	5

**Table 1C. Site names west of Kearney.** Acres and management after the 2016 survey date through 2019 and the number of plots placed at each location. Activities July 15, 2019, and later were completed after this survey.

SITE NAME	ACRES	MGMT 2016 Survey >July15	MGMT 2017	MGMT 2018	MGMT 2019 Survey <July15	# PLOTS
Cook Hay Meadow	61	Hayed after July 15	Hayed after July 15	Hayed after July 15	Spring burn & rested	3
Dyer Grassland	125	Grazed May 1-July 31 with 38 pair & 1 bull (1 AU/4 acres)	Grazed May 1-July 31 with 38 pair & 1 bull	Grazed May 1-July 31 with 33 pair & 1 bull	Spring burn & rested	6
		Spring burn & rested	Graze May 1-Oct 15 with 80 pair	Graze May 1-Oct 15 with 80 pair	Graze May 1-Oct 15 with 80 pair	
CWR North 1 & 2	81					6
CWR East Lloyd Island	252					9
CWR North 3						3
Morse North	166	Rotational graze June 1-15, Aug 1-15, & Oct 1-15 with 85 pair	Rotational graze June 1-15, Aug 1-15, & Oct 1-15 with 85 pair	Rotational graze June 1-15, Aug 1-15, & Oct 1-15 with 120 pair	Graze April 15-Oct 15 with 30 pair	6
Johns North Wet Meadow	381	Spring burn North 1/2 & Graze May 1-Oct 15 with 36 pair	Graze May 1-July 15 with 40 pair	Graze May 1-Oct 15 with 40 pair	Spring burn south 1/2 & Graze May 1-Oct 15 with 40 pair	12 13-1
Sullwald Hay Meadow	36	Hayed after July 15	Hayed after July 15	Rested	Rested	3
McCormick North Island	34	Rested	Rested	Rested	Rested	3
McCormick South Meadow	42	Spring burned & Rested	Graze April 1-May 1 with 109 pair	Graze April 1-May 1 with 72 pair	Graze April 1-June 1 with 70 pair	4

**Table 1D. Site names east of Kearney.** Acres and management after the 2016 survey date through 2019 and the number of plots placed at each location. Activities July 15, 2019, and later were completed after this survey.

SITE NAME	ACRES	MGMT 2016 Survey >July15	MGMT 2017	MGMT 2018	MGMT 2019 Survey <July15	# PLOTS
Blessing	68	Spring burned & Rested	Rotational graze May 1-15, June 1-15, July 1-15, & Aug 1-15 with 22 pair	Rotational graze May 1-15, June 1-15, July 1-15, & Aug 1-15 with 22 pair	Spring burned & Rested	3 4-1
WY South Meadow	118	Graze May 1-Sept 30 with 15 pair (1 AU/8 acres) & hay NE 1/4 & S 1/2 after July 15	Hayed after July 15th	Hayed after July 15th	Graze April 15-Sept 30 with 20 pair & hay NW 1/4 after July 15	4
Speidell North	298	Rested & hayed south 1/3 after July 15	Rested & Hayed after July 15 Spring burned, South portion not hayed	Rested	Spring burned & Rested	10
Speidell South	148	Graze May 1-Sept 30 with 70 pair (1 AU/3 acres)	Graze May 1-Sept 30 with 35 pair	Spring burn & Graze May 1-Sept 30 with 60 pair	Graze May 1-Sept 30 with 43 pair	5
Fox	181	Graze May 1-Sept 30 with 26 pair & 1 bull (1 AU/6.4 acres)	Grazed May 1-September 30 with 27 pair & 1 bull & Fall burn - overseed with HD forb mix	Grazed May 1-September 30 with 25 pair & 1 bull & Fall burn	Rested	6 5+1
Hostetler Crop	222	Graze May 1-Sept 30 with 22 pair & 1 bull (1 AU/9.6 acres)	Spring burned west 1/3 - Graze May 1-Sept 30 with 35 pair & 1 bull	Spring burned east 1/3 - Graze May 1-Sept 30 with 42 pair & 2 bull	Spring burned middle 1/3 - Graze May 1-Sept 30 with 43 pair & 2 bull	8
Binfield South Hay Meadow	30	Hayed after July 15	Hayed after July 15	Rested	Spring burned & Rested	3
Binfield South Meadow	57	Spring burned & Rested	Spring burned & Graze May 1- Sep 30 with 12 pair	Graze May 1- Sep 13 with 26 pair	Spring burned & Graze May 1- Sep 30 with 14 pair	3
Binfield East Meadow	179	Spring burn South 1/3 & Graze May 1- Sep 30 with 23 pair (1 AU/8 acres)	Graze May 1- Sep 30 with 37 pair	Graze May 1- Sep 30 with 37 pair & Rest NE 31 acres	Spring burn North 1/2 & Graze May 1- Sep 30 with 73 pair & rest SE 87 acres	6
Binfield West Meadow	361	Hayed after July 15	Hayed after July 15	Hayed after July 15	Spring burned & Rested	13
Binfield West Hay Meadow	124	Spring burn South 1/2 & Graze May 1- Sep 30 with 37 pair (1 AU/ 10 acres)	Graze May 1- Sep 30 with 70 pair	Graze May 1- Sep 30 with 70 pair & rest NW 95 acres	Spring burn North 1/2 & Graze May 1- Sep 30 with 38 pair & rest SW 42 acres	5
Dippel	376	N/A	N/A	Graze May 1-Sept 30 with 26 pair	Graze May 1-Sept 30 with 26 pair	14

**Table 2. Noxious Weeds.** Plots containing noxious weeds.

<u>MUSK THISTLE</u>	<u>CANADA THISTLE</u>	<u>LEAFY SPURGE</u>	<u>REED CANARYGRASS</u>	<u>PURPLE LOOSESTRIFE</u>
BLESS_19_G183	CWRN3_19_G153	DYER_19_G8	CWREL_19_G24	BIN_E_19_G132
CWREL_19_G16	DIPP_19_G267	JOHNS_NWM_19_G70	CWREL_19_G27	BIN_W_19_G135
CWREL_19_G18		JOHNS_NWM_19_G72	DIPP_19_G266	BIN_W_19_G136
CWREL_19_G19		JOHNS_NWM_19_G77	DIPP_19_G267	BIN_WH_19_G147
CWREL_19_G21		JOHNS_NWM_19_G79	DIPP_19_G268	BIN_WH_19_G148
CWREL_19_G22		McC_NI_19_G91	DIPP_19_G269	BIN_WH_19_G149
CWREL_19_G23			DIPP_19_G270	BIN_WH_19_G149
CWREL_19_G24			DIPP_19_G271	DIPP_19_G266
CWRN1_19_G10			DIPP_19_G274	DIPP_19_G270
CWRN2_19_G13			JOHNS_NWM_19_G70	DIPP_19_G271
CWRN2_19_G15			JOHNS_NWM_19_G71	JOHNS_NWM_19_G71
CWRN2_19_G15			JOHNS_NWM_19_G72	JOHNS_NWM_19_G77
CWRN3_19_G151			JOHNS_NWM_19_G76	JOHNS_NWM_19_G80
CWRN3_19_G152			JOHNS_NWM_19_G77	
CWRN3_19_G153			JOHNS_NWM_19_G78	
DIPP_19_G263			JOHNS_NWM_19_G80	
DYER_19_G5			McC_NI_19_G91	
DYER_19_G9			McC_SM_19_G97	
JOHNS_NWM_19_G71			SP_N_19_G164	
JOHNS_NWM_19_G73			SP_N_19_G167	
JOHNS_NWM_19_G79			SP_N_19_G169	
McC_NI_19_G91				
McC_SM_19_G97				
MORSEN_19_G28				
MORSEN_19_G29				
MORSEN_19_G32				
SP_N_19_G164				
SP_N_19_G165				
SP_N_19_G168				
SP_S_19_G157				
SP_S_19_G158				
SP_S_19_G159				
SP_S_19_G161				
SP_S_19_G162				
SP_S_19_G163				

**Table 3A. Cool season grass cover of the west sites.** Cover of individual cool season grass species listed by site. Exotic cool season grasses are listed first with a total cover followed by natives and a total of all cool season cover. Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

EXOTIC COOL SEASON SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWREL	MRS_ N	JOHNS _N	SLWD _HM	MCM_ S	MCM_ N
AGROSTIS GIGANTEA	redtop						3.13					
AGROSTIS STOLONIFERA	creeping bentgrass											
BROMUS INERMIS	smooth brome	53.03	2.22	17.08	0.53	2.65	14.83	23.80	7.19	76.95		0.50
BROMUS JAPONICUS	Japenese brome		2.38	2.55	26.20	3.87	13.89	6.08	13.39		5.57	4.93
BROMUS TECTORUM	downy brome	3.00	28.20	1.85	6.85	0.08	4.13	2.07	5.15			
ELYMUS REPENS	quackgrass											
PHLEUM PRATENSE	timothy						3.00					
POA COMPRESSA	Canada bluegrass		5.55	16.83	1.77	3.20	5.44	8.83	1.96	3.72		0.50
POA PRATENSIS	Kentucky bluegrass	33.25	0.62	6.00	51.73	5.98	25.25	9.75	13.21	9.95	1.23	0.08
SCHEDONORUS ARUNDINACEUS	tall fescue											
SCHEDONORUS PRATENSIS	meadow fescue						0.13	2.25		0.50		
THINOPYRUM PONTICUM	tall wheatgrass			2.12			8.53					
TRITICUM AESTIVUM	bread wheat											
TOTAL EXOTIC COOL SEASON		89.28	38.97	46.43	87.08	15.78	78.33	52.78	40.89	91.12	6.80	6.02
NATIVE COOL SEASON SPECIES												
Calamagrostis stricta	northern reedgrass					0.50			0.67			
Dichanthelium acuminatum	w. spring-panicum				1.40	2.55		1.71	3.23		0.62	
Dichanthelium oligosanthos	Scribner's panicum		1.00	3.08	11.05	3.53	1.15	3.62			7.05	0.08
Dichanthelium villosissimum	white-hair panicum											
Elymus canadensis	Canada wild-rye		10.25			1.07	0.13					
Elymus sp.												
Elymus trachycaulus	slender wheatgrass											
Elymus virginicus	Virginia wild-rye								0.05			
Festuca octoflora	six-weeks fescue				1.40			0.74				
Hordeum jubatum	foxtail barley						0.96		4.78			
Hordeum pusillum	little barley		0.50	0.75			6.13				0.75	
Koeleria macrantha	Junegrass								0.05			
Leersia oryzoides	rice cutgrass											
Muhlenbergia racemosa	marsh muhly					1.85	3.00					
Panicum dichotomiflorum	fall panicum								0.29			
Pascopyrum smithii	western wheatgrass		12.33	1.68	3.08		1.74	0.04	13.24		1.32	
Phalaris arundinacea	reed canary grass						2.29					10.47
Sphenopholis obtusata	prairie wedge grass								0.29		0.62	
TOTAL NATIVE COOL SEASON		0.00	24.08	5.52	16.93	9.50	15.42	6.11	22.60	0.00	10.35	10.55
TOTAL ALL COOL- SEASON		89.28	63.05	51.95	104.0	25.28	93.75	58.89	63.49	91.12	17.15	16.57

**Table 3B. Cool season grass cover of the east sites.** Cover of individual cool season grass species listed by site. Exotic cool season grasses are listed first with a total cover followed by natives and a total of all cool season cover. Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

EXOTIC COOL SEASON	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
AGROSTIS GIGANTEA	Redtop							4.12	1.57	2.99	39.83	0.77	0.63
AGROSTIS STOLONIFERA	creeping bentgrass				0.23				1.85		0.62	3.06	
BROMUS INERMIS	smooth brome	16.80	4.38	3.30	10.81	1.57	1.03	24.22	1.23	3.70	7.57	17.55	20.67
BROMUS JAPONICUS	Japanese brome	4.22		6.85	11.02	2.62	7.16			0.06	4.52		0.50
BROMUS TECTORUM	downy brome	5.37	8.39	2.27	3.50	10.32	0.06						0.30
ELYMUS REPENS	quackgrass												
PHLEUM PRATENSE	timothy					0.50	0.20						
POA COMPRESSA	Canada bluegrass	8.63		0.90	0.72		3.00			3.85	2.18		1.54
POA PRATENSIS	Kentucky bluegrass	18.37	3.35	22.07	36.06	3.03	1.33	0.33		1.20	8.50	2.00	5.71
SCHEDONORUS ARUNDINACEUS	tall fescue		22.53			3.00							2.80
SCHEDONORUS PRATENSIS	meadow fescue		22.96					0.62		0.19	0.58	3.08	8.10
THINOPYRUM PONTICUM	tall wheatgrass												
TOTAL EXOTIC COOL SEASON		53.38	61.66	35.38	62.34	21.54	12.77	29.28	4.65	11.99	63.80	26.46	40.75
Native cool season													
Calamagrostis stricta	northern reedgrass							0.53	1.07	1.26	1.53	0.10	
Dichanthelium acuminatum	W spring-panicum			0.50	0.07			0.58		0.06	1.67	1.07	0.02
Dichanthelium oligosanthes	Scribner's panicum			1.82	3.36			0.50	0.08	0.06	1.87	0.35	0.84
Dichanthelium villosissimum	white-hair panicum										3.70		
Elymus canadensis	Canada wild-rye			2.58		0.10	0.76						
Elymus sp.													
Elymus trachycaulus	slender wheatgrass		0.06										
Elymus virginicus	Virginia wild-rye												
Festuca octoflora	six-weeks fescue			0.74		0.37							
Hordeum jubatum	foxtail barley									0.13	5.75		
Hordeum pusillum	little barley		0.40								0.53		
Koeleria macrantha	Junegrass												
Leersia oryzoides	rice cutgrass												
Muhlenbergia racemosa	marsh muhly			1.00		0.50							
Panicum dichotomiflorum	fall panicum										0.17		
Pascopyrum smithii	western wheatgrass		0.06	2.30	0.23	0.50	31.84	0.50	4.65	2.26	19.50	0.15	
Phalaris arundinacea	reed canary grass			0.16	5.50								15.49
Phragmites australis	common reed												
Calamagrostis stricta	northern reedgrass			0.24							0.08		
Sphenopholis obtusata	prairie wedge grass								1.07	1.26	1.53	0.10	
TOTAL NATIVE COOL SEASON		0.00	0.53	9.32	9.16	1.47	32.60	2.12	5.80	3.78	34.80	1.67	16.34
TOTAL ALL COOL- SEASON		53.38	62.19	44.70	71.51	23.01	45.37	31.40	10.45	15.76	98.60	28.13	57.09

**Table 4A. Warm season grass cover of the west sites.** Cover of individual warm season grass species listed by site. Exotic warm season grasses are listed first with a total cover followed by natives and a total of all warm season cover. Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

SPECIES	COMMON NAME	COOK	DYER	CWR N1	CWR N2	CWR N3	CWRE L	MRS_ N	JOHN S_N	SLWD _HM	MCM _S	MCM _N
EXOTIC WARM SEASON												
ECHINOCHLOA CRUS-GALLI	barnyard grass								0.02		0.08	
SETARIA FABERI	Chinese foxtail		0.53									
SETARIA ITALICA	foxtail millet											0.08
SETARIA PUMILA	yellow foxtail		1.03			3.53					0.50	
SETARIA VIRIDIS	green foxtail		21.52			1.57			0.17		0.50	
TOTAL EXOTIC WARM SEASON		0.00	23.08	0.00	0.00	5.10	0.00	0.00	0.19	0.00	1.08	0.08
Andropogon gerardii	big bluestem	17.20	12.72	4.77	0.53	3.70	16.73	34.59	1.17	2.67	6.83	
Aristida purpurascens	three-awn				1.32							
Bouteloua curtipendula	sideoats grama					0.53						
Bouteloua dactyloides	buffalo grass		6.50	3.00								5.00
Bouteloua gracilis	blue grama											2.62
Calamovilfa longifolia	prairie sandreed											
Chloris verticillata	windmill grass		3.17	2.65	2.55			0.04	0.15			
Distichlis spicata	saltgrass	3.52		8.28	0.62		4.75	0.31				
Eragrostis spectabilis	purple lovegrass					0.70			0.50	0.50		
Panicum virgatum	switchgrass	0.53	6.00		3.00		6.71	7.13			6.53	2.87
Paspalum setaceum	sand paspalum		1.57	0.08		4.07		0.35			0.70	0.53
Schedonnardus paniculatus	tumblegrass											
Schizachyrium scoparium	little bluestem							0.53			3.52	8.00
Sorghastrum nutans	Indian grass	1.32	3.00	3.00	3.00	3.00	0.33	7.68			4.58	3.00
Spartina pectinata	prairie cordgrass	2.72	6.00		5.00	7.68	10.49	5.00				10.78
Sporobolus airoides	alkali sacaton			0.53								
Aristida purpurascens	three-awn	8.00				0.17	0.50	1.12	3.17	1.68	11.10	6.33
Sporobolus compositus	tall dropseed		36.77	2.55	1.07	8.38	0.46	0.04	1.80		6.10	2.55
Sporobolus cryptandrus	sand dropseed	17.20	12.72	4.77	0.53	3.70	16.73	34.59		2.67	6.83	
TOTAL NATIVE WARM SEASON		33.28	75.72	24.87	17.08	28.23	39.97	56.79	26.42	4.85	39.37	41.68
TOTAL WARM SEASON		33.28	98.80	24.87	17.08	33.33	39.97	56.79	26.61	4.85	40.45	41.77

**Table 4B. Warm season grass cover of the east sites.** Cover of individual warm season grass species listed by site. Exotic warm season grasses are listed first with a total cover followed by natives and a total of all warm season cover. Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
EXOTIC WARM SEASON													
ECHINOCHLOA CRUS-GALLI	barnyard grass			0.64						0.06			
ERAGROSTIS CILIANENSIS	stinkgrass												
SETARIA FABERI	Chinese foxtail				0.04								
SETARIA ITALICA	foxtail millet												
SETARIA PUMILA	yellow foxtail	1.68	0.06			0.25							
SETARIA VERTICILLATA	bristly foxtail						0.03						
SETARIA VIRIDIS var. VIRIDIS	green foxtail	0.25			0.60		0.98						
SORGHUM HALEPENSE	Johnson grass												
TOTAL EXOTIC WARM SEASON		1.93	0.06	0.64	0.64	0.25	1.01	0.00	0.00	0.06	0.00	0.00	0.00
Andropogon gerardii	big bluestem	24.20		43.65	22.93	14.78	2.44	28.88	11.45	2.00	14.67	3.58	3.72
Bouteloua curtipendula	sideoats grama					1.16	4.06						
Bouteloua gracilis	blue grama						3.71						
Bouteloua hirsuta var. hirsuta	hairy grama											0.05	
Calamovilfa longifolia	prairie sandreed				0.04								
Chloris verticillata	tumble windmill grass		0.53		0.04								
Digitaria cognata	fall witchgrass									0.06	2.72	0.05	
Distichlis spicata	saltgrass		0.59							1.05	12.17	0.25	
Eragrostis pectinacea	tufted lovegrass												
Eragrostis spectabilis	purple lovegrass		0.40			3.54	0.20	0.08			0.17		0.11
Eragrostis trichodes	Eragrostis trichodes												
Hesperostipa comata	needle-and-thread			0.93	3.00								
Panicum virgatum	switchgrass	3.00	0.13	2.98	5.94	1.53	6.16	0.17	4.93	9.09	41.60	2.49	1.56
Paspalum setaceum	yellow sand paspalum	0.50			1.04						0.08		
Schedonnardus paniculatus	tumblegrass												
Schizachyrium scoparium	little bluestem	8.95		0.98	5.00	0.69	1.00					0.37	0.50
Sorghastrum nutans	Indian grass	3.97		2.55	0.64	3.73	11.38	11.88	7.32	2.05	1.12	5.08	0.23
Spartina pectinata	prairie cordgrass		0.56	10.50					3.97	1.05	18.95	4.19	2.42
Sporobolus airoides	alkali sacaton												
Sporobolus compositus	tall dropseed	1.03	0.71	1.71	1.23	4.09	3.16	0.08		0.06		0.05	0.25
Sporobolus cryptandrus	sand dropseed	0.33	1.00	1.73	0.04	0.42	0.50	0.70					
Sporobolus heterolepis	prairie dropseed												
Tridens flavus var. flavus	purpletop			0.03									
TOTAL NATIVE WARM SEASON		41.98	3.91	65.04	39.88	29.94	32.61	56.63	27.67	15.36	91.47	16.11	8.78
TOTAL WARM SEASON		43.92	3.98	65.67	40.51	30.19	33.62	56.63	27.67	15.43	91.47	16.11	8.78



**Table 5A. Grass-like species for west sites.** These species are predominantly cool season and may influence overall management decisions if they are large components of any one site. Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

SPECIES	COMMON NAME	COOK	DYER	CWR N1	CWR N2	CWR N3	CWRE L	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
<i>Bolboschoenus fluviatilis</i>	river bulrush											
<i>Bolboschoenus maritimus</i>	salt-marsh bulrush											0.17
<i>Carex blanda</i>	woodland sedge											
<i>Carex brachyglossa</i>	yellow-fruit sedge											
<i>Carex brevior</i>	short-beak sedge		9.00	6.00	4.40	6.13	8.77	6.04	3.32	0.25	1.00	0.50
<i>Carex crawei</i>	Crawe's sedge										0.08	0.50
<i>Carex eleocharis</i>	needle-leaf sedge						0.13					
<i>Carex emoryi</i>	Emory's sedge								4.43			
	Hale's meadow											
<i>Carex granularis</i>	sedge		0.50									
<i>Carex gravida</i>	heavy-fruit sedge		0.50									
<i>Carex grisea</i>	gray wood sedge											
<i>Carex hallii</i>	deer sedge										0.53	
<i>Carex heliophila</i>	sun sedge											
<i>Carex meadii</i>	Mead's sedge											
<i>Carex molesta</i>	troublesome sedge										0.17	
<i>Carex pellita</i>	woolly sedge											
<i>Carex praeegracilis</i>	clustered field sedge		8.32	2.20	0.50		6.11	4.19				
<i>Carex spp.</i>			13.48	5.82		5.42	1.57	0.62	6.64		9.70	0.70
<i>Carex vulpinoidea</i>	fox sedge											
<i>Cyperus acuminatus</i>	short-pt flatsedge											
<i>Cyperus esculentus</i>	yellow nut-sedge								0.50			
<i>Cyperus lupulinus</i>	flatsedge			0.53	0.78	0.08	0.50		0.29		0.08	
<i>Cyperus schweinitzii</i>	sand flatsedge		0.50	0.78					1.60		0.08	
<i>Cyperus squarrosus</i>	awned flatsedge											
<i>Cyperus strigosus</i>	straw flatsedge											
<i>Eleocharis compressa</i>	flat-stem spikerush						0.02		0.53		0.62	
<i>Eleocharis palustris</i>	marsh spikerush							2.01	3.32		5.57	4.98
<i>Fimbristylis puberula</i>	hairy fimbry											
<i>Schoenoplectus pungens</i>	3-square bulrush					0.53	3.00		3.97			1.07
<i>Schoenoplectus tabernaemontani</i>	soft-stem bulrush											0.17
<i>Bolboschoenus maritimus</i>	salt-marsh bulrush											
<b>TOTAL GRASS-LIKE</b>		<b>0.00</b>	<b>32.30</b>	<b>15.33</b>	<b>5.68</b>	<b>12.17</b>	<b>20.10</b>	<b>12.86</b>	<b>24.58</b>	<b>0.25</b>	<b>17.83</b>	<b>7.92</b>

**Table 5B. Grass-like species for east sites.**

These species are predominantly cool season and may influence overall management decisions if they are large components of any one site. Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_S H	BIN_S	BIN_E	BIN_ W	BIN_ WH	DIPP
Bolboschoenus fluviatilis	river bulrush												
Bolboschoenus maritimus	salt-marsh bulrush												
Carex blanda	woodland sedge												
Carex brachyglossa	yellow-fruit sedge												0.50
Carex brevior	short-beak sedge	1.25	0.53	2.37	7.00	1.34	0.50	0.50	1.00	0.19	2.07		4.00
Carex crawei	Crawe's sedge				0.04			0.08		0.06	0.67	0.05	0.02
Carex eleocharis	needle-leaf sedge												
Carex emoryi	Emory's sedge												
Carex granularis	Hale's sedge				0.50	0.32							
Carex gravida	heavy-fruit sedge				0.50	0.32							
Carex grisea	gray wood sedge										0.50	0.25	
Carex hallii	deer sedge												
Carex heliophila	sun sedge			0.03									
Carex meadii	Mead's sedge							0.08					
Carex molesta	troublesome sedge												0.52
Carex pellita	woolly sedge								0.62	0.19	1.82	1.22	
Carex praegracilis	clustered field sedge		0.56		0.50			0.08		0.06	0.58		
Carex spp.				1.80	0.07	0.05	0.03	9.95	7.12	10.76	47.68	6.30	5.99
Carex vulpinoidea	fox sedge							0.50	0.50	0.50	0.53		
Cyperus acuminatus	short-pt flatsedge												
Cyperus esculentus	yellow nut-sedge												
Cyperus lupulinus	flatsedge			0.50	0.50						0.58		
Cyperus schweinitzii	sand flatsedge			0.98	1.00								
Cyperus squarrosus	awned flatsedge												
Cyperus strigosus	Straw flatsedge												
Eleocharis compressa	flat-stem spikerush				0.04			1.65	4.57	7.20	21.10	2.84	1.49
Eleocharis palustris	marsh spikerush		0.13	0.64					3.78	2.46	17.25	1.21	
Fimbristylis puberula	hairy fimbry												
Schoenoplectus pungens	3-square bulrush		0.63	0.56					0.25	2.41	13.62	0.74	5.05
<b>TOTAL GRASS-LIKE</b>		<b>1.25</b>	<b>1.84</b>	<b>6.86</b>	<b>10.14</b>	<b>2.03</b>	<b>0.53</b>	<b>12.58</b>	<b>17.83</b>	<b>23.84</b>	<b>106.4</b>	<b>12.98</b>	<b>17.56</b>

**Table 6A. Cover of exotic forb species on west sites.**

Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

EXOTIC FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWREL	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
ABUTILON THEOPHRASTI	velvet-leaf											
ASPARAGUS OFFICINALIS	garden asparagus					0.50			0.50			
ATRIPLEX PATULA	common spearscale											
ATRIPLEX PROSTATA	thin-leaf spearcale											
CANNABIS SATIVA	hemp		1.08		1.00	2.63	7.80	0.04	0.46		1.00	0.50
CARDUUS NUTANS	musk thistle		1.00	0.53	6.00	9.00	18.00	6.50	1.02		0.50	0.50
CHENOPODIUM ALBUM	lamb's-quarters				1.00		0.50		0.50		0.50	0.17
CHENOPODIUM GLAUCUM	oak-leaf goosefoot											
CIRSIIUM ARVENSE	Canada thistle					3.00						
CIRSIIUM VULGARE	bull thistle			0.50		3.00			0.50			
CONIUM MACULATUM	poison-hemlock											
CONVOLVULUS ARVENSIS	field bindweed	0.08										
DESCURAINIA SOPHIA	flix-weed tansy mustard											
ELAEAGNUS ANGUSTIFOLIA	Russian-olive						3.00					
EUPHORBIA ×PSEUDOVIRGATA	hybrid leafy spurge											
EUPHORBIA VIRGATA	leafy spurge		0.50						7.19		0.50	
KALI TRAGUS	prickly Russian-thistle											
LACTUCA SERRIOLA	prickly lettuce		2.07		1.00	2.12	0.02					
LEPIDIUM LATIFOLIUM	broad-leaf pepper-grass											
LYTHRUM SALICARIA	purple loosestrife								3.67			
MEDICAGO LUPULINA	black medick	15.90	3.05	19.23	16.27	19.65	15.02	20.87	2.17	2.75	5.10	1.57
MEDICAGO SATIVA ssp. SATIVA	alfalfa											
MELILOTUS ALBUS	white sweet-clover						3.00		1.05			
MELILOTUS OFFICINALIS	yellow sweet-clover	11.77		0.50	0.08	3.50	1.00	4.38	0.50	0.08		
MOLLUGO VERTICILLATA	green carpet-weed											
MORUS ALBA	white mulberry		1.00	0.08			0.50		0.17			0.50
NEPETA CATARIA	catnip		0.50			0.50						0.50
POLYGONUM AVICULARE ssp. AVICULARE	yard knotweed			0.17								
ROBINIA PSUEDOACAIA	black locust											
RUMEX CRISPUS	curly dock			0.50			3.00		1.02		0.50	
SILENE VULGARIS	bladder campion								0.02			0.08
SISYMBRIUM LOESELII	tall hedge mustard	0.50	1.00	0.50			3.00				0.50	

EXOTIC FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWREL	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
SONCHUS ASPER	prickly sow-thistle											
SONCHUS OLERACEUS	store-front sow-thistle											
TARAXACUM OFFICINALE	common dandelion	0.08	0.58	0.58	0.08		0.73		0.50			
THLASPI ARVENSE	field penny cress											
TRAGOPOGON DUBIUS	yellow goat's-beard	1.03	2.03		1.85	4.00		9.00	1.50			
TRIFOLIUM FRAGIFERUM	strawberry clover										0.08	
TRIFOLIUM HYBRIDUM	Alsike clover											
TRIFOLIUM PRATENSE	red clover	1.48									0.08	
TRIFOLIUM REPENS	white clover											
TYPHA ANGUSTIFOLIA	narrow-leaf cattail								0.50			
Ukn Forb												
ULMUS PUMILA	Siberian elm			0.08							0.08	
VERBASCUM THAPSUS	common mullein		3.50	0.58	1.00	3.00	6.00	3.00	13.00		1.50	0.50
VERONICA ANAGALLIS-AQUATICA	water speedwell											
TOTAL EXOTIC FORBS		30.85	16.32	23.27	28.28	50.90	61.56	43.78	34.28	2.83	10.35	4.32



**Table 6B. Cover of exotic forb species on east sites.**

Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

EXOTIC FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_S H	BIN_S	BIN_E	BIN_W	BIN_W H	DIPP
ABUTILON THEOPHRASTI	velvet-leaf	0.78	0.06	4.42	5.16	0.10							
ASPARAGUS OFFICINALIS	garden asparagus												
ATRIPLEX PATULA	common spearscale												
ATRIPLEX PROSTATA	thin-leaf spearscale												
CANNABIS SATIVA	hemp	0.78	0.06	4.42	5.16	0.10							
CARDUUS NUTANS	musk thistle	0.08		3.00	4.00								0.50
CHENOPODIUM ALBUM	lamb's-quarters	0.17		0.60	0.07	0.50	0.03						
CHENOPODIUM GLAUCUM	oak-leaf goosefoot												
CIRSIIUM ARVENSE	Canada thistle												5.00
CIRSIIUM VULGARE	bull thistle				0.54		1.03		0.50	0.90	0.50		0.52
CONIUM MACULATUM	poison-hemlock				0.11								
CONVOLVULUS ARVENSIS	field bindweed	0.78				0.89							0.59
DESCURAINIA SOPHIA	flix-weed tansy mustard						0.50						
ELAEAGNUS ANGUSTIFOLIA	Russian-olive												1.00
EUPHORBIA													
xPSEUDOVIRGATA	hybrid leafy spurge												
EUPHORBIA VIRGATA	leafy spurge												
KALI TRAGUS (	prickly Russian-thistle												
LACTUCA SERRIOLA	prickly lettuce						0.06	0.50			0.50	0.50	
LEPIDIUM LATIFOLIUM	broad-leaf pepper-grass												
LYTHRUM SALICARIA	purple loosestrife									0.50	0.58	1.50	5.04
MEDICAGO LUPULINA	black medick	0.62	1.38	19.79	6.55	2.22	4.46	1.65	1.03	0.31	11.28	5.13	4.99
MEDICAGO SATIVA	alfalfa												
MELILOTUS ALBUS	white sweet-clover			0.87	3.50		0.13			0.13	2.65	3.00	
MELILOTUS OFFICINALIS	yellow sweet-clover	0.50	0.31	0.61	1.50	9.76	4.24		0.08		0.17	0.50	2.26
MOLLUGO VERTICILLATA	green carpet-weed												
MORUS ALBA	white mulberry			1.50	0.50			0.50					1.00
NEPETA CATARIA	catnip				0.23	0.50			0.50				
POLYGONUM AVICULARE	yard knotweed						0.03						
ROBINIA PSUEDOACAIA	black locust												
RUMEX CRISPUS	curly dock		1.00					1.00	0.50	0.06	0.08		3.11
SILENE VULGARIS	bladder campion												
SISYMBRIUM LOESELII	tall hedge mustard				0.50		0.50						
SONCHUS ASPER	prickly sow-thistle						0.50						
SONCHUS OLERACEUS	store-front sow-thistle												
TARAXACUM OFFICINALE	common dandelion		1.00	0.21	0.50	0.50	0.79	0.08		0.25	2.03	0.90	1.00
THLASPI ARVENSE	field penny cress												
TRAGOPOGON DUBIUS	yellow goat's-beard			0.50	6.00	2.00	1.50					1.50	0.50

EXOTIC FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_S		BIN_E	BIN_W		DIPP
								H	BIN_S		H	DIPP	
TRIFOLIUM FRAGIFERUM	strawberry clover										0.08		0.11
TRIFOLIUM HYBRIDUM	Alsike clover						0.53						
TRIFOLIUM PRATENSE	red clover		1.09				0.50		0.62		3.19		0.17
TRIFOLIUM REPENS	white clover												
TYPHA ANGUSTIFOLIA	narrow-leaf cattail												
Ukn Forb													
ULMUS PUMILA	Siberian elm						1.00						
VERBASCUM THAPSUS	common mullein	5.58		2.66	10.00		1.00						3.13
VERONICA ANAGALLIS-AQU	water speedwell												
TOTAL EXOTIC FORBS		8.52	4.84	34.15	39.16	16.47	16.81	3.73	3.23	2.15	17.88	16.22	28.93

**Table 7A. Native forb cover for west sites.**

Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

NATIVE FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWRE L	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
<i>Achillea millefolium</i>	western yarrow											
<i>Acmispon americanus</i>	prairie trefoil								0.02			
<i>Allium canadense</i>	meadow garlic											
<i>Allium canadense</i>	prairie wild onion		0.50									
<i>Amaranthus retroflexus</i>	redroot pigweed											
<i>Ambrosia artemisiifolia</i>	common ragweed					4.10	5.95		0.50		0.50	
<i>Ambrosia psilostachya</i>	western ragweed	1.00	22.08	13.28	30.22	5.97	13.62	7.45	5.37	0.08	9.67	11.80
<i>Ambrosia trifida</i>	giant ragweed						0.13					
<i>Amorpha fruticosa</i>	false indigo-bush											
<i>Antennaria neglecta</i>	field pussytoes											
<i>Apocynum cannabinum</i>	hemp dogbane		3.08	3.00		0.62	2.00	0.50	4.52	1.00	1.50	
<i>Argemone polyanthemus</i>	plains prickly-poppy											
<i>Arnoglossum plantagineum</i>	Indian-plantain											
<i>Artemisia filifolia</i>	sandsage											
<i>Artemisia ludoviciana</i>	white sage											
<i>Asclepias</i> sp.												
<i>Asclepias speciosa</i>	showy milkweed	3.50	1.50	3.00	3.00	5.02	3.85	1.00	1.02	1.00	3.08	0.50
<i>Asclepias syriaca</i>	common milkweed	0.50	1.32			3.00						
<i>Asclepias verticillata</i>	whorled milkweed	1.00	0.58		0.58	0.50	0.13	0.21		0.33	2.10	
<i>Asclepias viridiflora</i>	green milkweed											
<i>Brickellia eupatorioides</i>	false-boneset		0.50									
<i>Callirhoe alcaeoides</i>	pale poppy-mallow											
<i>Callirhoe alcaeoides</i>	pale poppy-mallow											
<i>Callirhoe involucrata</i>	purple poppy-mallow	0.50	7.62	3.58	9.25		10.68	1.24	0.17		0.70	0.50
<i>Celtis occidentalis</i>	hackberry											
<i>Chenopodium berlandieri</i>	pitseed goosefoot											
<i>Chenopodium pratericola</i>	desert goosefoot											
<i>Chenopodium subglabrum</i>	smooth goosefoot											
<i>Cirsium altissimum</i>	tall thistle					1.07	0.02		1.50		0.50	
<i>Cirsium canescens</i>	Platte thistle											
<i>Cirsium flodmanii</i>	Flodman's thistle						0.63	3.50				

NATIVE FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWRE L	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
Cirsium undulatum	wavy-leaf thistle							0.50				
Conyza canadensis	horseweed		9.50	1.20	2.18	11.28	3.02	3.13	2.45		1.98	1.93
Conyza ramosissima	spreading fleabane			1.93								
Coreopsis tinctoria	plains coreopsis											
Cornus drummondii	rough-leaf dogwood						0.82		0.52	0.08		
Coryphantha vivipara	pincushion cactus		0.08						0.55			
Croton texensis	Texas croton							0.39	0.11			0.50
Cyclachaena xanthiifolia	giant marsh-elder											
Cycloloma atriplicifolium	winged-pigweed											
Dalea candida	white prairie-clover							3.00				
Dalea purpurea	purple prairie-clover											
Dalea villosa	silky prairie-clover										8.77	
Descurainia pinnata var. osmiarum	pinnate tansy mustard											
Desmanthus illinoensis	Illinois bundleflower	0.50				0.50	4.50	3.00	0.50	0.50		3.50
Desmodium illinoense	Illinois tick-clover											
Echinacea angustifolia	narrow-leaf coneflower											
Eleocharis sp.												
Equisetum arvense	field horsetail											
Equisetum laevigatum	smooth scouring-rush	3.53				2.38	6.50	0.17	1.02		1.58	
Erechtites hieraciifolius	burnweed											
Erigeron philadelphicus	marsh fleabane										3.00	0.53
Erigeron strigosus	daisy fleabane		3.00	3.50		3.00		0.50			0.50	0.50
Eupatorium altissimum	tall boneset											
Euphorbia davidii	western toothed spurge								0.52			
Euphorbia dentata	eastern toothed spurge		0.83									
Euphorbia geyeri	Geyer's spurge											
Euphorbia maculata	spotted spurge		0.08	0.78	0.95				0.52			
Euphorbia marginata	snow-on-the-mountain		0.67	2.15	0.53	4.73	3.00	0.08				1.50
Euphorbia nutans	eyebane										0.50	
Euphorbia serpyllifolia	thyme-leaf spurge											
Euphorbia sp.												
Euphorbia spathulata	warty spurge											
Eustoma russellianum	prairie-gentian											
Euthamia gymnospermoides	viscid goldentop											
Fallopia scandens	false-buckwheat											
Fraxinus pennsylvanica	green ash								2.15			
Galium aparine	catch-weed bedstraw											
Geum canadense	white avens						0.13					



NATIVE FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWRE L	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
Gleditsia triacanthos	honey-locust											
Glycyrrhiza lepidota	wild licorice			1.85					0.50	0.50	2.55	
Grindelia squarrosa	curly-top gumweed	1.08		0.50	1.00		0.50					
Hackelia virginiana	Virginia stickseed						0.02					
Hedeoma hispida	rough false-pennyroyal			0.08		0.53	0.50		1.02	0.08	1.40	
Helenium autumnale	sneezeweed											
Helianthus annuus	common sunflower	0.50					3.50		1.50		0.50	
Helianthus grosseserratus	sawtooth sunflower											
Helianthus maximiliani	Maximilian's sunflower											
Helianthus pauciflorus	stiff sunflower							0.50				
Helianthus petiolaris	plains sunflower	0.62				1.15			0.31			
Heliopsis helianthoides	false-sunflower											
Heterotheca latifolia	camphor-weed								0.66			2.10
Heterotheca villosa	hairy golden-aster											
Hypoxis hirsuta	yellow star-grass											
Iva annua	annual marsh-elder						3.00					
Juncus balticus	Baltic rush											
Juncus dudleyi	Dudley's rush						0.50		0.86			0.08
Juncus nodosus	knotted rush								1.00			
Juncus sp.												
Juncus torreyi	Torrey's rush										0.50	
Juniperus virginiana	eastern red-cedar											
Lactuca ludoviciana	western wild lettuce											
Lemna minor	common duckweed								0.52			
Lepidium densiflorum	prairie pepper-grass	0.83		0.50	0.08	3.25		0.50	1.21			2.52
Lespedeza capitata	round-head bush-clover								0.05			
Liatris glabrata	plains gayfeather											
Liatris punctata	dotted gayfeather											
Liatris pycnostachya	thick-spike gayfeather											
Linum sulcatum	grooved flax										0.08	
Lithospermum canescens	hoary puccoon											
Lithospermum incisum	fringed puccoon											
Lithospermum occidentale	marble-seed											
Lobelia spicata	pale-spike lobelia											
Lycopus americanus	American horehound								1.75			
Lycopus asper	rough bugleweed								0.02			
Lysimachia ciliata	fringed loosestrife											
Lythrum alatum	winged loosestrife								0.50			
Maianthemum stellatum	false Solomon's-seal											

NATIVE FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWRE L	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
Mentha canadensis	Canada mint										5.00	
Mimosa nuttallii	sensitive brier											
Mirabilis hirsuta	hairy four-o'clock											
Mirabilis linearis	narrow-leaf four-o'clock							0.50				
Monarda fistulosa	wild-bergamot											
MUHLENBERGIA SP.												
Oenothera biennis	eastern eve primrose											
Oenothera curtiflora	velvet butterfly-plant											
Oenothera curtiflora	velvet butterfly-plant											
Oenothera filiformis	long-flwr butterfly-plant											
Oenothera laciniata	cut-leaf eve primrose											
Oenothera rhombipetala	fourpoint eve primrose											
Oenothera serrulata	plains yellow-primrose											
Oenothera suffrutescens	scarlet butterfly-plant											
Opuntia fragilis	brittle prickly-pear											
Opuntia humifusa	eastern prickly-pear		3.00						0.50		0.08	0.50
Oxalis dillenii	gray-green wood-sorrel			0.95					0.50			
Oxalis stricta	yellow wood-sorrel		0.17						0.67		1.03	
Packera plattensis	prairie ragwort											
Parthenocissus quinquefolia	Virginia creeper											
Penstemon grandiflorus	shell-leaf penstemon						3.00					
Persicaria amphibia	water smartweed											
Persicaria coccinea	swamp smartweed									1.57		
Phyla lanceolata	northern fogfruit						0.46		3.30			
Physalis heterophylla	clammy ground-cherry								1.02	0.50		
Physalis longifolia	common ground-cherry	3.58	1.00	0.58	3.00	0.70	3.13	7.00	1.00	0.78	1.20	0.53
Physalis virginiana	Virginia ground-cherry							0.50				
Plantago eriopoda	alkali plantain											
Plantago patagonica	woolly plantain				1.60			0.13	0.21		1.48	
Plantago rugelii	black-seed plantain											
Plantago virginica	pale-seed plantain											
Polanisia dodecandra	clammy-weed											
Polygala verticillata	whorled milkwort											
Polygonum ramosissimum	bushy knotweed											
Populus deltoides	plains cottonwood								1.52		3.50	
Portulaca oleracea	garden purslane								0.02		0.50	
Potentilla norvegica	Norwegian cinquefoil								1.50			
Potentilla paradoxa	bushy cinquefoil											
Potentilla pensylvanica	Pennsylvania cinquefoil						0.13					

NATIVE FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWRE L	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
Prunella vulgaris	self-heal											
Pycnanthemum virginianum	Virginia mountain-mint											
Ratibida columnifera	upright coneflower											
Ratibida pinnata	gray-head coneflower											
Ribes odoratum	buffalo currant											
Rosa arkansana	dwarf prairie rose											
Rosa woodsii	western wild rose		0.50	3.58	3.00		3.00		3.00			
Rudbeckia hirta	black-eyed Susan							5.50				
Rumex altissimus	pale dock											
Salix amygdaloides	peach-leaf willow								0.50			
Salvia azurea	Pitcher's sage							1.06				
Silene antirrhina	sleepy catchfly			0.17								
Silphium integrifolium	rosinweed							0.50				
Sisyrinchium montanum	strict blue-eyed-grass						0.50					
Solanum carolinense	horse-nettle											
Solanum interius	plains black nightshade					2.72						
Solanum rostratum	buffalo-bur											
Solidago canadensis	Canada goldenrod						1.00		1.00			
Solidago gigantea	late goldenrod								3.50	3.00		
Solidago missouriensis	Missouri goldenrod						3.00					
Solidago mollis	ashy goldenrod											
Solidago mollis	ashy goldenrod											
Solidago rigida	stiff goldenrod							3.00				0.50
Solidago sp.												
Strophostyles leiosperma	Wild bean				0.53		0.50					
Symphoricarpos occidentalis	wolfberry								0.36			
Symphyotrichum ericoides	heath aster			0.70			0.50			3.00	0.08	
Symphyotrichum falcatum	prairie white aster											
Symphyotrichum lanceolatum	tall white aster						0.13			0.08	0.17	
Teucrium canadense	American germander		0.53			4.32			1.53		0.08	
Tomostima reptans	white whitlow-wort											
Toxicodendron radicans	eastern poison ivy		3.00						1.15			0.50
Tradescantia bracteata	long-bract spiderwort								0.71			
Tradescantia occidentalis	western spiderwort							0.50				
Triglochin maritima	shore arrow-grass											
Ulmus americana	American elm											
Verbena bracteata	prostrate vervain						0.13					
Verbena bracteata	prostrate vervain						0.13					
Verbena hastata	blue vervain						0.50		7.34		4.28	1.48

NATIVE FORB SPECIES	COMMON NAME	COOK	DYER	CWRN 1	CWRN 2	CWRN 3	CWRE L	MRS_ N	JHNS_ N	SLWD	McC_ S	McC_ N
Verbena stricta	hoary vervain	3.17	4.32	2.10	2.80	3.50	8.75	3.43	1.00		0.58	0.50
Vernonia baldwinii	western ironweed											
Vernonia fasciculata	prairie ironweed						0.13		0.02			
Veronica peregrina	purslane speedwell			0.17								
Vicia americana	American vetch											
Viola pedatifida	prairie violet											
Viola pratincola	meadow violet					1.40		0.31				
Vitis riparia	riverbank grape											
Xanthium strumarium var. canadense	cocklebur											
TOTAL NATIVE FORBS		17.28	66.90	43.62	58.20	60.27	87.53	48.59	61.71	12.52	57.42	29.98
TOTAL ALL FORBS		48.13	83.22	66.88	86.48	111.	149.1	92.38	95.99	15.35	67.77	34.30

**Table 7B. Native forb cover for east sites.**

Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

NATIVE FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
<i>Achillea millefolium</i>	western yarrow				4.50	0.50							0.13
<i>Acmispon americanus</i>	prairie trefoil												
<i>Allium canadense</i>	meadow garlic											0.50	0.50
<i>Allium canadense</i>	prairie wild onion							0.50	1.58		1.50	1.00	
<i>Amaranthus retroflexus</i>	redroot pigweed						0.50						0.50
<i>Ambrosia artemisiifolia</i>	common ragweed			1.35							0.08		7.74
<i>Ambrosia psilostachya</i>	western ragweed	0.50	1.00	1.80	10.36	1.36	2.29		4.43	5.10	14.78	0.05	4.43
<i>Ambrosia trifida</i>	giant ragweed												
<i>Amorpha fruticosa</i>	false indigo-bush												
<i>Antennaria neglecta</i>	field pussytoes												
<i>Apocynum cannabinum</i>	hemp dogbane		0.50				0.50	1.82	0.17		2.15	4.72	0.18
<i>Argemone polyanthemus</i>	plains prickly-poppy												
<i>Arnoglossum plantagineum</i>	tuberous Indian-plantain									0.50			
<i>Artemisia filifolia</i>	sandsage								0.08				
<i>Artemisia ludoviciana</i>	white sage								0.08				0.15
<i>Asclepias</i> sp.													
<i>Asclepias speciosa</i>	showy milkweed	3.50		1.03	5.00		0.50	1.00				0.50	4.00
<i>Asclepias syriaca</i>	common milkweed	1.00					0.50	0.50		0.50			
<i>Asclepias verticillata</i>	whorled milkweed		0.94	1.08				2.35	2.10	0.13	0.08	0.75	0.50
<i>Asclepias viridiflora</i>	green milkweed												
<i>Brickellia eupatorioides</i>	false-boneset			0.50				0.50					
<i>Callirhoe alcaeoides</i>	pale poppy-mallow			0.50				1.00				0.05	
<i>Callirhoe alcaeoides</i>	pale poppy-mallow			0.50				1.00				0.05	
<i>Callirhoe involucrata</i>	purple poppy-mallow	1.08		6.93	6.01	1.00	0.50	1.08	1.50	1.76	1.95	0.84	0.78
<i>Celtis occidentalis</i>	hackberry												
<i>Chenopodium berlandieri</i>	pitseed goosefoot												
<i>Chenopodium pratericola</i>	desert goosefoot			0.05									
<i>Chenopodium subglabrum</i>	smooth goosefoot												
<i>Cirsium altissimum</i>	tall thistle	0.08		1.10	1.00		1.59		0.08	0.50			2.02
<i>Cirsium canescens</i>	Platte thistle												
<i>Cirsium flodmanii</i>	Flodman's thistle							1.08	0.50	0.96	6.37	0.60	0.52
<i>Cirsium undulatum</i>	wavy-leaf thistle												
<i>Conyza canadensis</i>	horseweed	0.58	0.50	0.18	4.51	1.12	0.64		0.50				0.67
<i>Conyza ramosissima</i>	spreading fleabane												
<i>Coreopsis tinctoria</i>	plains coreopsis												



NATIVE FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
Cornus drummondii	rough-leaf dogwood						0.53				0.50	1.00	0.50
Coryphantha vivipara	purple pincushion cactus												
Croton texensis	Texas croton			0.50	1.04								
Cyclachaena xanthiifolia	giant marsh-elder												
Cycloloma atriplicifolium	winged-pigweed												
Dalea candida	eastern white prairie-clover			0.03	0.50				0.50		0.33	0.05	
Dalea purpurea	purple prairie-clover				3.50		4.03	1.08	1.00		1.67	0.50	
Dalea villosa	silky prairie-clover							0.50			0.53		
Descurainia pinnata	pinnate tansy mustard												
Desmanthus illinoensis	Illinois bundleflower			2.14	4.00		1.56	3.75	0.50		1.08	0.60	3.43
Desmodium illinoense	Illinois tick-clover						0.50						
Echinacea angustifolia	narrow-leaf coneflower												
Eleocharis sp.													
Equisetum arvense	field horsetail										1.07	0.10	0.04
Equisetum laevigatum	smooth scouring-rush		0.81	0.50	0.07			1.25	0.50	0.96	5.72	2.38	1.16
Erechtites hieraciifolius	burnweed						0.03						
Erigeron philadelphicus	marsh fleabane				3.50								
Erigeron strigosus	daisy fleabane							1.08	0.50		3.00	4.25	2.04
Eupatorium altissimum	tall boneset			0.82									
Euphorbia davidii	western toothed spurge			1.50									
Euphorbia dentata	eastern toothed spurge												
Euphorbia geyeri	Geyer's spurge												
Euphorbia maculata	spotted spurge		0.13		0.04								
Euphorbia marginata	snow-on-the-mountain			2.00	0.30								
Euphorbia nutans	eyebane			0.08	0.04								
Euphorbia serpyllifolia	thyme-leaf spurge												
Euphorbia sp.							0.03						
Euphorbia spathulata	warty spurge												
Eustoma russellianum	prairie-gentian									0.56	0.58	0.50	
Euthamia gymnospermoides	viscid goldentop								0.08	0.13	2.40		0.25
Fallopia scandens	climbing false-buckwheat												
Fraxinus pennsylvanica	green ash										0.08		
Galium aparine	catch-weed bedstraw												
Geum canadense	white avens										0.58		
Gleditsia triacanthos	honey-locust												0.02
Glycyrrhiza lepidota	wild licorice							0.50	1.48	3.59			0.50
Grindelia squarrosa	curly-top gumweed												1.00
Hackelia virginiana	Virginia stickseed												
Hedeoma hispida	rough false-pennyroyal												

NATIVE FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
Helenium autumnale	sneezeweed									0.06	4.42		0.32
Helianthus annuus	common sunflower			3.40	1.00		1.00						0.50
Helianthus grosseserratus	sawtooth sunflower						0.03						
Helianthus maximiliani	Maximilian's sunflower			0.16	0.50				0.50			10.50	0.02
Helianthus pauciflorus	stiff sunflower			0.63	0.50		0.03						
Helianthus petiolaris	plains sunflower	0.08	0.19	0.84									
Heliopsis helianthoides	false-sunflower						3.03						
Heterotheca latifolia	camphor-weed	3.00		0.03	0.23		1.92						0.30
Heterotheca villosa	hairy golden-aster												
Hypoxis hirsuta	yellow star-grass							0.58	0.50	0.50	0.25		
Iva annua	annual marsh-elder									0.53	0.50	0.32	3.00
Juncus balticus	Baltic rush		0.06						0.08		1.12	0.50	
Juncus dudleyi	Dudley's rush		0.50	0.72				3.00		0.56	8.12		3.02
Juncus nodosus	knotted rush										0.50		
Juncus sp.													
Juncus torreyi	Torrey's rush			0.03					0.50		1.20		
Juniperus virginiana	eastern red-cedar										0.50		
Lactuca ludoviciana	western wild lettuce												
Lemna minor	common duckweed												
Lepidium densiflorum	prairie pepper-grass			0.58	0.04		0.63						0.67
Lespedeza capitata	round-head bush-clover												
Liatris glabrata	plains gayfeather												
Liatris punctata	dotted gayfeather												
Liatris pycnostachya	thick-spike gayfeather												
Linum sulcatum	grooved flax				0.64		0.06	0.25	0.58	0.81	2.73	1.32	1.07
Lithospermum canescens	hoary puccoon			0.50									
Lithospermum incisum	fringed puccoon				0.50						0.50		0.50
Lithospermum occidentale	marble-seed			2.14							0.53		
Lobelia spicata	pale-spike lobelia							0.50					
Lycopus americanus	American water-horehound								0.08	0.13	1.40		
Lycopus asper	rough bugleweed									0.13			
Lysimachia ciliata	fringed loosestrife												0.50
Lythrum alatum	winged loosestrife								0.50		1.00		
Maianthemum stellatum	starry false Solomon's-seal											0.05	
Mentha canadensis	Canada mint										0.17		
Mimosa nuttallii	sensitive brier												
Mirabilis hirsuta	hairy four-o'clock												
Mirabilis linearis	narrow-leaf four-o'clock												
Monarda fistulosa	wild-bergamot			0.50	0.50								

NATIVE FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
MUHLENBERGIA SP.		0.50											
Oenothera biennis	eastern evening-primrose												
Oenothera curtiflora	velvet butterfly-plant			0.50			0.06			0.06	0.08		
Oenothera curtiflora	velvet butterfly-plant			0.50			0.06			0.06	0.08		
Oenothera filiformis	long-flower butterfly-plant												
Oenothera laciniata	cut-leaf evening-primrose												
Oenothera rhombipetala	fourpoint evening-primrose				1.00		0.50						
Oenothera serrulata	plains yellow-primrose												
Oenothera suffrutescens	scarlet butterfly-plant												
Opuntia fragilis	brittle prickly-pear												
Opuntia humifusa	eastern prickly-pear												
Oxalis dillenii	gray-green wood-sorrel			0.08							0.17		
Oxalis stricta	yellow wood-sorrel	0.67	0.13		0.11	0.05		0.58	2.55		0.17	0.25	0.59
Packera plattensis	prairie ragwort							0.08			0.08	0.30	
Parthenocissus quinquefolia	Virginia creeper								0.50				
Penstemon grandiflorus	shell-leaf penstemon				0.50								
Persicaria amphibia	water smartweed		0.25						0.50				
Persicaria coccinea	swamp smartweed												
Phyla lanceolata	northern fogfruit						0.46			9.78	12.62	0.57	1.03
Physalis heterophylla	clammy ground-cherry			1.06		0.50	0.06						0.02
Physalis longifolia	common ground-cherry	1.00	0.06	0.50	3.50	0.50	0.03					0.05	1.00
Physalis virginiana	Virginia ground-cherry	0.50											
Plantago eriopoda	alkali plantain									0.53	1.32	0.50	
Plantago patagonica	woolly plantain			2.36	0.79							0.42	
Plantago rugelii	black-seed plantain												
Plantago virginica	pale-seed plantain												
Polanisia dodecandra	sandy-seed clammy-weed												
Polygala verticillata	whorled milkwort		0.06					0.25	0.08			0.10	
Polygonum ramosissimum	bushy knotweed												
Populus deltoides	plains cottonwood			0.03									3.52
Portulaca oleracea	garden purslane												
Potentilla norvegica	Norwegian cinquefoil										0.50		0.13
Potentilla paradoxa	bushy cinquefoil												
Potentilla pensylvanica	Pennsylvania cinquefoil												
Prunella vulgaris	self-heal										3.03	0.87	
Pycnanthemum virginianum	Virginia mountain-mint							0.17	5.53	0.80	1.50		0.13
Ratibida columnifera	upright prairie-coneflower				7.50	0.50	2.20	0.58			0.50	1.37	
Ratibida pinnata	gray-head prairie-coneflower						0.50						
Ribes odoratum	buffalo currant												

NATIVE FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
Rosa arkansana	dwarf prairie rose								0.08			0.05	0.50
Rosa woodsii	western wild rose								0.58	1.26	23.37		0.54
Rudbeckia hirta	black-eyed Susan			0.08	0.04		3.48	0.50	1.17	3.00	0.58	6.65	1.00
Rumex altissimus	pale dock												
Salix amygdaloides	peach-leaf willow												
Salvia azurea var. grandiflora	Pitcher's sage												
Silene antirrhina	sleepy catchfly				0.50								
Silphium integrifolium	rosinweed												
Sisyrinchium montanum	strict blue-eyed-grass		0.50					0.50		0.50	2.20	0.25	
Solanum carolinense	horse-nettle			4.00	0.54						1.20	0.50	0.50
Solanum interius	plains black nightshade												
Solanum rostratum	buffalo-bur		0.31										
Solidago canadensis	Canada goldenrod			0.50	3.00		0.20	1.00	8.82	1.64	4.22	6.00	9.76
Solidago gigantea	late goldenrod			0.03			3.50	0.50		0.50			2.21
Solidago missouriensis	Missouri goldenrod			1.19									
Solidago mollis	ashy goldenrod							0.08					
Solidago mollis	ashy goldenrod							0.08					
Solidago rigida	stiff goldenrod			2.33	0.50	0.50			0.50				1.00
Solidago sp.													
Strophostyles leiosperma	slick-seed wild bean			0.03									
Symphoricarpos occidentalis	wolfberry			5.00	0.04				1.12		3.40		
Symphyotrichum ericoides	heath aster			0.50	0.50			3.25		0.46	1.00	0.50	1.13
Symphyotrichum falcatum	prairie white aster			1.77				1.03	0.25	1.61	7.22	0.45	1.17
Symphyotrichum lanceolatum	tall white aster			0.16				1.12	0.08	1.64	3.23	0.10	
Teucrium canadense	American germander							0.50			0.58	0.05	
Tomostima reptans	white whitlow-wort									0.80	0.17		
Toxicodendron radicans	eastern poison ivy												
Tradescantia bracteata	long-bract spiderwort												
Tradescantia occidentalis	western spiderwort				1.00								
Triglochin maritima	shore arrow-grass									0.40	18.00		
Ulmus americana	American elm												
Verbena bracteata	prostrate vervain	3.00											
Verbena hastata	blue vervain			3.50	3.50		0.50			1.50	1.25		3.35
Verbena stricta	hoary vervain	0.33		2.02	6.84	0.50		0.50	0.42	0.63	1.08		2.55
Vernonia baldwinii	western ironweed										0.08		
Vernonia fasciculata	prairie ironweed		0.06						0.62	0.46	6.13		
Veronica peregrina	purslane speedwell												
Vicia americana	American vetch												
Viola pedatifida	prairie violet											0.10	0.50

NATIVE FORB SPECIES	COMMON NAME	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
Viola pratensis	meadow violet			0.50					0.17		0.67	0.52	0.02
Vitis riparia	riverbank grape							0.58	0.50				0.50
Xanthium strumarium	cocklebur												
		15.83	6.00	58.66	78.12	6.53	31.96	34.65	41.82	43.03	161.83	50.73	72.09
		24.35	10.84	92.81	117.28	23.00	48.76	38.38	45.05	45.18	179.72	66.95	101.01



**Table 8A. Bare ground and litter for west sites.**

Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

	COOK	DYER	CWRN1	CWRN2	CWRN3	CWREL	MRS_N	JHNS_N	SLWD	McC_S	McC_N
BAREGROUND	39.22	62.45	30.52	5.48	35.88	4.62	8.45	34.46	3.15	25.52	50.80
LITTER	13.02	46.83	28.53	47.00	37.83	57.61	69.03	45.55	96.92	35.53	39.55
OPEN WATER								2.06			

**Table 8B. Bare ground and litter for east sites.**

Cover is given as absolute canopy cover and therefore the total cover may exceed 100%.

	BLESS	WY_S	SPN	SPS	FOX	HOST	BIN_SH	BIN_S	BIN_E	BIN_W	BIN_WH	DIPP
BAREGROUND	12.72	12.23	28.45	18.46	20.02	22.29	52.12	32.72	24.95	85.98	42.17	16.08
LITTER	29.48	62.61	26.52	39.63	33.46	51.70	17.35	15.47	55.66	214.52	14.38	68.28
OPEN WATER		11.99							2.58	4.05		

**Table 9. Floristic Quality Assessment Scores.**

Species composition is presented as the percent of exotic (non-native) species and the percent of native species. N= total number of species in the plots. Average C is the average of the conservatism value assigned to each native species. Non-native species have no value and are assigned a value of 0 in calculations. Weighted scores include abundance as an additional parameter in calculations.

Code	Site Name	% Exotic	% Native	Native only			Both Native and Exotic		Weighted		
				N	Ave. C	FQI	N	Ave. C	FQI	Ave. C	FQI
COOK	Cook Hay Meadow	32.00	68.00	17	2.59	10.67	25	1.76	8.80	6.99	34.96
DYER	Dyer Grassland	29.03	70.97	44	2.55	16.88	62	1.81	14.22	8.72	68.67
CWRN1	CWR North 1	32.08	67.92	36	2.11	12.67	53	1.43	10.44	4.17	30.37
CWRN2	CWR North 2	28.57	71.43	30	2.37	12.96	42	1.69	10.96	5.43	35.18
CWRN3	CWR North 3	30.36	69.64	39	2.64	16.49	56	1.84	13.76	4.72	35.31
CWREL	CWR East Lloyd Island	29.11	70.89	56	2.77	20.71	79	1.96	17.44	5.88	52.23
MRS_N	Morse North	20.69	79.31	46	3.15	21.38	58	2.50	19.04	8.15	62.09
JHNS_N	Johns North Wet Meadow	24.24	75.76	75	2.85	24.71	99	2.16	21.51	3.56	35.39
SLWD	Sullwald Hay Meadow	16.67	83.33	20	2.50	11.18	24	2.08	10.21	2.22	10.86
McC_S	McCormick South Meadow	26.47	73.53	50	3.02	21.35	68	2.22	18.31	6.01	49.60
McC_N	McCormick North Island	29.17	70.83	34	2.94	17.15	48	2.08	14.43	5.03	34.88
BLESS	Blessing	40.54	59.46	22	2.23	10.45	37	1.32	8.06	5.86	35.66
WY_S	WY South Meadow	27.91	72.09	31	2.77	15.45	43	2.00	13.11	0.80	5.23
SPN	Speidell North	17.58	82.42	75	2.92	25.29	91	2.41	22.96	5.60	53.42
SPS	Speidell South	25.88	74.12	63	2.97	23.56	85	2.20	20.28	5.01	46.22
FOX	Fox	35.71	64.29	27	3.04	15.78	42	1.95	12.65	3.71	24.02
HOST	Hostetler Crop	30.00	70.00	49	2.71	19.00	70	1.90	15.90	4.94	41.34
BIN_SH	Binfield South Hay Meadow	14.06	85.94	55	4.02	29.80	64	3.53	27.63	7.26	58.10
BIN_S	Binfield South Meadow	17.19	82.81	53	4.04	29.40	64	3.34	26.75	5.81	46.49
BIN_E	Binfield East Meadow	21.43	78.57	55	3.98	29.53	70	3.13	26.18	4.68	39.17
BIN_W	Binfield West Meadow	17.14	82.86	87	3.72	34.74	105	3.09	31.62	14.97	153.39
BIN_WH	Binfield West Hay Meadow	14.29	85.71	66	3.71	30.16	77	3.18	27.92	4.07	35.74
DIPP	Dlppel	29.00	71.00	67	3.30	27.00	95	2.33	22.67	3.00	29.23

**Table 10. Comparison of Floristic Quality Scores 2013 to 2019.**

Differences in each measure of floristic quality can be used to determine factors that produced changes in weighted floristic quality. Two of the sites were first surveyed in 2014 rather than 2013. Those values are in red in the table.

Site		2013 N	2016 N	2019 N	2013 Ave. C	2016 Ave. C	2019 Ave. C	2013 FQI	2016 FQI	2019 FQI	2013 FQIw	2016 FQIw	2019 FQIw
COOK	Cook Hay Meadow	39	10	25	1.38	2.00	1.76	8.65	6.32	8.80	30.52	28.68	34.96
DYER	Dyer Grassland	69	54	62	1.28	1.46	1.81	10.59	10.75	14.22	43.24	27.27	68.67
CWRN1	CWR North 1	40	48	53	1.83	2.21	1.43	11.54	15.30	10.44	21.13	25.00	30.37
CWRN2	CWR North 2	79	32	42	2.09	1.59	1.69	18.56	9.02	10.96	45.29	20.68	35.18
CWRN3	CWR North 3		59	56		1.98	1.84		15.23	13.76		39.38	35.31
CWREL	CWR East Lloyd Island	71	64	79	1.90	1.66	1.96	16.02	13.25	17.44	72.63	26.18	52.23
MRS_N	Morse North	74	57	58	2.09	2.33	2.50	18.02	17.62	19.04	47.43	39.79	62.09
JHNS_N	Johns N Wet Meadow	112	131	99	1.95	2.09	2.16	20.60	23.94	21.51	69.38	31.01	35.39
SLWD	Sullwald Hay Meadow	37	27	24	1.81	1.89	2.08	11.01	9.81	10.21	11.19	10.63	10.86
McC_S	McCormick S. Meadow	77	103	68	1.82	2.46	2.22	15.95	24.93	18.31	26.89	38.26	49.60
McC_N	McCormick North Island	83	57	48	1.83	1.89	2.08	16.68	14.30	14.43	17.13	19.97	34.88
BLESS	Blessing 2014	37	37	37	1.70	1.32	1.27	10.36	8.06	7.73	6.50	35.66	35.66
WY_S	WY South Meadow	57	57	43	1.51	1.81	2.00	11.39	11.89	13.11	9.72	21.53	5.23
SPN	Speidell North		104	91		2.50	2.41		25.50	22.96		47.79	53.42
SPS	Speidell South		88	85		2.61	2.20		24.52	20.28		42.57	46.22
FOX	Fox 2014	81	42	42	1.90	1.95	1.90	17.11	12.65	12.34	20.80	24.02	24.02
HOST	Hostetler Crop	52	54	70	1.29	1.65	1.90	9.29	12.11	15.90	47.11	26.84	41.34
BIN_SH	Binfield S Hay Meadow	49	55	64	3.35	3.10	3.53	23.43	25.41	27.63	23.15	102.73	58.10
BIN_S	Binfield South Meadow	47	71	64	2.89	2.87	3.34	19.84	24.21	26.75	38.84	81.79	46.49
BIN_E	Binfield East Meadow	63	64	70	3.13	3.23	3.13	24.82	25.88	26.18	132.1	60.06	39.17
BIN_W	Binfield West Meadow	74	93	105	3.18	3.09	3.09	27.32	29.76	31.62	61.40	73.05	153.39
BIN_WH	Binfield W Hay Meadow	56	62	77	3.34	3.31	3.18	24.99	26.04	27.92	39.66	61.85	35.74
DIPP	Dippel			95			2.33			22.67			29.23

**Table 11. Comparison of cool & warm season grass cover from 2013 to 2019.**

Data are presented for individual plots comparing native and exotic cool season grasses along with Carex species. This does not include macroplot data. Native warm season data are included for comparison. Fox and Blessing sites were first sampled in 2014. Those percentages are included in the 2013 columns. Warm season exotic species were not included in the table. Annual foxtail is the most common warm season exotic grass and is often found on disturbed or newly seeded areas

PLOT	2019 EXOTIC COOL	2019 NATIVE COOL	2019 CAREX SPECIES	2019 NATIVE WARM	2016 EXOTIC COOL	2016 NATIVE COOL	2016 CAREX SPECIES	2016 NATIVE WARM	2013 EXOTIC COOL	2013 NATIVE COOL	2013 CAREX SPECIES	2013 NATIVE WARM
BIN_E_19_G127	0	0	0	0	1.6	20.5	81.55	13.7	0	0	0	5.55
BIN_E_19_G128	4.2	5.05	9.65	22.8	28.75	1.85	67.2	1	0	2.1	19.05	16.65
BIN_E_19_G129	0	0	0	0	0	37.85	53	19	0.25	9.7	51.95	24.6
BIN_E_19_G130	31.3	2.1	10.3	16.75	34.5	1	8.75	13.05	33.4	0	1	19.25
BIN_E_19_G131	5.55	3.45	13.2	19.55	5.55	2.35	11.85	79.4	11.35	0.5	0	45.75
BIN_E_19_G132	6.9	0.5	17.15	2.35	0.75	0	17.5	7.4	5.55	0	12.75	29.2
BIN_S_19_G124	3.45	0	9.5	18.45	13.2	0.75	48.7	76.9	8.75	0	14.35	35.4
BIN_S_19_G125	5.8	6.9	15.55	29.95	3.95	6.9	33.15	19.25	34.9	0.25	8	10.25
BIN_S_19_G126	4.7	0	2.6	34.6	65.5	21.15	7.15	79.8	26.75	0.25	26.4	28.7
BIN_SH_19_G121	22.25	1.25	2.1	44.55	48.25	4.7	37.75	47.2	28.4	1.6	10.5	6.2
BIN_SH_19_G122	32.4	0.25	3.1	56.45	39.1	5.8	11.6	28.55	31.1	1.5	14.65	24.15
BIN_SH_19_G123	22.7	3.35	0.5	68.9	49.8	2.25	3.7	18	37.95	0.75	3.95	22.35
BIN_W_19_G133	0.25	13.05	22.2	5.05	1.6	18.25	123.1	20.1	3.7	17.75	0	0.25
BIN_W_19_G134	16.1	0	15.3	15.8	19.05	9.5	31.2	59.7	9.85	0.5	9.85	53.7
BIN_W_19_G135	1.85	0.5	18.95	10.35	0	0.5	9.5	10.6	0	2.35	16.4	39.8
BIN_W_19_G136	3.45	2.6	14.45	6.3	18.35	0	23.3	5.3	5.55	0.25	40.3	12.2
BIN_W_19_G137	0	28.7	7.15	36.5	1.85	0	9	5.2	11.6	1.85	26.95	39.1
BIN_W_19_G138	1.85	0.5	29.8	40.9	15.55	18.5	52.5	38.05	6.05	2.6	19.8	18.85
BIN_W_19_G139	33	11.95	17.45	26.2	20.1	0.25	25.8	12.95	25.75	0.75	10.1	26.4
BIN_W_19_G140	25.1	2	4.45	8.4	29.8	1	4.2	33.25	33.6	1.6	1.85	13.3
BIN_W_19_G141	16.3	1.5	6.55	22.55	3.95	1.6	9.5	37.5	16.9	2.35	4.2	17.9
BIN_W_19_G142	61.1	4.7	3.45	7.9	6.65	0	14.8	30.1	25.9	0	6.9	22.8
BIN_W_19_G143	14.25	5.2	10.5	16.4	2.1	0.5	41.1	21.25	36.45	0.75	12.8	28.25
BIN_W_19_G144	0.5	0.5	13.2	21.1	0	1.85	60.4	68.95	43.4	0	6.65	4.45
BIN_W_19_G145	11.65	4.7	3.7	29.95	9.5	8.15	14.3	98.85	32	0	3.2	23.05
BIN_WH_19_G146	22.8	2.25	2.35	24.05	50.6	3.7	16.3	9.65	19	0.25	6.9	31.45
BIN_WH_19_G147	19.85	2	16.55	15.2	33.45	23	33.55	20.9	13.8	3.35	2.85	26.25
BIN_WH_19_G148	31.1	2.6	4.95	12.7	40.8	1.85	19.85	37.05	39.05	0.25	6.65	21.45
BIN_WH_19_G149	42.15	0.5	2.6	2.1	54.1	0.25	42.65	41.15	26	0	22.25	9
BIN_WH_19_G150	16.4	1	4.45	9	39.75	0	18.2	45.8	31.55	0	4.8	26.2
BLESS_19_G181	67.3	0	0	16.1	68.1	0	0	1.6	2.6	0	0	0

PLOT	2019 EXOTIC COOL	2019 NATIVE COOL	2019 CAREX SPECIES	2019 NATIVE WARM	2016 EXOTIC COOL	2016 NATIVE COOL	2016 CAREX SPECIES	2016 NATIVE WARM	2013 EXOTIC COOL	2013 NATIVE COOL	2013 CAREX SPECIES	2013 NATIVE WARM
BLESS_19_G182	60.4	0	0.75	18.85	30.45	0	0.25	33.05	62.75	0	0	6.65
BLESS_19_G183	32.45	0	0	64	15.75	0.25	0	36.2	73.4	0	0	13.7
CookHM_19_G1	79.05	0	0	24.45	54.7	0	0	19.85	37.85	3.2	0	33.1
CookHM_19_G2	106.2	0	0	1.85	99.2	0	0	10.55	54.35	0	0	18.1
CookHM_19_G3	73.6	0	0	49.55	90.65	0	0	22.25	40.85	0	0	45.3
CWREL_19_G16	104.9	0.75	0.25	33.45	8.4	0.5	11.45	13.8	35.65	0	5.3	18.85
CWREL_19_G17	39.65	12.95	3.45	35.95	12.7	22.5	1.6	43.6	21.1	2.85	6.35	24
CWREL_19_G18	31.7	0.75	1.6	38	20.85	6.05	7.9	27.35	23.05	0.25	12.1	22
CWREL_19_G19	65.55	1.85	1.85	34.6	25.6	2.35	0.25	25.25	11.6	0.5	0.25	33.9
CWREL_19_G20	91.7	0	3.95	1.6	18	0.25	21.95	1.6	14.8	0	20.6	2.6
CWREL_19_G21	79.85	0	17	10.05	32.9	0.25	14.55	0.75	18.75	0	15.15	5.8
CWREL_19_G22	63.2	12.4	16.65	45.75	36.25	12.4	1.6	23.3	2.85	0.25	13.05	54.3
CWREL_19_G23	69.9	0.5	0	41.2	56.45	0	0	15.3	7.9	0	3.7	54.7
CWREL_19_G24	56.7	27.35	4.45	45	20.55	8.7	0.75	24.15	32.85	4.2	0.25	28.95
CWRN1_19_G10	29.9	10.6	1.6	43.4	42	2.6	0	31.85	49.15	2.35	1.6	38.05
CWRN1_19_G11	66.3	3.2	2.6	7.65	67.05	0	0	0	49.65	0	22.4	0
CWRN1_19_G12	43.1	1.25	6.35	5.55	45.2	1	14	2.6	28.15	0	3.7	1.85
CWRN2_19_G13	136.95	0.75	0	0	52.5	1.85	5.55	0	47.45	0	2.1	0
CWRN2_19_G14	62.8	1	0.25	7.4	50.5	4.45	7.9	0	10.25	0.25	17.5	4.95
CWRN2_19_G15	61.5	35.85	6.3	10.85	23.05	20.7	1.25	11.1	36.9	3.95	0.5	18.5
CWRN3_19_G151	28.5	5.3	0	19.35	1.85	42.65	2.6	3.2				
CWRN3_19_G152	2.1	6.55	0.25	28	1.6	5.2	9.75	18.8				
CWRN3_19_G153	16.75	15.15	9.5	10.35	12.75	15.35	3.45	9.25				
DIPP_19_G262	72.95	0.25	0	2.1								
DIPP_19_G263	33.65	0.25	0	43.65								
DIPP_19_G264	106.8	0	0	0								
DIPP_19_G265	42.85	4.2	0.25	11.6								
DIPP_19_G266	5.55	5.55	17.95	0								
DIPP_19_G267	1.6	25.75	0	0								
DIPP_19_G268	0	62.95	7.95	0								
DIPP_19_G269	0	37.3	3.45	8.7								
DIPP_19_G270	8.15	28.55	0.25	2.1								
DIPP_19_G271	1.85	33.3	8.6	6.35								
DIPP_19_G272	88.1	0	4.7	8.5								
DIPP_19_G273	56.45	0	1.5	14.85								
DIPP_19_G274	43.65	23.65	0	3.2								
DIPP_19_G275	80.9	0	0	7.9								
DYER_19_G5	16.4	0	0	38.05	20.7	0	0	13.8	13.7	0	0	4.1
DYER_19_G6	16.9	0	6.35	27.2	29.1	0	0	5.55	15.4	0	35.7	7.15



PLOT	2019 EXOTIC COOL	2019 NATIVE COOL	2019 CAREX SPECIES	2019 NATIVE WARM	2016 EXOTIC COOL	2016 NATIVE COOL	2016 CAREX SPECIES	2016 NATIVE WARM	2013 EXOTIC COOL	2013 NATIVE COOL	2013 CAREX SPECIES	2013 NATIVE WARM
DYER_19_G7	12.7	6.35	18.6	34.85	19.55	0.25	0	22.95	32.1	0	0	23.9
DYER_19_G8	44.95	20.05	0	22.9	18.1	2.1	66.3	15.65	31.75	0.25	38.9	14.65
DYER_19_G9	16.95	32.35	0	14.15	21.3	5.05	1.6	0.25	7.15	25.25	1.6	46.1
FOX_19_G174	25.9	0	1.85	30.9	0	0	0	0	16.9	4.2	0	12.4
FOX_19_G175	20.6	0	0	23.75	87.75	0	0	18.9	7.15	4.2	0	14.3
FOX_19_G176	3.95	0	0.5	38.75	15.55	3.2	1.6	101.55	14.85	15.05	0	13.35
FOX_19_G177	7.9	0.5	3.45	39.5	24.6	20.1	0.25	67.45	9	9.5	0	1.6
FOX_19_G178	26.85	0	0	14.3	56.75	0.25	0	10.75	7.65	1.6	0	2.35
HOST_C_19_G102	0.75	12.95	0	55.35	0	14.8	0	1.6	3.45	37.9	0	29.3
HOST_C_19_G103	10.6	54.45	0	6.35	0	9.5	0	0	0	0	0	20.35
HOST_C_19_G104	12.7	12.65	0	20.8	12.7	39.65	0	7.4	3.2	24.95	0	26.65
HOST_C_19_G105	12.45	74.05	0	31.7	0	22.45	0	4.7	3.2	14.8	0	24.55
HOST_C_19_G106	19.15	7.65	0	25.45	45.4	6.05	0	7.65	0	2.1	0	9
HOST_C_19_G107	9.25	45	0	51.5	0	6.3	0	0	0	1.6	0	10.35
HOST_C_19_G108	7.4	15	0	30.05	7.65	41.5	0	5.3	0	8.2	0	26.1
HOST_C_19_G109	1.85	39.05	0	3.7	0.25	49.05	0	15.1	1.6	3.7	0	38.05
JOHNS_NWM_19_G69	0	0	0	8.85	6.9	12.7	5.8	35.15	20.1	0	0	19.5
JOHNS_NWM_19_G70	44.15	3.45	0.5	23.95	22.7	18.9	27.05	28.1	23.3	0.5	6.85	8.75
JOHNS_NWM_19_G71	10.55	40	0.5	0.5	2.1	30.65	40.6	12.3	4.8	25.2	14.8	2.35
JOHNS_NWM_19_G72	24.35	10.7	0.25	15.75	9	18	43.05	21.95	17.9	6.05	14.25	15.6
JOHNS_NWM_19_G73	43.6	27.25	7.15	38.85	0.75	4.1	3.35	13.35	16.65	1.85	6.05	0.75
JOHNS_NWM_19_G74	39.1	1.85	0	24.45	16.15	0	17.45	20.7	26.45	1.6	9.55	5.55
JOHNS_NWM_19_G75	0	0	0	0					26.2	0.5	1.6	3.95
JOHNS_NWM_19_G76	0	39.75	39.55	3.95	1.85	3.85	25.3	2.6	0	5.45	7.4	0
JOHNS_NWM_19_G77	16.4	7.65	26	8.15	2.6	2.1	34.4	2.6	18.7	15.85	5.8	7.15
JOHNS_NWM_19_G78	70.9	21.7	3.45	53	5.3	0.5	0.25	26.5	28.7	0	0	25
JOHNS_NWM_19_G79	120.7	4.45	0	1.85	40.15	3.7	1.85	10.5	45.2	0	0	6.3
JOHNS_NWM_19_G80	0	46.25	31.2	1.6	1.85	0.25	78.25	0.25	0	11.6	10.2	23.55
JOHNS_NWM_19_G81	19.9	15.4	6.3	25.25	11.1	16.05	3.45	18.6	15.9	16.9	0	26.7
McC_NI_19_G91	5.05	30.15	3.7	11.9	20.25	9.8	51.95	12.7	3.45	7.15	1.85	0
McC_NI_19_G92	2.1	0	0	54.4	0	2.35	5.45	0.25	6.65	8.85	0	0.25
McC_NI_19_G93	7.9	0	14.95	9.25	4.7	0.5	5.45	2.1	16.8	0	0	28
McC_SM_19_G94	3.95	1	2.1	9	12.2	7.05	11.45	86.7	14.2	1	5.3	19.25
McC_SM_19_G95	0	0	0	0					6.85	13.45	0	4.2
McC_SM_19_G96	1.6	16.05	16.7	28.5	3.95	14.5	17.9	20.1	9.25	1.85	0.25	16.8
McC_SM_19_G97	14.85	9.5	2.6	52.1	10.25	6.05	2.35	16.65	21.5	0.25	1.85	3
MORSEN_19_G28	55.1	10.5	10.6	22.4	14.05	3.95	10	10	53.55	13.5	21.3	21.35
MORSEN_19_G29	46.5	0.5	8.6	53.9	41.8	0	4.45	12.7	22.9	0	0.5	13.7
MORSEN_19_G30	34.1	0	0.25	70.65	13.7	0	0	33.25	61.5	0	0	45.2

PLOT	2019 EXOTIC COOL	2019 NATIVE COOL	2019 CAREX SPECIES	2019 NATIVE WARM	2016 EXOTIC COOL	2016 NATIVE COOL	2016 CAREX SPECIES	2016 NATIVE WARM	2013 EXOTIC COOL	2013 NATIVE COOL	2013 CAREX SPECIES	2013 NATIVE WARM
MORSEN_19_G31	51.5	0	0	61.2	9.65	0	0	34.05	51.1	0.25	0	38.05
MORSEN_19_G32	73.55	3.2	0	11.7	32.8	0	0	21.75	74.5	0	0	4.35
MORSEN_19_G33	37.95	0	0	69.9	21.9	0	0	24.65	54.05	0	0	17.4
SLWD_HM_19_G88	97.6	0	0	0.25	91.7	0	0	3.45	84.45	0	0	0
SLWD_HM_19_G89	85.9	0	0.75	0	104.85	0	2.35	0	90.1	0	3.2	0
SLWD_HM_19_G90	88.35	0	0	12.8	112.7	0	0	0	58.15	0	0	8.7
SP_N_19_G164	66.45	5.55	0	43.7	28.35	0	0	73.45				
SP_N_19_G165	92.85	0	0	48.4	47.7	8.15	0	44.7				
SP_N_19_G166	33	8.15	0	71.7	2.1	24.15	0	29.75				
SP_N_19_G167	0.25	0	0	78.25	0	0	0	60.85				
SP_N_19_G168	33.4	9.75	0	51.35	24.6	22.2	0	74.1				
SP_N_19_G169	28.55	0	9.5	56.05	8.4	12.7	1	39.9				
SP_N_19_G170	10.1	4.8	0	87.8	8.5	2.1	0.25	23.5				
SP_N_19_G171	7.55	19.95	1.6	32.65	31.15	7.15	2.85	39.7				
SP_N_19_G172	31.9	10.75	3.45	36.35	28.3	6.9	14.4	22.6				
SP_N_19_G173	19.75	11.85	16.1	39.1	36.95	31.75	7.4	35.95				
SP_S_19_G157	20.7	0	0	44	32.25	3.7	0	36.4				
SP_S_19_G158	62.65	5.3	0	28.35	53.15	10.85	5.05	10.35				
SP_S_19_G159	51.15	2.1	0.25	28.25	72.45	5.05	0	17.85				
SP_S_19_G160	67.6	2.1	0	31.7	51.9	5.05	0.25	32.15				
SP_S_19_G161	60.9	16.15	0	28.55	41.5	5.8	1.6	34.7				
SP_S_19_G162	46.2	0	0.25	34.05	26.05	3.95	2.35	48.65				
SP_S_19_G163	74.7	0	0	0.25	66.9	10.3	0	0				
WY_19_G100	70.15	0.25	0.5	0.5	76.25	0	1.6	1.85	68.6	0	0.25	1.6
WY_19_G101	79.25	0	1	5.2	96.4	3.45	10.6	8.75	7.4	0.5	0	0.25
WY_19_G98	37.5	1.6	1.6	2.1	0.5	0	0	15.05	3.95	0	0	22.45
WY_19_G99	39.75	0.25	0.25	1.85	46.65	16.1	15.8	2.35	32.1	6.65	0	0

## **APPENDICES**

### **APPENDIX A: SAMPLING PROTOCOL**

See attached PDF document

## APPENDIX B: PLOT LOCATIONS

Site Location	Number	Latitude	Longitude	y_proj	x_proj	Orientation
Binfield East Meadow	G127N	40.771403	-98.5220535	4513490	540335.4	n
Binfield East Meadow	G127S	40.771134	-98.5220325	4513460	540337.3	s
Binfield East Meadow	G128N	40.770918	-98.518924	4513438	540599.8	n
Binfield East Meadow	G128S	40.770647	-98.5189119	4513408	540601	s
Binfield East Meadow	G129N	40.769975	-98.5260089	4513330	540002.4	n
Binfield East Meadow	G129S	40.769707	-98.5260221	4513300	540001.5	s
Binfield East Meadow	G130N	40.769048	-98.5189208	4513230	540601.2	n
Binfield East Meadow	G130S	40.768778	-98.5189178	4513200	540601.6	s
Binfield East Meadow	G131N	40.766191	-98.5256282	4512910	540036.8	n
Binfield East Meadow	G131S	40.765921	-98.5256293	4512880	540036.9	s
Binfield East Meadow	G132N	40.764116	-98.5241031	4512680	540166.8	n
Binfield East Meadow	G132S	40.763847	-98.5240959	4512650	540167.6	s
Binfield East Meadow	G135S	40.766893	-98.5350464	4512984	539241.5	s
Binfield South Hay Meadow	G121N	40.771665	-98.5124856	4513524	541142.7	n
Binfield South Hay Meadow	G121S	40.771395	-98.5124755	4513494	541143.7	s
Binfield South Hay Meadow	G122N	40.771159	-98.5136904	4513467	541041.3	n
Binfield South Hay Meadow	G122S	40.770889	-98.5136769	4513437	541042.6	s
Binfield South Hay Meadow	G123N	40.769818	-98.5159429	4513317	540852	n
Binfield South Hay Meadow	G123S	40.769548	-98.5159492	4513287	540851.7	s
Binfield South Meadow	G124N	40.767435	-98.5128739	4513054	541112.5	N
Binfield South Meadow	G124S	40.767166	-98.5128874	4513024	541111.5	s
Binfield South Meadow	G125N	40.764925	-98.517416	4512773	540730.7	N
Binfield South Meadow	G125S	40.764656	-98.5174244	4512743	540730.2	s
Binfield South Meadow	G126N	40.763258	-98.5209989	4512587	540429.3	N
Binfield South Meadow	G126S	40.762988	-98.5209851	4512557	540430.6	s
Binfield South Meadow	G134S	40.767905	-98.5329249	4513097	539420	s
Binfield West Hay Meadow	G146N	40.756645	-98.552117	4511839	537806.6	n
Binfield West Hay Meadow	G146S	40.756376	-98.5521241	4511809	537806.2	s
Binfield West Hay Meadow	G147N	40.756505	-98.5432484	4511827	538555.3	n
Binfield West Hay Meadow	G147S	40.756235	-98.5432283	4511797	538557.2	s
Binfield West Hay Meadow	G148N	40.755959	-98.5470381	4511765	538235.7	n
Binfield West Hay Meadow	G148S	40.755689	-98.5470285	4511735	538236.7	s
Binfield West Hay Meadow	G149N	40.754736	-98.5492443	4511628	538050.2	n
Binfield West Hay Meadow	G149S	40.754467	-98.5492498	4511598	538049.9	s
Binfield West Hay Meadow	G150N	40.754708	-98.5433907	4511627	538544.3	n
Binfield West Hay Meadow	G150S	40.754437	-98.5433864	4511597	538544.9	n
Binfield West Meadow	G133N	40.769453	-98.5283126	4513271	539808.3	n
Binfield West Meadow	G133S	40.769183	-98.5283139	4513241	539808.4	s
Binfield West Meadow	G134N	40.768175	-98.5329378	4513127	539418.7	n
Binfield West Meadow	G135N	40.767163	-98.5350617	4513014	539240.1	n
Binfield West Meadow	G136N	40.765406	-98.5308649	4512821	539595.3	n
Binfield West Meadow	G136S	40.765137	-98.5308734	4512791	539594.8	s
Binfield West Meadow	G137N	40.765303	-98.5351095	4512807	539237.2	n
Binfield West Meadow	G137S	40.765033	-98.5351057	4512777	539237.6	s
Binfield West Meadow	G138N	40.763809	-98.5378423	4512640	539007.4	n
Binfield West Meadow	G138S	40.763538	-98.5378459	4512610	539007.2	s

Site Location	Number	Latitude	Longitude	y_proj	x_proj	Orientation
Binfield West Meadow	G139N	40.763702	-98.5296096	4512632	539702.3	n
Binfield West Meadow	G139S	40.763433	-98.5296228	4512602	539701.3	s
Binfield West Meadow	G140N	40.762039	-98.533293	4512446	539392.4	n
Binfield West Meadow	G140S	40.76177	-98.5332981	4512416	539392.1	s
Binfield West Meadow	G141N	40.761872	-98.5366433	4512426	539109.7	n
Binfield West Meadow	G141S	40.761602	-98.5366545	4512396	539108.9	s
Binfield West Meadow	G142N	40.761041	-98.5273172	4512338	539897.4	n
Binfield West Meadow	G142S	40.760771	-98.5273281	4512308	539896.6	s
Binfield West Meadow	G143N	40.760057	-98.5379688	4512224	538998.9	n
Binfield West Meadow	G143S	40.759788	-98.5379759	4512194	538998.4	s
Binfield West Meadow	G144N	40.759281	-98.5343848	4512139	539301.9	n
Binfield West Meadow	G144S	40.759011	-98.5344035	4512109	539300.4	s
Binfield West Meadow	G145N	40.756972	-98.5377719	4511881	539017.3	n
Binfield West Meadow	G145S	40.756703	-98.5377861	4511851	539016.3	s
Blessing	G181N	40.664495	-99.044955	4501514	496200.8	n
Blessing	G181S	40.664226	-99.044956	4501484	496200.7	s
Blessing	G182N	40.665486	-99.048504	4501624	495900.9	n
Blessing	G182S	40.665215	-99.048506	4501594	495900.7	s
Blessing	G183N	40.666434	-99.050993	4501730	495690.6	n
Blessing	G183S	40.66616	-99.050991	4501699	495690.7	s
Cook Hay Meadow	G1E	40.676722	-99.5681442	4503026	451986.1	e
Cook Hay Meadow	G1W	40.676732	-99.5684943	4503027	451956.5	w
Cook Hay Meadow	G2N	40.676123	-99.5706905	4502960	451770.5	n
Cook Hay Meadow	G2S	40.675853	-99.5706941	4502931	451770	s
Cook Hay Meadow	G3E	40.675702	-99.5783088	4502918	451126.3	e
Cook Hay Meadow	G3W	40.675693	-99.5786743	4502917	451095.5	w
CWR East	G25N	40.67425	-99.456435	4502696	461425.4	n
CWR East	G25S	40.67398	-99.4564431	4502666	461424.6	s
CWR East	G26N	40.67316	-99.4598805	4502577	461133.6	n
CWR East	G26S	40.67289	-99.459891	4502547	461132.6	s
CWR East	G27N	40.671324	-99.4630002	4502374	460868.9	n
CWR East	G27S	40.671056	-99.4629959	4502344	460869.1	s
CWR East Lloyd Island	G16N	40.689478	-99.4545935	4504386	461589.8	n
CWR East Lloyd Island	G16S	40.689208	-99.4545772	4504356	461591	s
CWR East Lloyd Island	G17N	40.688663	-99.437738	4504288	463013.6	n
CWR East Lloyd Island	G17S	40.688394	-99.4377651	4504258	463011.1	s
CWR East Lloyd Island	G18N	40.688619	-99.4404746	4504284	462782.3	n
CWR East Lloyd Island	G18S	40.68835	-99.4404839	4504254	462781.4	s
CWR East Lloyd Island	G19N	40.688245	-99.4548132	4504249	461570.5	n
CWR East Lloyd Island	G19S	40.687978	-99.4547854	4504219	461572.7	s
CWR East Lloyd Island	G20N	40.687691	-99.4470796	4504184	462223.7	n
CWR East Lloyd Island	G20S	40.687421	-99.4470813	4504154	462223.4	s
CWR East Lloyd Island	G21N	40.687561	-99.4493844	4504171	462028.9	n
CWR East Lloyd Island	G21S	40.687292	-99.4493511	4504141	462031.5	s
CWR East Lloyd Island	G22N	40.687414	-99.4607196	4504159	461071	n
CWR East Lloyd Island	G22S	40.687144	-99.4606973	4504129	461072.7	s
CWR East Lloyd Island	G23N	40.687058	-99.4545593	4504117	461591.3	n
CWR East Lloyd Island	G23S	40.686787	-99.4545546	4504087	461591.5	s
CWR East Lloyd Island	G24N	40.686404	-99.4548149	4504045	461569.3	n

Site Location	Number	Latitude	Longitude	y_proj	x_proj	Orientation
CWR East Lloyd Island	G24S	40.686134	-99.4547976	4504015	461570.6	s
CWR North 1	G10E	40.692475	-99.4752825	4504728	459843.5	e
CWR North 1	G10W	40.692467	-99.4756372	4504727	459813.5	w
CWR North 1	G11E	40.692479	-99.4827381	4504732	459213.5	e
CWR North 1	G11W	40.692459	-99.4830925	4504729	459183.6	w
CWR North 1	G12E	40.692468	-99.4767472	4504727	459719.7	e
CWR North 1	G12W	40.692471	-99.4771021	4504728	459689.7	w
CWR North 2	G13N	40.690079	-99.4792047	4504463	459510.6	n
CWR North 2	G13S	40.689808	-99.4792046	4504433	459510.5	s
CWR North 2	G14N	40.689942	-99.4898906	4504453	458607.6	n
CWR North 2	G14S	40.689671	-99.489904	4504423	458606.3	s
CWR North 2	G15N	40.689931	-99.4747405	4504445	459887.7	n
CWR North 3	G151N	40.684954	-99.4920062	4503900	458425.8	n
CWR North 3	G151S	40.684678	-99.4920028	4503870	458425.9	s
CWR North 3	G152N	40.685826	-99.4896096	4503996	458628.8	n
CWR North 3	G152S	40.685551	-99.4896072	4503966	458628.9	s
CWR North 3	G153N	40.68626	-99.4830742	4504041	459181.3	n
CWR North 3	G153S	40.685985	-99.4830716	4504011	459181.4	s
CWR North 3	G15S	40.689662	-99.4747165	4504415	459889.6	s
DIPPEL	G262	40.7066008	-98.7941733	4506208	517387	n
DIPPEL	G263	40.7051140	-98.7958614	4506043	517245	n
DIPPEL	G264	40.7049091	-98.8157116	4506016	515568	n
DIPPEL	G265	40.7070997	-98.7899825	4506264	517741	n
DIPPEL	G266	40.7037975	-98.7927334	4505897	517509	n
DIPPEL	G267	40.7058105	-98.7856016	4506122	518111	n
DIPPEL	G268	40.7019520	-98.7936787	4505692	517430	n
DIPPEL	G269	40.7023757	-98.7974357	4505739	517112	n
DIPPEL	G270	40.7003832	-98.7995558	4505517	516934	n
DIPPEL	G271	40.6993787	-98.8044914	4505404	516517	n
DIPPEL	G272	40.7045551	-98.7999348	4505980	516901	n
DIPPEL	G273	40.7030396	-98.8022492	4505811	516706	n
DIPPEL	G274	40.7038860	-98.8094895	4505904	516094	n
DIPPEL	G275	40.6983169	-98.8109929	4505285	515968	n
Dyer Grassland	G4N	40.681018	-99.5539384	4503495	453189.7	n
Dyer Grassland	G4S	40.680745	-99.5539339	4503464	453189.9	s
Dyer Grassland	G5N	40.679532	-99.5524859	4503329	453311.4	n
Dyer Grassland	G5S	40.679263	-99.5524827	4503299	453311.5	s
Dyer Grassland	G6N	40.679341	-99.5498718	4503306	453532.2	n
Dyer Grassland	G6S	40.679076	-99.5498085	4503277	453537.3	s
Dyer Grassland	G7N	40.677765	-99.5595477	4503137	452713.4	n
Dyer Grassland	G7S	40.677492	-99.5595812	4503106	452710.3	s
Dyer Grassland	G8N	40.67721	-99.5638815	4503077	452346.7	n
Dyer Grassland	G8S	40.676941	-99.5638458	4503048	452349.6	s
Dyer Grassland	G9N	40.676515	-99.5642396	4503000	452316	n
Dyer Grassland	G9S	40.676246	-99.5642311	4502971	452316.5	s
Fox	FOX5E	40.667797	-98.982233	4501880	501502.4	e
Fox	FOX5W	40.667864	-98.982584	4501887	501472.8	w
Fox	FOX6N	40.671353	-98.982036	4502275	501519	n
Fox	FOX6S	40.67111	-98.982044	4502248	501518.3	s



Site Location	Number	Latitude	Longitude	y_proj	x_proj	Orientation
Fox	G174N	40.67293	-98.981074	4502450	501600.3	n
Fox	G174S	40.672656	-98.981069	4502419	501600.7	s
Fox	G175N	40.673195	-98.985923	4502479	501190.5	n
Fox	G175S	40.672927	-98.98592	4502449	501190.7	s
Fox	G176N	40.671393	-98.98728	4502279	501075.8	n
Fox	G176S	40.671126	-98.987281	4502249	501075.7	s
Fox	G177E	40.670492	-98.987812	4502179	501030.8	e
Fox	G177W	40.670495	-98.988168	4502179	501000.8	w
Fox	G178N	40.66644	-98.986985	4501729	501100.8	n
Fox	G178S	40.666171	-98.986986	4501699	501100.7	s
Hostetler Crop	G102N	40.668309	-98.961361	4501937	503266.6	n
Hostetler Crop	G102S	40.668042	-98.9613326	4501908	503269	s
Hostetler Crop	G103N	40.667921	-98.9660062	4501894	502874	n
Hostetler Crop	G103S	40.667651	-98.9660034	4501864	502874.2	s
Hostetler Crop	G104N	40.667421	-98.9715862	4501838	502402.3	n
Hostetler Crop	G104S	40.667152	-98.9715715	4501809	502403.6	s
Hostetler Crop	G105N	40.666156	-98.9662305	4501698	502855.1	n
Hostetler Crop	G105S	40.665885	-98.9662274	4501668	502855.4	s
Hostetler Crop	G106N	40.665648	-98.9792739	4501641	501752.6	n
Hostetler Crop	G106S	40.665378	-98.9792831	4501611	501751.8	s
Hostetler Crop	G107N	40.665503	-98.9617226	4501626	503236.1	n
Hostetler Crop	G107S	40.665234	-98.961727	4501596	503235.8	s
Hostetler Crop	G108N	40.665151	-98.9714864	4501586	502410.9	n
Hostetler Crop	G108S	40.66488	-98.9714838	4501556	502411.1	s
Hostetler Crop	G109N	40.664763	-98.9794654	4501543	501736.4	n
Hostetler Crop	G109S	40.664493	-98.9794417	4501513	501738.5	s
Johns North Wet Meadow	G69N	40.682611	-99.3378664	4503579	471449.8	n
Johns North Wet Meadow	G69S	40.682341	-99.3378699	4503549	471449.4	s
Johns North Wet Meadow	G70N	40.682508	-99.3349014	4503567	471700.3	n
Johns North Wet Meadow	G70S	40.682239	-99.3348748	4503537	471702.4	s
Johns North Wet Meadow	G71E	40.681378	-99.3317644	4503440	471964.9	e
Johns North Wet Meadow	G71W	40.68137	-99.3321183	4503439	471935	w
Johns North Wet Meadow	G72N	40.680947	-99.3339277	4503393	471781.9	n
Johns North Wet Meadow	G72S	40.680678	-99.3339157	4503363	471782.8	s
Johns North Wet Meadow	G73N	40.680384	-99.3386388	4503332	471383.5	n
Johns North Wet Meadow	G73S	40.680113	-99.3386328	4503302	471383.9	s
Johns North Wet Meadow	G74N	40.679867	-99.3313122	4503272	472002.5	n
Johns North Wet Meadow	G74S	40.679597	-99.3312892	4503242	472004.3	s
Johns North Wet Meadow	G75N	40.678292	-99.3235992	4503095	472653.6	n
Johns North Wet Meadow	G75S	40.678024	-99.3236131	4503065	472652.3	s
Johns North Wet Meadow	G76N	40.677856	-99.3395892	4503052	471302.1	n
Johns North Wet Meadow	G76S	40.677586	-99.3395823	4503022	471302.6	s
Johns North Wet Meadow	G77N	40.677665	-99.3311949	4503028	472011.5	n
Johns North Wet Meadow	G77S	40.677399	-99.3311875	4502998	472012	s
Johns North Wet Meadow	G78N	40.677304	-99.3364037	4502989	471571.1	n
Johns North Wet Meadow	G78S	40.677034	-99.3364098	4502959	471570.5	s
Johns North Wet Meadow	G79N	40.677133	-99.3388797	4502971	471361.8	n
Johns North Wet Meadow	G79S	40.676863	-99.3388776	4502941	471361.9	s
Johns North Wet Meadow	G80E	40.676025	-99.3255233	4502844	472490.1	e

Site Location	Number	Latitude	Longitude	y_proj	x_proj	Orientation
Johns North Wet Meadow	G80W	40.676038	-99.325877	4502845	472460.2	w
Johns North Wet Meadow	G81E	40.673271	-99.3257247	4502538	472471.9	e
Johns North Wet Meadow	G81W	40.673274	-99.326078	4502539	472442.1	w
McCormick North Island	G91N	40.679512	-99.3201228	4503229	472947.9	n
McCormick North Island	G91S	40.679241	-99.3201153	4503199	472948.4	s
McCormick North Island	G92N	40.678296	-99.3135642	4503092	473501.7	n
McCormick North Island	G92S	40.678026	-99.3135651	4503062	473501.5	s
McCormick North Island	G93N	40.678025	-99.3150099	4503063	473379.4	n
McCormick North Island	G93S	40.677755	-99.3150093	4503033	473379.3	s
McCormick South Island	G94N	40.672709	-99.31968	4502474	472982.6	n
McCormick South Island	G94S	40.67244	-99.3196812	4502444	472982.4	s
McCormick South Island	G95E	40.674526	-99.3131409	4502674	473536	e
McCormick South Island	G95W	40.674535	-99.3135025	4502675	473505.4	w
McCormick South Island	G96N	40.673368	-99.3173339	4502547	473181.1	n
McCormick South Island	G96S	40.673093	-99.3173505	4502516	473179.6	s
McCormick South Island	G97N	40.672769	-99.3141052	4502479	473453.8	n
McCormick South Island	G97S	40.6725	-99.314105	4502449	473453.7	s
Morse North	G28N	40.673978	-99.4666822	4502670	460559.2	n
Morse North	G28S	40.673705	-99.4666905	4502640	460558.4	s
Morse North	G29N	40.673575	-99.4798232	4502632	459448.4	s
Morse North	G29N	40.673844	-99.4798171	4502662	459449.1	n
Morse North	G30N	40.672245	-99.4730419	4502481	460020.7	n
Morse North	G30S	40.67197	-99.4730479	4502450	460020	s
Morse North	G31N	40.671943	-99.4689516	4502446	460366.2	n
Morse North	G31S	40.671668	-99.4689645	4502415	460365	s
Morse North	G32N	40.672	-99.4834819	4502459	459138.2	n
Morse North	G32S	40.67173	-99.4834778	4502429	459138.4	s
Morse North	G33N	40.67152	-99.4754946	4502402	459813	n
Morse North	G33S	40.671251	-99.4754985	4502372	459812.5	s
SpeidelIII North	G164N	40.665428	-99.0041538	4501617	499649.6	n
SpeidelIII North	G164S	40.665154	-99.0041534	4501586	499649.7	s
SpeidelIII North	G165N	40.664657	-99.0028757	4501531	499757.7	n
SpeidelIII North	G165S	40.664382	-99.0028748	4501501	499757.7	s
SpeidelIII North	G166E	40.666655	-99.004169	4501753	499648.4	e
SpeidelIII North	G166W	40.666618	-99.004493	4501749	499621	w
SpeidelIII North	G167N	40.668707	-99.0021983	4501981	499814.9	n
SpeidelIII North	G167S	40.668432	-99.0021992	4501950	499814.8	s
SpeidelIII North	G168N	40.664977	-98.9953437	4501567	500394.3	n
SpeidelIII North	G168S	40.664702	-98.995344	4501536	500394.3	s
SpeidelIII North	G169E	40.666194	-98.994223	4501702	500489	e
SpeidelIII North	G169W	40.666197	-98.994573	4501702	500459.4	w
SpeidelIII North	G170N	40.668321	-98.99586	4501938	500350.7	s
SpeidelIII North	G170S	40.668049	-98.99585	4501908	500351.5	n
SpeidelIII North	G171N	40.671243	-98.9921437	4502262	500664.7	n
SpeidelIII North	G171S	40.670968	-98.9921433	4502232	500664.8	s
SpeidelIII North	G172N	40.672113	-98.9913843	4502359	500728.9	n
SpeidelIII North	G172S	40.671838	-98.9913833	4502328	500729	s
SpeidelIII North	G173N	40.665013	-98.9901045	4501571	500837.2	n
SpeidelIII North	G173S	40.66474	-98.9901055	4501540	500837.1	s

Site Location	Number	Latitude	Longitude	y_proj	x_proj	Orientation
SpeidelIII South	G157N	40.662044	-99.0130183	4501241	498900.3	n
SpeidelIII South	G157S	40.661768	-99.0130167	4501211	498900.4	s
SpeidelIII South	G158N	40.664627	-99.0101251	4501528	499144.9	n
SpeidelIII South	G158S	40.664352	-99.0101248	4501497	499144.9	s
SpeidelIII South	G159N	40.662987	-99.0073002	4501346	499383.7	n
SpeidelIII South	G159S	40.662713	-99.0072994	4501315	499383.7	s
SpeidelIII South	G160N	40.66214	-99.0033171	4501252	499720.3	n
SpeidelIII South	G160S	40.661866	-99.0033185	4501221	499720.2	s
SpeidelIII South	G161N	40.662314	-98.9963409	4501271	500310	n
SpeidelIII South	G161S	40.662039	-98.996341	4501241	500310	s
SpeidelIII South	G162N	40.6633	-98.9906429	4501380	500791.7	n
SpeidelIII South	G162S	40.663026	-98.9906432	4501350	500791.6	s
SpeidelIII South	G163N	40.663457	-98.9889148	4501398	500937.7	n
SpeidelIII South	G163S	40.663182	-98.9889149	4501368	500937.7	s
Sullwald Hay Meadow	G88N	40.685239	-99.3219395	4503866	472796.7	n
Sullwald Hay Meadow	G88S	40.684971	-99.3219565	4503836	472795.2	s
Sullwald Hay Meadow	G89N	40.684984	-99.3208586	4503837	472887.9	n
Sullwald Hay Meadow	G89S	40.684713	-99.3208556	4503807	472888.1	s
Sullwald Hay Meadow	G90N	40.683996	-99.3166506	4503726	473243.1	n
Sullwald Hay Meadow	G90S	40.683729	-99.3166639	4503696	473241.9	s
Wyoming South Meadow	G100N	40.650389	-99.0389055	4499948	496711.5	n
Wyoming South Meadow	G100S	40.650118	-99.0389187	4499918	496710.4	s
Wyoming South Meadow	G101N	40.649841	-99.0420702	4499887	496443.9	n
Wyoming South Meadow	G101S	40.649571	-99.0420772	4499857	496443.3	s
Wyoming South Meadow	G98E	40.653419	-99.0388314	4500284	496717.9	e
Wyoming South Meadow	G98W	40.653438	-99.0391843	4500287	496688.1	w
Wyoming South Meadow	G99N	40.65139	-99.0431056	4500059	496356.4	n
Wyoming South Meadow	G99S	40.651119	-99.0431067	4500029	496356.3	s

## APPENDIX C: LIST OF VASCULAR PLANTS

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
ABTH	ABUTILON THEOPHRASTI	velvet-leaf	MALVACEAE	A-HERB	UPL/FACU	
ACMIO	Achillea millefolium	western yarrow	ASTERACEAE	P-HERB	FACU	2
ACAM4	Acmispon americanus	prairie trefoil	FABACEAE	A-HERB	FACU	3
AGGI2	AGROSTIS GIGANTEA	redtop	POACEAE	P-HERB	FACW	
AGSTP	AGROSTIS STOLONIFERA	creeping bentgrass	POACEAE	P-HERB	FACW	
ALCAC	Allium canadense	meadow garlic	AMARYLLIDACEAE	P-HERB	FACU	3
ALCAL	Allium canadense	prairie wild onion	AMARYLLIDACEAE	P-HERB	FACU	7
AMRE	Amaranthus retroflexus	redroot pigweed	AMARANTHACEAE	A-HERB	FACU	0
AMAR2	Ambrosia artemisiifolia	common ragweed	ASTERACEAE	A-HERB	FACU	0
AMPS	Ambrosia psilostachya	western ragweed	ASTERACEAE	P-HERB	FACU	1
AMTR	Ambrosia trifida	giant ragweed	ASTERACEAE	A-HERB	/FAC	0
AMFR	Amorpha fruticosa	false indigo-bush	FABACEAE	SHRUB	FACW	5
ANGE	Andropogon gerardii	big bluestem	POACEAE	P-HERB	FACU/FAC	5
ANNE	Antennaria neglecta	field pussytoes	ASTERACEAE	P-HERB	FACU/UPL	3
APCA	Apocynum cannabinum	hemp dogbane	APOCYNACEAE	P-HERB	FAC	2
ARPO2	Argemone polyanthemos	plains prickly-poppy	PAPAVERACEAE	P-HERB	UPL	1
ARPUP4	Aristida purpurascens	arrowfeather three-awn	POACEAE	P-HERB	UPL/FACU	7
ARPL4	Arnoglossum plantagineum	tuberous Indian-plantain	ASTERACEAE	P-HERB	FAC	7
ARFI2	Artemisia filifolia	sandsage	ASTERACEAE	P-SHRUB	UPL	4
ARLUL2	Artemisia ludoviciana	white sage	ASTERACEAE	P-HERB	UPL	4
ASCLEPIAS SP	Asclepias sp.					1
ASSP	Asclepias speciosa	showy milkweed	APOCYNACEAE	P-HERB	FAC	1
ASSY	Asclepias syriaca	common milkweed	APOCYNACEAE	P-HERB	UPL/FACU	1
ASVE	Asclepias verticillata	whorled milkweed	APOCYNACEAE	P-HERB	FACU	3
ASVI	Asclepias viridiflora	green milkweed	APOCYNACEAE	P-HERB		6
ASOF	ASPARAGUS OFFICINALIS	garden asparagus	ASPARAGACEAE	P-HERB	FACU	
ATPA4	ATRIPLEX PATULA	common spearscale	CHENOPODIACEAE	A-HERB	FACW/FAC	
ATPR	ATRIPLEX PROSTATA	thin-leaf spearscale	CHENOPODIACEAE	A-HERB	FACW	
BOFL3	Bolboschoenus fluviatilis	river bulrush	CYPERACEAE	P-HERB	OBL	3
BOMAP2	Bolboschoenus maritimus	salt-marsh bulrush	CYPERACEAE	P-HERB	OBL	5
BOCUC2	Bouteloua curtipendula	sideoats grama	POACEAE	P-HERB		5
BODA2	Bouteloua dactyloides	buffalo grass	POACEAE	P-HERB	FACU	2
BOGR2	Bouteloua gracilis	blue grama	POACEAE	P-HERB		4
BOHIH	Bouteloua hirsuta	hairy grama	POACEAE	P-HERB		6
BREUC	Brickellia eupatorioides	false-boneset	ASTERACEAE	P-HERB		4
BRIN2	BROMUS INERMIS	smooth brome	POACEAE	P-HERB	UPL/FACU	
BRJA	BROMUS JAPONICUS	Japanese brome	POACEAE	A-HERB		
BRTE	BROMUS TECTORUM	downy brome	POACEAE	A-HERB		

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
CAST36	Calamagrostis stricta	northern reedgrass	POACEAE	P-HERB	FACW	6
CALOL2	Calamovilfa longifolia	prairie sandreed	POACEAE	P-HERB		5
CAAL	Callirhoe alcaeoides	pale poppy-mallow	MALVACEAE	A-HERB		5
CAAL	Callirhoe alcaeoides	pale poppy-mallow	MALVACEAE	A-HERB	UPL	5
CAINI4	Callirhoe involucrata	purple poppy-mallow	MALVACEAE	P-HERB		2
CASA3	CANNABIS SATIVA	hemp	CANNABACEAE	A-HERB	FACU	
CANU4	CARDUUS NUTANS	musk thistle	ASTERACEAE	B-HERB	FACU	
CABL	Carex blanda	woodland sedge	CYPERACEAE	P-HERB	FAC	2
CABR28	Carex brachyglossa	yellow-fruit sedge	CYPERACEAE	P-HERB	FACW	7
CABR10	Carex brevior	short-beak sedge	CYPERACEAE	P-HERB	FAC	4
CACR3	Carex crawei	Crawe's sedge	CYPERACEAE	P-HERB	FACW	6
CAEL2	Carex eleocharis	needle-leaf sedge	CYPERACEAE		UPL	2
CAEM2	Carex emoryi	Emory's sedge	CYPERACEAE		OBL	5
CAGR4	Carex granularis	Hale's meadow sedge	CYPERACEAE	P-HERB	OBL	6
CAGR4	Carex gravida	heavy-fruit sedge	CYPERACEAE	P-HERB	FACW/FACU	4
CAGR24	Carex grisea	gray wood sedge	CYPERACEAE	P-HERB	FACW/FAC	3
CAHA3	Carex halli	deer sedge	CYPERACEAE	P-HERB	FAC/FACW	7
CAHE5	Carex heliophila	sun sedge	CYPERACEAE	P-HERB		5
CAME2	Carex meadii	Mead's sedge	CYPERACEAE	P-HERB	FAC	6
CAMO11	Carex molesta	troublesome sedge	CYPERACEAE	P-SEDGE	FACW/FAC	3
CAPE42	Carex pellita	woolly sedge	CYPERACEAE	P-HERB	OBL	4
CAPR5	Carex praegracilis	clustered field sedge	CYPERACEAE	P-HERB	FACW	4
CAREX SP.	Carex spp.					4
CAVU2	Carex vulpinoidea	fox sedge	CYPERACEAE	P-HERB	FACW	4
CEOC	Celtis occidentalis	hackberry	CANNABACEAE	TREE	FACU/FAC	4
CELO3	Cenchrus longispinus	field sandbur	POACEAE	A-HERB	UPL	0
CHAL7	CHENOPODIUM ALBUM	lamb's-quarters	CHENOPODIACEAE	A-HERB	FACU	
CHBEZ	Chenopodium berlandieri	pitseed goosefoot	CHENOPODIACEAE	A-HERB		0
CHGL3	CHENOPODIUM GLAUCUM	oak-leaf goosefoot	CHENOPODIACEAE	A-HERB	FAC/FACW	
CHPR5	Chenopodium pratericola	desert goosefoot	CHENOPODIACEAE	A-HERB		1
CHSU2	Chenopodium subglabrum	smooth goosefoot	CHENOPODIACEAE	A-HERB		6
CHVE2	Chloris verticillata	tumble windmill grass	POACEAE	P-HERB		0
CIAL2	Cirsium altissimum	tall thistle	ASTERACEAE	P-HERB		1
CIAR4	CIRSIUM ARVENSE	Canada thistle	ASTERACEAE	P-HERB	FACU	
CICA11	Cirsium canescens	Platte thistle	ASTERACEAE	B-HERB		4
CIFL	Cirsium flodmanii	Flodman's thistle	ASTERACEAE	P-HERB	FAC	4
CIUN	Cirsium undulatum	wavy-leaf thistle	ASTERACEAE	P-HERB	UPL/FACU	4
CIVU	CIRSIUM VULGARE	bull thistle	ASTERACEAE	B-HERB	FACU	
COMA2	CONIUM MACULATUM	poison-hemlock	APIACEAE	B-HERB	FACW	
COAR4	CONVOLVULUS ARVENSIS	field bindweed	CONVOLVULACEAE	P-HERB		

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
COCA5	<i>Conyza canadensis</i>	horseweed	ASTERACEAE	A-HERB	FACU	0
CORA4	<i>Conyza ramosissima</i>	spreading fleabane	ASTERACEAE	A-HERB	UPL	0
COTI3	<i>Coreopsis tinctoria</i>	plains coreopsis	ASTERACEAE	A-HERB	FAC/FACU	1
CODR	<i>Cornus drummondii</i>	rough-leaf dogwood	CORNACEAE	SHRUB	FAC	3
COVI9	<i>Coryphantha vivipara</i>	purple pincushion cactus	CACTACEAE	P-HERB		6
CRTET	<i>Croton texensis</i> var. <i>texensis</i>	Texas croton	EUPHORBIACEAE	A-HERB		1
CYXA	<i>Cyclachaena xanthiifolia</i>	giant marsh-elder	ASTERACEAE	A-HERB	FAC	0
CYAT	<i>Cycloloma atriplicifolium</i>	winged-pigweed	CHENOPODIACEAE	A-HERB	FACU	2
CYAC2	<i>Cyperus acuminatus</i>	short-point flatsedge	CYPERACEAE	A-HERB	OBL	3
CYESL	<i>Cyperus esculentus</i>	yellow nut-sedge	CYPERACEAE	P-HERB	FACW	0
CYLUL	<i>Cyperus lupulinus</i>	Great Plains flatsedge	CYPERACEAE	P-HERB	FACU	1
CYSC3	<i>Cyperus schweinitzii</i>	sand flatsedge	CYPERACEAE	P-HERB	FACU	4
CYSQ	<i>Cyperus squarrosus</i>	awned flatsedge	CYPERACEAE	A-HERB	OBL	2
CYST	<i>Cyperus strigosus</i>	straw-colored flatsedge	CYPERACEAE	P-HERB	FACW	4
DAGL	DACTYLIS GLOMERATA	orchard grass	POACEAE	P-HERB	FACU	
DACA7	<i>Dalea candida</i>	eastern white prairie-clover	FABACEAE	P-HERB		6
DAPUP	<i>Dalea purpurea</i> var. <i>purpurea</i>	purple prairie-clover	FABACEAE	P-HERB		6
DAVI	<i>Dalea villosa</i>	silky prairie-clover	FABACEAE	P-HERB		5
DEPIO6	<i>Descurainia pinnata</i> var. <i>osmiarum</i>	pinnate tansy mustard	BRASSICACEAE	A-HERB		4
DESO2	DESCURAINIA SOPHIA	flix-weed tansy mustard	BRASSICACEAE	A-HERB		
DEIL	<i>Desmanthus illinoensis</i>	Illinois bundleflower	FABACEAE	P-HERB	FACU	5
DEIL2	<i>Desmodium illinoense</i>	Illinois tick-clover	FABACEAE	P-HERB		6
DIACF	<i>Dichanthelium acuminatum</i>	western spring-panicum	POACEAE	P-HERB	FAC	6
DIOLS	<i>Dichanthelium oligosanthes</i>	Scribner's spring-panicum	POACEAE	P-HERB	FACU	4
DIVIP	<i>Dichanthelium villosissimum</i>	white-hair spring-panicum	POACEAE		UPL	6
DICO6	<i>Digitaria cognata</i>	fall witchgrass	POACEAE	P-HERB		4
DISP	<i>Distichlis spicata</i>	saltgrass	POACEAE	P-HERB	FACW	3
ECANA	<i>Echinacea angustifolia</i>	narrow-leaf purple coneflower	ASTERACEAE	P-HERB		5
ECCR	ECHINOCHLOA CRUS-GALLI	barnyard grass	POACEAE	A-HERB	FAC/FACW	
ELAN	ELAEAGNUS ANGUSTIFOLIA	Russian-olive	ELAEAGNACEAE	TREE	FACU	
ELCOC2	<i>Eleocharis compressa</i>	flat-stem spikerush	CYPERACEAE	P-HERB	FACW	6
ELPA3	<i>Eleocharis palustris</i>	marsh spikerush	CYPERACEAE	P-HERB	OBL	4
ELEOCHARIS SP.	<i>Eleocharis</i> sp.					4
ELCA4	<i>Elymus canadensis</i>	Canada wild-rye	POACEAE	P-HERB	FACU	5
ELRE4	ELYMUS REPENS	quackgrass	POACEAE	P-HERB	FACU	
ELYMUS SP.	<i>Elymus</i> sp.					4
ELTRT	<i>Elymus trachycaulus</i>	slender wheatgrass	POACEAE	P-HERB	FACU	5
ELVIV	<i>Elymus virginicus</i>	Virginia wild-rye	POACEAE	P-HERB	FAC/FACW	4
EQAR	<i>Equisetum arvense</i>	field horsetail	EQUISETACEAE	P-HERB	FAC	4



P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
EQLA	Equisetum laevigatum	smooth scouring-rush	EQUISETACEAE	P-HERB	FAC/FACW	4
ERCI	ERAGROSTIS CILIANENSIS	stinkgrass	POACEAE	A-HERB	FACU	
ERPEP2	Eragrostis pectinacea	tufted lovegrass	POACEAE	A-HERB	FAC	0
ERSP	Eragrostis spectabilis	purple lovegrass	POACEAE	P-HERB	UPL	3
ERTR3	Eragrostis trichodes	Eragrostis trichodes	POACEAE	P-HERB	UPL	5
ERHIH	Erechtites hieraciifolius	burnweed	ASTERACEAE	A-HERB	FACU/FAC	1
ERPHP	Erigeron philadelphicus	marsh fleabane	ASTERACEAE	B-HERB	FAC/FACW	3
ERSTS2	Erigeron strigosus	daisy fleabane	ASTERACEAE	A-HERB	FACU	2
EUAL3	Eupatorium altissimum	tall boneset	ASTERACEAE	P-HERB		3
EUDA5	Euphorbia davidii	western toothed spurge	EUPHORBIACEAE	A-HERB		0
EUDE4	Euphorbia dentata	eastern toothed spurge	EUPHORBIACEAE	A-HERB		0
CHGEG	Euphorbia geyeri	Geyer's spurge	EUPHORBIACEAE	A-HERB		5
EUMA7	Euphorbia maculata	spotted spurge	EUPHORBIACEAE	A-HERB	FACU	0
EUMA8	Euphorbia marginata	snow-on-the-mountain	EUPHORBIACEAE	A-HERB	FACU	0
EUNU	Euphorbia nutans	eyebane	EUPHORBIACEAE	A-HERB		0
CHSES	Euphorbia serpyllifolia	thyme-leaf spurge	EUPHORBIACEAE	A-HERB		2
EUPHORBIA SP.	Euphorbia sp.					0
EUSP	Euphorbia spathulata	warty spurge	EUPHORBIACEAE	A-HERB	FACU	2
EUVI7	EUPHORBIA VIRGATA	leafy spurge	EUPHORBIACEAE	P-HERB		
EURU4	Eustoma russellianum	prairie-gentian	GENTIANACEAE	A-HERB	FACW	4
EUGY	Euthamia gymnospermoides	viscid goldentop	ASTERACEAE	P-HERB	FAC/FACW	4
FASC	Fallopia scandens	climbing false-buckwheat	POLYGONACEAE	P-VINE	FACU/FAC	1
FEOC3	Festuca octoflora	six-weeks fescue	POACEAE	A-HERB	FACU	3
FIPUI	Fimbristylis puberula	hairy fimbry	CYPERACEAE	P-HERB	OBL	7
FRPE	Fraxinus pennsylvanica	green ash	OLEACEAE	TREE	FAC/FACW	2
GAAP2	Galium aparine	catch-weed bedstraw	RUBIACEAE	A-HERB	FACU	0
GECA7	Geum canadense	white avens	ROSACEAE	P-HERB	FAC	3
GLTR	Gleditsia triacanthos	honey-locust	FABACEAE	TREE	FACU	1
GLLE3	Glycyrrhiza lepidota	wild licorice	FABACEAE	P-HERB	FACU	4
GRSQ	Grindelia squarrosa	curly-top gumweed	ASTERACEAE	B-HERB	UPL/FACU	1
HAVI2	Hackelia virginiana	Virginia stickseed	BORAGINACEAE	B-HERB	FACU	2
HEHI	Hedeoma hispida	rough false-pennyroyal	LAMIACEAE	A-HERB		2
HEAU	Helenium autumnale	sneezeweed	ASTERACEAE	P-HERB	FACW	6
HEAN3	Helianthus annuus	common sunflower	ASTERACEAE	A-HERB	FACU	0
HEGR4	Helianthus grosseserratus	sawtooth sunflower	ASTERACEAE	P-HERB	FACW	4
HEMA2	Helianthus maximiliani	Maximilian's sunflower	ASTERACEAE	P-HERB	FACU/UPL	4
HEPAS2	Helianthus pauciflorus	stiff sunflower	ASTERACEAE	P-HERB		5
HEPEP	Helianthus petiolaris	plains sunflower	ASTERACEAE	A-HERB		1
HEHEO	Heliopsis helianthoides	false-sunflower	ASTERACEAE	P-HERB	FACU	4
HECOC9	Hesperostipa comata	needle-and-thread	POACEAE	P-HERB		6

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
HELA5	Heterotheca latifolia	camphor-weed	ASTERACEAE	A-HERB		2
HEVIV	Heterotheca villosa	hairy golden-aster	ASTERACEAE	P-HERB		4
HOJUI	Hordeum jubatum	foxtail barley	POACEAE	P-HERB	FACW/FAC	1
HOPU	Hordeum pusillum	little barley	POACEAE	A-HERB	FACU/FAC	1
HYHI2	Hypoxis hirsuta	yellow star-grass	HYPOXIDACEAE	P-HERB	FACW/FAC	7
IVAN2	Iva annua	annual marsh-elder	ASTERACEAE	A-HERB	FAC	1
JUBAL	Juncus balticus	Baltic rush	JUNCACEAE	P-HERB	FACW/OBL	6
JUDU2	Juncus dudleyi	Dudley's rush	JUNCACEAE	P-HERB	FACW	5
JUNON	Juncus nodosus	knotted rush	JUNCACEAE	P-HERB	OBL	6
JUNCUS SP.	Juncus sp.					5
JUTO	Juncus torreyi	Torrey's rush	JUNCACEAE	P-HERB	FACW	4
JUVIV	Juniperus virginiana	eastern red-cedar	CUPRESSACEAE	TREE	UPL/FACU	1
SATR12	KALI TRAGUS	prickly Russian-thistle	CHENOPODIACEAE	A-HERB	FACU	
KOMA	Koeleria macrantha	Junegrass	POACEAE	P-HERB		6
LALU	Lactuca ludoviciana	western wild lettuce	ASTERACEAE	B-HERB	FACU	3
LASE	LACTUCA SERRIOLA	prickly lettuce	ASTERACEAE	A-HERB	FAC/FACU	
LEOR	Leersia oryzoides	rice cutgrass	POACEAE	P-HERB	OBL	4
LEMI3	Lemna minor	common duckweed	ARACEAE	P-HERB	OBL	5
LEDE	Lepidium densiflorum	prairie pepper-grass	BRASSICACEAE	A-HERB	FAC	0
LELA2	LEPIDIUM LATIFOLIUM	broad-leaf pepper-grass	BRASSICACEAE	P-HERB	FACW	
LECA8	Lespedeza capitata	round-head bush-clover	FABACEAE	P-HERB	UPL/FACU	5
LIGL4	Liatris glabrata	plains gayfeather	ASTERACEAE	P-HERB		5
LIPUP	Liatris punctata	dotted gayfeather	ASTERACEAE	P-HERB		5
LIPYP	Liatris pycnostachya	thick-spike gayfeather	ASTERACEAE	P-HERB	FAC	7
LISU4	Linum sulcatum	grooved flax	LINACEAE	A-HERB		6
LICA12	Lithospermum canescens	hoary puccoon	BORAGINACEAE	P-HERB		5
LIIN2	Lithospermum incisum	fringed puccoon	BORAGINACEAE	P-HERB		5
ONOC	Lithospermum occidentale	marble-seed	BORAGINACEAE	P-HERB		4
LOSP	Lobelia spicata	pale-spike lobelia	CAMPANULACEAE	P-HERB	FAC	6
LYAM	Lycopus americanus	American water-horehound	LAMIACEAE	P-HERB	OBL	4
LYAS	Lycopus asper	rough bugleweed	LAMIACEAE	P-HERB	OBL	5
LYCI	Lysimachia ciliata	fringed loosestrife	PRIMULACEAE	P-HERB	FACW	5
LYALA4	Lythrum alatum	winged loosestrife	LYTHRACEAE	P-HERB	OBL	6
LYSA2	LYTHRUM SALICARIA	purple loosestrife	LYTHRACEAE	P-HERB	OBL	
MAST4	Maianthemum stellatum	starry false Solomon's-seal	RUSCACEAE	P-HERB	FACU/FAC	4
MELU	MEDICAGO LUPULINA	black medick	FABACEAE	A-HERB	FACU	
MESAS	MEDICAGO SATIVA	alfalfa	FABACEAE	P-HERB	UPL/VACU	
MEAL2	MELILOTUS ALBUS	white sweet-clover	FABACEAE	B-HERB	FACU	
MEOF	MELILOTUS OFFICINALIS	yellow sweet-clover	FABACEAE	B-HERB	FACU	
MECA7	Mentha canadensis	Canada mint	LAMIACEAE	P-HERB	FACW	4

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
MINU6	Mimosa nuttallii	sensitive brier	FABACEAE	P-HERB		6
MIHI	Mirabilis hirsuta	hairy four-o'clock	NYCTAGINACEAE	P-HERB		5
MILIL	Mirabilis linearis	narrow-leaf four-o'clock	NYCTAGINACEAE	P-HERB		4
MOVE	MOLLUGO VERTICILLATA	green carpet-weed	MOLLUGINACEAE	A-HERB	FAC	
MOFIM3	Monarda fistulosa	wild-bergamot	LAMIACEAE	P-HERB	UPL/FACU	4
MOAL	MORUS ALBA	white mulberry	MORACEAE	TREE	FACU/FAC	
MURA	Muhlenbergia racemosa	marsh muhly	POACEAE	P-HERB	FACW	4
MUHLENBERGIA	MUHLENBERGIA SP.					3
NECA2	NEPETA CATARIA	catnip	LAMIACEAE	P-HERB	FACU	
OEBI	Oenothera biennis	eastern evening-primrose	ONAGRACEAE	B-HERB	FACU	1
GAPA6	Oenothera curtiflora	velvet butterfly-plant	ONAGRACEAE	A-HERB		1
GAPA6	Oenothera curtiflora	velvet butterfly-plant	ONAGRACEAE	A-HERB		1
GALO3	Oenothera filiformis	long-flower butterfly-plant	ONAGRACEAE	B-HERB		3
OELA	Oenothera laciniata	cut-leaf evening-primrose	ONAGRACEAE	A-HERB	FACU	1
OERH	Oenothera rhombipetala	fourpoint evening-primrose	ONAGRACEAE	B-HERB	FACU	2
OESE3	Oenothera serrulata	plains yellow-primrose	ONAGRACEAE	P-HERB		5
GACO5	Oenothera suffrutescens	scarlet butterfly-plant	ONAGRACEAE	P-HERB		4
OPFR	Opuntia fragilis	brittle prickly-pear	CACTACEAE	P-HERB		3
OPHUH	Opuntia humifusa	eastern prickly-pear	CACTACEAE	P-HERB		5
OXDI2	Oxalis dillenii	gray-green wood-sorrel	OXALIDACEAE	A-HERB	FACU	0
OXST	Oxalis stricta	yellow wood-sorrel	OXALIDACEAE	A-HERB	FACU	0
PAPL12	Packera plattensis	prairie ragwort	ASTERACEAE	B-HERB	FACU	5
PACA6	Panicum capillare	common witchgrass	POACEAE	A-HERB	FAC	0
PADID	Panicum dichotomiflorum	fall panicum	POACEAE	A-HERB	FAC/FACW	0
PAVI2	Panicum virgatum	switchgrass	POACEAE	P-HERB	FAC	4
PAQU2	Parthenocissus quinquefolia	Virginia creeper	VITACEAE	W-VINE	FACU	5
PASM	Pascopyrum smithii	western wheatgrass	POACEAE	P-HERB	FACU	3
PASES	Paspalum setaceum	yellow sand paspalum	POACEAE	A-HERB	FAC/FACU	2
PEGR7	Penstemon grandiflorus	shell-leaf penstemon	PLANTAGINACEAE	P-HERB		5
PEAM8	Persicaria amphibia	water smartweed	POLYGONACEAE	P-HERB	OBL	6
PECO23	Persicaria coccinea	swamp smartweed	POLYGONACEAE	P-HERB	OBL	2
PHAR3	Phalaris arundinacea	reed canary grass	POACEAE	P-HERB	FACW	0
PHPR3	PHLEUM PRATENSE	timothy	POACEAE	P-HERB	FACU	
PHAU7	Phragmites australis	common reed	POACEAE	P-HERB	FACW	3
PHLA3	Phyla lanceolata	northern fogfruit	VERBENACEAE	P-HERB	FACW/OBL	3
PHHE5	Physalis heterophylla	clammy ground-cherry	SOLANACEAE	P-HERB		4
PHLO4	Physalis longifolia	common ground-cherry	SOLANACEAE	P-HERB		0
PHVI5	Physalis virginiana	Virginia ground-cherry	SOLANACEAE	P-HERB		6
PLER	Plantago eriopoda	alkali plantain	PLANTAGINACEAE	P-HERB	FAC	5
PLPA2	Plantago patagonica	woolly plantain	PLANTAGINACEAE	A-HERB		1

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
PLRU	<i>Plantago rugelii</i>	black-seed plantain	PLANTAGINACEAE	P-HERB	FACU/FAC	0
PLVI	<i>Plantago virginica</i>	pale-seed plantain	PLANTAGINACEAE	A-HERB	FACU	2
POCO	<i>POA COMPRESSA</i>	Canada bluegrass	POACEAE	P-HERB	FACU	
POPR	<i>POA PRATENSIS</i>	Kentucky bluegrass	POACEAE	P-HERB	FACU	
PODOT2	<i>Polanisia dodecandra</i>	sandy-seed clammy-weed	CLEOMACEAE	A-HERB	FACU/UPL	0
POVEI	<i>Polygala verticillata</i>	whorled milkwort	POLYGALACEAE		FACU/UP	4
POAV	<i>POLYGONUM AVICULARE</i>	yard knotweed	POLYGONACEAE	A-HERB	FACU	
PORA3	<i>Polygonum ramosissimum</i>	bushy knotweed	POLYGONACEAE	A-HERB	FACW/FACU	1
POMOS	<i>POLYPOGON MONSPELIENSIS</i>	rabbitfoot grass	POACEAE	A-HERB	FACW/OBL	
PODEO	<i>Populus deltoides</i>	plains cottonwood	SALICACEAE	TREE	FAC	3
POOL	<i>Portulaca oleracea</i>	garden purslane	PORTULACACEAE	A-HERB	FAC/FACU	0
PONO3	<i>Potentilla norvegica</i>	Norwegian cinquefoil	ROSACEAE	P-HERB	FAC	2
POPA15	<i>Potentilla paradoxa</i>	bushy cinquefoil	ROSACEAE	A-HERB	FACW	4
POPE8	<i>Potentilla pensylvanica</i>	Pennsylvania cinquefoil	ROSACEAE	P-HERB	FACU	6
PRVUL3	<i>Prunella vulgaris</i>	self-heal	LAMIACEAE	P-HERB	FAC	4
PYVI	<i>Pycnanthemum virginianum</i>	Virginia mountain-mint	LAMIACEAE	P-HERB	FAC/FACW	6
RACO3	<i>Ratibida columnifera</i>	upright prairie-coneflower	ASTERACEAE	P-HERB		4
RAPI	<i>Ratibida pinnata</i>	gray-head prairie-coneflower	ASTERACEAE	P-HERB		4
RIOD	<i>Ribes odoratum</i>	buffalo currant	GROSSULARIACEAE	SHRUB	FACU/FAC	4
ROPS	<i>ROBINIA PSUEDOACAIA</i>	black locust	FABACEAE	TREE	UPL/FACU	
ROAR3	<i>Rosa arkansana</i>	dwarf prairie rose	ROSACEAE	SHRUB	FACU	4
ROWOW	<i>Rosa woodsii</i>	western wild rose	ROSACEAE	SHRUB	FACU	4
RUHIP	<i>Rudbeckia hirta</i>	black-eyed Susan	ASTERACEAE	B-HERB	FACU	4
RUAL4	<i>Rumex altissimus</i>	pale dock	POLYGONACEAE	P-HERB	FAC	0
RUCR	<i>RUMEX CRISPUS</i>	curly dock	POLYGONACEAE	P-HERB	FACW	
SAAM2	<i>Salix amygdaloides</i>	peach-leaf willow	SALICACEAE	TREE	FACW	4
SAAZG	<i>Salvia azurea</i>	Pitcher's sage	LAMIACEAE	P-HERB		6
SCPA	<i>Schedonnardus paniculatus</i>	tumblegrass	POACEAE	P-HERB		0
SCAR7	<i>SCHEDONORUS ARUNDINACEUS</i>	tall fescue	POACEAE	P-HERB	FACU	
SCPR4	<i>SCHEDONORUS PRATENSIS</i>	meadow fescue	POACEAE	P-GRASS	FACU	
SCSCS	<i>Schizachyrium scoparium</i>	little bluestem	POACEAE	P-HERB	FACU	4
SCPU10	<i>Schoenoplectus pungens</i>	three-square bulrush	CYPERACEAE	P-HERB	OBL	4
SCTA2	<i>Schoenoplectus tabernaemontani</i>	soft-stem bulrush	CYPERACEAE	P-HERB	OBL	5
SEFA	<i>SETARIA FABERI</i>	Chinese foxtail	POACEAE	A-HERB	UPL/FACU	
SEIT	<i>SETARIA ITALICA</i>	foxtail millet	POACEAE	A-HERB	FACU	
SEPUP2	<i>SETARIA PUMILA</i>	yellow foxtail	POACEAE	A-HERB	FACU/FAC	
SEVE3	<i>SETARIA VERTICILLATA</i>	bristly foxtail	POACEAE	A-HERB	FAC	
SEVIV	<i>SETARIA VIRIDIS</i>	green foxtail	POACEAE	A-HERB		
SIAN2	<i>Silene antirrhina</i>	sleepy catchfly	CARYOPHYLLACEAE	A-HERB		2
SIVU	<i>SILENE VULGARIS</i>	bladder campion	CARYOPHYLLACEAE	P-HERB		

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
SIINI	<i>Silphium integrifolium</i>	rosinweed	ASTERACEAE	P-HERB		4
SILO3	<i>SISYMBRIUM LOESELII</i>	tall hedge mustard	BRASSICACEAE	A-HERB		
SIMOM	<i>Sisyrinchium montanum</i>	strict blue-eyed-grass	IRIDACEAE	P-HERB	FAC	5
SOCAC4	<i>Solanum carolinense</i>	horse-nettle	SOLANACEAE	P-HERB	UPL/FACU	2
SOIN2	<i>Solanum interius</i>	plains black nightshade	SOLANACEAE	P-HERB		1
SORO	<i>Solanum rostratum</i>	buffalo-bur	SOLANACEAE	A-HERB		0
SOCALH	<i>Solidago canadensis</i>	Canada goldenrod	ASTERACEAE	P-HERB	FACU	2
SOGI	<i>Solidago gigantea</i>	late goldenrod	ASTERACEAE	P-HERB	FAC/FACW	3
SOMI2	<i>Solidago missouriensis</i>	Missouri goldenrod	ASTERACEAE	P-HERB		5
SOMO	<i>Solidago mollis</i>	ashy goldenrod	ASTERACEAE	P-HERB	UPL	4
SOMO	<i>Solidago mollis</i>	ashy goldenrod	ASTERACEAE	P-HERB		4
SORIH	<i>Solidago rigida</i>	stiff goldenrod	ASTERACEAE	P-HERB	FACU	3
SOLIDAGO SP.	<i>Solidago sp.</i>					3
SOAS	<i>SONCHUS ASPER</i>	prickly sow-thistle	ASTERACEAE	A-HERB	FAC/FACU	
SOOL	<i>SONCHUS OLERACEUS</i>	store-front sow-thistle	ASTERACEAE	A-HERB	UPL/FACU	
SONU2	<i>Sorghastrum nutans</i>	Indian grass	POACEAE	P-HERB	FACU	5
SOHA	<i>SORGHUM HALEPENSE</i>	Johnson grass	POACEAE	P-HERB	FACU	
SPPE	<i>Spartina pectinata</i>	prairie cordgrass	POACEAE	P-HERB	FACW	5
SPOB	<i>Sphenopholis obtusata</i>	prairie wedge grass	POACEAE	P-HERB	FACW	5
SPAI	<i>Sporobolus airoides</i>	alkali sacaton	POACEAE	P-HERB	FAC	5
SPCOC2	<i>Sporobolus compositus</i>	tall dropseed	POACEAE	P-HERB	FACU	3
SPCR	<i>Sporobolus cryptandrus</i>	sand dropseed	POACEAE	P-HERB	FACU	2
SPHE	<i>Sporobolus heterolepis</i>	prairie dropseed	POACEAE	P-HERB	UPL/FACU	7
STLE6	<i>Strophostyles leiosperma</i>	slick-seed wild bean	FABACEAE	A-VINE		4
SYOC	<i>Symphoricarpos occidentalis</i>	wolfberry	CAPRIFOLIACEAE	SHRUB	UPL	2
SYERE	<i>Symphyotrichum ericoides</i>	heath aster	ASTERACEAE	P-HERB	FACU	3
SYFAC	<i>Symphyotrichum falcatum</i>	prairie white aster	ASTERACEAE	P-HERB	FACU/FAC	4
SYLAL4	<i>Symphyotrichum lanceolatum</i>	tall white aster	ASTERACEAE	P-HERB	FACW/FAC	2
TAOF	<i>TARAXACUM OFFICINALE</i>	common dandelion	ASTERACEAE	P-HERB	FACU	
TECAC	<i>Teucrium canadense</i>	American germander	LAMIACEAE	P-HERB	FACW	4
THPO7	<i>THINOPYRUM PONTICUM</i>	tall wheatgrass	POACEAE	P-HERB		
THAR5	<i>THLASPI ARVENSE</i>	field penny cress	BRASSICACEAE	A-HERB	FACU	
DRRE2	<i>Tomostima reptans</i>	white whitlow-wort	BRASSICACEAE	A-HERB	UPL	3
TORAN2	<i>Toxicodendron radicans</i>	eastern poison ivy	ANACARDIACEAE	W-VINE	FACU	2
TRBR	<i>Tradescantia bracteata</i>	long-bract spiderwort	COMMELINACEAE	P-HERB	FACU	5
TROCO	<i>Tradescantia occidentalis</i>	western spiderwort	COMMELINACEAE	P-HERB	UPL	5
TRDU	<i>TRAGOPOGON DUBIUS</i>	yellow goat's-beard	ASTERACEAE	B-HERB		
TRFLF	<i>Tridens flavus</i>	purpletop	POACEAE	P-HERB	UPL	2
TRFR2	<i>TRIFOLIUM FRAGIFERUM</i>	strawberry clover	FABACEAE	P-HERB	FAC/FACU	
TRHY	<i>TRIFOLIUM HYBRIDUM</i>	Alsike clover	FABACEAE	P-HERB	FACU	

P-SYMBOL	SPECIES	COMMON NAME	FAMILY	PHYSIO	WETNESS	C
TRPR2	TRIFOLIUM PRATENSE	red clover	FABACEAE	P-HERB	FACU	
TRRE3	TRIFOLIUM REPENS	white clover	FABACEAE	P-HERB	FACU	
TRMA20	Triglochin maritima	shore arrow-grass	JUNCAGINACEAE	P-HERB	OBL	5
TRAE	TRITICUM AESTIVUM	bread wheat	POACEAE	A-HERB		
TYAN	TYPHA ANGUSTIFOLIA	narrow-leaf cattail	TYPHACEAE	P-HERB	OBL	
ULAM	Ulmus americana	American elm	ULMACEAE	TREE	FAC/FACW	3
ULPU	ULMUS PUMILA	Siberian elm	ULMACEAE	TREE	UPL	
VETH	VERBASCUM THAPSUS	common mullein	SCROPHULARIACEAE	B-HERB	UPL	
VEBR	Verbena bracteata	prostrate vervain	VERBENACEAE	A-HERB	FACU	0
VEBR	Verbena bracteata	prostrate vervain	VERBENACEAE	P-HERB	FAC	0
VEHA2	Verbena hastata	blue vervain	VERBENACEAE	P-HERB	FACW	4
VEST	Verbena stricta	hoary vervain	VERBENACEAE	P-HERB		2
VEBAI2	Vernonia baldwinii	western ironweed	ASTERACEAE	P-HERB	FACU/UPL	3
VEFAF	Vernonia	prairie ironweed	ASTERACEAE	P-HERB	FAC/FACW	4
VEAN2	VERONICA ANAGALLIS	water speedwell	PLANTAGINACEAE	P-HERB	OBL	
VEPEP	Veronica peregrina	purslane speedwell	PLANTAGINACEAE	A-HERB	FACW	1
VIAMM	Vicia americana	American vetch	FABACEAE	P-HERB	FACU	6
VIPE2	Viola pedatifida	prairie violet	VIOLACEAE	P-HERB	FACU	6
VIPR5	Viola pratensis	meadow violet	VIOLACEAE	P-HERB	FACW	1
VIRI	Vitis riparia	riverbank grape	VITACEAE	W-VINE	FAC/FACW	3
XASTC	Xanthium strumarium	cocklebur	ASTERACEAE	A-HERB	FAC	1