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Wet Meadow Plant Associations, Malheur National Wildlife Refuge, Harney County, Oregon

John A. Christy
Portland State University

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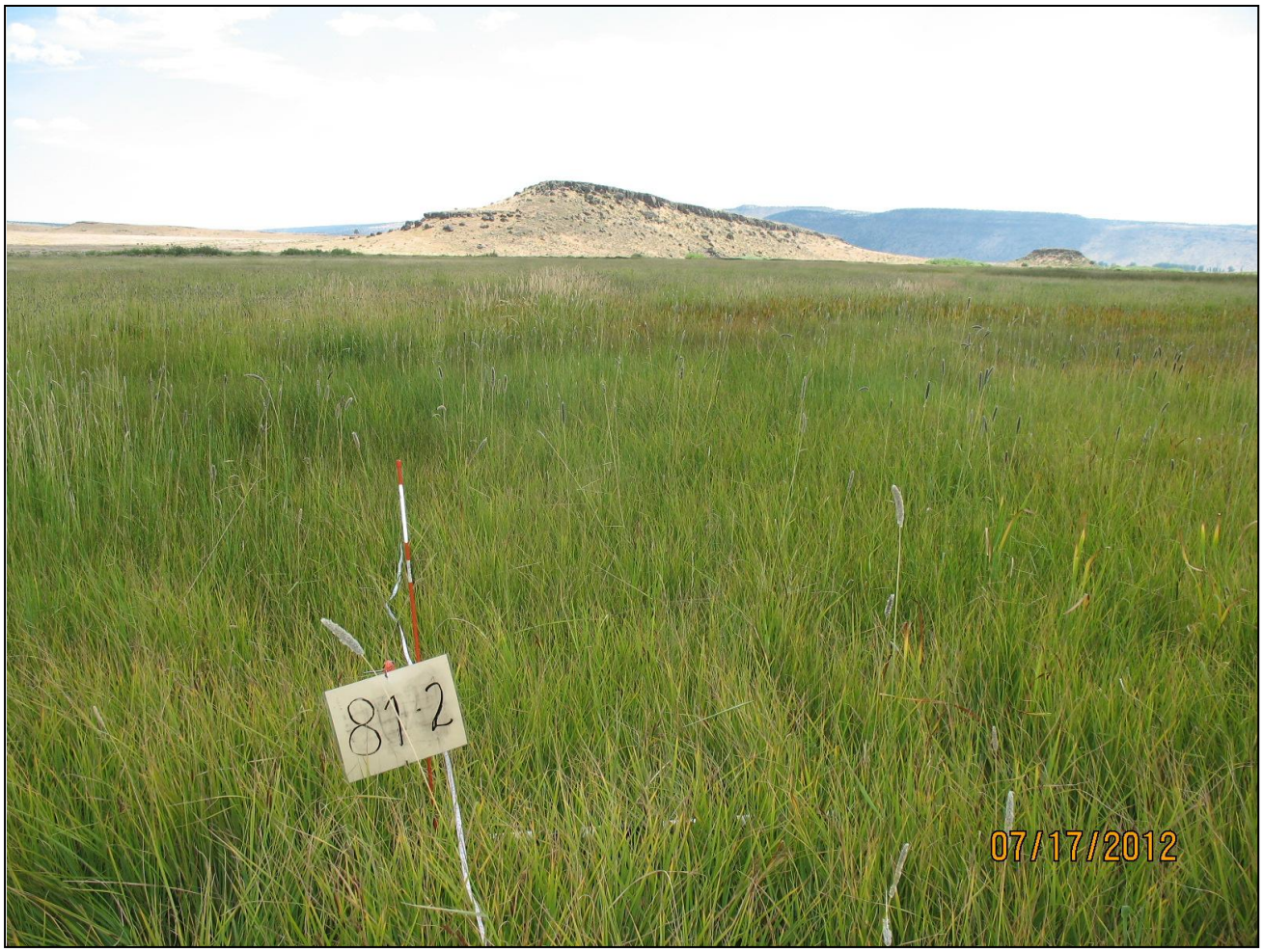

John A. Christy

Oregon Biodiversity Information Center, Institute for Natural Resources
Portland State University

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Summary

In July 2012, we sampled 131 plots in wet meadow habitat at the southern end of the Malheur National Wildlife Refuge. Analysis of the data identified eleven different plant associations: *Alopecurus pratensis, Carex aquatilis* var. *aquatilis, Carex nebrascensis, Carex pellita, Carex praegracilis, Carex sheldonii, Distichlis spicata, Juncus balticus, Leymus triticoides, Phalaris arundinacea*, and *Sparganium eurycarpum*. Plant associations spanned a wetland gradient from seasonally moist to seasonally or perennially flooded, but surface water had left most stands at time of sampling. Mean Wetland Indicator Status scores help to place the plant associations within gradients in soil moisture and alkalinity. The *Alopecurus pratensis* and *Phalaris arundinacea* associations are dominated by exotic, invasive species and appear to be outcompeting native plant associations. Phases of the *Carex praegracilis* association appear to be replaced by the *Alopecurus pratensis* association, while the *Carex pellita*, *Juncus balticus*, and *Leymus triticoides* associations may be replaced by the *Phalaris arundinacea* association. The *Carex aquatilis* and *Sparganium eurycarpum* associations were undersampled and provide only an estimate of composition. Most associations are consistent with what has been included in the National Vegetation Classification.

Acknowledgments

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Introduction

As part of ongoing efforts by the Ecology Working Group (EWG) to better understand the composition and dynamics of wet meadow communities on MNWR, the US Fish and Wildlife Service (USFWS) contracted with Portland State University's Oregon Biodiversity Information Center (ORBIC), part of the Oregon University System's Institute for Natural Resources, to sample and classify wet meadow vegetation on the refuge. Results will be applied by EWG to development of state and transition models (STM) for managing wetlands on the MNWR.

Wetlands on MNWR. Based on Cowardin et al. (1979), wetlands on the MNWR include palustrine, lacustrine, and riverine systems. Wetland types present include palustrine aquatic bed, emergent marsh, seasonally wet meadow, willow shrub swamp, and playa. Vegetation is largely determined by hydroperiod, or how long water stays on the site, and by soil and water chemistry. Cowardin hydroperiods applicable to the MNWR include (a) permanently flooded—surface water present all year, (b) semipermanently flooded—surface water present most years, (c) seasonally flooded—surface water present for extended periods during part of the growing season, but absent by the end of the season, (d) saturated—soil perennially wet, but surface water seldom present, (e) intermittently flooded—surface

water usually absent, sometimes present in wet years, and lacking any seasonal pattern, and (f) artificially flooded—amount and duration of flooding controlled by infrastructure. In addition to hydroperiod, wetland communities of the region are strongly influenced by alkaline and saline soils, which determine what plant species can survive at a given site (Lev et al. 2012).

Major **aquatic bed** vegetation on MNWR includes sago pondweed (*Potamogeton pectinatus*), coontail (*Ceratophyllum demersum*), pondweeds (*Zannichellia palustris*, *Potamogeton* spp.), white water buttercup (*Ranunculus aquatilis*), widgeongrass (*Ruppia maritima*), pond lily (*Nuphar polysepala*), and common bladderwort (*Utricularia macrorhiza*). These occur in lakes, ponds, and in channels of both the Blitzen River and irrigation canals. **Emergent marsh** communities include hardstem bulrush (*Schoenoplectus acutus*), cattails (*Typha latifolia*, *Typha angustifolia*), broadfruit bur-reed (*Sparganium eurycarpum*), and longroot smartweed (*Persicaria amphibia*). Water depths in marshes typically range from 2-3 inches to 2-3 feet. **Shrub swamp** or scrub-shrub on MNWR is primarily coyote willow (*Salix exigua*) with some box elder (*Acer negundo*) occurring along the floodplain of the Blitzen River. **Saline or alkaline wetlands** with intermittent hydroperiod, particularly **playas**, support more specialized shrub communities dominated by silver sagebrush (*Artemisia cana*) and greasewood (*Sarcobatus vermiculatus*), with basin wildrye (*Leymus cinereus*) and Nevada bluegrass (*Poa secunda*). Our study of seasonally **wet meadow** is described below. Only a few alkaline and emergent marsh wetlands were sampled, in order to place wet meadow within the context of a hydrologic and salinity gradient.

Hydrology and vegetation. MNWR occurs in an arid landscape, with precipitation in the study area averaging about 12 inches per year. The supply of water is a limiting factor for wetlands. Precipitation is variable from year to year, and runoff may vary within the same year, resulting in both drought and surplus years, and everything in between. Like most bottomlands in the region, MNWR contains an extensive network of dikes, ditches, and impoundments that divert water from the Blitzen River for seasonal flood irrigation to support habitat management on the Refuge. Primary management activities affecting wet meadow vegetation in the study area are haying (baling and rake-bunch) and seasonal cattle grazing. In general, wet meadow in the study area can only produce one hay crop per year before summer drought induces dormancy (Cooper 1956; Rumberg 1963; Wenick 2000)

For each decade, about two years in ten have abundant water, two years in ten have drought, and the remaining six years are somewhere in between (Wenick 2009, Stofleth 2011). There is also intra-annual variation in precipitation, when heavy runoff may occur more than once in the same year. Given the extremes in water supply caused by these climatic cycles, wetlands in the study area historically were adapted to expand and contract, and both hydrology and vegetation were in a continual state of flux between and within years. Wetland boundaries were moving targets. Today, despite human alterations in flow patterns and timing, wetlands still expand and contract with climatic extremes, and conditions may vary greatly from one year to the next (Lev et al. 2012).

Water control infrastructure on MNWR has had a profound effect on wetland habitats, decimating some types and causing others to proliferate, with ancillary effects on soils and vegetation. Water surplus years may bring longer irrigation seasons and sometimes flooding, while drought years may cause wetland vegetation to contract or be invaded by exotic species. Channelization and downcutting have separated the Blitzen River from its floodplain, reducing water storage capacity in the soil and desiccating riparian vegetation (Salant et al. 2010). Invasive species, particularly reed canary, perennial pepperweed, and meadow foxtail have impacted a number of wet meadow communities, as described below.

Vegetation Classification. Analysis of plant species composition and percent cover helps to identify different types of vegetation present in the study area. The types are then compared with concepts known to the author or reported in the literature. The classification in this report follows the National Vegetation Classification System (NVCS; FGDC 2008; Jennings et al. 2009). NVCS uses the plant association as the basic unit of classification, defined as having a distinct floristic composition, a more or less uniform appearance, and uniform habitat conditions. It applies to existing vegetation regardless of successional status. Each association is named after one or more diagnostic species in each vegetation layer. Dominant species in the herb layer are defined here as having at least 20% cover (U.S. Army Corps of Engineers 2008), or having the highest cover available in depauperate stands.

On MWNR, wet meadow species indicative of high alkalinity, such as *Distichlis spicata, Puccinellia lemmonii, Puccinellia nuttalliana, Suaeda calceoliformis,* and to a lesser extent *Poa secunda,* are often useful in differentiating plant associations, and their distributions are fairly discrete. Similarly, species at the wettest end of the hydrologic gradient (e.g., *Carex aquatilis, Eleocharis palustris, Mimulus guttatus*) contrast with those at the driest end (e.g., *Carex pachystachya, Leymus triticoides*). Indicator species are often not present in every plot from a given locality, and while their frequency within an association may be as low as 10-15 percent, they may occur intermittently in patches with cover of 30-50 percent. These species should not be overlooked, particularly when trying to identify an association in the field.

Study area. In 2012, vegetation sampling in wet meadow was restricted to a study area of approximately 17,000 acres at the south end of the Refuge, between Krumbo Lane and Frenchglen (Figure 1). Topography is nearly flat, with an elevation gain of about 100 ft from north (4100 ft) to south (4200 ft) over a distance of about 11 miles. Target habitat was about 8,000 acres classified by USFWS in 2010 as moist to wet meadow.

METHODS

We sampled wet meadow vegetation on MNWR in July 2012. John Christy and Bruce Newhouse rotated alternate weeks in the field, and assistant Barry Smith was present for the entire month. Gwen Kittel of NatureServe, and Esther Lev of TWC each spent two days with us in the field.

Plot selection. Plots were selected mostly in wet meadow habitats using MNWR's Phase 1 habitat map created by USFWS in 2010. Plot locations were selected to provide (1) general coverage across the sampling area, generally within one mile of the nearest road, (2) a representative sample of different plant associations occurring within the study area, and (3) a series of samples along presumed moisture gradients in several irrigated management units, extending from the driest points just north of diked impoundments to emergent marsh occurring at the head of the next impoundment to the north (Figure 1). To capture the range of variability present in wet meadow communities, we tried to select plots that looked more or less uniform in composition, and plots that looked different from one another. Wetland vegetation often contains nearly monotypic patches or clones of different species, and patches often end up being included in plots even if they are not obvious at first.

Vegetation sampling. Each plot was circular, with a radius of 20 feet, covering a total area of about 0.25 acre. GPS coordinates were recorded at the center point of each plot with consumer-grade Garmin units,

with a general accuracy of ± 15 feet. Within each circular plot, plant species composition and absolute percent cover were sampled in four 1 m^2 quadrats installed 10 ft from the center point of the plot, with each quadrat placed in each of the four cardinal directions, adjusted to compass declination. Each quadrat was located to the left of the measuring tape when facing outward from the center point. Each quadrat was identified by a sign indicating the plot number (1-131) and quadrat number (1-4) within each plot. When sampling of the four quadrats was completed, we inspected the remaining area within the circular plot and recorded the names of any additional species not captured in the quadrats. If any of these species were invasive, we recorded crude estimates ($m^{2)}$ of their cover in the plot. Voucher specimens were collected as needed to aid in identification of species, and the specimens were examined between September and November 2012.

Photopoints. Eight photographs were taken in each plot, four showing the landscape view in each cardinal direction when facing outward from the center point (including the quadrat for that portion of the plot), and four showing a close-up of each of the four quadrats.

Ecological Integrity Assessment. Site condition for each plot was assessed using Level 2 metrics selected from NatureServe's Ecological Integrity Assessment (EIA) methodology (Faber-Langendoen et al. 2012). Each plot was scored for (1) structural integrity of vegetation, (2) relative cover of native species, (3) cover of exotic invasive species, (4) vegetation composition, and (5) soil disturbance. Results will be summarized separately with NatureServe.

Soils and depth to water table. A hand augur was used at the center point of each plot to qualitatively describe soil texture, soil color, and estimated depth to water table.

Wetland Indicator Status (WIS). WIS variables for the Arid West were assigned to each species using the June 2012 National Wetland Plant List (NWPL). I then assigned each WIS score a weighted number as follows: OBL=5, FACW=4, FAC=3, FACU=2, UPL=1. Bare ground, species not assigned a WIS, and taxa identified only to genus were excluded. I then calculated a mean WIS value for each plot, and from these I calculated a mean WIS for each plant association.

Data analysis. Plot data were transcribed into an MS Excel spreadsheet. For ease in interpretation of species names in output, 6-letter acronyms were used instead of the PLANTS acronyms, and are provided in Appendix 1. Species cover data from each of the four quadrats were then averaged to provide a mean value for each species in the plot. Plant associations were identified using cluster analysis, TWINSPAN, and Bray-Curtis ordination provided in PC-ORD (McCune and Mefford 1999). A series of TWINSPAN runs analyzed (1) the entire dataset, (2) minus bare ground and litter, (3) minus bare ground and *Juncus balticus*, (4) minus bare ground, *Alopecurus pratensis*, and *Juncus balticus*, (5) minus bare ground and all exotic species, and (6) minus bare ground, all exotic species, and *Juncus balticus*. The first two TWISPAN runs captured most of the differentiation between different plant associations among the 131 plots. Using MS Excel, I then created stand tables for each association, summarizing each species' frequency, average percent cover, and maximum and minimum cover values. For analysis of exotic species distribution in plots, a matrix of 128 plots was used, omitting three unclassified plots (35, 58, and 120).

Botanical nomenclature. Whenever possible, plant names and native vs. exotic status conform to (1) the Oregon Flora Project checklist, and (2) the USDA PLANTS database.

RESULTS

We sampled 131 plots in the study area (Figure 1), for a total of 524 quadrats and 4,928 observations for individual species, bare ground, litter, and moss. Averaged cover values from the 524 quadrats yielded 1,229 observations. A total of 167 plant taxa were observed in the plots, 121 (72%) of which were native and 46 (28%) exotic (Appendix 1). Almost all vegetation sampled was herbaceous, with the exception of scant amounts of *Acer negundo*, *Rosa woodsii*, and *Salix exigua*.

We were unable to record any environmental variables that would help differentiate vegetation in most of the plots because of the uniformity of conditions at the site. Soils were silty clay loams of more or less uniform color, though sometimes some contained greater amounts of sand. As the water table dropped and clay loam soils dried and hardened, it became increasingly difficult to obtain any useful information with the soil augur. Depth to water table was observable early in July and at the wettest sites, but by the middle of July we could only estsimate depth to water table based on how deep we were able to bore, and some plots with hardended soil were impossible to bore. Microtopography was mostly uniformly flat or slightly hummocky, with only a few concave areas occurring in old meander channels.

To compensate for the lack of useful environmental information on soils or depth to water table at the time of sampling, I used mean Wetland Indicator Status (WIS) as a surrogate indicator of hydroperiod for each plant association (Figures 2 and 3). WIS for each species is given in Appendix 1, and mean WIS for each plant association is given in Table 1.

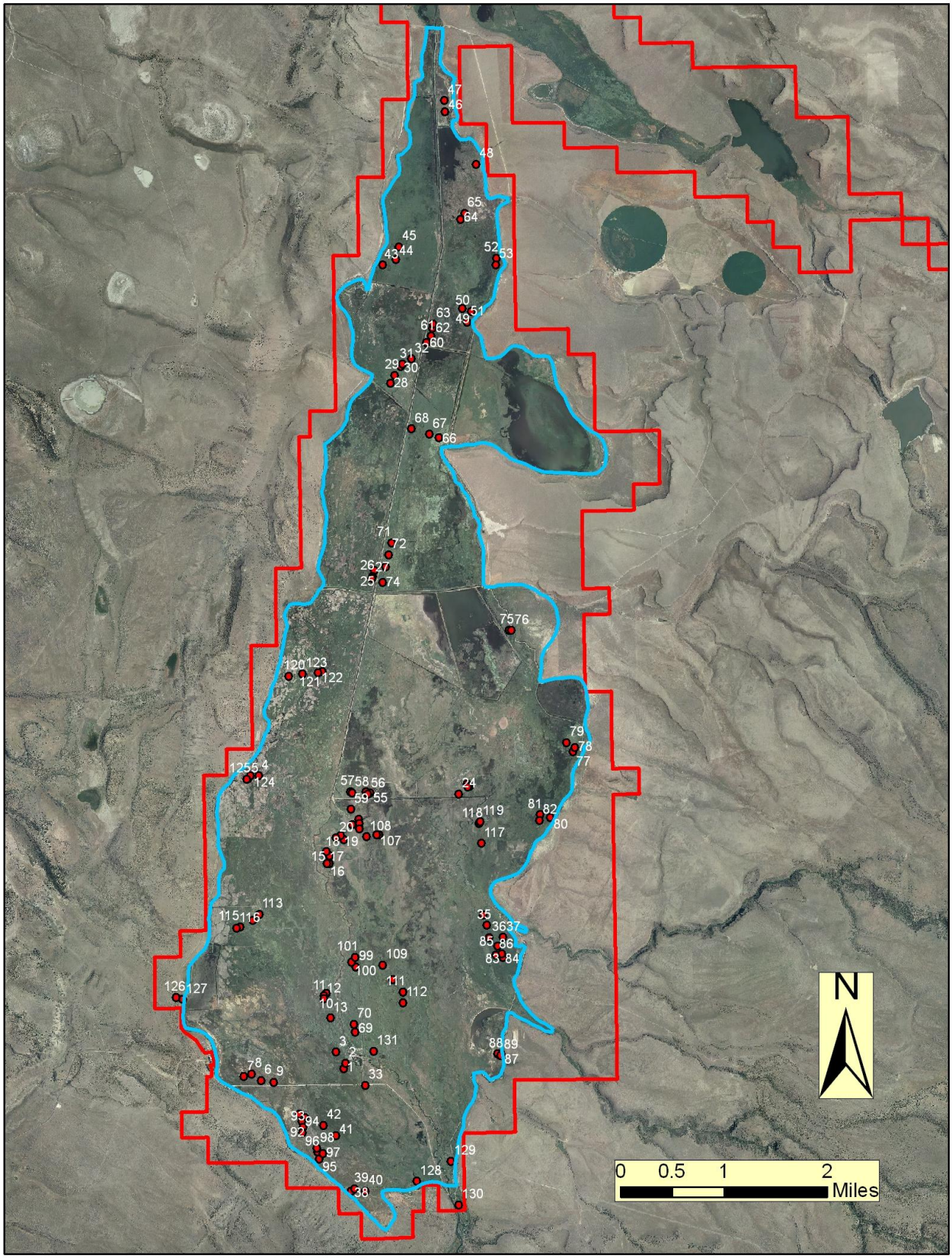

Figure 1. 2012 MNWR wet meadow sampling area, showing plot locations. Red = Refuge boundary, blue = wetland border. Imagery from 2005 NAIP.

1. Plant Associations

Eleven plant associations were identified from 128 plots (Table 1). Three plots (35, 58 and 120) were left unclassified because their TWINSPAN grouping was driven by bare ground or inconclusive species composition. Two of the associations are dominated by the exotic species *Alopecurus pratensis* and *Phalaris arundinacea*, and qualify for inclusion as ruderal associations in the NVCS. Descriptions for each plant association are given in Section 4 below.

All of the associations tolerate fluctuating water levels over the course of the year. Almost all plots had consistently high values for bare ground and litter, ranging from large amounts of dead biomass in wetter sites, residual litter or bare ground from rake-bunch haying and grazing, or naturally bare ground in drier meadow and alkaline sites. Moss was mostly restricted to wetter sites. The *Carex praegracilis* association, with 92 species recorded, is extremely diverse and similar to the 85 species reported for the region by Cooper (1956). The *Juncus balticus, Alopecurus pratensis*, and *Leymus triticoides* associations had somewhat lower species diversity, though there is considerable overlap among them. Stands now dominated by *Alopecurus pratensis* appear to have developed on sites previously supporting *Carex praegracilis*, which probably accounts for its relatively high diversity. The wettest associations (*Carex aquatilis* var. *aquatilis, Carex nebrascensis, Carex sheldonii,* and *Sparganium eurycarpum*) have low species diversity, typical of wet stands that tend toward single-species or monotypic composition. The most alkaline association, *Distichlis spicata*, also has low diversity because of the limited number of species adapted to the extreme soil conditions.

Table 1. Plant associations identified on south end of MNWR. For Wetland Indicator Status, OBL=5, FACW=4, FAC=3, FACU=2, UPL=1. Bare ground, species not assigned a WIS, and taxa identified only to genus were excluded.

Scientific name	Common name	# plots	# species	Mean Wetland Indicator Status
Alopecurus pratensis	meadow foxtail	13	56	3.7
Carex aquatilis var. aquatilis	water sedge	3	20	4.3
Carex nebrascensis	Nebraska sedge	12	34	4.4
Carex pellita	woolly sedge	11	46	3.8
Carex praegracilis	clustered field sedge	26	92	3.2
Carex sheldonii	Sheldon sedge	4	9	4.6
Distichlis spicata	inland saltgrass	7	16	3.0
Juncus balticus	Baltic rush	12	62	3.8
Leymus triticoides	beardless wildrye	18	50	3.4
Phalaris arundinacea	reed canarygrass	19	37	4.2
Sparganium eurycarpum	broadfruit burreed	4	21	4.4

2. Relative hydrology of plant associations

Because depth to water table could not be determined for most of the plots, I used a mean Wetland Indicator Status (WIS) as a surrogate to approximates the hydroperiod for each of the eleven associations (Figures 2 and 3). Definitions of indicator status for species in the June 2012 National Wetland Plant List (NWPL) are stricly qualitative (U.S. Army Corps of Engineers 2011):

OBL (Obligate wetland) = almost always is a hydrophyte, rarely in uplands
FACW (Facultative wetland) = usually is a hydrophyte but occasionally found in uplands
FAC (Facultative) = commonly occurs as either a hydrophyte or non-hydrophyte
FACU (Facultative upland) = occasionally is a hydrophyte but usually occurs in uplands
UPL (Upland) = rarely is a hydrophyte, almost always in uplands

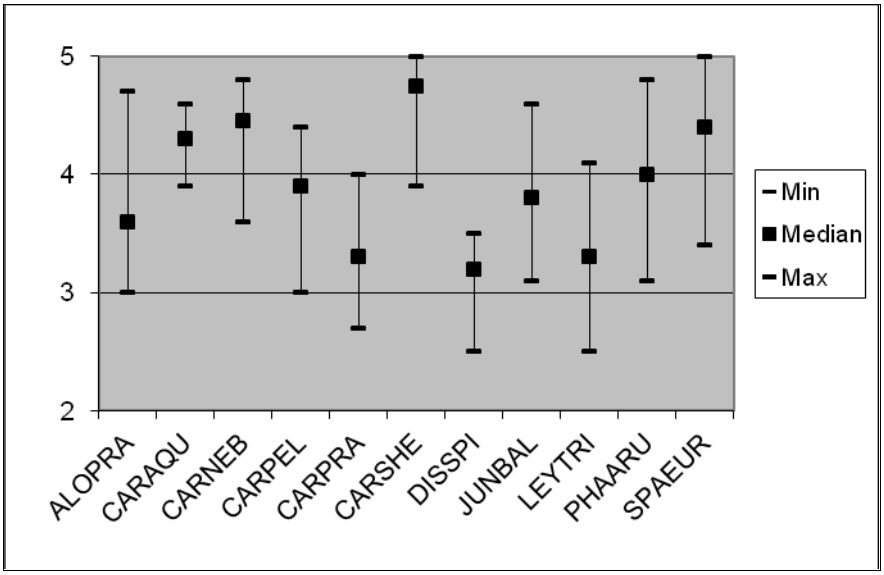

Figure 2. Line plots of mean Wetland Indicator Status for all 11 plant associations at MNWR. 5=OBL, 4=FACW, 3=FAC, 2=FACU

Most of the plant associations show considerable overlap between maximum and minimum values, but the distribution of the means of most plots were fairly discrete. The *Alopecurus pratensis* association has a wide hydrological amplitude that includes nearly all of the *Carex pellita*, *Carex aquatilis*, *Carex praegracilis*, and *Juncus balticus* associations, and a large part of the *Leymus triticoides* association. The *Distichlis spicata* association is the driest of the group but overlaps somewhat with drier, more alkaline phases of the *Carex praegracilis* and *Leymus triticoides* associations. The *Carex aquatilis*, *Carex nebrascensis*, *Carex sheldonii*, and *Sparganium eurycarpum* associations are the wettest of the group, their mean WIS all being wetter than FACW, but the *Carex sheldonii*, and *Sparganium eurycarpum* associations have wide amplitudes. Under controlled conditions in a growth chamber, Gomm (1978) confirmed the relative hydrologic positions of *Carex praegracilis*, *Leymus triticoides*, and *Phalaris arundinacea*. The first two species performed better in moist soil, while *Phalaris* performed better in

saturated soil. Implications of the relative hydrologies among the different associations are discussed in Section 4 below.

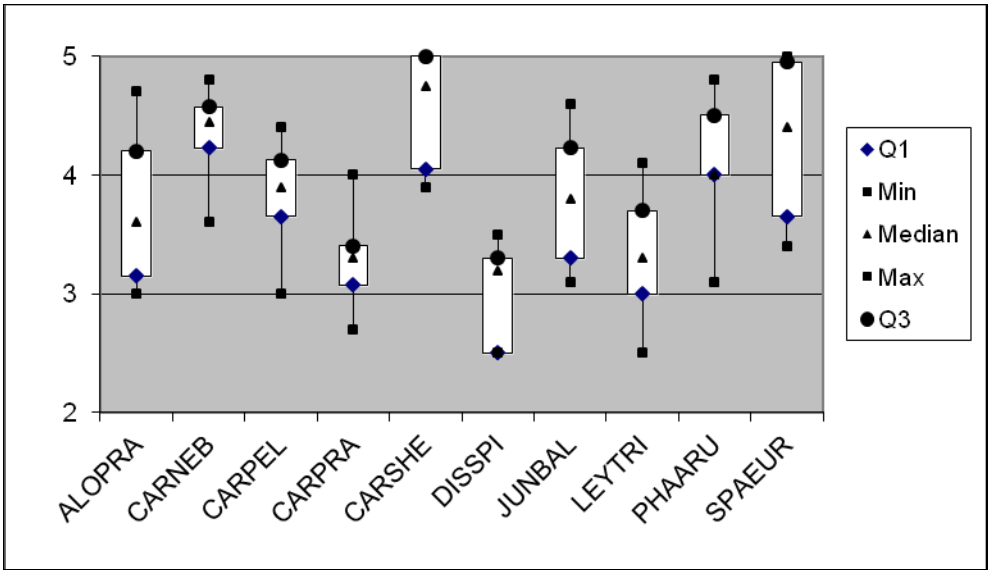

Figure 3. Box plots of mean Wetland Indicator Status for 10 plant associations at MNWR that had four or more plots (sufficient minimal data for box plots). 5=OBL, 4=FACW, 3=FAC, 2=FACU. The *Carex aquatilis* association is excluded because it had fewer than four samples.

3. Exotic species

Thirty-two exotic species were recorded in the plots, five of which (*Alopecurus pratensis, Cirsium arvense, Thlaspi arvense, Lepidium latifolium, Phalaris arundinacea*) occurred in more than 20% of the plots (Table 2). These figures reflect only presence of exotics in the plots sampled, and not their relative abundance at the south end of the Refuge.

Table 2. Exotic species recorded in plots at south end of MNWR

Scientific name	Common name	Number of plots with species	Percent of plots containing species
Alopecurus pratensis	meadow foxtail	53	40.5
Cirsium arvense	Canada thistle	40	30.5
Thlaspi arvense	field pennycress	33	25.2
Lepidium latifolium	perennial pepperweed	27	20.6
Phalaris arundinacea	reed canarygrass	27	20.6
Lactuca serriola	prickly lettuce	25	19.1
Poa pratensis	Kentucky bluegrass	18	13.7
Veronica anagallis-aquatica	water speedwell	13	9.9

Agrostis stolonifera	creeping bentgrass	12	9.2
Phleum pratense	common timothy	12	9.2
Taraxacum officinale	common dandelion	9	6.9
Trifolium pratense	red clover	8	6.1
Medicago lupulina	black medick	6	4.6
Trifolium hybridum	alsike clover	6	4.6
Apera interrupta	dense silkybent	5	3.8
Poa palustris	fowl bluegrass	5	3.8
Rumex crispus	curly dock	5	3.8
Tragopogon dubius	yellow salsify	4	3.1
Barbarea vulgaris	garden yellowrocket	2	1.5
Bromus inermis	smooth brome	2	1.5
Myosotis arvensis	field forget-me-not	2	1.5
Polypogon monspeliensis	annual rabbitfoot grass	2	1.5
Polygonum ramosissimum	bushy knotweed	2	1.5
Acer negundo	box elder	1	0.8
Bromus tectorum	cheatgrass	1	0.8
Descurainia sophia	herb sophia	1	0.8
Dipsacus fullonum	teasel	1	0.8
Lepidium campestre	field pepperweed	1	0.8
Lepidium perfoliatum	clasping pepperweed	1	0.8
Salsola tragus	prickly Russian thistle	1	0.8
Sonchus asper	spiny sowthistle	1	0.8
Veronica catenata	chain speedwell	1	0.8

Table 3 shows the frequency with which exotic species occurred in each of the eleven plant associations. Not unexpectedly, *Alopecurus pratensis* and *Phalaris arundinacea* showed highest frequencies in their respective plant associations, but along with *Cirsium arvense, Lepidium latifolium*, and *Thlaspi arvense* they also occur across a broad hydrologic gradient, which enables them to invade multiple native associations. *Alopecurus pratensis* appears to grow in all but the wettest and most alkaline habitats, with slight preference for both the *Carex nebrascensis* and *Leymus triticoides* associations. *Cirsium arvense* occurs over the broadest spectrum of all vegetation types, dry or wet, but appears to favor the *Carex praegracilis* association. Both *Lepidium latifolium* and *Thlaspi arvense* show a similar pattern, but are most frequent in the *Leymus triticoides* association. *Phalaris arundinacea* did not occur in either the *Alopecurus pratensis* or *Carex nebrascensis* association, perhaps because they are too dry seasonally. The most alkaline association, *Distichlis spicata*, was least favorable for any of the exotic species. Of all associations sampled on the MNWR, the *Carex praegracilis* association has the greatest species diversity, in part because it appears to be the most favorable for exotic forage species and native species that increase with a history of grazing.

Table 3. Frequency of exotic species by plant association (n=128 plots), south end of MNWR											
Exotic species ↓	Frequency of species per plant association										
	Alopecurus pratensis	*Carex aquatilis* var. *aquatilis*	*Carex nebrascensis*	*Carex pellita*	*Carex praegracilis*	*Carex sheldonii*	*Distichlis spicata*	*Juncus balticus*	*Leymus triticoides*	*Phalaris arundinacea*	*Sparganium eurycarpum*
Acer negundo	0.8										
Agrostis stolonifera			1.6	1.6	4.7			1.6			
Alopecurus pratensis	10.2	2.3	7.0	0.8	5.5			4.7	7.0	2.3	0.8
Apera interrupta	0.8		1.6					0.8	0.8		
Barbarea vulgaris								0.8	0.8		
Bromus inermis					1.6						
Bromus tectorum									0.8		
Cirsium arvense	3.1			6.3	10.9	0.8		1.6	6.3	0.8	0.8
Descurainia sophia								0.8			
Dipsacus fullonum				0.8							
Lactuca serriola	1.6	0.8	0.8	0.8	4.7			3.9	6.3	0.8	
Lepidium campestre								0.8			
Lepidium latifolium	2.3		0.8	0.8	2.3			4.7	7.0	1.6	0.8
Lepidium perfoliatum					0.8						
Medicago lupulina	0.8				3.9						
Myosotis arvensis			0.8					0.8			
Phalaris arundinacea				1.6	0.8	0.8		2.3	0.8	14.8	
Phleum pratense	0.8			0.8	6.3			0.8			0.8
Poa palustris	0.8		0.8	1.6	0.8						
Poa pratensis	1.6		0.8	0.8	8.6			0.8	1.6		
Polygonum ramosissimum									0.8	0.8	
Polypogon monspeliensis		0.8								0.8	
Rumex crispus	0.8	0.8		0.8	0.8				0.8		
Salsola tragus							0.8				
Sonchus asper					0.8						
Taraxacum officinale	0.8				5.5				0.8		
Thlaspi arvense	3.9	0.8	3.1		0.8			3.1	10.2	3.9	
Tragopogon dubius					1.6		0.8		0.8		
Trifolium hybridum		0.8			3.9						

Trifolium pratense	0.8				4.7			0.8			
Veronica anagallis-aquatica			4.7	0.8				2.3	0.8	1.6	
Veronica catenata											0.8

4. Descriptions of plant associations

This section describes the eleven plant associations identified on MNWR. Abbreviated stand tables are included here, and complete stand tables are provided in Appendix 2. Each description includes the status of each association in the National Vegetation Classification (NVCS), its global and state (subnational) conservation rank (ORBIC rank)[1], habitat, hydrology, species composition, ecology, and a photograph. Unless noted otherwise, additional sources for descriptions of plant associations can be found by following the link to the NVCS classification page.

Alopecurus pratensis Association

Meadow foxtail

Classification:
NVCS: new to classification, ruderal
ORBIC rank: G5S5
Plots sampled at MNWR: 13

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain flats and depressions
Hydrology: seasonally moist to seasonally flooded
Soils: silty clay loam

Species	Freq	Percent cover		
		Ave	Min	Max
Alopecurus pratensis	100.0	62.2	32.5	95.0
Bare/ litter	100.0	14.2	0.8	56.3
Juncus balticus	61.5	7.0	0.0	33.8
Carex aquatilis var. aquatilis	38.5	1.0	0.0	4.0
Thlaspi arvense	38.5	0.3	0.0	2.8
Cirsium arvense	30.8	1.7	0.0	15.0
Leymus triticoides	23.1	2.6	0.0	20.0
Potentilla gracilis	23.1	1.1	0.0	11.3
Carex nebrascensis	23.1	0.5	0.0	3.8
Carex pellita	23.1	0.3	0.0	2.8
Agoseris cf. glauca var. glauca	23.1	0.2	0.0	1.5
Lepidium latifolium	23.1	0.1	0.0	1.0
Hordeum brachyantherum	23.1	0.1	0.0	0.5
Vicia americana	23.1	0.1	0.0	0.8
Carex praegracilis	15.4	3.2	0.0	28.8
Poa pratensis	15.4	1.5	0.0	17.5

[1] ORBIC participates in NatureServe's international system for ranking rare, threatened and endangered species and plant associations. The ranking uses a scale of 1-5, based primarily on the number of known occurrences, but also including threats, sensitivity, area occupied, and other biological factors. The Global Rank begins with a "G" and the State Rank begins with an "S." Details of the methodology are available at: http://www.natureserve.org/explorer/ranking.htm#global

1= Critically imperiled because of extreme rarity or because it is somehow especially vulnerable to extinction or extirpation, typically with 5 or fewer occurrences.
2 = Imperiled because of rarity or because other factors demonstrably make it very vulnerable to extinction (extirpation), typically with 6-20 occurrences. Taxa extirpated from Oregon are listed as 2-ex.
3 = Rare, uncommon or threatened, but not immediately imperiled, typically with 21-100 occurrences.
4 = Not rare and apparently secure, but with cause for long-term concern, usually with more than 100 occurrences.
5 = Demonstrably widespread, abundant, and secure.
H = Historical occurrence, with implied expectation that it may be rediscovered.
Q = Taxonomic questions
T = Rank for subspecies or variety

Habitat, uses, hydrology: Habitat at MNWR is seasonally moist to wet meadow, including flood-irrigated hay meadow. *Alopecurus pratensis* is an exotic, invasive grass that is an extremely important forage species throughout the region. At the time of sampling on MNWR in July, depth to water table for this association ranged from 15-34 inches. Mean WIS ranged from slightly wetter than FAC to slightly wetter than FACW, with one stand extending nearly to OBL. The association overlaps primarily with the *Carex pellita*, *Carex aquatilis*, *Carex praegracilis*, and *Juncus balticus* associations, and a large part of the *Leymus triticoides* association (Figures 2 and 3).

Vegetation: Slightly over 50 species are present (Appendix 2), but most occur with low frequency and cover. *Alopecurus pratensis* is the primary species with an average cover of 62 percent, but it can range up to 95 percent. *Juncus balticus* and *Carex aquatilis* are the second most important components, occurring at modest frequency but low cover. Weedy native increasers such as *Drymocallis glandulosa*, *Potentilla gracilis*, and exotic forage species like *Poa pratensis*, *Phleum pratense*, and *Trifolium pratense* indicate a mesic phase with a history of pasture improvements and grazing. Hydric components include *Juncus balticus*, *Carex aquatilis*, *Carex pellita*, *Eleocharis palustris*, *Mimulus guttatus*, and *Persicaria amphibia*, but these are scarce. An alkaline component is indicated by *Carex nebrascensis*, *Leymus triticoides*, and *Poa secunda*.

Ecology and condition: *Alopecurus pratensis* is viable across a broad spectrum of native plant associations at MNWR, particularly the *Carex pellita*, *Carex aquatilis*, *Carex praegracilis*, and *Juncus balticus* associations, and a large part of the *Leymus triticoides* association (Figures 2 and 3; Appendix 2). Soil pH can range from 4.5 to 8.5 (Schoth 1945, Morisawa 1999). Similarity in landform position and species composition suggests that *Alopecurus pratensis* has successfully invaded and replaced phases of the *Carex praegracilis* association, with some plots containing up to 29 percent cover of *Carex praegracilis*. When compared to the highly diverse *Carex praegracilis* association, the lower species diversity of the *Alopecurus pratensis* association may result from its competitive superiority over many of the species of the former community that were simply crowded out. It remains to be seen if its formidable competitive abilities will enable it to overwhelm other wet meadow vegetation types.

Classification: The *Alopecurus pratensis* association has yet to be included in NVCS. Though its existence has been known for many years, it has not been formally described in the literature. ORBIC will add it to its classification as a ruderal community.

Conservation: ORBIC has assigned a tentative rank of G5S5 to this ruderal association, based on its extensive distribution and the high number of occurrences rangewide. Threats are unknown at this point. *Alopecurus pratensis* is a threat to riparian and wetland areas throughout the region because it spreads rapidly and replaces native vegetation. First collected in Oregon west of the Cascade Range in 1883, the earliest known collections from eastern Oregon date from 1971 (Grant County), 1978 (Wallowa Countty), and 1980 (Klamath and Lake Counties; Oregon Flora Project Atlas). It was not among species listed in earlier studies of local flood-irrigated hay meadows (Cooper 1956, Rumberg and Cooper 1961, Rumberg and Sawyer 1965), but it is now a dominant species in these habitats (Angell and Bailey 1998). In Lake County, Christy (2001) observed complete replacement of *Carex nebrascensis* and *Eleocharis palustris* meadow communities by *Alopecurus pratensis* over a 20-year period. Fire, herbicides, prolonged inundation during the growing season, and excavation of root mats have been used in local applications, but these treatments are too expensive to apply at a landscape scale.

Figure 4. ***Alopecurus pratensis*** **association, MNWR.**

Carex aquatilis var. *aquatilis* Association

Water sedge

Species	Freq	Percent cover		
		Ave	Min	Max
Carex aquatilis var. aquatilis	100.0	54.3	20.5	82.5
Alopecurus pratensis	100.0	12.0	8.0	15.5
Bare/ litter	100.0	8.1	3.3	15.0
Juncus balticus	66.7	8.6	0.0	25.0
Eleocharis palustris	66.7	8.0	0.0	19.3
Carex simulata	66.7	4.8	0.0	13.8
Unknown	66.7	0.3	0.0	0.5
Carex nebrascensis	33.3	1.2	0.0	3.5
Epilobium	33.3	0.2	0.0	0.5
Rorippa	33.3	0.2	0.0	0.5
Rumex crispus	33.3	0.2	0.0	0.5
Thlaspi arvense	33.3	0.2	0.0	0.5
Agrostis oregonensis	33.3	0.1	0.0	3.3
Beckmannia syzigachne	33.3	0.1	0.0	0.3
Carex	33.3	0.1	0.0	0.3
Epilobium ciliatum ssp. ciliatum	33.3	0.1	0.0	0.3
Lactuca serriola	33.3	0.1	0.0	0.3
Polypogon monspeliensis	33.3	0.1	0.0	0.3
Trifolium hybridum	33.3	0.1	0.0	0.3
Veronica	33.3	0.1	0.0	0.3

Classification:
NVCS: *Carex aquatilis* var. *aquatilis* Herbaceous Vegetation
ORBIC rank: G5S4
Plots sampled at MNWR: 3

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain depressions
Hydrology: seasonally moist to perennially flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is depressional topography on floodplains. With adequate moisture, stands are tall and dense, and can be grazed and cut for hay. *Carex aquatilis* remains a reasonably good forage plant after other species go dormant in summer drought (Hansen et al. 1990; Kovalchik and Clausnitzer 2004). At the time of sampling on MNWR in July, depth to water table for this association ranged from 2 to at least 18 inches. Though the sample size was too small to graph a box plot, mean WIS is between FACW and OBL, overlapping primarily with the *Carex nebrascensis*, *Carex sheldonii*, *Phalaris arundinacea*, and *Sparganium eurycarpum* associations (Figures 2 and 3).

Vegetation: Only three stands of this association were sampled at MNWR in 2012, and may not be very characteristic. Like most hydric communities that tend toward single-species or monotypic composition, species diversity in this association is relatively low, with only 20 species present (Appendix 2). *Carex aquatilis* is the dominant species, with cover ranging from 20 to 83 percent. Secondary species include exotic *Alopecurus pratensis* and native *Juncus balticus*, *Eleocharis palustris*, and *Carex simulata*, the last three all being hydrophytes. The remainder of the composition is a mix of native hydrophytes and agricultural weeds that occur at low cover in drier situations.

Ecology and condition: Soil pH can range from 6.2 to 7.1 (Oregon State University 2005a). Stands of *Carex aquatilis* in good condition and quantity are good indicators of a perennial water table and generally healthy riparian system (Johnston 2001). The association may not be very abundant on the Refuge, but it is distinctive in the field. It is resistant to a variety of abuses and has potential for restoring wetland habitats (Wilson et al. 2008).

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G5S4 to this association, based on the extensive distribution and high number of occurrences rangewide. Threats are limited at this point.

Figure 5. ***Carex aquatilis*** **var.** ***aquatilis*** **associaiton, MNWR.**

Carex nebrascensis Association

Nebraska sedge

Species	Freq	Percent cover		
		Ave	Min	Max
Carex nebrascensis	100.0	52.5	13.5	90.0
Bare/ litter	91.7	7.9	0.0	43.8
Alopecurus pratensis	75.0	12.2	0.0	67.5
Juncus balticus	75.0	9.4	0.0	27.5
Epilobium ciliatum ssp. ciliatum	58.3	2.1	0.0	21.3
Hordeum brachyantherum	50.0	3.1	0.0	26.3
Veronica anagallis-aquatica	50.0	0.8	0.0	4.8
Epilobium brachycarpum	50.0	0.3	0.0	1.8
Eleocharis palustris	33.3	2.4	0.0	21.3
Juncus nevadensis	33.3	2.2	0.0	17.0
Thlaspi arvense	33.3	0.9	0.0	9.8
Moss	33.3	0.3	0.0	1.5
Carex simulata	25.0	4.0	0.0	42.5
Agrostis	25.0	0.7	0.0	6.8

Classification:
NVCS: *Carex nebrascensis* Herbaceous Vegetation
ORBIC rank: G4S4
Plots sampled at MNWR: 12

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain flats and depressions
Hydrology: seasonally moist to seasonally flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is floodplain flats. The association ranges from tall stands in perennially flooded sites to stunted stands on seasonally droughty, alkaline soils. *Carex nebrascensis* is an important late-season forage plant when others have gone dormant during summer drought (Hermann 1970; Cronquist et al. 1977, Wilson et al. 2008, Tilley et al. 2012). When dry enough, stands are grazed and cut for hay. Historically, stands were extensive and a major source of native hay (Griffiths 1902). At the time of sampling on MNWR in July, depth to water table for this association ranged from 0 (water at or above surface) to at least 25 inches. Mean WIS is midway between FACW and OBL, overlapping primarily with the *Carex aquatilis*, *Carex sheldonii*, *Phalaris arundinacea*, and *Sparganium eurycarpum* associations (Figures 2 and 3).

Vegetation: Species diversity is moderate in this association, with 34 species recorded (Appendix 2). *Carex nebrascensis* is the dominant species, with cover ranging from 52 to 90 percent. Secondary species include exotic *Alopecurus pratensis* and native *Juncus balticus, Epilobium ciliatum*, and *Hordeum brachyantherum*, and includes patches of *Eleocharis palustris* and *Carex simulata*. The remaining species are mostly native hydrophytes, with a scattering of agricultural weeds on drier sites.

Ecology and condition: The dense root mass of *Carex nebrascensis* makes it resistant to soil compaction and erosion, and the species is widely used in restoration work (Tilley et al. 2012) It is sometimes a native increaser with heavy grazing (Wilson et al. 2008). The water table for *Carex nebrascensis* typically lies between 0 and 7.9 inches (Oregon State University 2005b). It can tolerate total inundation for about 3 months, and disappears when the water table drops more than 3 ft below the root zone late in the growing season (Tilley et al. 2012). Under prolonged, heavy grazing it can be replaced by *Poa pratensis* (Utah State University 2002, Oregon State University 2005b).

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G4S4 to this association, based on the relatively high number of occurrences rangewide. Threats are limited at this point.

Figure 6. Carex nebrascensis asssociation, MNWR.

Carex pellita Association

Woolly sedge

Species	Freq	Percent cover		
		Ave	Min	Max
Carex pellita	100.0	27.1	3.5	62.5
Bare/ litter	100.0	24.6	2.0	56.3
Juncus balticus	80.0	19.5	0.0	38.8
Cirsium arvense	80.0	4.2	0.0	22.5
Mentha canadensis	50.0	1.3	0.0	6.3
Leymus triticoides	30.0	2.1	0.0	11.3
Carex nebrascensis	30.0	6.8	0.0	40.0
Persicaria amphibia	30.0	1.5	0.0	11.8
Carex aquatilis var. aquatilis	20.0	0.8	0.0	7.0
Stachys pilosa	20.0	2.3	0.0	20.0
Eleocharis palustris	20.0	1.7	0.0	14.0
Carex praegracilis	20.0	0.4	0.0	4.0
Phalaris arundinacea	20.0	0.4	0.0	2.5
Agrostis stolonifera	20.0	0.2	0.0	0.8
Poa palustris	20.0	0.2	0.0	1.3

Nomenclatural note: Until recently, *Carex pellita* was called *Carex lanuginosa*.

Classification:
NVCS: *Carex pellita* Herbaceous Vegetation
ORBIC rank: G3S3
Plots sampled at MNWR: 10

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain depressions
Hydrology: seasonally moist to seasonally flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is depressional topography on floodplains. *Carex pellita* is a reasonably good forage plant (Hermann 1970; Cronquist et al. 1977, Johnston 2001). With adequate moisture, stands are tall and dense, and when dry enough are grazed or cut for hay. Historically, stands were extensive and a major source of native hay (Griffiths 1902). At the time of sampling on MNWR in July, depth to water table for this association ranged from 2-13 inches. Although superficially similar to the *Carex sheldonii* and taller expressions of the *Carex nebrascensis* associations, its mean WIS is FACW, indicating that it has a shorter hydroperiod than the others. It overlaps primarily with the *Alopecurus pratensis* and *Juncus balticus* associations (Figures 2 and 3).

Vegetation: Species diversity is moderate in this association, with 46 species recorded (Appendix 2). *Carex pellita* is the dominant species, with cover ranging from 27 to 63 percent. Secondary species include *Juncus balticus* and the exotic *Cirsium arvense*. The remaining species are a mix of mostly native hydrophytes, with some large inclusions of native *Carex nebrascensis* and *Stachys pilosa*, and exotic *Dipsacus fullonum*. Presence of *Leymus triticoides* indicates that some phases tolerate some alkalinity.

Ecology and condition: Stands of *Carex pellita* in good condition and quantity are good indicators of a perennial water table and generally healthy riparian system (Johnston 2001). At MNWR, stands can dry out by July, historically allowing access to livestock or machinery. The fairly consistent presence of *Cirsium arvense* in stands at MNWR suggests that they may not be in the best condition.

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G3S3 to this association, based on the relatively high number of occurrences rangewide. However, high-quality stands are uncommon because of overgrazing and hydrologic alterations (Jankovsky-Jones 2000). Sampling at MNWR in 2012 indicates that under the right conditions, the *Carex pellita* association may be subject to replacement by the *Phalaris arundinacea* association.

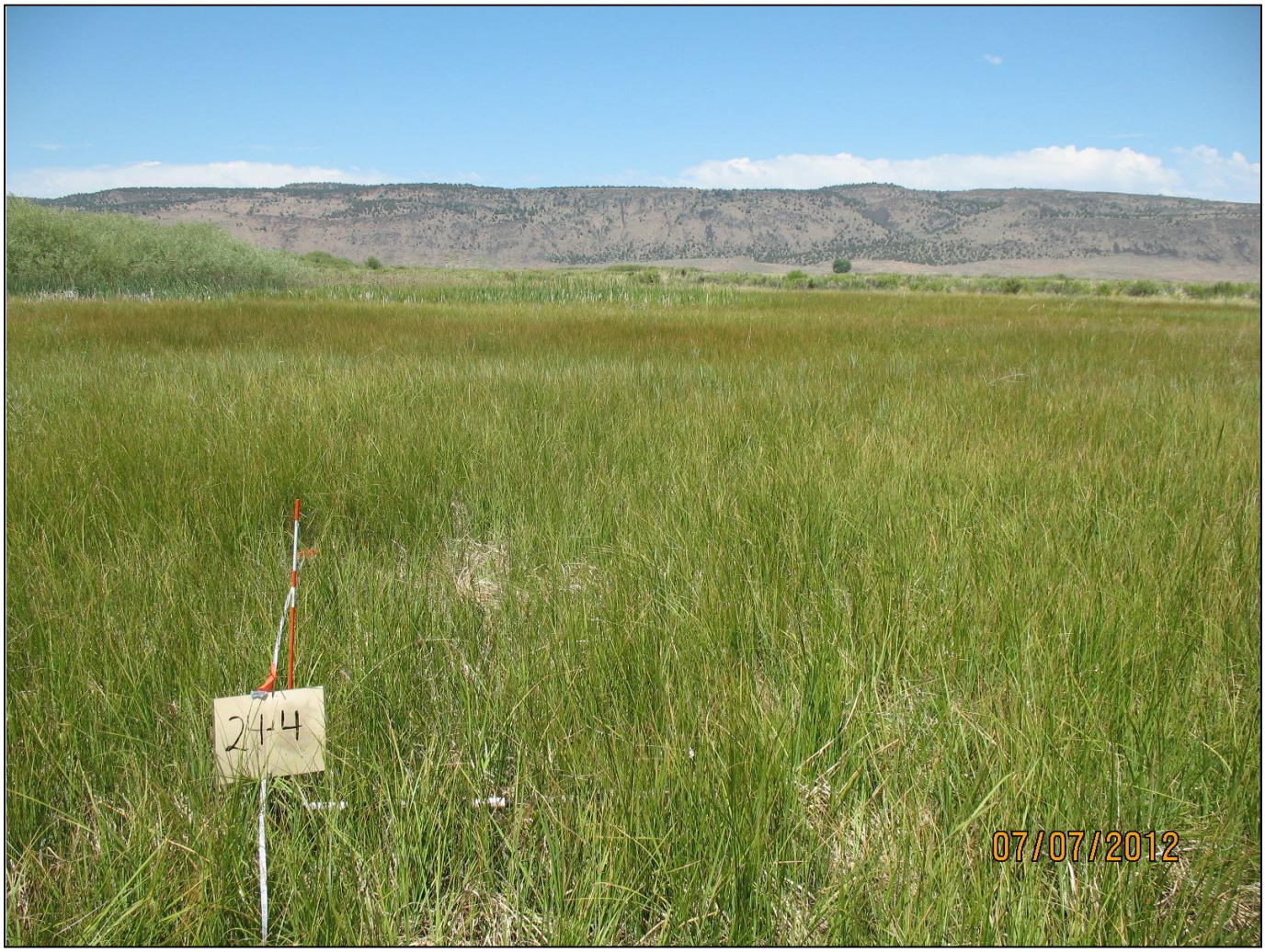

Figure 7. *Carex pellita* association, MNWR.

Carex praegracilis Association

Clustered field sedge

Species	Freq	Percent cover		
		Ave	Min	Max
Carex praegracilis	100.0	31.8	5.8	86.3
Bare/ litter	96.2	15.7	0.0	56.3
Juncus balticus	76.9	11.2	0.0	48.8
Leymus triticoides	61.5	9.9	0.0	63.8
Cirsium arvense	53.8	1.0	0.0	14.5
Potentilla gracilis	50.0	5.1	0.0	27.5
Poa pratensis	42.3	3.1	0.0	27.5
Equisetum laevigatum	42.3	0.4	0.0	2.5
Sidalcea oregana	38.5	1.2	0.0	13.8
Poa secunda ssp. secunda	34.6	1.1	0.0	22.5
Phleum pratense	30.8	1.3	0.0	17.5
Alopecurus pratensis	26.9	4.4	0.0	52.5
Agoseris cf. glauca var. glauca	26.9	1.1	0.0	9.0
Crepis runcinata ssp. hispidulosa	26.9	0.8	0.0	15.0
Unknown	26.9	0.3	0.0	6.0
Muhlenbergia asperifolia	26.9	0.2	0.0	2.5
Taraxacum officinale	26.9	0.1	0.0	0.8
Agrostis stolonifera	23.1	1.3	0.0	15.0
Trifolium pratense	23.1	1.3	0.0	19.5
Lactuca serriola	23.1	0.1	0.0	0.8
Trifolium hybridum	19.2	2.0	0.0	19.8
Medicago lupulina	19.2	0.2	0.0	3.0
Sisyrinchium idahoense	19.2	0.1	0.0	0.8

Classification:
NVCS: *Carex praegracilis* Herbaceous Vegetation
ORBIC rank: G3S2
Plots sampled at MNWR: 26

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain flats and depressions
Hydrology: seasonally wet to seasonally moist
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is floodplain flats and swales, often near settled areas with a history of flood irrigation and grazing. It is an important forage species throughout the region, but its low stature often precludes its inclusion in hay (Hermann 1970; Cronquist et al. 1977, Wilson et al. 2008). Historically, stands were extensive and a major source of native pasture, but not for hay (Griffiths 1902). At the time of sampling on MNWR in July, depth to water table for this association ranged from 1 to at least 34 inches. Mean WIS is slightly wetter than FAC, indicating considerably drier conditions than the other sedge-dominated associations on MNWR. It overlaps primarily with the *Alopecurus pratensis*, *Juncus balticus*, and *Leymus triticoides* associations, and less alkaline phases of the *Distichlis spicata* associations (Figures 2 and 3).

Vegetation: The *Carex praegracilis* association is the most diverse wet meadow community on the MNWR. With over 90 species present (Appendix 2), composition is highly variable and reflects both a history of disturbance and a broad ecological amplitude, ranging from moist sites to seasonally dry alkaline sites. *Carex praegracilis* is the principal species with cover ranging up to to 86 percent, but it is often masked by considerable admixture of tall native and exotic species such as *Alopecurus pratensis*, *Juncus balticus*, *Leymus triticoides*, *Poa pratensis*, and *Phleum pratense*. In contrast, nearly pure stands of *Carex praegracilis* with much lower stature occur on seasonally droughty, alkaline soils. Moist phases of this association, and a history of grazing and proximity to habitation, make this association ideal habitat for a host of native increasers such as *Potentilla anserina*, *Potentilla gracilis*, *Drymocallis glandulosa*, and exotic pasture species such as *Poa pratensis*, *Agrostis stolonifera*, *Phleum pratense*, *Trifolium pratense*, and *Alopecurus pratensis*. The association's composition and species diversity is similar to that reported before the advent of *Alopecurus pratensis* (Cooper 1956, Rumberg and Cooper 1961, Rumberg and Sawyer 1965).

Ecology and condition: While this association is the most diverse wet meadow community on the MNWR, it also may be the most at-risk association. High-quality examples with primarily native composition are being outcompeted and replaced by the *Alopecurus pratensis* association. This appears to be happening in all but the most alkaline sites that are not favorable to *Alopecurus pratensis*, and it is happening throughout central and eastern Oregon.

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G3S2 to this association, based on the relative dearth of high-quality examples. A long history of grazing, water diversion, and agriculture have impacted most occurrences, and few high-quality remnants remain. Most occurrences are privately owned and difficult to protect.

Figure 8. *Carex praegracilis* association, short stature phase on drier alkaline soil, MNWR.

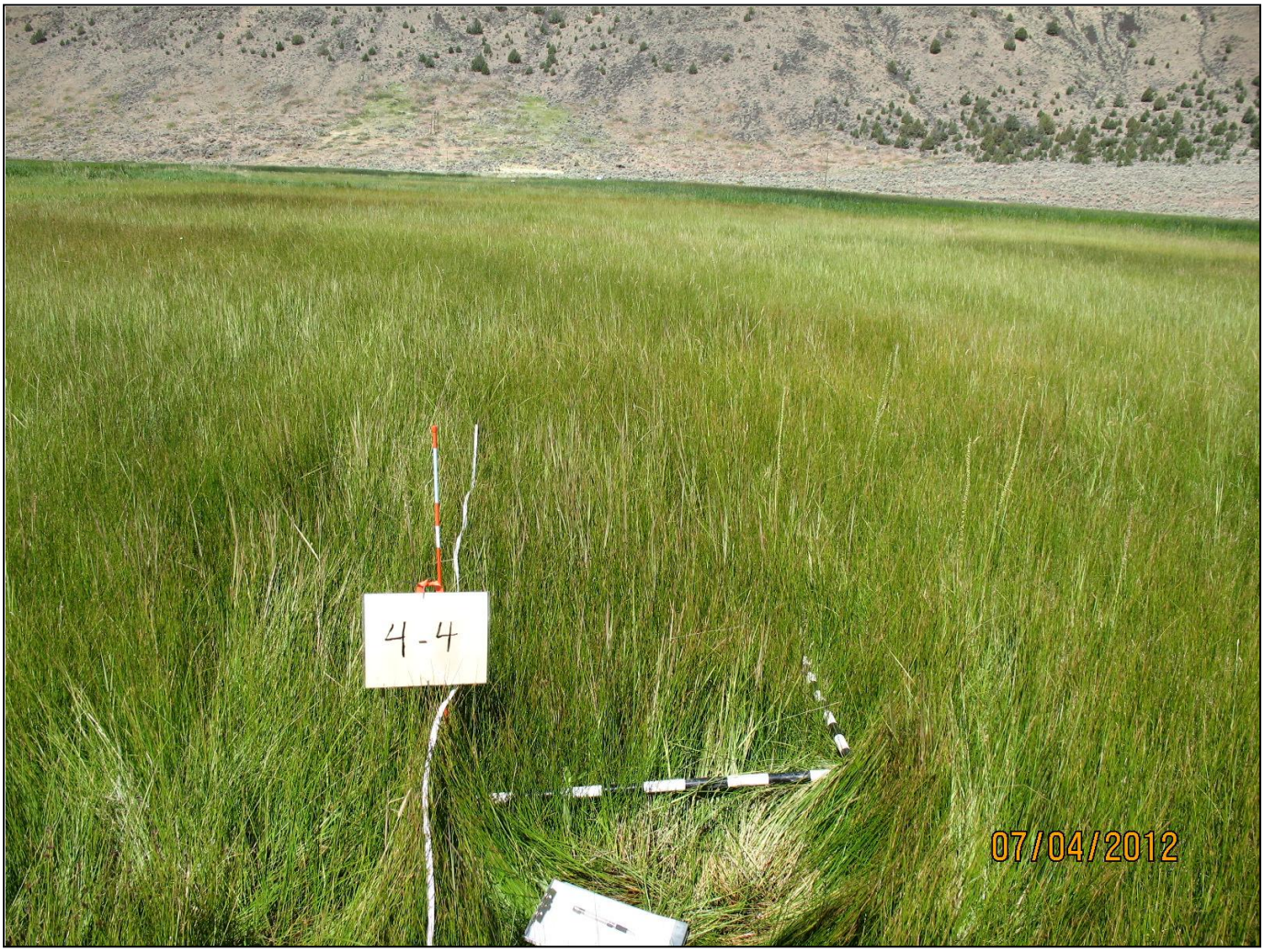

Figure 9. *Carex praegracilis* association, taller stature phase on mesic non-alkaline soil, MNWR.

Carex sheldonii Association

Sheldon sedge

Species	Freq	Percent cover		
		Ave	Min	Max
Carex sheldonii	100.0	83.1	80.0	88.8
Bare/ litter	100.0	13.0	2.5	20.0
Rorippa sphaerocarpa	50.0	2.4	0.0	8.5
Galium trifidum var. pacificum	25.0	0.8	0.0	3.0
Potentilla biennis	25.0	0.3	0.0	1.0
Cirsium arvense	25.0	0.2	0.0	0.8
Phalaris arundinacea	25.0	0.1	0.0	0.5
Unknown	25.0	0.1	0.0	0.5
Chenopodium rubrum	25.0	0.1	0.0	0.3

Classification:
NVCS: new to classification
ORBIC rank: G4S2
Plots sampled at MNWR: 4

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain flats and depressions
Hydrology: seasonally moist to seasonally flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is depressional topography on floodplains, in wet to ephemeral meadows (Newhouse et al. 1995). When stands are dry enough, *Carex sheldonii* is a useful forage plant (Murphy 2002). At the time of sampling on MNWR in July, depth to water table for this association ranged from 25-29 inches. However, mean WIS ranges from FACW to OBL, overlapping primarily with the *Carex aquatilis*, *Carex nebrascensis*, *Phalaris arundinacea*, and *Sparganium eurycarpum* associations (Figures 2 and 3). It is the wettest of the eleven wet meadow associations sampled on MNWR in 2012, supported by the fact that extensive, nearly monotypic stands are typical for wetland plant associations occurring at the wetter end of the spectrum. In actuality, well-developed *Sparganium eurycarpum* association is wetter than *Carex sheldonii*, but it was undersampled in this study, and the four plots were at the dry end of the spectrum for that vegetation type.

Vegetation: Species diversity is the lowest of any plots sampled at MNWR in 2012, with only 9 species recorded in the plots. *Carex sheldonii* is the principal species, ranging from 83 to 88 percent cover. Half of the plots contain what we think is native *Rorippa sphaerocarpa*, which might be new to the Oregon flora. The remaining species present in one-quarter of the plots were mostly exotic, indicating that the stands dry out for a significant portion of the season. Aerial imagery indicates that the stands sampled could be several hundred acres in extent.

Ecology and condition: Moseley (1998) noted that the *Carex sheldonii* association occupied the ecotone between *Schoenoplectus acutus* marsh and uplands in the Owyhee River canyon. Crowe and Clausnitzer (1997) and Crowe (2004) reported it from similar landforms but at higher elevation in the Blue Mountains. Presence of exotic species in wetter plant associations indicates that at least some stands dry out sufficiently in summer to enable these species to become established, and perhaps indicates some compromised field condition.

Classification: The *Carex sheldonii* association has yet to be included in NVCS, although the association was first described by Crowe and Clausnitzer (1997) and reviewed in Crowe et al. (2004). Composition

of the plots at MNWR are more or less consistent with descriptions in these references, but the occurrences are much more extensive.

Conservation: The *Carex sheldonii* association may be the rarest of the eleven wet meadow associations on the MNWR, but the sample size is small and we know little of its rangewide distribution. The species was considered infrequent to rare by Hermann (1970) and Hurd et al. (1998), but its distribution is somewhat better known today (e.g., Wilson et al. 2008). Compared to the other *Carex* associations described for MNWR, *Carex sheldonii* is more restricted geographically, occurring only in the northern Great Basin and southwestern Idaho. ORBIC estimates that 6-20 occurrences may exist rangewide, and has assigned a tentative rank of G4S2 based on the potential number of occurrences. Threats are unknown at this point.

Figure 10. *Carex sheldonii* association, MNWR.

Distichlis spicata Association

Inland saltgrass

Species	Freq	Percent cover		
		Ave	Min	Max
Distichlis spicata	100.0	23.6	7.5	51.3
Bare/ litter	100.0	29.8	9.5	51.3
Poa secunda ssp. secunda	85.7	26.5	0.0	71.3
Juncus balticus	57.1	7.1	0.0	26.3
Puccinellia lemmonii	42.9	5.3	0.0	21.3
Carex praegracilis	28.6	5.6	0.0	20.0
Puccinellia nuttalliana	14.3	1.4	0.0	9.8
Sporobolus airoides	14.3	0.8	0.0	5.3
Tragopogon dubius	14.3	0.1	0.0	0.8
Pyrrocoma lanceolata	14.3	0.1	0.0	0.5
Equisetum laevigatum	14.3	0.0	0.0	0.3
Penstemon rydbergii var. oreocharis	14.3	0.0	0.0	0.3
Pyrrocoma racemosa	14.3	0.0	0.0	0.3
Salsola tragus	14.3	0.0	0.0	0.3
Suaeda calceoliformis	14.3	0.0	0.0	0.3
Symphyotrichum	14.3	0.0	0.0	0.3

Classification:
NVCS: *Distichlis spicata* Herbaceous Vegetation
ORBIC rank: G5S4
Plots sampled at MNWR: 7

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: alkaline or saline flats and depressions
Hydrology: intermittently to seasonally moist
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is well to poorly drained alkaline flats, depressions, elevated stands of *Leymus cinereus* and *Sarcobatus vermiculatus*, and around edges of playas. Salt deposits are usually present on the surface. *Distichlis spicata* can provide valuable late-season forage (Skaradek and Miller 2010). Sites have low productivity and are not used for haying. At MNWR, we sampled only stands in intermittently to seasonally moist meadow, avoiding stands of *Leymus cinereus* and *Sarcobatus*. At the time of sampling on MNWR in July, depth to water table for this association was at least 25 inches. Mean WIS ranges from middle FACU to middle FAC, overlapping the alkaline phases of the *Carex praegracilis* and *Leymus triticoides* associations (Figures 2 and 3). It is the driest of the eleven wet meadow associations sampled on MNWR in 2012.

Vegetation: Species diversity was low in this association, with 16 species recorded in the plots. *Distichlis spicata* is the dominant species with cover ranging up to 51 percent (Appendix 2). Secondary but frequently abundant species were *Poa secunda*, *Juncus balticus*, *Puccinellia lemmonii*, and *Carex praegracilis*, with cover ranging from 20-71 percent. *Distichlis spicata* may be dwarfed in very saline habitats.

Ecology and condition: *Distichlis spicata* is rhizomatous, tolerant of moderate grazing, and its roots resist trampling. If grazed heavily, *Distichlis spicata* will decline and may be replaced by less desirable warm-season grasses such as *Hordeum jubatum* (Costello 1944, Jones and Walford 1995). Severely disturbed sites are susceptible to invasion by introduced species such as *Bromus tectorum, Lepidium latifolium, Lepidium perfoliatum*, and *Bassia hyssopifolia* (Franklin and Dyrness 1973). The low diversity of the *Distichlis spicata* association is attributable to the limited number of plants adapted to the extreme soil and moisture conditions. Because of moisture and soil limitations, the association was the least favorable for any of the exotic species at MNWR. While WIS overlaps to some degree with the *Carex praegracilis* and *Leymus triticoides* associations, species composition is significantly different. It is too

dry and alkaline for either *Alopecurus pratensis* or *Phalaris arundinacea*, so these species most likely will never be competitive in this habitat, and few threats are thought to exist.

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G5S4 to this association, based on the high number of occurrences rangewide. Threats are limited at this point.

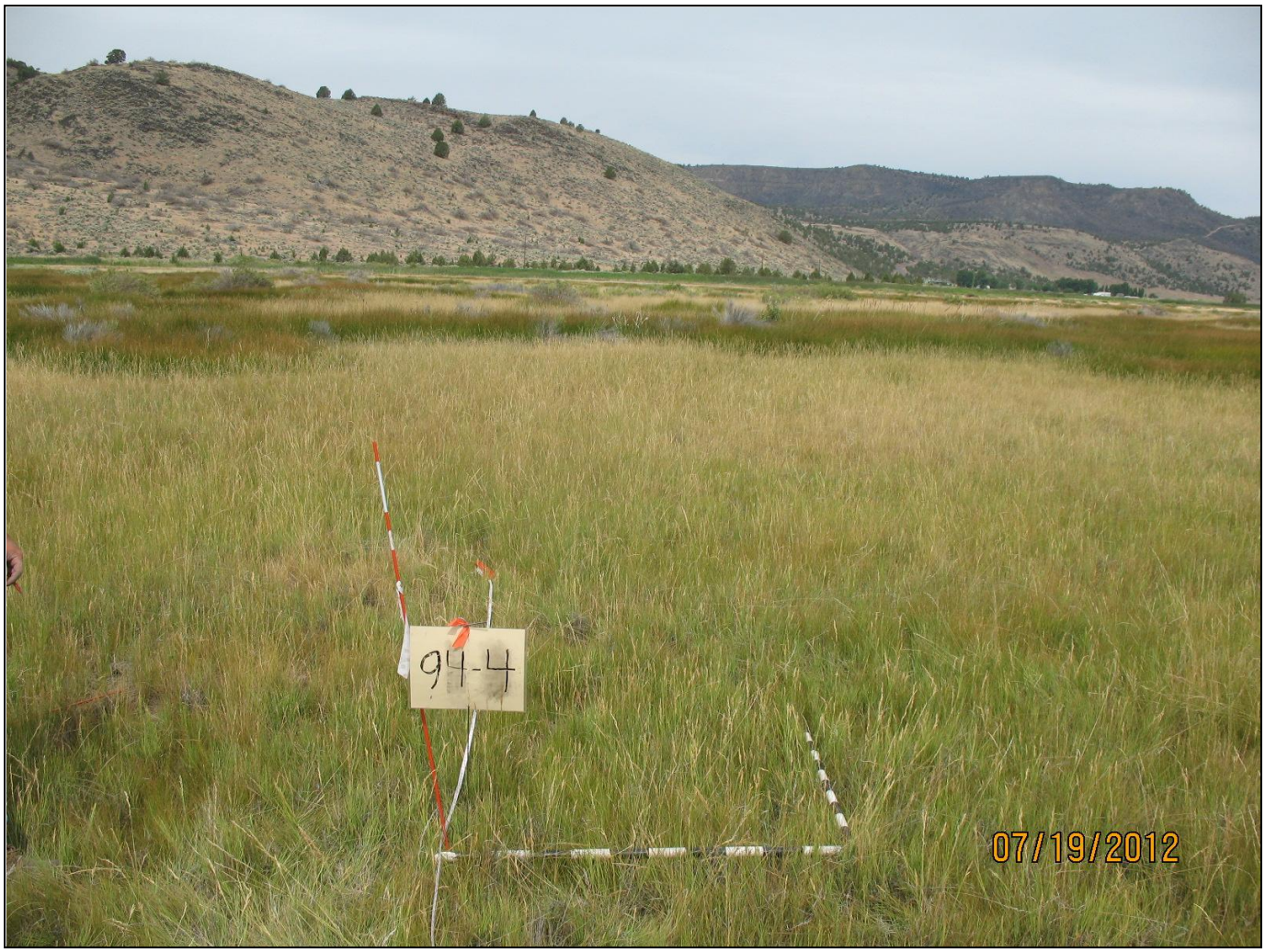

Figure 11. *Distichlis spicata* association, MNWR.

Juncus balticus Association

Baltic rush

Species	Freq	Percent cover		
		Ave	Min	Max
Juncus balticus	100.0	35.2	8.8	58.8
Bare/ litter	91.7	30.8	0.0	63.8
Carex nebrascensis	58.3	2.9	0.0	16.3
Lepidium latifolium	50.0	0.7	0.0	4.8
Alopecurus pratensis	50.0	2.8	0.0	11.3
Lactuca serriola	41.7	0.7	0.0	3.5
Moss	41.7	2.4	0.0	11.8
Leymus triticoides	41.7	3.3	0.0	17.5
Epilobium ciliatum ssp. ciliatum	33.3	0.2	0.0	1.0
Thlaspi arvense	33.3	0.7	0.0	5.8
Eleocharis palustris	33.3	0.8	0.0	6.3
Hordeum brachyantherum	33.3	4.1	0.0	27.5
Epilobium brachycarpum	25.0	0.1	0.0	0.5
Veronica anagallis-aquatica	25.0	1.3	0.0	14.5
Phalaris arundinacea	25.0	1.6	0.0	18.5
Carex pellita	25.0	2.2	0.0	12.0
Potentilla gracilis	25.0	2.5	0.0	27.5

Classification:
NVCS: *Juncus balticus* Herbaceous Vegetation
ORBIC rank: G5S5
Plots sampled at MNWR: 12

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain flats and depressions
Hydrology: seasonally moist to seasonally flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is flat to hummocky floodplains and depressions. Depending on hydrology, stands can be tall or short. *Juncus balticus* is a poor forage species, but can a useful late-season source of feed. It is usually included in hay, and is tolerant of grazing (Padgett et al. 1989, Hansen et al. 1995). Sites usually have a long history of grazing. At the time of sampling on MNWR in July, depth to water table for this association ranged from 0 (water at or above surface) to at least 25 inches. Mean WIS ranges from somewhat wetter than FAC to somewhat wetter than FACW, overlapping to some degree with most of the wet meadow associations sampled at MNWR in 2012 (Figures 2 and 3).

Vegetation: The *Juncus balticus* association at MNWR contains 62 species (Appendix 2). *Juncus balticus* is the primary species with up to 59 percent cover. *Carex nebrascensis, Lepidium latifolium,* and *Alopecurus pratensis* are important secondary species with greater than 50% frequency. Patches of *Leymus triticoides, Hordeum brachyantherum, Phalaris arundinacea, Potentilla gracilis, Poa pratensis*, and *Phleum pratense* occur with more than 15% cover, though at less than 50% frequency, and indicate a range of soil and range conditions, including admixture of exotic pasture species.

Ecology and condition: The *Juncus balticus* association occurs over a broad array of hydrology and soils, but appears to avoid the wettest sites. As a species, *Juncus balticus* occurs with greater than 50% frequency in all but the *Carex sheldonii*, *Phalaris arundinacea*m, and *Sparganium eurycarpum* associations at MNWR. Monotypic stands may indicate a history of heavy grazing (Hansen et al. 1995), but may also be stable late-seral communities (Kittel and Lederer 1993).

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G5S5 to this association, based on the high number of occurrences rangewide. Threats are limited at this point. Sampling at MNWR in 2012 indicates that under

the right conditions, the *Juncus balticus* association may be subject to replacement by the *Phalaris arundinacea* association.

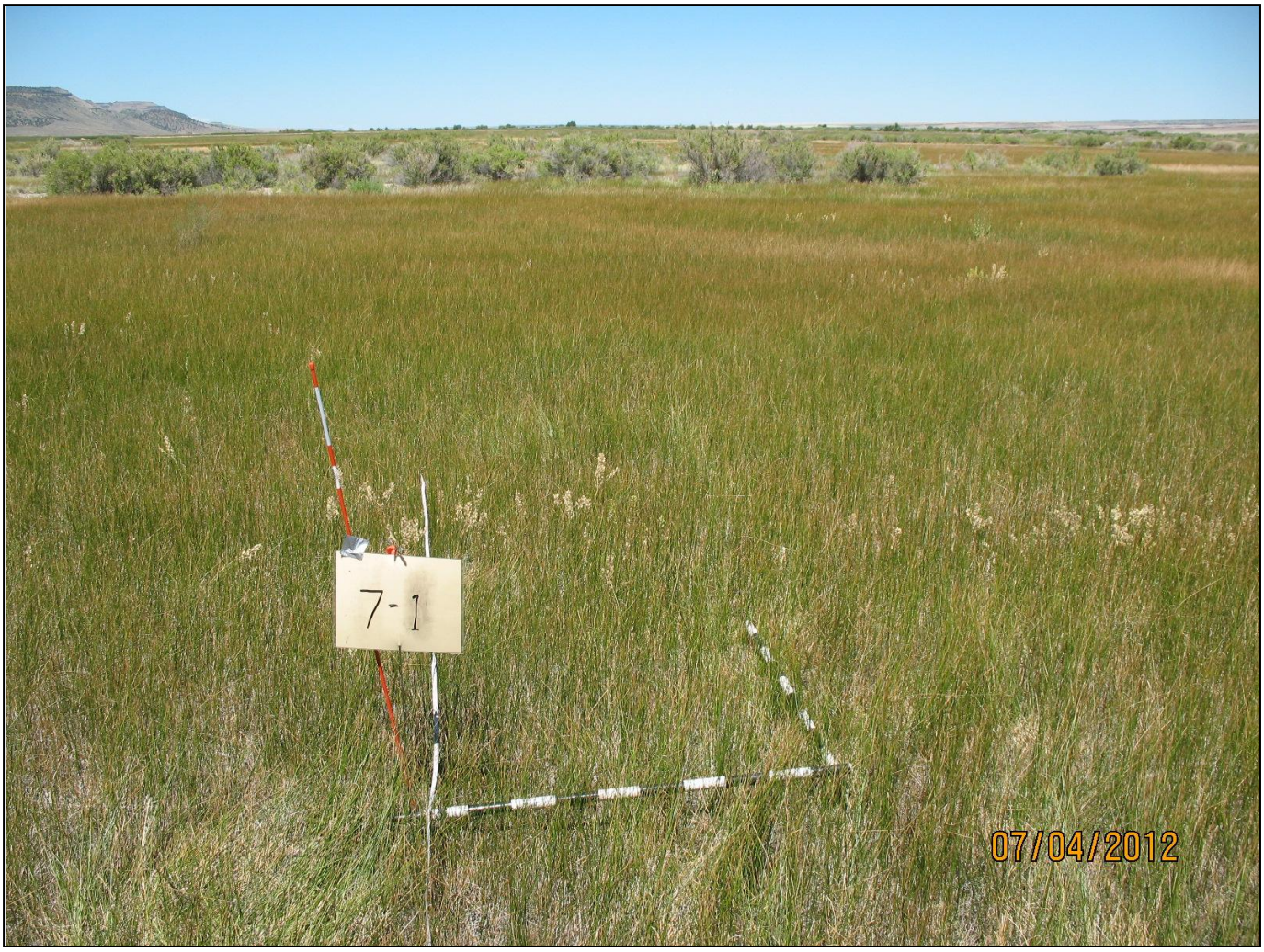

Figure 13. *Juncus balticus* association, MNWR.

Leymus triticoides Association

Beardless wildrye, creeping wildrye

Species	Freq	Percent cover		
		Ave	Min	Max
Leymus triticoides	100.0	49.5	6.5	88.8
Bare/ litter	100.0	19.2	2.5	45.0
Thlaspi arvense	72.2	4.3	0.0	40.0
Juncus balticus	55.6	7.4	0.0	57.5
Alopecurus pratensis	50.0	1.4	0.0	8.8
Lepidium latifolium	50.0	1.2	0.0	5.8
Cirsium arvense	44.4	1.4	0.0	10.8
Lactuca serriola	44.4	0.7	0.0	6.5
Hordeum brachyantherum	38.9	2.4	0.0	24.5
Carex nebrascensis	27.8	6.5	0.0	58.8
Galium aparine	22.2	1.0	0.0	10.5
Agoseris cf. glauca var. glauca	22.2	0.3	0.0	2.8

Classification:
NVCS: *Leymus triticoides - Poa secunda* Herbaceous Vegetation
ORBIC rank: G2S2
Plots sampled at MNWR: 18

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain flats
Hydrology: seasonally moist to seasonally flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is floodplain flats and valley bottoms. *Leymus triticoides* is a good early-season forage species and is grown for hay (Young-Mathews and Winslow 2010). Historically, it was the region's primary native meadow species and made the best hay (Griffiths 1902). At the time of sampling on MNWR in July, depth to water table for this association ranged from 0 (water at or above surface) to at least 30 inches. Mean WIS ranges from low to mid-FAC, overlapping primarily with the *Carex praegracilis* association, wetter phases of the *Distichlis spicata* association, and drier and more alkaline phases of the *Alopecurus pratensis*, and *Juncus balticus* associations (Figures 2 and 3).

Vegetation: The *Leymus triticoides* association at MNWR contains 50 species (Appendix 2). *Leymus triticoides* is the primary species, with up to 89 percent cover. Exotic *Thlaspi arvense* and native *Juncus balticus, Hordeum brachyantherum, Carex nebrascensis, Carex praegracilis* can have patches with up to 59 percent cover. The relatively high species diversity is made up of a mix of native and exotic species at medium to low frequencies and cover.

Ecology and condition: The *Leymus triticoides* association had slighlty less bare ground than comparable associations sampled at MNWR in 2012. The relatively high species diversity may be attributed to early to mid-season drought and a history of grazing and haying, indicating that stands on MNWR may not be in best condition. *Leymus triticoides* tolerates trampling and recovers well following grazing (Bishop 1996). This species tolerates neutral to strongly alkaline soils (pH 6.0 to 9.0), moderate shading, 7 to 60 inches of precipitation, and strongly saline soils (Young-Mathews and Winslow 2010).

Classification: The plots sampled at MNWR differ from the description of the *Leymus triticoides - Poa secunda* association in NVCS. *Poa secunda* may have been more abundant historically, or the associaiton is closer to the *Leymus triticoides - Juncus balticus* association described by Easterday and Mamone (1980) from the Warner Valley. The NVCS description is poor because of limited available information.

Conservation: ORBIC assigned a rank of G2S2 to this association. A long history of grazing, water diversion, and agriculture have impacted most occurrences, and few high-quality remnants remain. Most occurrences are privately owned and difficult to protect. Sampling at MNWR in 2012 indicates that under the right conditions, the *Leymus triticoides* association may be subject to replacement by the *Phalaris arundinacea* association.

Figure 14. *Leymus triticoides* association, MNWR

Phalaris arundinacea Association

Reed canarygrass

Species	Freq	Percent cover		
		Ave	Min	Max
Phalaris arundinacea	100.0	63.7	21.3	93.8
Bare/ litter	100.0	25.9	1.3	67.5
Eleocharis palustris	26.3	2.1	0.0	33.0
Thlaspi arvense	26.3	1.4	0.0	24.5
Alopecurus pratensis	21.1	2.0	0.0	28.8
Veronica	15.8	0.3	0.0	2.5
Veronica anagallis-aquatica	15.8	0.3	0.0	2.5
Hordeum jubatum	15.8	0.2	0.0	2.0
Hordeum brachyantherum	10.5	1.1	0.0	19.3
Agrostis	10.5	0.4	0.0	6.3
Carex pellita	10.5	0.1	0.0	2.0
Beckmannia syzigachne	10.5	0.1	0.0	0.5
Lepidium latifolium	10.5	0.1	0.0	0.8
Alisma triviale	10.5	0.0	0.0	0.5
Chenopodium rubrum	10.5	0.0	0.0	0.3

Classification:
NVCS: *Phalaris arundinacea* Western Herbaceous Vegetation
ORBIC rank: G5S5
Plots sampled at MNWR: 19

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain flats and depressions
Hydrology: seasonally moist to seasonally or perennially flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is floodplain flats, particularly in the ecotone between seasonally and perennially flooded areas. Most stands are thought to be European genotypes that were developed for soil stabilization and wetland forage. It is rated as good forage, and stands are grazed and cut for hay. At the time of sampling on MNWR in July, depth to water table for this association ranged from 0 (water at or above surface, one plot flooded to 8 inches) to at least 30 inches. Mean WIS ranges from low to mid-FACW to OBL, overlapping primarily with the *Carex aquatilis*, *Carex nebrascensis*, *Carex sheldonii*, and *Sparganium eurycarpum* associations (Figures 2 and 3).

Vegetation: The *Phalaris arundinacea* association at MNWR contains 37 species (Appendix 2). *Phalaris arundinacea* is the primary species, but conspicuous patches of *Eleocharis palustris*, *Thlaspi arvense*, *Alopecurus pratensis*, and *Hordeum brachyantherum* may be present at lower frequencies but with cover up to 33 percent. The relatively high species diversity is composed of a mix of native and exotic species at medium to low frequencies and cover.

Ecology and condition: As a species, *Phalaris arundinacea* occurs across a broad hydrologic gradient, which enables it to invade multiple native associations. It occurs in all wet meadow communities at MNWR except for the *Alopecurus pratensis*, *Carex nebrascensis*, and *Sparganium eurycarpum* associations, presumably because they are either too dry seasonally or too wet. However, as a plant association, its strongest expression appears to occur in relatively narrow hydrologic space, most of the plots being distributed in the low to mid FACW range (Figures 2 and 3). It is tolerant of moderate grazing by livestock, although heavy grazing will reduce density (Hansen et al. 1995).

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G5S5, based on the extensive distribution and high number of occurrences rangewide. Threats are unknown at this point. *Phalaris arundinacea* degrades riparian and wetland habitats throughout the region because it invades rapidly, excludes native vegetation, and is

difficult to remove once established (Hansen et al. 1995). Although it has been known from western Oregon since the 1875, the earliest known collections from eastern Oregon are from 1904 and 1920 (Klamath County; Oregon Flora Project Atlas). It was collected near Burns and at Harney Lake as early as 1925 and 1927, and has long been a component of flood-irrigated hay meadows in the region. Unlike *Alopecurus pratensis*, it appears to have a much narrower tolerance for hydroperiod and soil chemistry, but it is nevertheless highly competitive under the right conditions and is notorious for replacing native wetland plant associations. Based on sampling done over a limited area of MNWR in 2012, the *Phalaris arundinacea* association appears to be most abundant in the ecotone surrounding emergent marsh occurring in impoundments, as well as in swales and old meanders anywhere on the Blitzen River floodplain. In these areas it was adjacent to and may be replacing stands of the *Carex pellita*, *Juncus balticus*, and *Leymus triticoides* associations. Fire, herbicides, prolonged inundation during the growing season, and excavation of root mats have been used in local applications, but these treatments are too expensive to apply at a landscape scale.

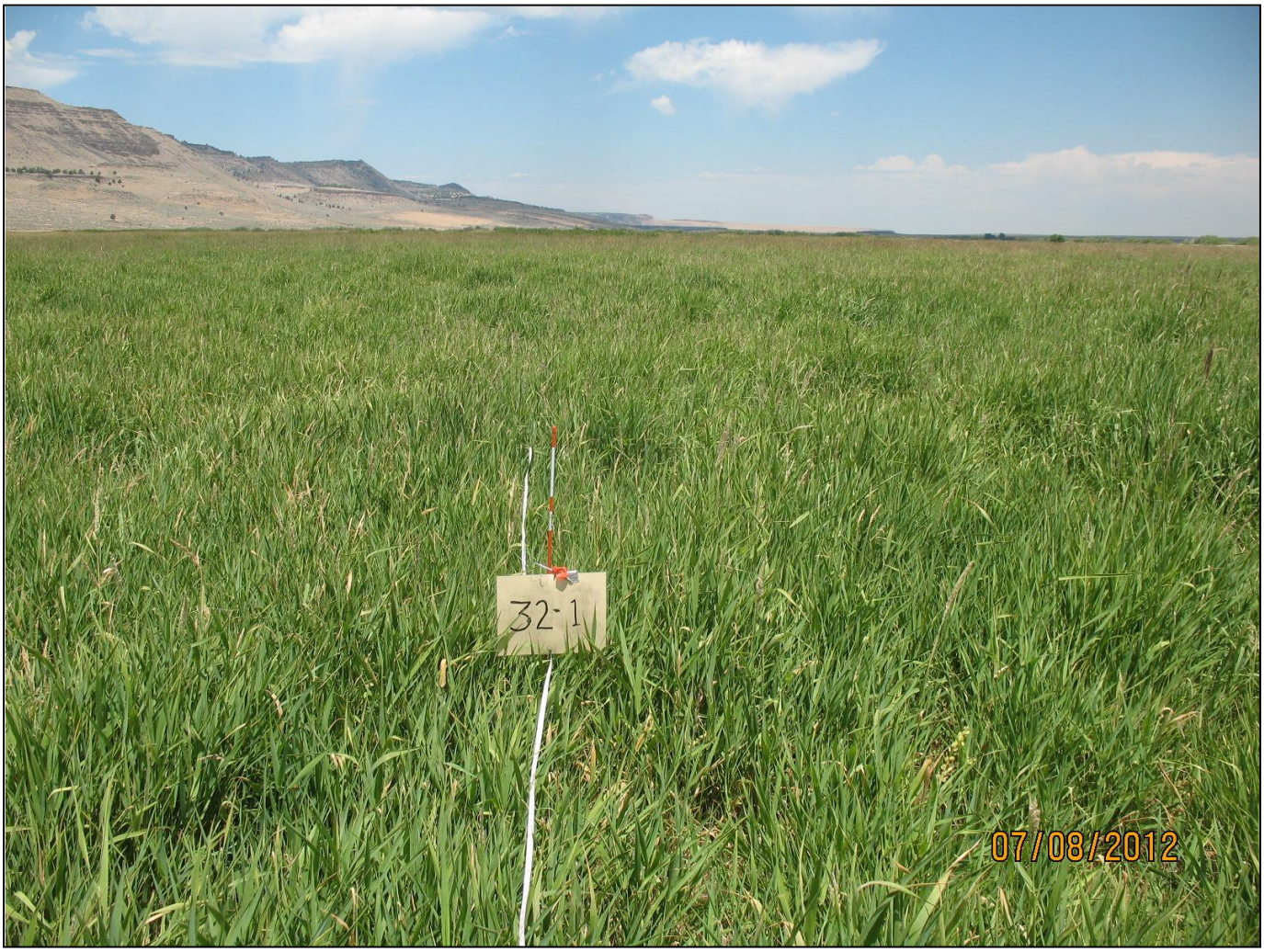

Figure 15. *Phalaris arundinacea* association, MNWR

Sparganium eurycarpum Association

Broadfruit burreed

Species	Freq	Percent cover		
		Ave	Min	Max
Bare/ litter	100.0	45.2	18.8	63.8
Sparganium eurycarpum	100.0	27.6	10.3	57.5
Eleocharis palustris	75.0	10.8	0.0	20.3
Schoenoplectus acutus	50.0	4.6	0.0	18.3
Alisma triviale	50.0	0.3	0.0	0.8
Cirsium arvense	50.0	0.3	0.0	0.5
Ranunculus aquatilis	50.0	0.2	0.0	0.5
Beckmannia syzigachne	25.0	0.1	0.0	0.3
Typha latifolia	25.0	5.3	0.0	21.3
Myosotis laxa	25.0	1.6	0.0	6.3
Veronica catenata	25.0	1.6	0.0	6.3
Ranunculus gmelinii	25.0	0.4	0.0	1.8
Alopecurus pratensis	25.0	0.4	0.0	1.5
Carex sheldonii	25.0	0.3	0.0	1.3
Lepidium latifolium	25.0	0.3	0.0	1.3
Persicaria amphibia	25.0	0.2	0.0	0.8
Phleum pratense	25.0	0.1	0.0	0.5
Callitriche	25.0	0.1	0.0	0.3
Chenopodium rubrum	25.0	0.1	0.0	0.3
Hordeum jubatum	25.0	0.1	0.0	0.3
Sagittaria latifolia	25.0	0.1	0.0	0.3
Unknown	25.0	0.1	0.0	0.3

Classification:
NVCS: *Sparganium eurycarpum* Herbaceous Vegetation
ORBIC rank: G4S3
Plots sampled at MNWR: 4

Environment:
Elevation (ft): 4100-4200
Slope (deg): 0
Landform position: floodplain depressions and impoundments
Hydrology: seasonally wet to perennially flooded
Soils: silty clay loam

Habitat, uses, hydrology: Habitat at MNWR is emergent marsh, in ponds impounded behind cross dikes. Stands may be dense and up to five feet tall. Historically, stands were extensive and a major source of native hay (Griffiths 1902). At the time of sampling on MNWR in July, depth to water table for this association ranged from 12 to at least 24 inches. Though the sample size was small, mean WIS is midway between FACW and OBL, and the distribution of plots overlaps primarily with the *Carex nebrascensis, Carex sheldonii*, and *Phalaris arundinacea* associations (Figures 2 and 3). Although *Sparganium eurycarpum* is OBL, other species in the plots diminished the mean WIS of the association. This is the second-wettest association sampled at WNWR, but it has a wide hydrologic amplitude. More plots in better-developed stands would probably make it the wettest association.

Vegetation: The *Sparganium eurycarpum* association at MNWR contains 21 species (Appendix 2), although the sample size is small. Typical of very wet plant associations, it tends toward single-species or monotypic composition. *Sparganium eurycarpum* is the primary species, with cover ranging from 10-58 percent. Lesser native species include *Alisma triviale, Ranunculus aquatilis,* and *Schoenoplectus acutus*. We did not sample emergent marsh to any extent at MNWR, and these four plots were from the edge of such stands, in the ecotone between them and the *Carex nebrascensis* and *Phalaris arundinacea* associations. Most of the aquatic to palustrine emergent taxa clustered here in the analysis, making this grouping a somewhat artificial mixture of more often monotypic emergent marsh types. In addition to the *Sparganium eurycarpum* association, sampling of more plots at the wet end of wet meadow communities at MNWR probably would identify additional monotypic associations such as *Persicaria amphibia, Schoenoplectus acutus, Typha angustifolia,* and *Typha latifolia*.

Ecology and condition: These stands are flooded for much of the year and competition tends to be limited to shifting compositions of clones of the various large emergent hydrophytes mentioned in the previous section. Stands are generally too wet for the *Phalaris arundinacea* association, but occur

immediately adjacent to it, along with the *Carex nebrascensis* and *Carex sheldonii* associations, at the wet end of the wet meadow gradient. As is true of many emergent marsh communities, most of the species recorded are native. Presence of exotic *Cirsium arvense* and *Lepidium latifolium* indicate some seasonal drying and potential condition issues.

Classification: The plots at MNWR are consistent with the description in NVCS.

Conservation: ORBIC has assigned a rank of G4S3 to this association, based on an estimated minimum of 25 occurrences in the state, although the actual number is unknown because many stands occur on private land. Threats are unknown at this point.

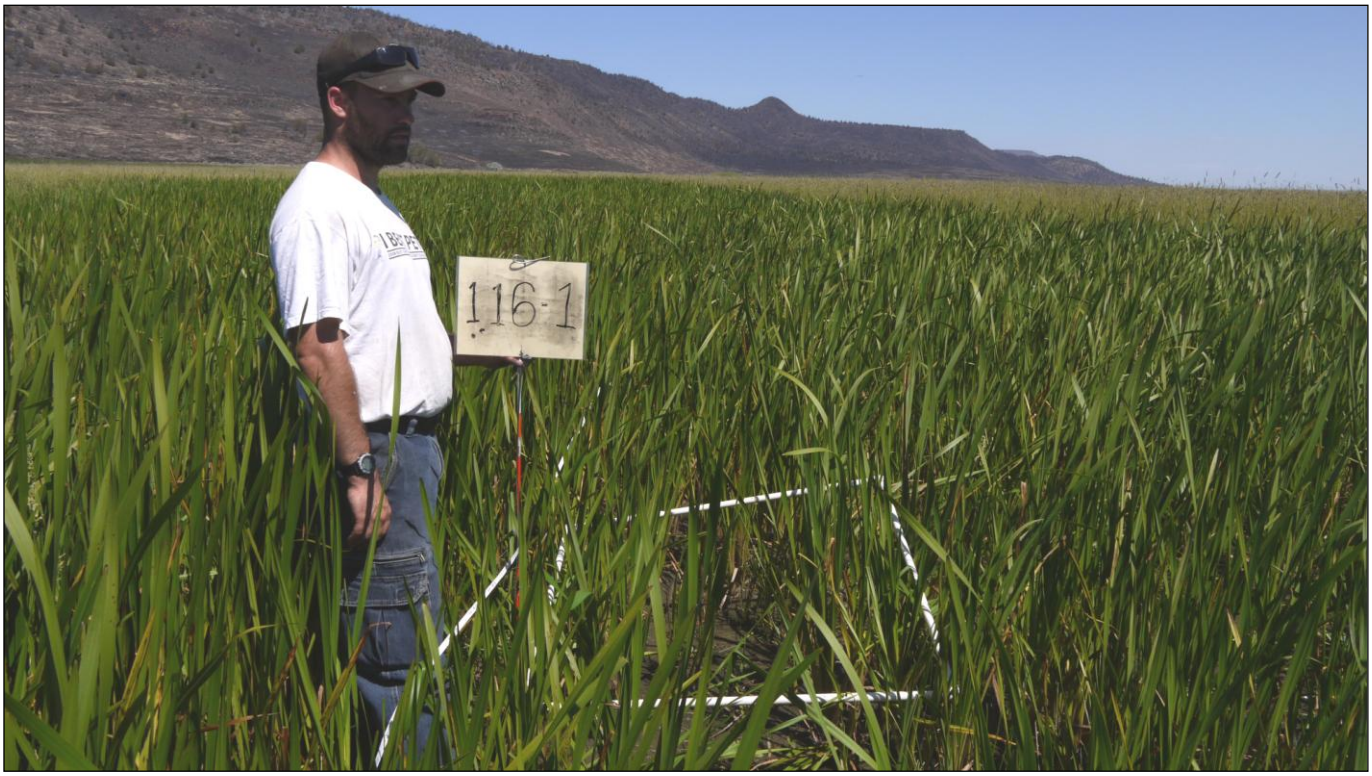

Figure 16. *Sparganium eurycarpum* association, MNWR

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APPENDIX 1. Plant taxa observed in plots, with Wetland Indicator Status. n/a = Wetland Indicator Status not available.

Scientific Name	Common Name	Native/ Exotic	Acronyms used in dataset	Wetland Indicator Status
Acer negundo	box elder	E	ACENEG	FACW
Achillea millefolium	western yarrow	N	ACHMIL	FACU
Agoseris cf. glauca var. glauca	pale agoseris	N	AGOGLAG	FACU
Agoseris heterophylla	annual agoseris	N	AGOHET	n/a
Agrostis exarata	spike bentgrass	N	AGREXA	FACW
Agrostis gigantea	red top	E	AGRGIG	FACW
Agrostis oregonensis	Oregon bentgrass	N	AGRORE	FACW
Agrostis pallens	seashore bentgrass	N	AGRPAL	FACU
Agrostis scabra	rough bentgrass	N	AGRSCA	FAC
Agrostis stolonifera	creeping bentgrass	E	AGRSTO	FACW
Alisma triviale	American water plantain	N	ALITRI	OBL
Alopecurus aequalis	shortawn foxtail	N	ALOAEQ	OBL
Alopecurus geniculatus	water foxtail	N	ALOGEN	OBL
Alopecurus pratensis	meadow foxtail	E	ALOPRA	FACW
Apera interrupta	dense silkybent	E	APEINT	n/a
Arctium minus	lesser burdock	E	ARCLAP	FACU
Barbarea orthoceras	American yellowrocket	N	BARORT	FACW
Barbarea vulgaris	garden yellowrocket	E	BARVUL	FAC
Beckmannia syzigachne	American sloughgrass	N	BECSYZ	OBL
Bromus inermis	smooth brome	E	BROINE	FACU
Bromus secalinus	rye brome	E	BROSEC	n/a
Bromus tectorum	cheatgrass	E	BROTEC	n/a
Calamagrostis stricta ssp. inexpansa	northern reed grass	N	CALSTRI	FACW
Callitriche heterophylla	twoheaded water-starwort	N	CALHET	OBL
Camelina microcarpa	littlepod false flax	E	CAMMIC	FACU
Carex aquatilis var. aquatilis	water sedge	N	CARAQUA	OBL
Carex athrostachya	slenderbeak sedge	N	CARATH	FACW
Carex aurea	golden sedge	N	CARAUR	OBL
Carex douglasii	Douglas' sedge	N	CARDOU	FAC
Carex lenticularis	Kellogg's sedge	N	CARLEN	OBL
Carex nebrascensis	Nebraska sedge	N	CARNEB	OBL
Carex pachystachya	thick-headed sedge	N	CARPAC	FAC
Carex pellita	woolly sedge	N	CARPEL	OBL
Carex praegracilis	clustered field sedge	N	CARPRA	FACW
Carex sheldonii	Sheldon's sedge	N	CARSHE	OBL

Carex simulata	short-beak sedge	N	CARSIM	OBL
Carex utriculata	southern beaked sedge	N	CARUTR	OBL
Castilleja tenuis	hairy paintbrush	N	CASTEN	FAC
Chenopodium album	lambsquarters	E	CHEALB	FACU
Chenopodium leptophyllum	narrowleaf goosefoot	N	CHELEP	FACU
Chenopodium rubrum	red goosefoot	N	CHERUB	FACW
Chrysothamnus viscidiflorus	yellow rabbitbrush	N	CHRVIS	n/a
Cirsium arvense	Canada thistle	E	CIRARV	FACU
Cirsium scariosum	meadow thistle	N	CIRSCA	FAC
Cirsium vulgare	bull thistle	E	CIRVUL	FACU
Conium maculatum	poison hemlock	E	CONMAC	FACW
Crepis runcinata ssp. hispidulosa	fiddleleaf hawksbeard	N	CRERUNH	FACU
Cynoglossum officinale	gypsyflower	E	CYNOFF	FACU
Deschampsia danthonioides	annual hairgrass	N	DESDAN	FACW
Descurania pinnata	western tansymustard	N	DESPIN	n/a
Descurania sophia	herb sophia	E	DESSOP	n/a
Dipsacus fullonum	teasel	E	DIPFUL	FAC
Distichlis spicata	inland saltgrass	N	DISSPI	FAC
Downingia bicornuta	doublehorn calicoflower	N	DOWBIC	OBL
Drymocallis glandulosa	sticky cinquefoil	N	DRYGLA	FAC
Elatine chilensis	Chilean waterwort	N	ELACHI	OBL
Eleocharis acicularis	needle spikerush	N	ELEACI	OBL
Eleocharis palustris	common spikerush	N	ELEPAL	OBL
Elymus lanceolatus ssp. riparius	streambank wheatgrass	N	ELYLANR	UPL
Elymus trachycaulus ssp. trachycaulus	thickspike wheatgrass	N	ELYTRAT	FACU
Epilobium brachycarpum	tall annual willowherb	N	EPIBRA	n/a
Epilobium ciliatum ssp. ciliatum	fringed willowherb	N	EPICILC	FACW
Epilobium densiflorum	denseflower willowherb	N	EPIDEN	FACW
Epilobium saximontanum	Rocky Mountain willowherb	N	EPISAX	FACW
Equisetum laevigatum	smooth horsetail	N	EQULAE	FACW
Galium aparine	stickywilly	N	GALAPA	FACU
Galium trifidum var. pacificum	threepetal bedstraw	N	GALTRIP	FACW
Geum aleppicum	yellow avens	N	GEUALE	FAC
Geum macrophyllum	large-leaf avens	N	GEUMAC	FACW
Hackelia micrantha	Jessica sticktight	N	HACMIC	FACU
Hordeum brachyantherum	meadow barley	N	HORBRA	FACW
Hordeum jubatum	foxtail barley	N	HORJUB	FAC
Iva axillaris	povertyweed	N	IVAAXI	FAC
Juncus balticus	Baltic rush	N	JUNBAL	FACW
Juncus longistylis	longstyle rush	N	JUNLON	FACW
Juncus nevadensis	Sierra rush	N	JUNNEV	FACW

Juncus orthophyllus	straightleaf rush	N	JUNORT	FACW
Koeleria macrantha	prairie junegrass	N	KOEMAC	n/a
Lactuca serriola	prickly lettuce	E	LACSER	FACU
Lepidium campestre	field pepperweed	E	LEPCAM	n/a
Lepidium draba	whitetop (hoary cress)	E	LEPDRA	n/a
Lepidium latifolium	perennial pepperweed	E	LEPLAT	FAC
Lepidium perfoliatum	clasping pepperweed	E	LEPPER	FACU
Leymus triticoides	beardless wildrye	N	LEYTRI	FAC
Madia glomerata	mountain tarweed	N	MADGLO	FACU
Maianthemum stellatum	false Solomon's seal	N	MAISTE	FACU
Medicago lupulina	black medick	E	MEDLUP	FAC
Melilotus officinalis	sweetclover	E	MELOFF	FACU
Mentha canadensis	field mint	E	MENCAN	FACW
Mimulus guttatus	yellow monkeyflower	N	MIMGUT	OBL
Montia chamissoi	water minerslettuce	N	MONCHA	OBL
Montia linearis	narrowleaf minerslettuce	N	MONLIN	FAC
Muhlenbergia asperifolia	alkali muhly	N	MUHASP	FACW
Muhlenbergia richardsonis	mat muhly	N	MUHRIC	FAC
Myosotis arvensis	field forget-me-not	E	MYOARV	FAC
Myosotis laxa	bay forget-me-not	N	MYOLAX	OBL
Nepeta cataria	catnip	E	NEPCAT	FACU
Pascopyrum smithii	western wheatgrass	N	PASSMI	FAC
Penstemon rydbergii var. oreocharis	Rydberg's penstemon	N	PENRYDO	FACU
Persicaria amphibia	water smartweed	N	PERAMP	OBL
Phalaris arundinacea	reed canarygrass	E	PHAARU	FACW
Phleum alpinum	alpine timothy	N	PHLALP	FAC
Phleum pratense	common timothy	E	PHLPRA	FACU
Plagiobothrys salsus	salty popcornflower	N	PLASAL	FACW
Plagiobothrys scouleri	Scouler's popcornflower	N	PLASCO	FACW
Poa palustris	fowl bluegrass	E	POAPAL	FAC
Poa pratensis	Kentucky bluegrass	E	POAPRA	FAC
Poa secunda ssp. juncifolia	big bluegrass	N	POASECJ	FACU
Poa secunda ssp. secunda	one sided bluegrass	N	POASEC	FACU
Podagrostis thurburiana	Thurber's bentgrass	N	PODTHU	n/a
Polygonum ramosissimum	bushy knotweed	E	POLRAM	FAC
Polypogon monspeliensis	annual rabbitfoot grass	E	POLMON	FACW
Potentilla anserina	silverweed	N	POTANS	FACU
Potentilla biennis	biennial cinquefoil	N	POTBIE	FACW
Potentilla gracilis	slender cinquefoil	N	POTGRA	FAC
Puccinellia lemmonii	Lemmon's alkaligrass	N	PUCLEM	FACW
Puccinellia nuttalliana	Nuttall's alkaligrass	N	PUCNUT	FACW

Pyrrocoma lanceolata	lanceleaf goldenweed	N	PYRLAN	FAC
Pyrrocoma racemosa	clustered goldenweed	N	PYRRAC	FAC
Ranunculus aquatilis	white water buttercup	N	RANAQU	OBL
Ranunculus gmelinii	Gmelin's buttercup	N	RANGME	FACW
Ranunculus macounii	Macoun's buttercup	N	RANMAC	OBL
Rorippa curvisiliqua	curvepod yellowcress	N	RORCUR	OBL
Rorippa palustris ssp. palustris	bog yellowcress	N	RORPALP	OBL
Rorippa sphaerocarpa	roundfruit yellowcress	N	RORSPH	FACW
Rosa woodsii	Wood's rose	N	ROSWOO	FACU
Rumex crispus	curly dock	E	RUMCRI	FAC
Rumex occidentalis	western dock	N	RUMOCC	FACW
Rumex salicifolius	willow dock	N	RUMSAL	FACW
Sagittaria latifolia	wapato	N	SAGLAT	n/a
Salix exigua	coyote willow	N	SALEXI	FACW
Salsola tragus	prickly Russian thistle	E	SALTRA	FACU
Schoenoplectus acutus	hardstem bulrush	N	SCHACU	OBL
Senecio hydrophilus	water ragwort	N	SENHYD	OBL
Senecio integerrimus	woolly groundsel	N	SENINT	FACU
Sidalcea oregana	Oregon checker mallow	N	SIDORE	FACW
Sisyrinchium idahoense	Idaho blue-eyed grass	N	SISIDA	FACW
Sium suave	hemlock waterparsnip	N	SIUSUA	OBL
Sonchus asper	spiny sowthistle	E	SONASP	FAC
Sparganium emersum	simplestem burreed	N	SPAEME	OBL
Sparganium eurycarpum	broadfruit burreed	N	SPAEUR	OBL
Sporobolus airoides	alkali sacaton	N	SPOAIR	FAC
Stachys pilosa	hairy hedgenettle	N	STAPIL	FACW
Stellaria borealis ssp. sitchana	Sitka starwort	N	STEBORS	FACW
Stellaria longipes ssp. longipes	longstalk starwort	N	STELONL	FACW
Suaeda calceoliformis	Pursh seepweed	N	SUACAL	FACW
Taraxacum officinale	common dandelion	E	TAROFF	FACU
Thermopsis rhombifolia var. montana	golden pea	N	THERHOM	FAC
Thinopyrom intermedium	intermediate wheatgrass	E	THIINT	FAC
Thlaspi arvense	field pennycress	E	THLARV	OBL
Toxicoscordion venenosum	meadow death camas	N	TOXVEN	FACU
Tragopogon dubius	yellow salsify	E	TRADUB	n/a
Trifolium hybridum	alsike clover	E	TRIHYB	FAC
Trifolium pratense	red clover	E	TRIPRA	FACU
Trifolium variegatum var. variegatum	whitetip clover	N	TRIVAR	FAC
Trifolium wormskioldii	springbank clover	N	TRIWOR	FACW
Triglochin maritima	seaside arrowgrass	N	TRIMAR	OBL
Typha angustifolia	narrow-leaved cattail	N	TYPANG	OBL

Typha latifolia	common cattail	N	TYPLAT	OBL
Verbascum thapsis	common mullein	E	VERTHA	FACU
Veronica anagallis-aquatica	water speedwell	E	VERANA	OBL
Veronica catenata	chain speedwell	E	VERCAT	n/a
Veronica peregrina var. xalapensis	hairy purslane speedwell	N	VERPER	OBL
Vicia americana	American vetch	N	VICAME	FAC
Vicia americana var. minor	mat vetch	N	VICAMEM	FAC
Zeltnera exaltata	western centaury	N	ZELEXA	FACW
Agoseris	n/a	n/a	AGOSER	n/a
Agrostis	n/a	n/a	AGROST	n/a
Aster	n/a	n/a	ASTER	n/a
Asteraceae	n/a	n/a	ASTERA	n/a
Bare/ litter	n/a	n/a	BARE	n/a
Brassicaceae	n/a	n/a	BRASSI	n/a
Callitriche	n/a	n/a	CALLIT	n/a
Cardamine	n/a	n/a	CARDAM	n/a
Cirsium	n/a	n/a	CIRSIU	n/a
Descurania	n/a	n/a	DESCUR	n/a
Epilobium	n/a	n/a	EPILOB	n/a
Erigeron	n/a	n/a	ERIGER	n/a
Fabaceae	n/a	n/a	FABACE	n/a
Hieracium	n/a	n/a	HIERAC	n/a
Lamiaceae	n/a	n/a	LAMIAC	n/a
Lepidium	n/a	n/a	LEPIDI	n/a
Liliaceae	n/a	n/a	LILIAC	n/a
Muhlenbergia	n/a	n/a	MUHLEN	n/a
Persicaria	n/a	n/a	PERSIC	n/a
Plagiobothrys	n/a	n/a	PLAGIO	n/a
Poa	n/a	n/a	POA	n/a
Poaceae	n/a	n/a	POACEA	n/a
Polygonum	n/a	n/a	POLYGO	n/a
Rorippa	n/a	n/a	RORIPP	n/a
Rumex	n/a	n/a	RUMEX	n/a
Scutellaria	n/a	n/a	SCUTEL	n/a
Sparganium	n/a	n/a	SPARGA	n/a
Solidago	n/a	n/a	SOLIDA	n/a
Symphyotrichum	n/a	n/a	SYMPHY	n/a
Trifolium	n/a	n/a	TRIFOL	n/a
Unknown	n/a	n/a	UNK	n/a
Veronica	n/a	n/a	VERONI	n/a

APPENDIX 2. STAND TABLES CONTAINING ALL SPECIES IN PLOTS

1. *Alopecurus pratensis* Association

Plot number	6	13	34	40	49	52	59	69	112	114	115	121	123	Freq	Percent cover		
															Ave	Min	Max
Alopecurus pratensis	45	68	33	58	81	95	71	53	38	68	76	40	85	100.0	62.2	32.5	95.0
Bare/ litter	23	1	5	4	13	2	4	3	45	14	1	56	15	100.0	14.2	0.8	56.3
Juncus balticus	26	0	6	34	0	3	10	2	9	0	2	0	0	61.5	7.0	0.0	33.8
Carex aquatilis var. aquatilis	0	0	4	0	2	0	0	0	3	4	0	0	0	38.5	1.0	0.0	4.0
Thlaspi arvense	0	0	3	0	0	0	0	0	0	0	0	0	0	38.5	0.3	0.0	2.8
Cirsium arvense	0	15	0	0	0	0	0	4	0	0	0	3	0	30.8	1.7	0.0	15.0
Leymus triticoides	0	0	0	0	0	0	13	1	0	0	20	0	0	23.1	2.6	0.0	20.0
Potentilla gracilis	0	0	11	0	0	0	0	3	0	1	0	0	0	23.1	1.1	0.0	11.3
Carex nebrascensis	4	0	0	0	2	0	0	1	0	0	0	0	0	23.1	0.5	0.0	3.8
Carex pellita	0	1	0	0	0	0	3	0	0	0	0	0	0	23.1	0.3	0.0	2.8
Agoseris cf. glauca var. glauca	0	0	2	0	0	0	0	1	0	0	0	0	0	23.1	0.2	0.0	1.5
Lepidium latifolium	0	0	0	0	0	0	0	0	0	0	0	1	0	23.1	0.1	0.0	1.0
Hordeum brachyantherum	0	0	1	0	0	0	0	0	0	1	0	0	0	23.1	0.1	0.0	0.5
Vicia americana	0	0	0	0	0	0	0	1	0	0	0	0	0	23.1	0.1	0.0	0.8
Carex praegracilis	0	0	29	0	0	0	0	13	0	0	0	0	0	15.4	3.2	0.0	28.8
Poa pratensis	0	3	0	0	0	0	0	18	0	0	0	0	0	15.4	1.5	0.0	17.5
Lactuca serriola	0	0	1	0	0	0	0	0	0	0	0	0	0	15.4	0.1	0.0	1.3
Agrostis	0	0	1	0	0	0	0	0	0	0	0	0	0	15.4	0.1	0.0	1.0
Eleocharis palustris	0	0	0	1	0	0	0	0	0	0	0	0	0	15.4	0.1	0.0	0.8
Stellaria longipes ssp. longipes	0	0	0	0	0	0	0	0	0	0	0	0	0	15.4	0.0	0.0	0.3
Trifolium pratense	0	8	0	0	0	0	0	0	0	0	0	0	0	7.7	0.6	0.0	8.3
Agrostis pallens	0	0	0	0	0	0	0	0	0	8	0	0	0	7.7	0.6	0.0	7.5
Persicaria amphibia	0	0	0	0	0	0	0	0	4	0	0	0	0	7.7	0.3	0.0	4.0
Phleum pratense	0	0	0	0	0	0	0	0	0	4	0	0	0	7.7	0.3	0.0	4.0
Trifolium variegatum var. variegatum	0	0	3	0	0	0	0	0	0	0	0	0	0	7.7	0.2	0.0	2.5
Apera interrupta	2	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.1	0.0	1.8
Poa palustris	0	0	0	0	0	0	0	0	0	2	0	0	0	7.7	0.1	0.0	1.5
Achillea millefolium	0	0	0	0	0	0	0	1	0	0	0	0	0	7.7	0.1	0.0	1.0
Epilobium ciliatum ssp. ciliatum	0	0	0	1	0	0	0	0	0	0	0	0	0	7.7	0.1	0.0	1.0
Taraxacum officinale	0	0	0	0	0	0	0	1	0	0	0	0	0	7.7	0.1	0.0	1.0

Epilobium	0	0	0	1	0	0	0	0	0	0	0	0	0	7.7	0.1	0.0	0.8
Mimulus guttatus	1	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.1	0.0	0.8
Drymocallis glandulosa	0	1	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.5
Poa secunda ssp. secunda	1	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.5
Veronica peregrina var. xalapensis	1	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.5
Acer negundo	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Agoseris heterophylla	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Carex	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Carex athrostachya	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Chenopodium album	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Epilobium saximontanum	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Lepidium	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Madia glomerata	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Medicago lupulina	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Persicaria	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Plagiobothrys salsus	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Podagrostis thurburiana	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Polygonum	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Rorippa	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Rumex crispus	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Scutellaria	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Senecio integerrimus	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Sidalcea oregana	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Trifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Trifolium wormskioldii	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
Vicia	0	0	0	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.3
TOTAL COVER	102	96	100	99	98	100	100	100	99	100	100	100	100	100.0	99.5	96.3	101.8

2. *Carex aquatilis* var. *aquatilis* Association

Plot number	38	39	113	Freq	Percent cover		
					Ave	Min	Max
Carex aquatilis var. aquatilis	20.5	60.0	82.5	100.0	54.3	20.5	82.5
Alopecurus pratensis	15.5	12.5	8.0	100.0	12.0	8.0	15.5
Bare/ litter	15.0	3.3	6.0	100.0	8.1	3.3	15.0
Juncus balticus	25.0	0.8	0	66.7	8.6	0.0	25.0
Eleocharis palustris	19.3	4.8	0	66.7	8.0	0.0	19.3
Carex simulata	0.8	13.8	0	66.7	4.8	0.0	13.8
Unknown	0	0.3	0.5	66.7	0.3	0.0	0.5
Carex nebrascensis	3.5	0	0	33.3	1.2	0.0	3.5
Epilobium	0	0	0.5	33.3	0.2	0.0	0.5
Rorippa	0	0	0.5	33.3	0.2	0.0	0.5
Rumex crispus	0	0.5	0	33.3	0.2	0.0	0.5
Thlaspi arvense	0	0	0.5	33.3	0.2	0.0	0.5
Agrostis oregonensis	0	3.3	0	33.3	0.1	0.0	3.3
Beckmannia syzigachne	0	0	0.3	33.3	0.1	0.0	0.3
Carex	0.3	0	0	33.3	0.1	0.0	0.3
Epilobium ciliatum ssp. ciliatum	0.3	0	0	33.3	0.1	0.0	0.3
Lactuca serriola	0	0.3	0	33.3	0.1	0.0	0.3
Polypogon monspeliensis	0	0	0.3	33.3	0.1	0.0	0.3
Trifolium hybridum	0	0.3	0	33.3	0.1	0.0	0.3
Veronica	0	0	0.3	33.3	0.1	0.0	0.3
TOTAL COVER	100	100	99.3	100.0	99.6	99.3	100.0

3. *Carex nebrascensis* Association

Plot number	27	77	79	80	81	82	84	85	86	95	99	100	Freq	Percent cover		
														Ave	Min	Max
Carex nebrascensis	51.3	40.0	46.3	45.0	76.3	13.5	90.0	70.0	65.0	38.8	33.8	60.0	100.0	52.5	13.5	90.0
Bare/ litter	1.8	1.3	3.8	0	13.0	4.5	7.0	5.5	5.8	43.8	7.5	0.8	91.7	7.9	0.0	43.8
Alopecurus pratensis	0	37.5	3.0	12.5	2.3	67.5	0.5	0	1.8	0	20.8	0.8	75.0	12.2	0.0	67.5
Juncus balticus	20.0	5.0	0	0	2.5	12.5	0	15.0	27.5	15.0	12.0	3.8	75.0	9.4	0.0	27.5
Epilobium ciliatum ssp. ciliatum	21.3	0.3	0.5	0	0	0	1.8	0.3	0	0	0.8	1.0	58.3	2.1	0.0	21.3
Hordeum brachyantherum	0.5	8.8	26.3	0	0.5	0.8	0	0	0	0	0	0.3	50.0	3.1	0.0	26.3
Veronica anagallis-aquatica	4.8	0	0	0	1.0	0.3	0.3	2.8	0	0.5	0	0	50.0	0.8	0.0	4.8
Epilobium brachycarpum	0	0.3	1.8	0.3	0.3	0.3	0	0.5	0	0	0	0	50.0	0.3	0.0	1.8
Eleocharis palustris	0	0	0	0	0	0.3	0	1.5	0	0	6.0	21.3	33.3	2.4	0.0	21.3
Juncus nevadensis	0	0	0	0	0	0	0	0.8	1.5	0	17.0	7.3	33.3	2.2	0.0	17.0
Thlaspi arvense	0.3	0	9.8	0	0.5	0	0.3	0	0	0	0	0	33.3	0.9	0.0	9.8
Moss	0	0	0	0.5	0	0	0	0	0	0.3	1.5	1.0	33.3	0.3	0.0	1.5
Carex simulata	0	0.3	0	42.5	0	0	0	5.0	0	0	0	0	25.0	4.0	0.0	42.5
Agrostis	0	6.8	1.3	0	0	0	0.3	0	0	0	0	0	25.0	0.7	0.0	6.8
Poa secunda ssp. secunda	0	0	5.5	0	0	0.5	0	0	0	0	0	0	16.7	0.5	0.0	5.5
Agrostis stolonifera	0	0	0	0	0	0	0	0	0	0	2.0	1.5	16.7	0.3	0.0	2.0
Myosotis laxa	0	0	0	0	2.8	0.3	0	0	0	0	0	0	16.7	0.3	0.0	2.8
Mimulus guttatus	0	0	0	0	0	0	0.3	2.0	0	0	0	0	16.7	0.2	0.0	2.0
Trifolium wormskioldii	0	0	0	0	0	1.0	0.3	0	0	0	0	0	16.7	0.1	0.0	1.0
Veronica peregrina var. xalapensis	0	0	0.3	0	0	0	0	0	0	0	0	1.0	16.7	0.1	0.0	1.0
Apera interrupta	0	0	0.3	0	0.5	0	0	0	0	0	0	0	16.7	0.1	0.0	0.5
Beckmannia syzigachne	0	0	0	0	0	0	0	0	0	0.3	0.3	0	16.7	0.0	0.0	0.3
Carex pellita	0	0	0	0	0	0	0	0	0	0	0	2.8	8.3	0.2	0.0	2.8
Montia chamissoi	0	0	0	0	0	0	0	0	0	2.0	0	0	8.3	0.2	0.0	2.0
Sparganium eurycarpum	0	0	0	0	1.3	0	0	0	0	0	0	0	8.3	0.1	0.0	1.3
Poa pratensis	0	1.0	0	0	0	0	0	0	0	0	0	0	8.3	0.1	0.0	1.0
Lepidium latifolium	0	0	0.8	0	0	0	0	0	0	0	0	0	8.3	0.1	0.0	0.8
Persicaria amphibia	0.8	0	0	0	0	0	0	0	0	0	0	0	8.3	0.1	0.0	0.8
Sium suave	0	0	0	0	0	0	0	0	0	0	0	0.8	8.3	0.1	0.0	0.8
Poa palustris	0	0	0.5	0	0	0	0	0	0	0	0	0	8.3	0.0	0.0	0.5
Lactuca serriola	0	0	0.3	0	0	0	0	0	0	0	0	0	8.3	0.0	0.0	0.3
Myosotis arvensis	0	0	0	0	0	0	0	0.3	0	0	0	0	8.3	0.0	0.0	0.3
Rumex	0	0	0	0	0.3	0	0	0	0	0	0	0	8.3	0.0	0.0	0.3

Stellaria longipes ssp. longipes	0	0	0	0	0	0.3	0	0	0	0	0	0	8.3	0.0	0.0	0.3
TOTAL COVER	100.5	101.0	100.0	100.8	101	101.5	100.5	103.5	101.5	100.5	101.5	102.0	100.0	101.2	100.0	103.5

4. *Carex pellita* Association

Plot number	5	24	54	55	57	76	108	119	128	130	Freq	Percent cover		
												Ave	Min	Max
Carex pellita	20.8	22.5	37.5	10.8	14.0	3.5	19.3	36.3	44.0	62.5	100.0	27.1	3.5	62.5
Bare/ litter	20.0	20.0	27.5	46.3	36.3	25.0	56.3	2.0	3.3	9.3	100.0	24.6	2.0	56.3
Juncus balticus	28.8	21.3	21.3	27.5	36.3	38.8	10.0	10.8	0	0	80.0	19.5	0.0	38.8
Cirsium arvense	0	5.0	1.3	0.3	0	1.0	0.5	0.3	11.3	22.5	80.0	4.2	0.0	22.5
Mentha canadensis	0	3.8	0.3	1.8	1.0	6.3	0	0	0	0	50.0	1.3	0.0	6.3
Leymus triticoides	11.3	0	0	6.8	0	0	0	3.0	0	0	30.0	2.1	0.0	11.3
Carex nebrascensis	3.0	25.0	0	0	0	0	0	40.0	0	0	30.0	6.8	0.0	40.0
Persicaria amphibia	0	0	0	0	11.8	3.3	0.3	0	0	0	30.0	1.5	0.0	11.8
Carex aquatilis var. aquatilis	0	0	7.0	1.3	0	0	0	0	0	0	20.0	0.8	0.0	7.0
Stachys pilosa	0	0	0	0	0	20.0	0	2.5	0	0	20.0	2.3	0.0	20.0
Eleocharis palustris	0	0	0	0	0	0	14.0	2.8	0	0	20.0	1.7	0.0	14.0
Carex praegracilis	4.0	0	0.3	0	0	0	0	0	0	0	20.0	0.4	0.0	4.0
Phalaris arundinacea	2.5	0	0	0	0	1.5	0	0	0	0	20.0	0.4	0.0	2.5
Agrostis stolonifera	0	0	0.8	0.8	0	0	0	0	0	0	20.0	0.2	0.0	0.8
Poa palustris	0	1.3	0	0.3	0	0	0	0	0	0	20.0	0.2	0.0	1.3
Epilobium	0	0	0	0	0	0	0	0	0.8	0	10.0	0.1	0.0	0.8
Dipsacus fullonum	0	0	0	0	0	0	0	0	26.0	0	10.0	2.6	0.0	26.0
Veronica anagallis-aquatica	0	5.3	0	0	0	0	0	0	0	0	10.0	0.5	0.0	5.3
Solidago	0	0	0	0	0	0	0	0	0	5.0	10.0	0.5	0.0	5.0
Moss	3.8	0	0	0	0	0	0	0	0	0	10.0	0.4	0.0	3.8
Carex utriculata	0	0	0	3.3	0	0	0	0	0	0	10.0	0.3	0.0	3.3
Lepidium latifolium	0	0	3.0	0	0	0	0	0	0	0	10.0	0.3	0.0	3.0
Poa pratensis	0	0	0	0	0	0	0	0	2.5	0	10.0	0.3	0.0	2.5
Poa secunda ssp. secunda	1.8	0	0	0	0	0	0	0	0	0	10.0	0.2	0.0	1.8
Myosotis laxa	1.5	0	0	0	0	0	0	0	0	0	10.0	0.2	0.0	1.5
Hackelia micrantha	0	0	0	0	0	0	0	0	1.3	0	10.0	0.1	0.0	1.3
Phleum pratense	1.3	0	0	0	0	0	0	0	0	0	10.0	0.1	0.0	1.3
Triglochin maritima	1.3	0	0	0	0	0	0	0	0	0	10.0	0.1	0.0	1.3
Hordeum brachyantherum	1.0	0	0	0	0	0	0	0	0	0	10.0	0.1	0.0	1.0
Unknown	0	0	1.0	0	0	0	0	0	0	0	10.0	0.1	0.0	1.0
Calamagrostis stricta ssp. inexpansa	0	0.8	0	0	0	0	0	0	0	0	10.0	0.1	0.0	0.8
Eleocharis acicularis	0.8	0	0	0	0	0	0	0	0	0	10.0	0.1	0.0	0.8
Epilobium ciliatum ssp. ciliatum	0	0.8	0	0	0	0	0	0	0	0	10.0	0.1	0.0	0.8

Agoseris cf. glauca var. glauca	0	0.5	0	0	0	0	0	0	0	0	10.0	0.1	0.0	0.5
Geum macrophyllum	0	0	0	0	0	0	0	0	0.5	0	10.0	0.1	0.0	0.5
Rorippa palustris ssp. palustris	0	0.5	0	0	0	0	0	0	0	0	10.0	0.1	0.0	0.5
Alopecurus pratensis	0	0	0	0	0.3	0	0	0	0	0	10.0	0.0	0.0	0.3
Cirsium	0	0	0	0.3	0	0	0	0	0	0	10.0	0.0	0.0	0.3
Descurainia	0	0	0	0	0	0	0	0	0	0.3	10.0	0.0	0.0	0.3
Hordeum jubatum	0	0	0	0	0	0.3	0	0	0	0	10.0	0.0	0.0	0.3
Lactuca serriola	0	0	0	0	0	0	0	0	0	0.3	10.0	0.0	0.0	0.3
Rumex crispus	0	0.3	0	0	0	0	0	0	0	0	10.0	0.0	0.0	0.3
Scutellaria	0	0	0	0.3	0	0	0	0	0	0	10.0	0.0	0.0	0.3
Veronica	0	0	0	0	0	0	0.3	0	0	0	10.0	0.0	0.0	0.3
TOTAL COVER	80.75	84.3	62.25	88.5	85.5	96	81.25	61.25	45.5	37.25	100.0	72.3	37.3	96.0

5. *Carex praegracilis* Association (a)

Plot number	2	4	10	12	18	19	20	33	41	42	56	70	83	96	97
Carex praegracilis	13.8	14.5	8.5	32.8	30.0	47.5	20.0	38.8	12.3	18.8	28.8	36.3	35.0	46.3	32.5
Bare/ litter	7.5	13.8	2.5	0.5	27.5	11.3	40.0	4.5	2.8	14.5	45.0	0	2.5	35.0	56.3
Juncus balticus	13.3	48.8	7.3	1.5	0	0	0	18.8	37.5	25.0	15.0	5.0	36.3	5.0	7.5
Leymus triticoides	63.8	3.8	6.0	2.5	17.5	31.3	8.0	6.5	0	0	1.8	0	21.3	0.5	0
Cirsium arvense	0	0	0.5	0	14.5	0.3	0	0.5	2.5	0	2.5	1.8	0	0.3	0.3
Potentilla gracilis	0	0	27.5	0	0	0	0	7.3	15.5	0	0	8.3	0	1.3	0
Poa pratensis	0	0	0	2.8	0.5	3.3	0	0	12.0	0	0	27.5	0	0	0
Equisetum laevigatum	0	0	0	1.8	0.3	0.8	2.5	0	0	0	0	0.3	0	0	0
Sidalcea oregana	0	0.3	0	4.5	0.5	0	1.5	13.8	0	0	0	3.0	0	0	0.8
Poa secunda ssp. secunda	0	2.5	0	0	0.3	0	22.5	0	0.5	1.5	0	0	1.3	0	0.5
Phleum pratense	0	0	17.5	0	0	0	0.5	0	3.0	0	0	7.3	0	0	0.3
Alopecurus pratensis	0	2.5	20.0	0	0	0	0	0	0	0	0	8.3	0	0	0
Agoseris cf. glauca var. glauca	0.5	0	0	0	3.3	0	4.3	4.3	0	0	0	0	0	9.0	4.5
Crepis runcinata ssp. hispidulosa	0	0	0	0.5	0	0	0	0.8	0	15.0	0	0	0	2.0	0.8
Unknown	0	0	0	0	0	0	0	0	0	0.3	6.0	0	0	0	0
Muhlenbergia asperifolia	0	0	0	0	0	0	0.8	0	0	0	0.3	0	0	0	0.3
Taraxacum officinale	0	0	0.5	0.8	0.5	0.3	0	0.5	0	0	0	0	0	0	0
Agrostis stolonifera	0	0	0	15.0	0	0	0	0	0.3	0	0	0	0	0	0
Trifolium pratense	0	0	0	19.5	0	0	0	0	9.3	0	0	0.5	0	0	0
Lactuca serriola	0.8	0	0	0	0	0.3	0	0.3	0	0	0	0	0	0.3	0
Trifolium hybridum	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Medicago lupulina	0	0	0	3.0	0	0	0.5	0.3	0	0	0	0.5	0	0	0
Sisyrinchium idahoense	0	0	0	0.5	0	0	0	0	0.5	0.8	0	0	0	0	0
Symphyotrichum	0	0	0	0	0	0	0	3.3	0	0	0	0	0	0	0
Erigeron	0	0	0	1.0	0	0	0	0	0	0	0	0	0	0	0
Carex aquatilis var. aquatilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Achillea millefolium	0	0	0.3	0	0.3	0	0	0	0	0	0	0	0	0	0
Cirsium scariosum	0.5	0	0	0	0	0	0	0	0	0.3	0.3	0	0	0	0
Drymocallis glandulosa	0	0	0	8.0	0	0.8	5.8	0	0	0	0	0	0	0	0
Carex nebrascensis	0	0	8.8	0	0	0	0	0	0	0	0	0	0	0.3	0
Maianthemum stellatum	0	0	0	0	0	5.8	0	0	0	0	0	0.8	0	0	0
Carex pellita	0	0	0	2.5	4.5	0	0	0	0	0	0	0	0	0	0
Agrostis	0	0	0	0	0	0	0	0	0	2.8	0	0	0	0	0

Lepidium latifolium	0	0	0	0	0.5	2.8	0	0	0	0	0.3	0	0	0	0
Agoseris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria longipes ssp. longipes	0	0	0	0	0	0	0	0	0.3	0	0	0	0	1.5	0.5
Trifolium wormskioldii	0.5	0	0.3	0	0	0	0	0	0	0	0	0.8	0	0	0
Asteraceae	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0
Distichlis spicata	0	0	0	0	0.5	0	0.3	0	0	0.3	0	0	0	0	0
Stellaria borealis ssp. sitchana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0
Moss	0	4.0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
Hordeum brachyantherum	0	0	0	0	0	0	0	0	0	0	0	0	1.8	0	0
Tragopogon dubius	0	0	0	0	1.0	0	1.5	0	0	0	0	0	0	0	0
Podagrostis thurburiana	0	0	0	0	0	0	0	0	0	0	0	1.0	0	1.0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	1.3	0	0	0
Pyrrocoma lanceolata	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0
Vicia americana	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0
Elymus trachycaulus ssp. trachycaulus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penstemon rydbergii var. oreocharis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sporobolus airoides	0	0	0	0	0	0	0	0	0	19.0	0	0	0	0	0
Schoenoplectus acutus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus longistylis	0	8.8	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrrocoma racemosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla anserina	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thermopsis rhombifolia var. montana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phleum alpinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola	0	0	0	4.8	0	0	0	0	0	0	0	0	0	0	0
Persicaria amphibia	0	3.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Vicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Muhlenbergia richardsonis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iva axillaris	0	0	0	0	0	0	0	1.3	0	0	0	0	0	0	0
Thlaspi arvense	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus nevadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phalaris arundinacea	0	0	0	0	0	0	0	0	1.0	0	0	0	0	0	0
Epilobium	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilobium brachycarpum	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0
Hordeum jubatum	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0

Puccinellia nuttalliana	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0
Suaeda calceoliformis	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0
Carex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex athrostachya	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex douglasii	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Hieracium	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Liliaceae	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0
Pascopyrum smithii	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0
Sonchus asper	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Carex aurea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex lenticularis	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0
Chenopodium rubrum	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0
Eleocharis acicularis	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus orthophyllus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Koeleria macrantha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium perfoliatum	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0
Montia linearis	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0
Muhlenbergia	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Suaeda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Toxicoscordion venenosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COVER	103	103	101	101.8	102	104	109	101	99	98	101	103	101	103	104

Carex praegracilis Association (b)

98	101	103	109	110	111	117	118	126	127	129	Freq	Percent cover		
												Ave	Min	Max
21.3	53.8	51.5	34.0	5.8	33.8	35.0	86.3	32.5	21.3	36.3	100.0	31.8	5.8	86.3
56.3	1.5	15.0	2.5	4.0	2.0	9.3	4.0	14.8	20.0	15.0	96.2	15.7	0.0	56.3
17.5	3.3	4.0	5.0	6.3	0.5	14.5	0	20.0	0	0	76.9	11.2	0.0	48.8
0	0	10.0	0.5	0	0	0	0	25.0	56.3	3.3	61.5	9.9	0.0	63.8
0.5	0	0	0	0	0	0	0.3	0.3	1.0	1.3	53.8	1.0	0.0	14.5
1.8	15.8	5.3	18.5	5.8	19.3	5.0	2.5	0	0	0	50.0	5.1	0.0	27.5
0	2.8	0	4.3	1.5	21.3	0	0	3.5	0	0.3	42.3	3.1	0.0	27.5
0	0.8	0.3	0	0.3	2.0	0	0.5	0	0	0.5	42.3	0.4	0.0	2.5
0	1.3	5.0	0.8	0	0	0	0	0	0	0	38.5	1.2	0.0	13.8
0.3	0	0	0.5	0	0	0	0	0	0	0	34.6	1.1	0.0	22.5
0	0	0	4.3	0	0.8	0.3	0	0	0	0	30.8	1.3	0.0	17.5
0	4.5	0	0	52.5	0.3	27.0	0	0	0	0	26.9	4.4	0.0	52.5
2.5	0	0	0	0	0	0	0	0	0	0	26.9	1.1	0.0	9.0
0.5	0	0	0	0	0	0	1.5	0	0	0	26.9	0.8	0.0	15.0
0	0	0	0.6	0.3	0.5	0	0	0	1	0.3	26.9	0.3	0.0	6.0
0	0	2.5	0	0	0	0	0.3	0	0.5	0.3	26.9	0.2	0.0	2.5
0	0	0	0.3	0	0	0.3	0	0	0	0	26.9	0.1	0.0	0.8
0	0	1.8	0.5	0	0	3.3	0	0	0	13.8	23.1	1.3	0.0	15.0
0	2.8	0	0	0.3	0.3	0	0	0	0	0	23.1	1.3	0.0	19.5
0.5	0	0	0	0	0	0	0	0.5	0	0	23.1	0.1	0.0	0.8
0	0	0	19.8	16.3	14.5	1.8	0	0	0	0	19.2	2.0	0.0	19.8
0	0	0	0	0	0.3	0	0	0	0	0	19.2	0.2	0.0	3.0
0	0	0	0.3	0	0.3	0	0	0	0	0	19.2	0.1	0.0	0.8
0	0.3	0	0	0	0	0	0	0	0.3	0.8	15.4	0.2	0.0	3.3
0.3	0	0	1.0	0	0	0	0	0.3	0	0	15.4	0.1	0.0	1.0
0	0	0	0.5	1.0	0	0.3	0.3	0	0	0	15.4	0.1	0.0	1.0
0	0	0	0	0	0.3	0	0	0	0	0.8	15.4	0.1	0.0	0.8
0.5	0	0	0	0	0	0	0	0	0	0	15.4	0.1	0.0	0.5
0	0	0	0	0	0	0	0	0	0	0	11.5	0.6	0.0	8.0
0	4.0	0	0	0	0	0	0	0	0	0	11.5	0.5	0.0	8.8
0	2.3	0	0	0	0	0	0	0	0	0	11.5	0.3	0.0	5.8
0	0	0	0	0.8	0	0	0	0	0	0	11.5	0.3	0.0	4.5
0	0	0	1.0	0	0	0	0	0.3	0	0	11.5	0.2	0.0	2.8

0	0	0	0	0	0	0	0	0	0	0	11.5	0.1	0.0	2.8
0	0	0	0	0	0	0.5	1.8	0	0	0.3	11.5	0.1	0.0	1.8
0	0	0	0	0	0	0	0	0	0	0	11.5	0.1	0.0	1.5
0	0	0	0	0	0	0	0	0	0	0	11.5	0.1	0.0	0.8
0	0	0	0	0	0.8	0	0.3	0	0	0	11.5	0.0	0.0	0.8
0	0	0	0	0	0	0	0	0	0	0	11.5	0.0	0.0	0.5
0	0	0	0.5	0.3	0.3	0	0	0	0	0	11.5	0.0	0.0	0.5
0	0	0	0	0	0	0	0	0	0	10.5	7.7	0.4	0.0	10.5
0	0	0	0	0	0	0	0	0	0	0	7.7	0.2	0.0	4.0
0	0	0	0	0	0	0	0	2.3	0	0	7.7	0.2	0.0	2.3
0	0	0	0	0	0	0	0	0	0	0	7.7	0.1	0.0	1.5
0	0	0	0	0	0	0	0	0	0	0	7.7	0.1	0.0	1.0
0	0	0	0	0	0	0	0	0	0	0.3	7.7	0.1	0.0	1.3
0.8	0	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.8
0	0.3	0	0	0	0	0	0	0	0	0	7.7	0.0	0.0	0.5
0	0	0.3	0	0	0	0	0	0	0	0.3	7.7	0.0	0.0	0.3
0	0.3	0	0	0.3	0	0	0	0	0	0	7.7	0.0	0.0	0.3
0	0	0	0	0	0.3	0	0	0.3	0	0	7.7	0.0	0.0	0.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.7	0.0	19.0
0	0	0	0	0	0	0	0	0	0	15.5	3.8	0.6	0.0	15.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.3	0.0	8.8
0	0	5.5	0	0	0	0	0	0	0	0	3.8	0.2	0.0	5.5
0	0	0	5.0	0	0	0	0	0	0	0	3.8	0.2	0.0	5.0
0	0	0	0	5.0	0	0	0	0	0	0	3.8	0.2	0.0	5.0
0	4.8	0	0	0	0	0	0	0	0	0	3.8	0.2	0.0	4.8
0	0	0	0	0	0	0	0	0	0	0	3.8	0.2	0.0	4.8
0	0	0	0	0	0	0	0	0	0	0	3.8	0.1	0.0	3.3
0	0	0	0	0	0	3.0	0	0	0	0	3.8	0.1	0.0	3.0
0	0	0	0	0	2.0	0	0	0	0	0	3.8	0.1	0.0	2.0
0	0	0	0	0	0	0	1.5	0	0	0	3.8	0.1	0.0	1.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	1.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	1.3
0	1.0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	1.0
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	1.0
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.8
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.8
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.8

0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.8
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.8
0	0	0.5	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.5
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.5
0	0	0	0.3	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0.3	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0.3	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0	0	0	0	0.3	0	0	0	0	3.8	0.0	0.0	0.3
0	0	0.3	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
0	0.3	0	0	0	0	0	0	0	0	0	3.8	0.0	0.0	0.3
103	99	102	100	100	99	100	99	100	100	99	100.0	101.2	98.3	108.5

6. *Carex sheldonii* Association

Plot number	48	50	64	65	Freq	Percent cover		
						Ave	Min	Max
Carex sheldonii	88.8	80.0	83.8	80.0	100.0	83.1	80.0	88.8
Bare/ litter	11.3	20.0	2.5	18.3	100.0	13.0	2.5	20.0
Rorippa sphaerocarpa	0	0	8.5	1.3	50.0	2.4	0.0	8.5
Galium trifidum var. pacificum	0	0	3.0	0	25.0	0.8	0.0	3.0
Potentilla biennis	0	0	1.0	0	25.0	0.3	0.0	1.0
Cirsium arvense	0	0	0.8	0	25.0	0.2	0.0	0.8
Phalaris arundinacea	0	0	0.5	0	25.0	0.1	0.0	0.5
Unknown	0	0.5	0	0	25.0	0.1	0.0	0.5
Chenopodium rubrum	0	0	0.3	0	25.0	0.1	0.0	0.3
TOTAL COVER	100.0	100.5	100.3	99.5	100.0	100.1	99.5	100.5

7. *Distichlis spicata* Association

Plot number	17	37	87	88	92	93	94	Freq	Percent cover		
									Ave	Min	Max
Bare/ litter	41.3	21.8	31.3	51.3	38.8	15.0	9.5	100.0	29.8	9.5	51.3
Distichlis spicata	16.0	27.0	7.5	27.5	51.3	16.3	20.0	100.0	23.6	7.5	51.3
Poa secunda ssp. secunda	1.0	0.3	38.0	0	6.3	68.8	71.3	85.7	26.5	0.0	71.3
Juncus balticus	21.3	26.3	2.0	0	0.5	0	0	57.1	7.1	0.0	26.3
Puccinellia lemmonii	0	0	11.8	21.3	4.3	0	0	42.9	5.3	0.0	21.3
Carex praegracilis	19.5	20.0	0	0	0	0	0	28.6	5.6	0.0	20.0
Puccinellia nuttalliana	0	0	9.8	0	0	0	0	14.3	1.4	0.0	9.8
Sporobolus airoides	0	5.3	0	0	0	0	0	14.3	0.8	0.0	5.3
Tragopogon dubius	0.8	0	0	0	0	0	0	14.3	0.1	0.0	0.8
Pyrrocoma lanceolata	0	0	0.5	0	0	0	0	14.3	0.1	0.0	0.5
Equisetum laevigatum	0.3	0	0	0	0	0	0	14.3	0.0	0.0	0.3
Penstemon rydbergii var. oreocharis	0.3	0	0	0	0	0	0	14.3	0.0	0.0	0.3
Pyrrocoma racemosa	0	0.3	0	0	0	0	0	14.3	0.0	0.0	0.3
Salsola tragus	0	0	0	0	0.3	0	0	14.3	0.0	0.0	0.3
Suaeda calceoliformis	0	0	0	0	0.3	0	0	14.3	0.0	0.0	0.3
Symphyotrichum	0.3	0	0	0	0	0	0	14.3	0.0	0.0	0.3
TOTAL COVER	100.5	100.8	100.8	100.0	101.5	100.0	100.8	100.0	100.6	100.0	101.5

8. *Juncus balticus* Association (a)

Plot number	1	3	7	9	11	16	22	25	36	89
Juncus balticus	32.5	58.8	55.0	47.5	8.8	32.8	32.5	22.5	52.5	26.3
Bare/ litter	22.5	13.0	43.8	0	2.0	25.0	53.8	1.8	26.8	63.8
Carex nebrascensis	2.0	0	0	16.3	3.3	7.5	0	2.0	0	0
Lepidium latifolium	0	4.8	1.5	0	0	0.3	1.0	0.8	0	0.5
Alopecurus pratensis	0.3	3.8	0	1.5	0	0	11.3	7.5	0	0
Lactuca serriola	0	0	0	0.5	0	3.5	0	2.3	0.8	1.3
Moss	11.8	0	0	2.8	0.8	0	0	0	0	0
Leymus triticoides	6.3	17.5	0.8	0	0	0	0	15.0	0	0.3
Epilobium ciliatum ssp. ciliatum	0	0.5	0	1.0	0.3	0	0	0	0	0
Thlaspi arvense	0	0	0.8	0	0	5.8	0	2.0	0.3	0
Eleocharis palustris	0	0.8	0	6.3	0	0	2.0	0	0	0
Hordeum brachyantherum	0.5	0	0	0	0	10.0	0	27.5	11.5	0
Epilobium brachycarpum	0	0	0	0.3	0.5	0	0	0.3	0	0
Veronica anagallis-aquatica	0	0.5	0	14.5	0	0	0.5	0	0	0
Phalaris arundinacea	18.5	0.8	0	0	0	0	0.5	0	0	0
Carex pellita	2.5	0	0	0	12.0	11.8	0	0	0	0
Potentilla gracilis	0	0	0	0	27.5	0	0	1.0	0	1.3
Sium suave	0	0	0	0.3	0	0	0.3	0	0	0
Unknown	0	0	0	0	0	0	0.3	0	0.3	0
Hordeum jubatum	0	0	0	0	0	0	0.5	0	0	0.3
Beckmannia syzigachne	0	0	0	0.3	0	0	0.8	0	0	0
Poa secunda ssp. secunda	0	0	0	0	0	0	0	2.3	0.3	0
Agrostis stolonifera	0	0	0	0	0	0.8	0	2.5	0	0
Cirsium arvense	0	0	0	0	0	0	0	5.5	0	0
Carex praegracilis	0.3	0	0	0	0	0	0	0	6.3	0
Agoseris heterophylla	0	0	0	0	0.3	0	0	0	0	0
Agrostis exarata	0	0	0	0.3	0	0	0	0	0	0
Apera interrupta	0.3	0	0	0	0	0	0	0	0	0
Cardamine	0	0	0	0	0	0	0	0	0	0
Chenopodium rubrum	0	0	0	0	0	0.3	0	0	0	0
Eleocharis acicularis	0.3	0	0	0	0	0	0	0	0	0

Elatine chilensis	0	0	0	0	0	0	0	0	0	0
Fabaceae	0	0	0	0	0	0	0	0	0.3	0
Galium trifidum var. pacificum	0	0	0	0	0	0	0.3	0	0	0
Pascopyrum smithii	0	0	0	0	0	0	0	0	0	0.3
Polypogon monspeliensis	0	0	0	0.3	0	0	0	0	0	0
Toxicoscordion venenosum	0	0	0	0	0.3	0	0	0	0	0
Alisma triviale	0	0	0	0.5	0	0	0	0	0	0
Carex	0	0	0	0	0	0	0	0	0	0.5
Cirsium scariosum	0.5	0	0	0	0	0	0	0	0	0
Descurainia sophia	0	0	0.5	0	0	0	0	0	0	0
Lepidium campestre	0	0	0	0	0	0	0	0	0.5	0
Mentha canadensis	0	0	0	0	0	0	0.5	0	0	0
Persicaria amphibia	0	0	0	0	0	0	0	0.5	0	0
Rorippa palustris ssp. palustris	0	0	0	0	0	0	0.5	0	0	0
Rosa woodsii	0	0	0	0	0	0.5	0	0	0	0
Agoseris cf. glauca var. glauca	0.8	0	0	0	0	0	0	0	0	0
Barbarea vulgaris	0	0	0	0	0	0.8	0	0	0	0
Callitriche heterophylla	0	0	0	0	0	0	0.8	0	0	0
Carex pachystachya	0	0	0	0	0	0	0	0.8	0	0
Potentilla biennis	0	0	0	0	0	0	0	1.0	0	0
Penstemon rydbergii var. oreocharis	0	0	0	0	0	1.3	0	0	0	0
Epilobium	0	0	0	0	0	0	0	0	0	0
Mimulus guttatus	0	0	0	2.3	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	0	2.5	0	0
Trifolium wormskioldii	0	0	0	0	2.8	0	0	0	0	0
Galium aparine	0	0	0	0	0	0	0	5.8	0	0
Myosotis arvensis	6.8	0	0	0	0	0	0	0	0	0
Sidalcea oregana	0	0	0	0	0	0	0	0	0	7.5
Myosotis laxa	0	0	0	11.3	0	0	0	0	0	0
Poa pratensis	0	0	0	0	20.0	0	0	0	0	0
Phleum pratense	0	0	0	0	21.3	0	0	0	0	0
TOTAL COVER	106	100.3	102.3	105.5	99.5	100	105.3	103.3	99.25	101.8

Juncus balticus Association (b)

90	91	Freq	Percent cover		
			Ave	Min	Max
25.0	28.8	100.0	35.2	8.8	58.8
60.0	57.5	91.7	30.8	0.0	63.8
1.3	2.0	58.3	2.9	0.0	16.3
0	0	50.0	0.7	0.0	4.8
9.8	0	50.0	2.8	0.0	11.3
0	0	41.7	0.7	0.0	3.5
4.3	9.3	41.7	2.4	0.0	11.8
0	0	41.7	3.3	0.0	17.5
0.3	0	33.3	0.2	0.0	1.0
0	0	33.3	0.7	0.0	5.8
0.3	0	33.3	0.8	0.0	6.3
0	0	33.3	4.1	0.0	27.5
0	0	25.0	0.1	0.0	0.5
0	0	25.0	1.3	0.0	14.5
0	0	25.0	1.6	0.0	18.5
0	0	25.0	2.2	0.0	12.0
0	0	25.0	2.5	0.0	27.5
0	0	16.7	0.0	0.0	0.3
0	0	16.7	0.0	0.0	0.3
0	0	16.7	0.1	0.0	0.5
0	0	16.7	0.1	0.0	0.8
0	0	16.7	0.2	0.0	2.3
0	0	16.7	0.3	0.0	2.5
0	0.5	16.7	0.5	0.0	5.5
0	0	16.7	0.5	0.0	6.3
0	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3
0	0.3	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3
0.3	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3

0	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.3
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.0	0.0	0.5
0	0	8.3	0.1	0.0	0.8
0	0	8.3	0.1	0.0	0.8
0	0	8.3	0.1	0.0	0.8
0	0	8.3	0.1	0.0	0.8
0	0	8.3	0.1	0.0	1.0
0	0	8.3	0.1	0.0	1.3
0	1.5	8.3	0.1	0.0	1.5
0	0	8.3	0.2	0.0	2.3
0	0	8.3	0.2	0.0	2.5
0	0	8.3	0.2	0.0	2.8
0	0	8.3	0.5	0.0	5.8
0	0	8.3	0.6	0.0	6.8
0	0	8.3	0.6	0.0	7.5
0	0	8.3	0.9	0.0	11.3
0	0	8.3	1.7	0.0	20.0
0	0	8.3	1.8	0.0	21.3
101	99.75	100.0	101.9	99.3	105.5

9. *Leymus triticoides* Association (a)

Plot number	8	14	15	23	26	28	29	30	44	53	66	72	73	74	78
Leymus triticoides	51.3	58.8	56.3	37.5	55.0	65.0	63.8	81.3	51.3	88.8	75.0	68.8	21.3	10.0	18.3
Bare/ litter	40.0	37.5	19.5	27.5	2.8	11.0	2.5	11.8	33.8	8.3	16.3	18.8	13.8	12.3	5.3
Thlaspi arvense	0.8	0	0.3	0	1.3	3.5	4.3	1.5	0	0	3.8	3.0	6.3	9.0	40.0
Juncus balticus	6.0	1.8	2.5	25.0	8.3	0	0	0	0	0	0	0	0	13.8	1.3
Alopecurus pratensis	0	4.8	2.5	8.8	1.3	0	0	0	5.0	0.3	0	1.5	0	0	0.8
Lepidium latifolium	0	0	0.8	1.8	0	1.8	3.3	5.8	1.3	0.8	0	0	0	0	4.5
Cirsium arvense	0	0	2.5	1.0	5.8	10.8	0	0	0	0	0.5	0	0	2.8	1.3
Lactuca serriola	1.0	0	6.5	0	3.5	0	0	0	0	0	0	0	0	0.5	0.3
Hordeum brachyantherum	0	0	0	0	2.5	0	24.5	0.8	1.0	1.3	0	5.8	0	0	7.8
Carex nebrascensis	0	0	9.5	0	1.0	0	0	0	0	0	0	0	58.8	46.3	2.0
Galium aparine	0	0	0	0	10.5	0	0	0	0	0	0	0	1.8	0.3	6.3
Agoseris cf. glauca var. glauca	0	0	0	0	1.5	0.5	0	0	0	0	0	0	0	1.0	2.8
Eleocharis palustris	0	0	0	0	0	0	0	0	3.3	0	0	0	0	0	0
Epilobium brachycarpum	0	0	0	0	1.0	0	0.3	0	0	0	0	0	0	0	0
Descurainia pinnata	0	0	0	0	0	0	0	0	0	0	5.8	0	0	0	9.3
Carex aquatilis var. aquatilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex pellita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha canadensis	0	0	0	2.5	0	0	0	0	0	0	0	0	0	0	0
Poa pratensis	0	0	0	0	0.3	1.0	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0
Carex praegracilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla gracilis	0	0	0	0	4.5	0	0	0	0	0	0	0	0	0	0
Cardamine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tragopogon dubius	0	0	0	0	0	3.5	0	0	0	0	0	0	0	0	0
Phalaris arundinacea	0	0	0	0	0	0	0	0	3.0	0	0	0	0	0	0
Barbarea vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	0
Vicia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apera interrupta	0	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0
Moss	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0	0
Persicaria amphibia	0	0	0	0	0	1.0	0	0	0	0	0	0	0	0	0
Plagiobothrys salsus	0	0	0	0	0	0	1.0	0	0	0	0	0	0	0	0
Epilobium	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0
Potentilla biennis	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0

Pyrrocoma racemosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex athrostachya	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0
Geum aleppicum	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
Polygonum ramosissimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Rumex crispus	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0
Senecio hydrophilus	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
Sparganium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
Veronica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barbarea orthoceras	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0
Bromus tectorum	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium rubrum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3
Penstemon rydbergii var. oreocharis	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0
Senecio integerrimus	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0
Trifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha latifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Veronica anagallis-aquatica	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0
TOTAL COVER	99.25	102.8	100.8	106.3	101.5	99.3	99.75	101	98.75	99.5	101.3	97.75	101.8	98.8	100.3

Leymus triticoides Association (b)

102	104	105	Freq	Percent cover		
				Ave	Min	Max
29.5	52.5	6.5	100.0	49.5	6.5	88.8
45.0	12.0	27.5	100.0	19.2	2.5	45.0
3.5	1.3	0	72.2	4.3	0.0	40.0
1.3	16.3	57.5	55.6	7.4	0.0	57.5
0	1.0	0	50.0	1.4	0.0	8.8
2.5	0	0	50.0	1.2	0.0	5.8
0.3	0	0	44.4	1.4	0.0	10.8
0.8	0.5	0.3	44.4	0.7	0.0	6.5
0	0	0	38.9	2.4	0.0	24.5
0	0	0	27.8	6.5	0.0	58.8
0	0	0	22.2	1.0	0.0	10.5
0	0	0	22.2	0.3	0.0	2.8
0	0.5	1.3	16.7	0.3	0.0	3.3
0	0.5	0	16.7	0.1	0.0	1.0
0	0	0	11.1	0.8	0.0	9.3
0	3.8	2.3	11.1	0.3	0.0	3.8
0	3.5	1.3	11.1	0.3	0.0	3.5
0	0.8	0	11.1	0.2	0.0	2.5
0	0	0	11.1	0.1	0.0	1.0
0	0.3	0	11.1	0.0	0.0	0.3
14.3	0	0	5.6	0.8	0.0	14.3
0	0	0	5.6	0.3	0.0	4.5
0	4.0	0	5.6	0.2	0.0	4.0
0	0	0	5.6	0.2	0.0	3.5
0	0	0	5.6	0.2	0.0	3.0
0	0	0	5.6	0.1	0.0	2.5
2.3	0	0	5.6	0.1	0.0	2.3
0	0	0	5.6	0.1	0.0	1.3
0	0	0	5.6	0.1	0.0	1.3
0	0	0	5.6	0.1	0.0	1.0
0	0	0	5.6	0.1	0.0	1.0
0	0	0	5.6	0.0	0.0	0.8
0	0	0	5.6	0.0	0.0	0.8

0.8	0	0	5.6	0.0	0.0	0.8
0	0	0	5.6	0.0	0.0	0.5
0	0	0	5.6	0.0	0.0	0.5
0	0	0	5.6	0.0	0.0	0.5
0	0	0	5.6	0.0	0.0	0.5
0	0	0	5.6	0.0	0.0	0.5
0	0.5	0	5.6	0.0	0.0	0.5
0	0	0	5.6	0.0	0.0	0.5
0	0.5	0	5.6	0.0	0.0	0.5
0	0	0	5.6	0.0	0.0	0.3
0	0	0	5.6	0.0	0.0	0.3
0	0	0	5.6	0.0	0.0	0.3
0	0	0	5.6	0.0	0.0	0.3
0	0	0	5.6	0.0	0.0	0.3
0.3	0	0	5.6	0.0	0.0	0.3
0	0.3	0	5.6	0.0	0.0	0.3
0	0	0	5.6	0.0	0.0	0.3
100.3	98	96.5	100.0	100.2	96.5	106.3

10. *Phalaris arundinacea* Association (a)

Plot number	21	31	32	43	45	46	47	51	60	61	62	63	67	68	71
Phalaris arundinacea	35.0	88.3	83.8	76.3	58.8	32.5	42.5	87.5	76.3	77.5	52.5	61.3	93.8	78.8	38.8
Bare/ litter	32.5	1.3	16.3	22.5	32.5	67.5	57.5	11.8	23.8	22.5	47.5	36.3	6.0	4.5	15.0
Eleocharis palustris	1.3	3.5	0	0	1.0	0	0	0	0	0	0	0	0	0	0
Thlaspi arvense	0	0	0.5	0	0	0	0	0	0.3	0	0	0	0.8	0	24.5
Alopecurus pratensis	28.8	7.5	0	0	0.3	0	0	0	0	0	0	0	0	0	0
Veronica	0	0	0	0	1.8	0	0	0	0	0	0	0	0	0	0
Veronica anagallis-aquatica	2.0	0.3	0	0	0	0	0	0	0	0	0	2.5	0	0	0
Hordeum jubatum	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.0
Hordeum brachyantherum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19.3
Agrostis	0	0	0	0	6.3	0	0	0	0	0	0	0	0	0	0
Carex pellita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beckmannia syzigachne	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidium latifolium	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alisma triviale	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodium rubrum	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0.3
Juncus balticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex athrostachya	0	0	0	0	0	0	0	0	0	0	0	0	0	16.3	0
Myosotis laxa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Callitriche heterophylla	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Persicaria amphibia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Typha angustifolia	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0	0
Carex nebrascensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirsium arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Descurainia pinnata	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0
Epilobium brachycarpum	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Lactuca serriola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Polygonum ramosissimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Polypogon monspeliensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rumex	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0
Sparganium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex sheldonii	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0
Downingia bicornuta	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mentha canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Poaceae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ranunculus aquatilis	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sparganium emersum	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL COVER	104.5	100.8	101.3	100	100.8	100	100	99.25	100.3	100	100	100.5	100.5	100	101.3

Phalaris arundinacea Association (b)

75	107	125	131	Freq	Percent cover		
					Ave	Min	Max
83.8	50.0	21.3	72.5	100.0	63.7	21.3	93.8
16.3	47.5	4.0	27.5	100.0	25.9	1.3	67.5
0	0.3	33.0	0	26.3	2.1	0.0	33.0
0.3	0	0	0	26.3	1.4	0.0	24.5
0	0	0.8	0	21.1	2.0	0.0	28.8
0	2.5	0.5	0	15.8	0.3	0.0	2.5
0	0	0	0	15.8	0.3	0.0	2.5
0	0	0.3	0	15.8	0.2	0.0	2.0
0	0	2.0	0	10.5	1.1	0.0	19.3
0	0	0.5	0	10.5	0.4	0.0	6.3
0	0	2.0	0.3	10.5	0.1	0.0	2.0
0	0	0.5	0	10.5	0.1	0.0	0.5
0	0.3	0	0	10.5	0.1	0.0	0.8
0	0.3	0	0	10.5	0.0	0.0	0.5
0	0	0	0	10.5	0.0	0.0	0.3
0	0	16.8	0	5.3	0.9	0.0	16.8
0	0	0	0	5.3	0.9	0.0	16.3
0	0	14.5	0	5.3	0.8	0.0	14.5
0	0	0	0	5.3	0.1	0.0	1.5
0	0	1.3	0	5.3	0.1	0.0	1.3
0	0	0	0	5.3	0.1	0.0	1.3
0	0	0.5	0	5.3	0.0	0.0	0.5
0	0	0	0	5.3	0.0	0.0	0.5
0	0	0	0	5.3	0.0	0.0	0.5
0	0	0	0	5.3	0.0	0.0	0.5
0	0	0	0	5.3	0.0	0.0	0.5
0	0	0	0	5.3	0.0	0.0	0.5
0	0	0.5	0	5.3	0.0	0.0	0.5
0	0	0	0	5.3	0.0	0.0	0.5
0	0.5	0	0	5.3	0.0	0.0	0.5
0	0	0	0	5.3	0.0	0.0	0.3
0	0	0	0	5.3	0.0	0.0	0.3
0	0	0.3	0	5.3	0.0	0.0	0.3

0	0	0.3	0	5.3	0.0	0.0	0.3
0	0	0	0	5.3	0.0	0.0	0.3
0	0	0	0	5.3	0.0	0.0	0.3
100.3	101.3	98.8	100.3	100.0	100.5	98.8	104.5

11. *Sparganium eurycarpum* Association

Plot number	106	116	122	124	Freq	Percent cover		
						Ave	Min	Max
Bare/ litter	60.0	63.8	18.8	38.3	100.0	45.2	18.8	63.8
Sparganium eurycarpum	10.3	30.0	57.5	12.5	100.0	27.6	10.3	57.5
Eleocharis palustris	0	3.5	20.3	19.3	75.0	10.8	0.0	20.3
Schoenoplectus acutus	18.3	0	0	0.3	50.0	4.6	0.0	18.3
Alisma triviale	0.5	0.8	0	0	50.0	0.3	0.0	0.8
Cirsium arvense	0.5	0	0.5	0	50.0	0.3	0.0	0.5
Ranunculus aquatilis	0.5	0.3	0	0	50.0	0.2	0.0	0.5
Beckmannia syzigachne	0	0.3	0	0	25.0	0.1	0.0	0.3
Typha latifolia	0	0	0	21.3	25.0	5.3	0.0	21.3
Myosotis laxa	0	0	0	6.3	25.0	1.6	0.0	6.3
Veronica catenata	6.3	0	0	0	25.0	1.6	0.0	6.3
Ranunculus gmelinii	1.8	0	0	0	25.0	0.4	0.0	1.8
Alopecurus pratensis	0	1.5	0	0	25.0	0.4	0.0	1.5
Carex sheldonii	0	0	0	1.3	25.0	0.3	0.0	1.3
Lepidium latifolium	0	0	1.3	0	25.0	0.3	0.0	1.3
Persicaria amphibia	0.8	0	0	0	25.0	0.2	0.0	0.8
Phleum pratense	0	0	0.5	0	25.0	0.1	0.0	0.5
Callitriche	0.3	0	0	0	25.0	0.1	0.0	0.3
Chenopodium rubrum	0	0	0.3	0	25.0	0.1	0.0	0.3
Hordeum jubatum	0	0	0.3	0	25.0	0.1	0.0	0.3
Sagittaria latifolia	0	0.3	0	0	25.0	0.1	0.0	0.3
Unknown	0	0.3	0	0	25.0	0.1	0.0	0.3
TOTAL COVER	99.0	100.5	99.3	99.0	100.0	99.4	99.0	100.5