



Perennial Food Plot Study

*Final Report
2007*

**North Dakota Game and Fish Department
and
USDA-NRCS Bismarck Plant Materials Center**



Plots were chemically treated with glyphosate to kill sod.



Old John's Lake WMA site showing plot shortly after it was burned



Completed no-till seeding



Seeding into grass sod that was chemically killed and burned provided an excellent seedbed.

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Perennial Food Plot Study

Executive Summary

This report is the final cumulative report (2003-2007) for the cooperative Perennial Food Plot Study between the Natural Resources Conservation Service (NRCS), Plant Materials Center, Bismarck, North Dakota, and the North Dakota State Game and Fish Department (NDGFD), Bismarck, North Dakota. The project was a cooperative five-year study to evaluate establishment and plant performance of species in two perennial food plot seed mixes: a native mix and an introduced mix. Establishment and growth characteristics were documented for each mix. Recommended species and seeding rates for wildlife perennial food plots were evaluated and technical guidance was incorporated into NRCS Field Office Technical Guide for use in establishing perennial food plots.

The study was located northeast of Wilton, North Dakota, on the Russell Stuart Wildlife Management Area (WMA) and Old John's Lake WMA. Two sites were identified, one on each of the wildlife management areas. Refer to each individual planting site for specific project activities. The following are main observations and findings from the study:

- Perennial food plots containing forbs and legumes are more attractive to wildlife species and provide additional food and cover types compared to grasses alone.
- Planting site management and seedbed preparation is critical for success. Existing weeds and soil seed banks should be controlled prior to seeding.
- Diverse seed mixes comprised of high percentages of forbs pose increased management concerns by limiting weed control options after planting.
- Perennial food plots can be a valuable addition in improving wildlife habitat when used in conjunction with other available wildlife practices, such as annual food plots, wildlife tree and shrub plantings, upland nesting habitat, and others as part of a complete wildlife management plan.
- Perennial food plot mixes, both native and introduced, need to be customized to each planting site with considerations given to soil type, annual precipitation, and other climatic conditions.
- Maximilian sunflower, stiff sunflower, Lewis blue flax, shell-leaf penstemon, stiff goldenrod, sainfoin, cicer milkvetch, and alfalfa were the forb species found with the highest densities on the sites. These species appear to compete well with weeds and provide flower, seed, and forage for wildlife use.
- Buffaloberry, snowberry, and prairie rose generally did the best of the shrub species.
- The size of perennial food plots should be a minimum of 5 to 10 acres to provide the greatest wildlife benefits.

Annual Summary and Comments

2004: The dense sod of Kentucky bluegrass and other low growing vegetation did not burn well at the Russell Stuart WMA site leaving large areas of litter on the soil surface. Kentucky bluegrass sod retained a large mass of both above and below ground residue that impacted seed to soil contact when no-till seeding into the killed and burned residue. Burning removed most surface litter at the Old John's Lake WMA. The site was predominantly smooth bromegrass and sideoats grama, which provided a much more desirable seedbed. Available soil moisture at the time of seeding was good at both sites.



2005: The Russell Stuart WMA and the Old John's Lake WMA plots were split in half from north to south to allow half of the native seeding and half of the introduced seeding to have herbicide applied in 2005. A 4-oz/acre rate of Plateau® herbicide was applied on May 5, 2005. No surfactant was used in the application.

No planted seedlings were actively growing on any of the eight treatments at the time of Plateau® herbicide application on May 5, 2005. Canada thistle, absinth wormwood, and other weedy species seedlings were observed in low numbers for all treatments at this time. The Old John's Lake WMA plot had fewer actively growing weeds and less surface residue after over-wintering as compared to the Russell Stuart WMA plot. The surface (1-2 inch depth) soil moisture conditions in the plots were very dry.

Plots were evaluated in July 2005. Species counts were randomly taken using a 2.4-ft² frame. See Tables 5 through 8 for data collected on the Russell Stuart WMA plots and Tables 17 through 20 for data collected on the Old John's Lake WMA plots in 2005.

On September 9, 2005, general stand observations were noted. The following comments were recorded. All treatments on the Russell Stuart WMA plots had higher planted species densities and much less weed competition than the Old John's Lake WMA plots. All plots planted with native species had the greatest seedling emergence and stand establishment (at Russell Stuart WMA and Old John's Lake WMA plots). Lack of surface residue, which exposed black mineral soil, may have contributed to the poorer stands at Old John's Lake WMA plots. The soil surface may have warmed too soon in the spring, causing seeds to germinate and seedlings to freeze. The Russell Stuart WMA site had more surface residue and was lower in elevation which probably resulted in cooler soil temperatures. This may have reduced the chances for emergence of the planted species and potential of frost damage to the planted species.

2006: Both sites received very limited amounts of rainfall during the 2006 growing season. Late spring frosts and limited moisture reduced overall plant growth and caused early dormancy and death in some species. Native species showing persistence in the stand were stiff sunflower, Maximilian sunflower, purple prairie clover, blue flax, shell-leaf penstemon, big bluestem, and switchgrass. Introduced species observed in the highest numbers included intermediate wheatgrass, Dahurian wildrye, and alfalfa. Large populations of absinth wormwood invaded both sites even with the use of no-till methods. Old John's had the highest concentrations of absinth wormwood. The Russell Stuart plots were less contaminated. The success of these small food plots has been greatly influenced by the surrounding vegetation. Smooth brome grass, quackgrass, and Kentucky bluegrass will quickly invade the plots even when they have been chemically removed prior to planting. See Tables 9-12 and 21-24 for data collection from 2006.

2007: Increased moisture conditions in 2007 had a positive effect on all planted species present in the plots. The use of no-till seeding methods still promoted perennial weeds such as absinth wormwood, quackgrass, and Kentucky bluegrass. These perennial weeds continue to invade the plots. Large populations of absinth wormwood invaded both sites. The Old John's plots had the highest concentrations of absinth wormwood, and it was decided to apply herbicides to control the absinth wormwood at the expense of some of the seeded perennial forbs and shrubs. An application of 2 quarts of 2, 4-D was applied on the Old John's plots on June 12, 2007. Species counts were completed and recorded on June 12, 2007, prior to chemical application. The Russell Stuart plots are not as contaminated and no herbicide was applied to the plots. Due to the small size of the food plots, success has been greatly affected by the surrounding vegetation. Smooth brome grass, quackgrass, and Kentucky bluegrass have quickly invaded the plots even after being chemically removed from the plots prior to planting. Plantings dominated by forbs appear to be less competitive than grass dominated plantings and can result in invasion of unwanted species fairly quickly. The slow to no spreading characteristics of a forb-dominated planting leaves high percentages of bare ground and a favorable weed environment. Seeding rates of forb dominated plantings may need to be increased to provide a denser canopy cover and less bare ground. See Tables 13-16 and 25-28 for data collection information from 2007.

Seedbed preparation and site selection are critical in perennial food plot success. Seeding into clean, weed-free cropland stubble may be the best option as both annual and perennial weeds will have been controlled throughout the cropping history. Seeding into killed grass sod (except Kentucky bluegrass sod) provides a very nice seedbed but potential weed banks and regrowth of perennial weed species will likely pose establishment problems. When seeding into killed sod, multiple chemical burn down applications are recommended for a minimum of two growing seasons for successful perennial weed control and food plot establishment. Spring planting is recommended as most forbs and native species require a shallow seeding depth and are prone to fall germination if soil and moisture temperatures are favorable. If a fall dormant seeding is planned, the seeding should occur when soil temperatures are below 40 degrees F. The seeding should also be planted into high residue amounts to help reduce soil temperature fluctuations and extended periods of warm soil conditions that promote fall germination of seed. These plantings provide beneficial diversity to the landscape and should be part of most wildlife management plans.

Study Objective

The objective of this five-year study is to evaluate establishment and plant performance of species in two perennial seed mixes, a native mix and an introduced mix. Establishment and growth characteristics will be documented for each mix. Recommended species and seeding rates for wildlife perennial food plots is a potential outcome of this study.

The study is located northeast of Wilton, North Dakota, on the Russell Stuart WMA and Old John's Lake WMA. Two sites were identified, one on each of the wildlife management areas.

Site Preparation and Seeding

Both sites were chemically treated on June 10, 2003, and July 15, 2003, with a tank mix of 1 quart/ac of glyphosate and 1 pint/ac Poast®. The plot borders were mowed on August 8, 2004. A third chemical application of 2 quarts of glyphosate, 11 ounces of Stinger®, 2 pints of 2,4-D amine, and 3 gallons of ammonia sulfate were applied on August 13, 2004. The plots were burned by the North Dakota Game and Fish Department on October 11, 2004.

Plots were planted on November 4, 2004, using a no-till Truax grass drill. Each site (2.4 acres) was split in half to make two plots (1.2 acres) per site. The south half of each plot was seeded to an introduced mix and the north half was seeded to a native mix. See Tables 1 and 2 for a list of native species and seeding information. See Tables 3 and 4 for a list of introduced species and seeding information. Both plots were split in half from north to south to compare establishment with and without herbicide application.

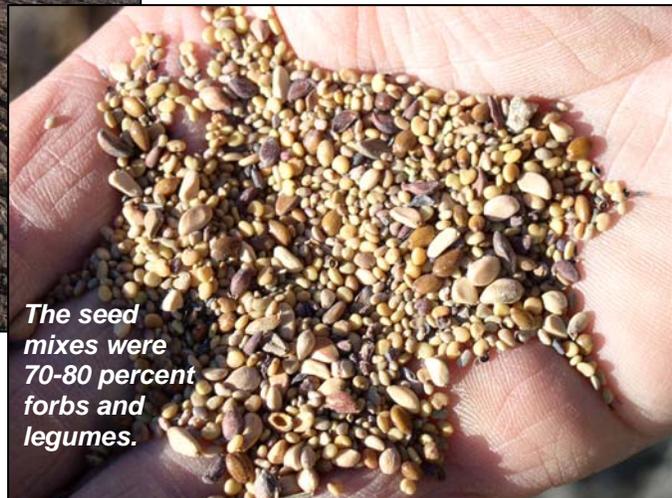


Table 1. List of native species, including trees and shrubs, planted 11/04/2004 on two 1.2-acre sites.

Species	Name	Type*	Seeds per lb	Russ Stuart Planted PLS lb/ac	Old John's Planted PLS lb/ac
<i>Elymus canadensis</i>	Canada wildrye	g	115000	0.37	0.37
<i>Panicum virgatum</i>	switchgrass	g	390000	0.11	0.11
<i>Andropogon gerardii</i>	big bluestem	g	176000	0.21	0.21
<i>Dalea candida</i>	white prairieclover	l	278000	0.28	0.24
<i>Dalea purpurea</i>	purple prairieclover	l	290000	0.27	0.27
<i>Astragalus canadensis</i>	Canada milkvetch	l	266000	0.29	0.29
<i>Amorpha canescens</i>	leadplant	l	200000	0.39	0.38
<i>Chamaecrista nictitans</i>	partridge pea	l	50000	1.57	1.57
<i>Helianthus maximiliani</i>	Maximilian sunflower	f	250000	0.17	0.17
<i>Helianthus pauciflorus</i>	stiff sunflower	f	85000	0.51	0.51
<i>Silphium perfoliatum</i>	cup plant	f	34000	1.28	1.28
<i>Linum lewisii</i>	wild blue flax	f	287000	0.15	0.15
<i>Ratibida columnifera</i>	longheaded coneflower	f	737000	0.12	0.06
<i>Liatris punctata</i>	dotted gayfeather	f	63000	0.32	0.32
<i>Echinacea angustifolia</i>	echinacea	f	120000	0.36	0.37
<i>Gaillardia aristata</i>	blanket flower	f	157000	0.27	0.27
<i>Penstemon grandiflorus</i>	penstemon	f	273000	0.16	0.16
<i>Rudbeckia laciniata</i>	golden glow-cutleaf	f	252222	0.06+.12**	0.06+.12**
<i>Solidago rigida</i>	stiff goldenrod	f	772000	0.06	0.06
<i>Agastache foeniculum</i>	giant hyssops	f	1538000	0.03	0.03
<i>Desmodium canadense</i>	showy tick trefoil	f	88000	0.26	0.26
<i>Monarda fistulosa</i>	wild bergamot	f	1463000	0.03	0.03
<i>Liatris ligulistylis</i>	meadow blazing star	f	90000est	0.09	0.09
<i>Rosa arkansana</i>	rose	w	45000	0.25	0.25
<i>Shepherdia argentea</i>	buffaloberry	w	41000	0.40	0.40
<i>Amorpha fruticosa</i>	false indigo	w	52000	0.32	0.32
<i>Amelanchier alnifolia</i>	juneberry	w	82000	0.20	0.20
<i>Symphoricarpos occidentalis</i>	snowberry	w	74400	0.22	0.22
<i>Ribes aureum</i>	currant	w	240000	0.07	0.07
<i>Prunus virginiana</i>	chokecherry	w	4790	3.40**	3.40**
<i>Cornus sericea</i>	redosier dogwood	w	18500	0.78	0.78
<i>Coreopsis tinctoria</i>	plains coreopsis	a	1650000	0.08	0.08

*Type: g=grasses; l=legumes; f=forbs; w=woodies; a=annuals

**bulk seed amount, not PLS

Table 2. Seeding information for native species, including trees and shrubs.

Type	grasses	legumes	forbs	woodies	annuals	Total seeds/ft ² *
number	3	5	15	8	1	30
%of mix	10	30	50	10	10	
seeds/ft ² /specie	1.00	1.80	1.00	0.38	3.00	
seeds/acre**	43560	78408	43560	16335	130680	

*Annuals were not counted in the 30 seeds/ft² seeding rate.

**Actual amount of seed planted for a species may differ from target seeding rate due to seed availability, quality and variation in seeds/pound (depending on reference).

Table 3. List of introduced species and native trees/shrubs planted 11/04/2004 on two 1.2-acre sites.

Species	Name	Type	Seeds per lb	Russ Stuart Planted PLS lb/ac	Old John's Planted PLS lb/ac
<i>Leymus racemosus</i>	mammoth wildrye	g	55000	3.58	3.55
<i>Thinopyrum intermedium</i>	intermediate wheatgrass	g	88000	0.76	0.76
<i>Elymus dahuricus</i>	Dahurian wildrye	g	86000	0.76	0.76
<i>Thinopyrum ponticum</i>	tall wheatgrass	g	79000	0.82	0.82
<i>Medicago sativa</i>	alfalfa	l	210000	1.10	1.10
<i>Astragalus cicer</i>	cicer milkvetch	l	134000	1.37	1.37
<i>Trifolium pratense</i>	red clover	l	275000	0.67	0.67
<i>Onobrychis vicifolia</i>	sainfoin	l	22000	8.30	8.30
<i>Vicia villosa</i>	hairy vetch	l	20000	9.55	9.55
<i>Rosa arkansana</i>	rose	w	45000	0.37	0.37
<i>Sherpherdia argentea</i>	buffaloberry	w	41000	0.40	0.40
<i>Amorpha fruticosa</i>	false indigo	w	52000	0.32	0.32
<i>Amelanchier alnifolia</i>	juneberry	w	82000	0.20	0.20
<i>Symphoricarpos occidentalis</i>	snowberry	w	74400	0.22	0.22
<i>Ribes aureum</i>	currant	w	240000	0.07	0.07
<i>Cornus sericea</i>	redosier dogwood	w	18500	1.06	1.06
<i>Prunus virginiana</i>	chokecherry	w	4790	3.4**	3.4**
<i>Coreopsis tinctoria</i>	plains coreopsis	a	1650000	0.08	0.08

*Type: g=grasses; l=legumes; f=forbs; w=woodies; a=annuals

**bulk seed amount, not PLS

Table 4. Seeding information for introduced species and native trees/shrubs.

Type	grasses	legumes	forbs	woodies	annuals	Total seeds/ft ² *
number	4	5	0	8	1	30
%of mix	20	70	0	10	10	
seeds/ft ² /specie	1.50	4.20	0	0.38	3.00	
seeds/ac/specie**	65340	182952	0	16335	130680	

*Annuals were not counted in the 30 seeds/ft² seeding rate.

**Actual amount of seed planted for a species may differ from target seeding rate due to seed availability, quality and variation in seeds/pound (depending on reference).

Russell Stuart Wildlife Management Area

Site description:

The site is a 2.4-acre plot located on the Russell Stuart Wildlife Management Area in Burleigh County, North Dakota. The site is fairly level and is comprised primarily of Bearden silty clay loam; slight or very slight saline. The ecological site is “limy subirrigated.” See Figure 1 for aerial view of the site.

Figure 1.



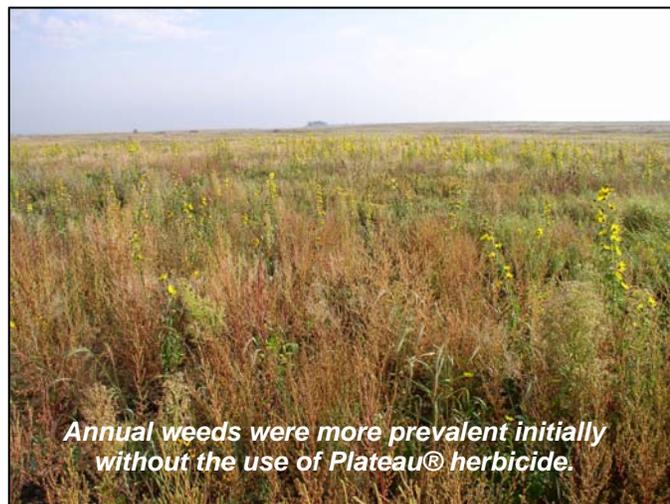
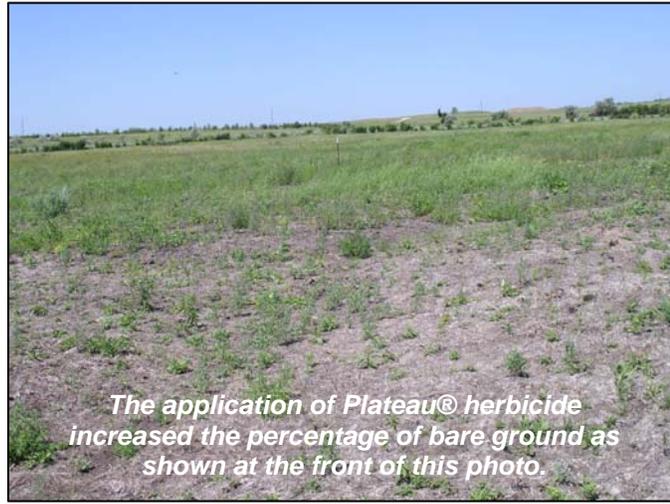
Russell Stuart WMA

Native species seeding - No Plateau® herbicide applied

2005: Weed competition from annual weeds was much higher compared to the native plot that had Plateau® herbicide applied. Annual weeds showing the highest populations were lambsquarter, common ragweed, and kochia. Most of the planted species were observed in the plot. Native shrubs including buffaloberry, golden currant, redosier dogwood, western snowberry, and juneberry were observed in this plot.

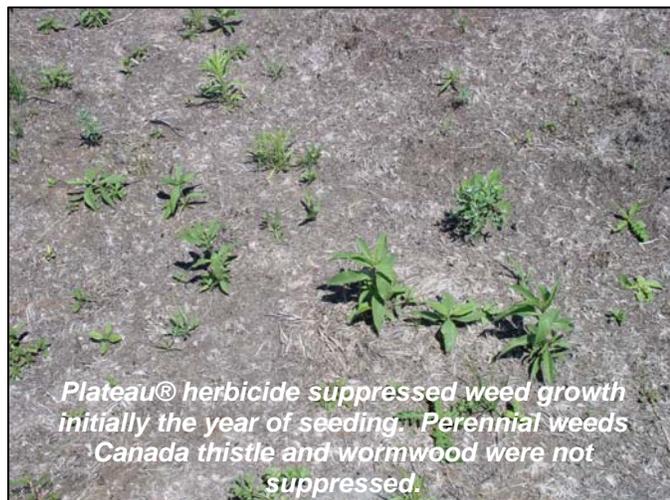
2006: Species showing the highest plant densities in the plots were shell-leaf penstemon, blue flax, stiff sunflower, and Maximilian sunflower. Similar to the native sprayed plot, there was a great diversity of species. Plots had less bare ground than the native sprayed plots but had increased amounts of invading Kentucky bluegrass.

2007: A 27 percent weed canopy was measured throughout this plot. Wild bergamot, cup plant, hyssops, Maximilian sunflower, shell-leaf penstemon, stiff goldenrod, stiff sunflower, yellow coneflower, and prairie rose were the dominant species present. The plot had good species diversity. The stand composition was similar to the native plot with Plateau® herbicide application but had more area of bare ground.

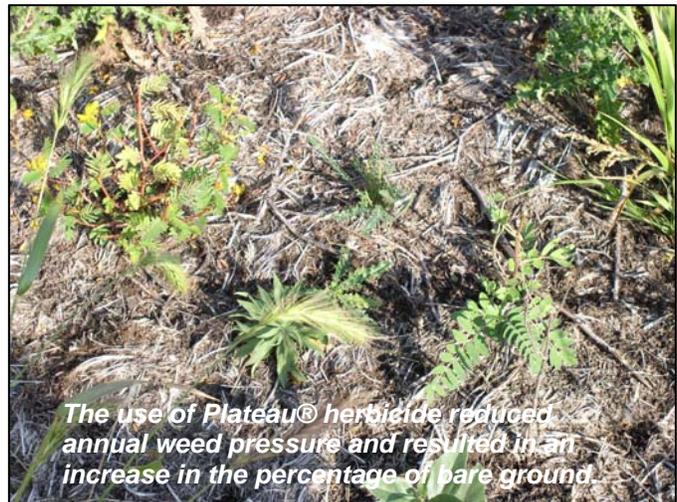


Native species seeding - Plateau® herbicide applied

2005: Large areas of bare ground were observed on this site. Canada thistle densities were higher compared to the unsprayed native plot. Most planted species were present but their growth was suppressed considerably. Maximilian sunflower and stiff sunflower appeared to be the least affected by the Plateau® herbicide in growth suppression. The overall stand composition was very similar to the unsprayed native plot.



2006: This plot has a more patchy appearance than the native unsprayed plot. Total cover is less due to reduced weed density. The increased bare ground has allowed increased encroachment of absinth wormwood and Canada thistle but less invasion of annual weeds and perennial grasses. This plot has good plant diversity with Maximilian sunflower, stiff sunflower, shell-leaf penstemon, blue flax, blanketflower, and hyssops being the most prominent in the plot.



2007: A 34 percent weed canopy was measured throughout this plot. Species composition was dominated by blanketflower, blue flax, narrow-leaved purple coneflower, Maximilian sunflower, stiff goldenrod, stiff sunflower, Canada wildrye, and western snowberry. Good species diversity existed throughout the plot.

Introduced species seeding - No Plateau® herbicide applied

2005: Annual weed population is similar to the native species seeding without the Plateau® herbicide application. Higher densities of annual weeds occur compared to the introduced species seeding that was sprayed with the Plateau® herbicide.



Intermediate wheatgrass, tall wheatgrass, and Dahurian wildrye were the dominant planted grass species observed. The grasses observed were healthy and vigorous, many were headed out, and contained good seed fill. Alfalfa, sainfoin, and cicer milkvetch were the dominant planted forbs observed.

2006: These plots had the poorest stand of all Russell Stuart WMA plots. Planted species of intermediate wheatgrass, tall wheatgrass, Dahurian wildrye, and alfalfa dominated the site. Large populations of wormwood, Kentucky bluegrass, and smooth brome grass invaded this plot.



2007: A 37 percent weed canopy was measured throughout this plot. Alfalfa, cicer milkvetch, sainfoin, intermediate wheatgrass, and Dahurian wildrye were the most dominant planted species of this plot. A good population of alfalfa and intermediate wheatgrass were found throughout this plot.

Introduced species seeding - Plateau® herbicide applied

2005: A higher percentage of open ground was observed compared to the other three plots. Lower numbers of planted species were observed as compared to the unsprayed plot. Planted species present showed suppressed growth and lower vigor than the unsprayed introduced plot. Canada thistle populations were higher and annual weeds were lower on the sprayed plot compared to the unsprayed plot.

2006: The stand is much better than the unsprayed introduced plot. Plant diversity is higher compared to the unsprayed introduced plot. The planted species are more vigorous and have less competition from invading perennial weeds and more bare ground.

2007: A 51 percent weed canopy was measured throughout this plot. Alfalfa, sainfoin, intermediate wheatgrass, Dahurian wildrye, and western snowberry were the dominant planted species found in this plot. Large areas of Kentucky bluegrass were present in this plot. Higher weed populations developed on this plot compared to the other Russell Stuart plots.

Table 7. Russell Stuart WMA, introduced species seeded with herbicide application.
Random species counts taken 7/6/2005.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
cicer milkvetch	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
planted grasses	10	1	3	4	2	1	5	0	0	6	3	0	5	5	2	0	7	2	3	3	62
buffaloberry	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	4
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
																					Avg
WEED CANOPY %	2	1	5	10	2	0	10	2	5	3	3	15	3	2	3	1	2	0	10	20	5

Table 8. Russell Stuart WMA; introduced species seeded with no herbicide application.
Random species counts taken 7/6/2005.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	3
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	3
hairy vetch	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
plains coreopsis	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	3
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	0	0	2	1	8
planted grasses	0	0	3	9	7	2	1	5	0	4	3	2	0	2	8	3	5	3	2	10	69
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	60	30	80	30	0	5	15	35	30	60	10	5	35	50	35	75	60	95	50	75	42

Table 9. Russell Stuart WMA; native species seeded with herbicide application. Random species counts taken 9/8/2006.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
bergamot	6	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0	0	9
blanketflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
blue flax	0	0	0	0	2	0	0	2	2	2	0	0	0	0	1	0	0	1	1	1	12
Canada milkvetch	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	2
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	2
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximilian sunflower	0	7	0	0	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	0	10
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
partridge pea	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	3
penstemon	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
purple prairieclover	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
stiff goldenrod	0	1	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	2	7
stiff sunflower	6	2	6	6	0	9	0	5	0	0	0	0	0	0	13	0	0	10	5	0	62
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
yellow coneflower	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	0	7
big bluestem	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
switchgrass	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	1	1	0	6
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	3	2	0	0	0	2	0	1	0	0	0	0	0	0	2	10
																					Avg
WEED CANOPY %	15	20	10	5	20	5	10	25	40	10	5	10	5	25	15	20	5	10	10	10	14

Table 10. Russell Stuart WMA; native species seeded with no herbicide application.
Random species counts taken 9/8/2006.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
bergamot	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
blanketflower	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
blue flax	1	0	3	0	1	0	0	5	0	0	0	0	3	0	0	0	0	1	0	0	14
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
golden glow	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
hyssops	3	0	0	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	8
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximilian sunflower	3	3	0	5	8	0	5	5	3	0	2	0	7	0	12	5	0	14	0	0	72
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
penstemon	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	4
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
stiff goldenrod	1	1	1	0	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	7
stiff sunflower	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4	2	10
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
yellow coneflower	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	2	6
big bluestem	0	0	0	0	0	1	0	0	1	0	0	0	2	0	0	0	0	0	0	0	4
Canada wildrye	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	3	0	0	0	2	8
switchgrass	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	3
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
prairie rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
																					Avg
WEED CANOPY %	60	40	30	10	30	50	40	70	20	30	50	40	80	40	20	30	30	30	50	20	39

Table 11. Russell Stuart WMA, introduced species seeded with herbicide application. Random species counts taken 9/8/2006.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	1	0	4	0	0	0	0	0	2	1	0	1	0	0	0	0	0	1	10
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
Dahurian wildrye	1	0	1	0	0	1	0	0	0	0	0	1	2	0	1	1	1	1	2	1	13
intermediate wheatgrass	0	0	0	1	2	1	1	0	0	1	2	0	0	2	0	0	0	3	0	0	13
mammoth wildrye	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0	0	0	0	5
tall wheatgrass	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	3
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0	0	5
																					Avg
WEED CANOPY %	10	5	5	10	5	5	5	5	10	30	40	25	50	10	5	20	20	30	10	10	16

Table 12. Russell Stuart WMA, introduced species seeded without herbicide application. Random species counts taken 9/8/2006.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	0	1	0	5
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
Dahurian wildrye	1	1	0	3	1	1	0	2	1	0	1	1	1	1	2	0	0	3	2	1	22
intermediate wheatgrass	0	2	1	0	0	1	1	1	0	1	0	1	1	0	0	1	1	0	0	0	11
mammoth wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tall wheatgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
																					Avg
WEED CANOPY %	50	40	60	60	50	40	30	20	60	50	30	20	75	60	80	40	30	50	40	40	46

Table 14. Russell Stuart WMA; native species with no herbicide application.
Random species counts taken July 12, 2007.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
bergamot	0	1	0	0	0	3	0	3	0	0	1	0	0	0	0	0	0	4	0	0	12
blanketflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
blue flax	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Canada milkvetch	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cupplant	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	5
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hyssops	0	6	0	0	0	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	10
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximilian sunflower	4	0	0	17	16	3	15	1	11	0	2	0	5	0	4	7	6	8	0	0	99
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
penstemon	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	2	5
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
stiff goldenrod	1	0	0	0	7	0	1	1	0	0	0	2	0	1	0	0	0	0	0	1	14
stiff sunflower	1	15	0	0	0	5	2	1	4	8	1	3	0	5	4	0	3	4	0	4	60
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
yellow coneflower	0	0	1	0	0	0	0	0	4	2	0	1	2	0	0	0	0	0	0	0	10
big bluestem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada wildrye	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
prairie rose	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	30	30	30	20	20	10	10	20	10	15	40	30	10	30	20	40	40	20	80	30	27

Table 15. Russell Stuart WMA; introduced species with herbicide application.
 Random species counts taken July 12, 2007.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	0	1	0	0	0	2	0	2	0	0	0	0	2	1	0	1	0	0	9
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	4
planted grasses	0	2	2	3	3	3	2	1	1	1	3	0	0	2	0	1	1	2	4	1	32
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	4
rose	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	2
snowberry	0	4	0	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	8
																					Avg
WEED CANOPY %	100	80	70	20	10	20	40	20	70	70	30	80	70	20	70	70	70	50	40	20	51

Table 16. Russell Stuart WMA; introduced species with no herbicide application.
Random species counts taken July 12, 2007.

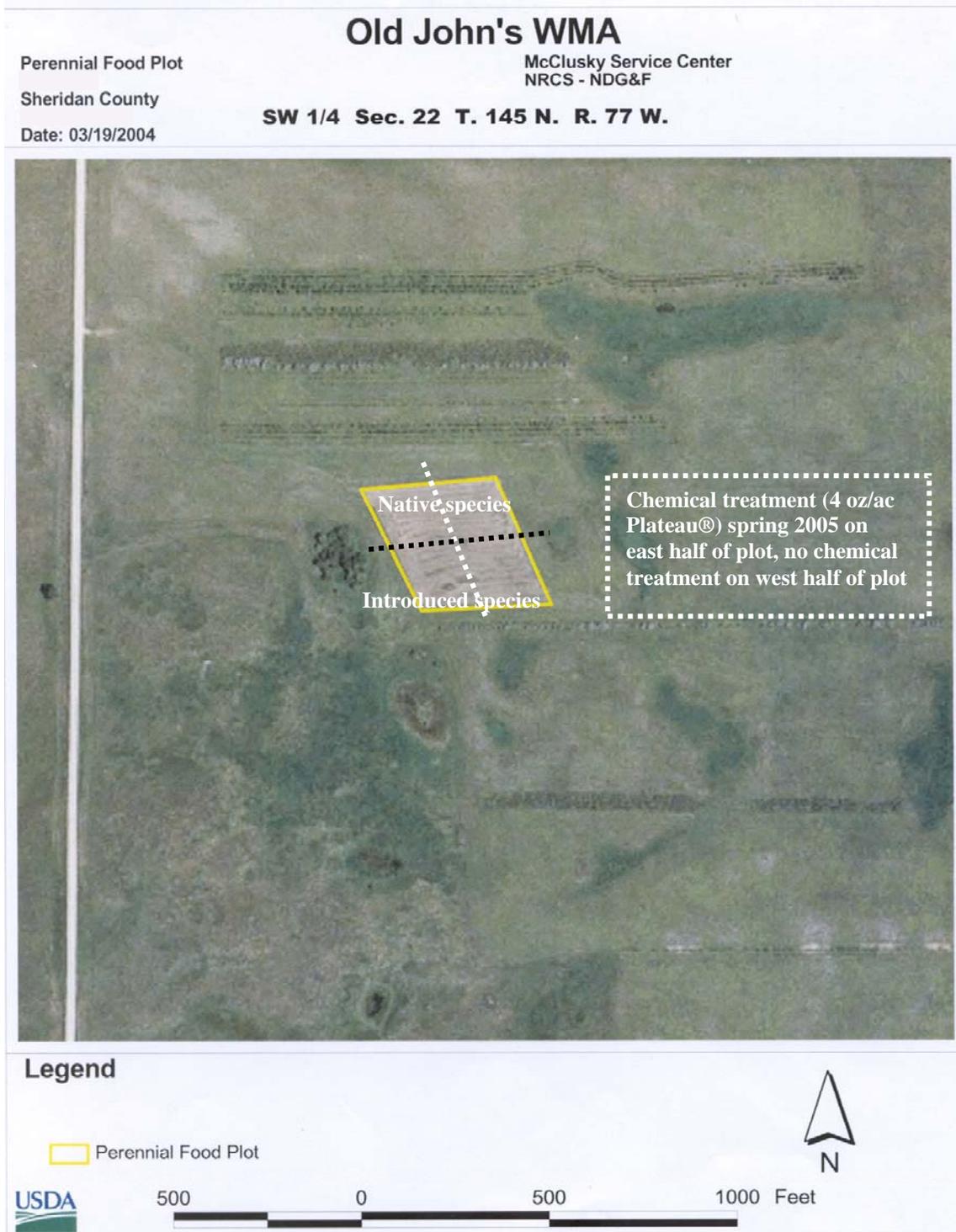
SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	1	0	1	1	0	1	1	2	0	2	1	1	0	1	0	0	0	1	0	0	13
cicer milkvetch	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	2	2	0	0	1	8
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	5	0	2	1	1	0	1	0	0	0	0	0	0	0	0	0	0	10
planted grasses	2	6	2	1	0	3	5	3	0	1	2	1	1	0	1	0	2	1	2	3	36
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
snowberry	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
																					Avg
WEED CANOPY %	30	30	10	10	50	60	20	20	80	10	40	10	80	80	70	70	10	50	0	10	37

Old John's Lake Wildlife Management Area

Site description:

The site is a 2.4-acre plot located on Old John's Lake Wildlife Management Area in Sheridan County, North Dakota. Soils are mapped as a Williams loam on B slope. The ecological site is loamy. See Figure 2 for an aerial view of the site.

Figure 2.



Old John's Lake WMA

Native species seeding - No Plateau® herbicide applied

2005: High weed competition was observed with high densities of quackgrass, green foxtail, smooth brome grass, and absinth wormwood present. This plot had the most planted species present in the planting. The population of both Maximilian and stiff sunflower was less compared to the sprayed native plot. Little bare ground was present at this time. The best stands were observed on the higher aspects of the site due to the decreased weed competition as compared to the lower site. Good densities of switchgrass and big bluestem were seen.

2006: Diversity of planted species was high. Shell-leaf penstemon, stiff sunflower, Maximilian sunflower, hyssops, green needlegrass, Canada wildrye, and big bluestem were the dominant planted species observed. Quackgrass and smooth brome grass were very dense in many areas.

2007: A 43 percent weed canopy was measured throughout this plot. Blue flax, Maximilian sunflower, shell-leaf penstemon, stiff sunflower, and big bluestem were the dominant species observed.



Native species seeding - Plateau® herbicide applied

2005: More bare ground was observed compared to the unsprayed plot. Sweetclover and Canada thistle densities were higher on this site as compared to the unsprayed plot. Planted species densities were less and had suppressed growth when compared to the unsprayed.

2006: This plot had the highest density of quackgrass compared to all the Old John's plots. More bare ground was observed compared to the unsprayed plots. The species diversity was high. Species most prevalent were shell-leaf penstemon, blanketflower, stiff sunflower, Maximilian sunflower, and wild bergamot. Extremely dry conditions and the competition of quackgrass noticeably reduced the plant vigor of the native species.

2007: A 42 percent weed canopy was measured throughout the plot. Stiff sunflower, Maximilian sunflower, shell-leaf penstemon, hyssops, and prairie rose were the dominant species on this plot. Populations of new stiff sunflower seedlings were observed in high numbers on this plot. Quackgrass and absinth wormwood were abundant.

Introduced species seeding -No Plateau® herbicide applied

2005: The heaviest concentrations of absinth wormwood were observed on this site. The stand was poor and very few of the planted species were observed. Highest densities of sweetclover, smooth brome grass, and annual weeds occurred compared to the other three treatments.

2006: The stand was very poor and the density of smooth brome grass, yellow sweetclover, and absinth wormwood was high. Some alfalfa, intermediate wheatgrass, and Dahurian wildrye was present but vigor was greatly reduced.

2007: A 54 percent weed canopy was measured throughout this plot. Alfalfa, cicer milkvetch, and intermediate wheatgrass were most abundant on this plot. Very high populations of absinth wormwood and quackgrass were present on this plot. This plot contained the highest weed populations of all the Old John's plots.

Introduced species seeding - Plateau® herbicide applied

2005: The overall stand was poor. Some of the planted species were present in very low numbers. Their growth was suppressed. A higher percentage of bare ground was observed.

2006: There was an increased percentage of bare ground compared to the unsprayed plots. Cicer milkvetch and alfalfa were fairly abundant in this plot and plant vigor is good. The plot had the lowest concentrations of absinth wormwood but a heavy invasion of sweetclover. This plot lacks the grass component and was rated as poor.

2007: A 49 percent weed canopy was measured throughout this plot. Alfalfa, cicer milkvetch, prairie rose, and intermediate were the most prevalent species recorded in frames.



Table 19. Old John's Lake WMA; introduced species seeded with herbicide application.
Random species counts taken 7/6/2005.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	1	2	2	2	0	0	3	0	0	1	0	0	2	0	0	0	0	0	0	1	14
cicer milkvetch	1	2	1	1	0	0	0	0	0	0	1	0	2	0	0	0	0	0	1	1	10
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
planted grasses	1	0	2	0	0	0	0	0	1	0	0	0	0	0	0	4	6	0	0	0	14
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	50	20	25	25	60	5	35	35	15	35	20	20	15	70	10	15	60	15	10	15	28

Table 20. Old John's Lake WMA; introduced species seeded with no herbicide application. Random species counts taken 7/6/2005.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	3
cicer milkvetch	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	3
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
planted grasses	0	0	2	3	6	6	0	2	2	0	2	2	3	9	3	0	0	0	0	0	40
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	70	40	50	35	40	70	30	60	65	70	75	50	90	95	95	75	70	85	30	60	63

Table 21. Old John's Lake WMA; native species seeded with herbicide application. Random species counts taken 9/8/2006.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
bergamot	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
blanketflower	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
blue flax	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cupplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
echinacea-coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
leadplant	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
longheaded coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximilian sunflower	2	0	3	1	0	2	0	1	3	1	3	0	0	0	0	1	0	3	0	0	20
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
penstemon	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	2
purple prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
stiff sunflower	0	10	0	0	0	4	0	2	0	0	0	0	0	0	1	2	0	0	0	0	19
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
yellow coneflower	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
big bluestem	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	0	0	0	5
switchgrass	2	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
prairie rose	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	5
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	10	15	5	10	20	80	20	10	15	20	10	10	5	20	10	50	40	20	10	5	19

Table 23. Old John's Lake WMA; introduced species seeded with herbicide application. Random species counts taken 9/8/2006.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	2	0	0	0	0	0	0	0	0	1	0	2	2	2	2	3	4	1	19
cicer milkvetch	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
hairy vetch	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	1	0	2	0	0	0	0	1	0	0	1	0	0	2	0	1	0	0	3	11
Dahurian wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
intermediate wheatgrass	0	0	0	0	1	0	2	1	0	2	1	1	0	0	0	1	0	1	1	0	11
mammoth wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tall wheatgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	4
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	40	20	60	30	20	20	30	50	40	30	20	60	20	40	40	50	20	30	30	20	34

Table 24. Old John's Lake WMA; introduced species seeded with no herbicide application. Random species counts taken 9/8/2006.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	0	0	0	3	1	0	0	1	1	0	0	0	0	1	0	0	0	0	7
cicer milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Dahurian wildrye	1	1	0	0	2	0	0	0	0	0	0	1	3	4	0	1	0	0	0	0	13
intermediate wheatgrass	0	1	0	1	0	1	0	0	0	1	1	1	0	0	1	1	1	1	0	0	10
mammoth wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
tall wheatgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	60	50	80	90	70	60	60	70	60	80	70	50	40	50	60	70	50	70	80	80	65

Table 26. Old John's Lake WMA; native species seeded with no herbicide application. Random species counts taken 6/12/2007.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
bergamot	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	3
blanketflower	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3
blue flax	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	5
Canada milkvetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cupplant	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	2
dotted blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
echinacea-coneflower	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
golden glow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
hyssops	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
leadplant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
longheaded coneflower	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Maximilian sunflower	0	0	0	2	0	0	6	3	0	6	0	0	0	0	0	1	0	1	0	0	19
meadow blazing star	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
partridge pea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
penstemon	0	0	0	0	4	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	8
purple prairieclover	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
stiff goldenrod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
stiff sunflower	12	0	15	8	0	8	10	1	12	0	18	8	4	2	0	0	0	0	0	0	98
tick trefoil	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
white prairieclover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
yellow coneflower	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
big bluestem	0	0	0	1	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	5
Canada wildrye	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
switchgrass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
prairie rose	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
red dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	40	70	20	20	20	15	10	30	18	10	30	35	75	60	70	40	80	70	80	60	43

Table 27. Old John's Lake WMA; introduced species seeded with herbicide application. Random species counts taken 6/12/2007.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	3	0	1	3	0	0	0	0	0	1	3	2	0	2	1	0	0	2	0	0	18
cicer milkvetch	0	0	0	0	0	0	1	0	0	0	1	0	1	2	1	0	1	2	0	0	9
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
planted grasses	1	0	0	1	0	0	1	0	0	0	0	1	0	1	0	0	0	0	2	4	11
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	0	0	0	2	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	6
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	20	20	80	80	80	80	60	50	80	40	40	40	40	60	40	60	10	30	30	30	49

Table 28. Old John's Lake WMA; introduced species seeded with no herbicide application. Random species counts taken 6/12/2007.

SPECIES	FRAME (2.4-ft ²)																				Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
alfalfa	0	0	0	0	2	0	0	0	0	2	0	0	0	2	0	0	1	1	3	0	11
cicer milkvetch	0	0	0	0	1	0	2	0	0	5	3	1	0	2	0	0	0	0	0	0	14
hairy vetch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
plains coreopsis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
red clover	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
sainfoin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
planted grasses	0	1	2	0	2	2	0	1	1	2	3	1	2	0	0	1	1	1	0	1	21
buffaloberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
chokecherry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
false indigo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
golden currant	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
juneberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
redosier dogwood	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
rose	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
snowberry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
																					Avg
WEED CANOPY %	80	60	70	80	60	60	30	30	70	30	40	50	60	60	30	40	50	50	40	80	54