

Changes in vegetation at Lawrence Memorial Grasslands Preserve from 1993-2008

Adrien Elseroad and Nathan Emery
The Nature Conservancy
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Introduction

The Lawrence Memorial Grasslands is a 380-acre preserve located on the Shaniko Plateau in southern Wasco County, Oregon. The Nature Conservancy acquired this property in 1974 to protect a high quality example of the Columbia Basin mounded prairie grassland. In 1993, a monitoring program was established to track changes in plant community composition in major community types and document the spread of non-native species on the preserve (Soll 1993). Results from 1993, 1994, and 2000 monitoring efforts were summarized in Soll (1993) and Berry et al. (2000). The purpose of this report is to document the 2008 monitoring effort and summarize the changes in plant community composition that occurred over the last fifteen years.

Methods

Vegetation sampling

Vegetation monitoring macroplots are located within mound, intermound, ravine head and sidewall, and ravine bottom plant communities (Soll 1993; Figure 1). In mounds and intermounds, there are four 100m x 50m macroplots (macroplots 1, 2, 3, and 4). Within each mound/intermound macroplot, 100 nested frequency quadrats are sampled on the mounds and 100 nested frequency quadrats are sampled on the intermounds. In ravine head and sidewalls, there are four macroplots (macroplots 5, 6, 7, and 8) and 100 nested frequency quadrats are sampled in each macroplot, but the size of the macroplots varies (macroplot 5 is 100m x 20m, macroplot 6 is 100m x 50m, macroplot 7 is 100m x 20m, and macroplot 8 is 50m x 50m). In ravine bottoms, there are 3 macroplots (macroplot 10, 11 and 12), each consisting of one linear transect. Macroplot 10 consisted of 45 nested frequency quadrats sampled along a 45m-long transect, macroplot 11 consisted of 50 nested frequency quadrats sampled along a 50m-long transect, and macroplot 12 consisted of 10 nested frequency quadrats sampled along a 10m-long transect. At each macroplot, the two ends of the baseline transects are marked with a 4' piece of 3/8" rebar. Aluminum tags affixed to the rebar identifies whether the rebar marks the origin or the end of the baseline transect, and gives compass direction (not corrected for declination) to other rebar. Detailed plot setup and sampling information is provided in Table 1.

In 2008, we followed the methods described in Soll (1994). However, information about transect layout was not provided for several of the macroplots. For macroplots 4, 5, 7, and 8, information about which direction the side transects were placed in relation to the baseline transect was not provided. We attempted to place the side transects in the direction that matched the description of the vegetation provided in Soll (1994) (see Table 1), but we could not be certain that we sampled the same area that was sampled in previous years. For macroplots 4 and 5, we placed the side transects to the northeast of the baseline transect because that direction seemed to most closely match the description of the vegetation provided in Soll (1994). For macroplot 7, we placed the side transects uphill of the baseline transect, because running transects downhill would have required crossing a fence. For macroplot 8, we placed the side transects downhill of the baseline transect, because if transects had been run uphill, mound/intermound vegetation would have been sampled rather than ravine vegetation. There was also

incomplete information about the location of the ravine bottom transects. Soll (1994) stated that there are four ravine bottom transects, however in a map from 1993 showing plot locations, only three are shown. Also, Soll (1994) refers to one of the ravine bottom macroplots as macroplot 9, but the tag on the rebar at that location states that it is macroplot 12 (it is also labeled as macroplot 12 on the 1993 map), so in our data we referred to this macroplot as macroplot 12. For macroplot 11, we were unable to find rebar marking this plot in the location described in Soll (1994), but did find a metal post marked with "Transect 16". For macroplot 11, we sampled from this post downslope for 50m (at 232°), placing quadrats every meter, on alternate sides of the tape. After vegetation monitoring was completed, we found a GIS layer from 2000 showing plot locations, and confirmed that where we sampled macroplot 11 was very close to where it was sampled in the past.

In 2008, Adrien Elseroad and Nathan Emery collected data from June 10-16 using Smartlist to Go electronic datasheets loaded on Palm handheld computers. Species frequencies were scored based on the smallest nested plot size within which it was rooted. Species were recorded as "1" if present in the 0.01 m² plot size, "2" if present in the 0.1 m² plot size, and "3" if present in the 1 m² plot size. We recorded the presence of all species in each quadrat, with the exception of *Holosteum umbellatum* and *Draba verna*. These early season annual forbs were mostly dried up and difficult to detect during sampling. In contrast, in 2000 the only annual forbs recorded were the non-native *Tragopogon dubius* and *Lactuca serriola* (Berry et al. 2000). In 2008, unknown species were collected and keyed using Hitchcock and Cronquist's (1973) Flora of the Pacific Northwest.

In addition to the plant data, at each macroplot (with the exception of the ravine bottom plots due to loss of battery power) we used a Trimble Juno to collect GPS points of the rebar marking each end of the baseline transect (Table 2). We obtained locations of ravine bottom macroplots from a 2000 GIS layer and added them to this table after vegetation monitoring was completed.

Data analysis

In order to compare data collected in 2008 with data collected in previous years, several species were combined for analysis. Species previously recorded as *Poa scabrella*, *Poa juncifolia*, *Poa nevadensis*, Poa1, and POXX were combined to *Poa secunda*. *Poa scabrella*, *Poa juncifolia*, and *Poa nevadensis* are no longer considered separate species and are now all called *Poa secunda* (USDA 2008). Poa1 and POXX were assumed to part of the same species complex. *Juncus brachyphyllus* (recorded in 1993 and 2000) and *Juncus confusus* (recorded in 2008), found in ravine bottom plots, were combined to *Juncus* spp1. Since these two species are very similar in appearance, we assumed that one of these was misidentified during sampling. *Alyssum desertorum* (recorded in 1993) and *Alyssum alyssoides* (recorded in 2008), also found in ravine bottom plots, were combined to *Alyssum* spp. These two species are very similar in appearance and we also assumed that one of these was misidentified during sampling.

Frequency values by species and plant guild were calculated separately for each mound, intermound, and ravine head and sidewall macroplot using The Nature Conservancy's Nested Frequency Data Management and Analysis Workbook (The Nature Conservancy 2000). Ravine bottom macroplots were combined for analysis. Changes in frequency between 1993, 1994 (excluding ravine bottoms because data were not collected in 1994), 2000, and 2008 within each plant community type were calculated for dominant native grasses, shrubs, the non-native annual grasses *Bromus tectorum* and *Taeniatherum caput-medusae*, and native perennial forb and native annual (combined with biennial) forb plant guilds in the best-fit quadrat size. The best-fit quadrat size is that for which the average frequency over all macroplots is closest to 50%.

Results

Data limitations

Our interpretation of 1993-2008 monitoring results assumes that we sampled the same areas in 2008 that were sampled in previous years. However, because we lacked information about transect layout for some of the macroplots, as previously described, it is possible that some of the changes in vegetation we describe below are a result of sampling different locations rather than actual changes over time. Also, in 2008 we experienced difficulties distinguishing among some of the *Lomatium* species. Differences in *Lomatium* species frequencies between 2008 and previous years that are shown in the tables at the end of this report are probably at least partially due to misidentification rather than actual changes among individual species. However, in spite of these data limitations, 2008 results provide important information about the current plant species composition at Lawrence Memorial Grasslands Preserve and provide a baseline for detecting future changes.

Mound plots

Native perennial grasses- *Agropyron spicatum* and *Festuca idahoensis* frequencies fluctuated over the four sampling periods, but there were no consistent trends over time (Figure 2a). *Poa secunda* in 0.1m² quadrats declined from 59-66% in 1993-1994 to 49% in 2000 and 35% in 2008.

Native perennial forbs- Native perennial forb frequencies fluctuated over time, and although values were lower in 2008 than in 1993 and 2000, they were similar to 1994 levels (Figure 2b). Dominant native perennial forbs in all years included *Lomatium* spp., *Achillea millefolium*, and *Calochortus macrocarpa* (Table 3).

Native annual forbs- Native annual forbs declined over time, from 93% in 1993 to 56% in 1994, and to 35% in 2008 in 0.1m² quadrats (Figure 2b). Native annual forbs were not recorded in 2000. Declines were largely due to *Microsteris gracilis* and *Montia linearis* (Table 3).

Shrubs- *Artemesia rigida* frequencies fluctuated from an average of 18-23% frequency in 1m² quadrats, with no consistent trends over time (Figure 2c).

Non-native annual grasses- *Bromus tectorum* frequencies increased substantially in 2000, but in 2008, values were close to 1993-1994 levels and averaged 46% in 1m² quadrats (Figure 2d). *Taeniatherum caput-medusae* increased over time, from 3% in 1993 and 0.25% in 1994, to 8% in 2000 and 10% in 2008 in 1m² quadrats.

Intermound plots

Native perennial grasses- *Agropyron spicatum*, *Festuca idahoensis*, and *Poa secunda* frequencies fluctuated over the four sampling periods, but there were no consistent trends over time (Figure 3a). *Elymus elymoides* declined from an average of 80-84% in 1m² quadrats from 1993-1994 to 53% in 2000 and 39% in 2008.

Native perennial forbs- Native perennial forbs decreased in 2008, from 38-49% in 0.01m² quadrats from 1993-2000 to 18% in 2008 (Figure 3b). Declines were largely due to declines in *Lithophragma bulbifera*, *Microseris troximoides*, and *Phlox hoodii* (Table 4).

Native annual forbs- Native annual forbs decreased in 2008, from an average of 75-84% in 0.1m² quadrats from 1993-1994 to 59% in 2008 (Figure 3b). Declines were largely due to *Microsteris gracilis* and *Collinsia parviflora* (Table 4). Native annual forbs were not recorded in 2000.

Shrubs- *Artemisia rigida* frequencies declined slightly, from 63-65% frequency in 1m² plots from 1993-1994, to 57% in 2000 and 56% in 2008 (Figure 3c).

Non-native annual grasses- *Bromus tectorum* increased substantially in 2000, from 18-20% frequency in 1m² quadrats in 1993-1994 to 46% in 2000, but then frequencies declined to 27% in 2008 (Figure 3d). *Taeniatherum caput-medusae* slowly increased over time, from only 0.25% frequency in 1993 to 11% in 2008 (Figure 3d). There was also a large increase in *Bromus mollis* in 2008, from a high of 5% in 1m² quadrats in 1994 to 24% in 2008 (Figure 3d).

Ravine head and sidewalls

Native perennial grasses- Frequencies of all three dominant native perennial grasses species were lower in 2008 than in previous years, but there was substantial variability among plots (Figure 4a). *Agropyron spicatum* in 0.1m² quadrats fluctuated between 53-55% in 1993, 1994, and 2000 and declined to 45% in 2008. *Festuca idahoensis* in 0.1m² quadrats fluctuated between 34-38% in 1993, 1994, and 2000 and declined to 25% in 2008. *Poa secunda* in 0.1m² quadrats fluctuated between 32-40% in 1993, 1994, and 2000 and declined to 21% in 2008.

Native perennial forbs- Native perennial forb frequencies were lower in 2008 than in 1993 and 2000, but were similar to 1994 levels (Figure 4b). Declines were largely due to declines in *Lithophragma bulbifera* and *Achillea millefolium* (Table 5).

Native annual forbs- Native annual forb frequencies in 2008 were lower in 2008 than 1993 but were similar to 1994 levels (Figure 4b). *Collomia linearis* and *Collinsia parviflora* were the dominant native annual forb species in all years. Native annual forbs were not recorded in 2000.

Non-native annual grasses- *Bromus tectorum* increased substantially in 2000, from 34-41% frequency in 0.01m² quadrats in 1993-1994 to 53% in 2000, but then frequencies declined to 40% in 2008 (Figure 4c). *Taeniatherum caput-medusae* slowly increased over time, from 2% frequency 1m² quadrats in 1993 to 15% in 2008 (Figure 4c). *Bromus mollis* declined in 2008, from 39% in 1m² quadrats in 1993, 50% in 1994, 51% in 2000, to 24% in 2008 (Figure 4c).

Ravine bottoms

Native perennial grasses- *Festuca idahoensis* and *Poa secunda* frequencies fluctuated over the three sampling periods, but there were no consistent trends over time (Figure 5a).

Native perennial forbs- Native perennial forb frequencies in 2008 were similar to 1993 and 2000 levels (Figure 5b). *Achillea millefolium* and *Camassia quamash* and *Delphinium burkei* were the dominant native perennial forb species in all years.

Native annual forbs- Native annual forb frequencies in 2008 were slightly lower than in 1993 (Figure 5b). *Madia gracilis* and *Plectritis macrocera* were the dominant native annual forb species in both years. Native annual forbs were not recorded in 2000.

Non-native annual grasses- *Bromus tectorum* decreased substantially in 2000, from 55% frequency in 1m² quadrats in 1993 to 19% in 2000, but then frequencies increased to 39% in 2008 (Figure 5c). *Taeniatherum caput-medusae* increased over time, from 5% frequency 1m² quadrats in 1993 to 10% in 2000 and 38% in 2008 (Figure 5c). *Bromus mollis* increased between 1993 and 2000, but then decreased to 53% in 0.1m² quadrats in 2008 (Figure 5c).

Other non-native species- In addition to the non-native annual grasses, several other non-native species were common on ravine bottom plots. *Phleum pretense* and *Poa pratensis*, both non-native perennial grasses, and *Taraxacum officinale*, a non-native perennial forb, increased substantially between 1993 and 2000, but all declined to near or below 1993 levels by 2008 (Figure 5d). Frequency of *Lactuca serriola*, a non-native annual forb, was 50% in 1m² quadrats in 1993, but declined in later years, to 23% in 2000 and 29% in 2008 (Figure 5d).

Discussion

Over the last 15 years, there were only a few consistent changes in plant species frequencies in vegetation macroplots at Lawrence Memorial Grasslands Preserve. Most native species fluctuated in frequency over time without a consistent upward or downward trend. The few species that exhibited a downward trend included *Poa secunda* and native annual forbs in mound plots, and *Elymus elymoides* and native perennial forbs in intermound plots, but none of these declines in frequency were greater than 20%.

Of more concern than the changes in native species frequencies was the consistent increase in the non-native annual grass *Taeniatherum caput-medusae*. In contrast to the other non-native annual grasses present in macroplots (*Bromus tectorum* and *Bromus mollis*), which fluctuated in frequency over time, frequencies of *Taeniatherum caput-medusae* consistently increased in all macroplots. Frequencies averaged across all macroplots were 14% in 1m² quadrats in 2008, up from 2% in 1993. It is difficult to predict whether this species will continue to increase, or even what level of abundance poses a threat to native species. However, even small increases are concerning because *Taeniatherum caput-medusae* is an aggressive invasive that can alter fire regimes, displace native species, and form monocultures. The fact that it has continued to increase in the absence of any major disturbance in areas that are in relatively high ecological condition suggests that active control efforts will be needed to prevent further increases. Previous attempts to develop control methods for *Taeniatherum caput-medusae* at Lawrence Memorial Grasslands Preserve (Berry et al. 2000) may be worth revisiting.

Management recommendations

- 1) Develop an action plan to prevent further increases in *Taeniatherum caput-medusae*.
- 2) Continue periodic monitoring of *Taeniatherum caput-medusae* in macroplots to determine whether increases continue. Monitoring that is scaled back to record only the presence of *Taeniatherum caput-medusae* and other annual grasses could be completed in just a few days.

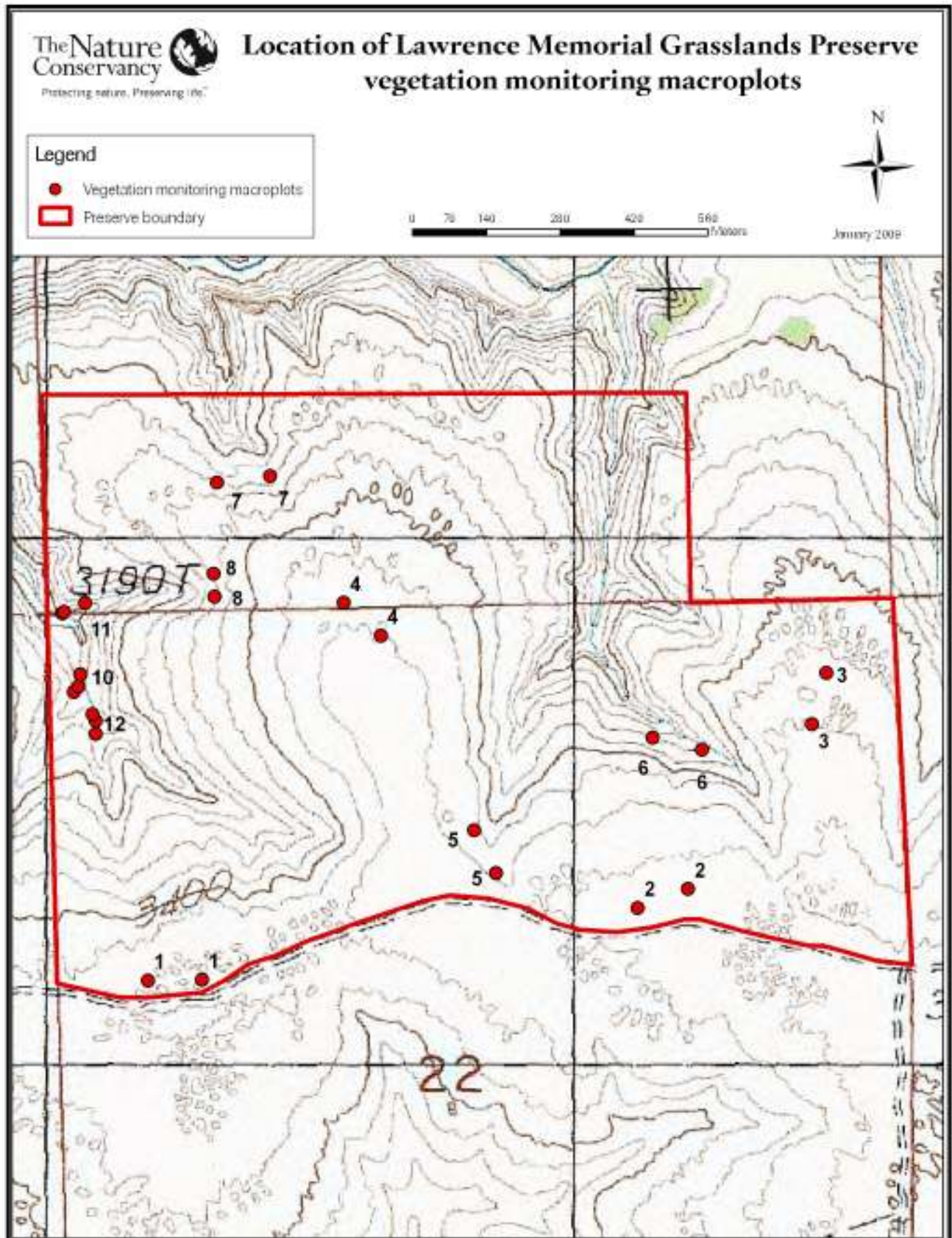
Literature cited

Berry, M, B. Youtie, and N. Rudd. 2000. Vegetation Monitoring and Non-native Species Management: Lawrence Memorial Grassland Preserve Annual Report, 2000. Unpublished report. The Nature Conservancy.

Soll, J. and B. Youtie 1993. Lawrence Memorial Grasslands Preserve Vegetation Monitoring and Analysis. Unpublished report. The Nature Conservancy.

Soll, J. 1994. Notes on sampling/monitoring procedures at Lawrence Memorial Grasslands (Filename: NOTES94.doc). Unpublished report. The Nature Conservancy.

Figure 1.



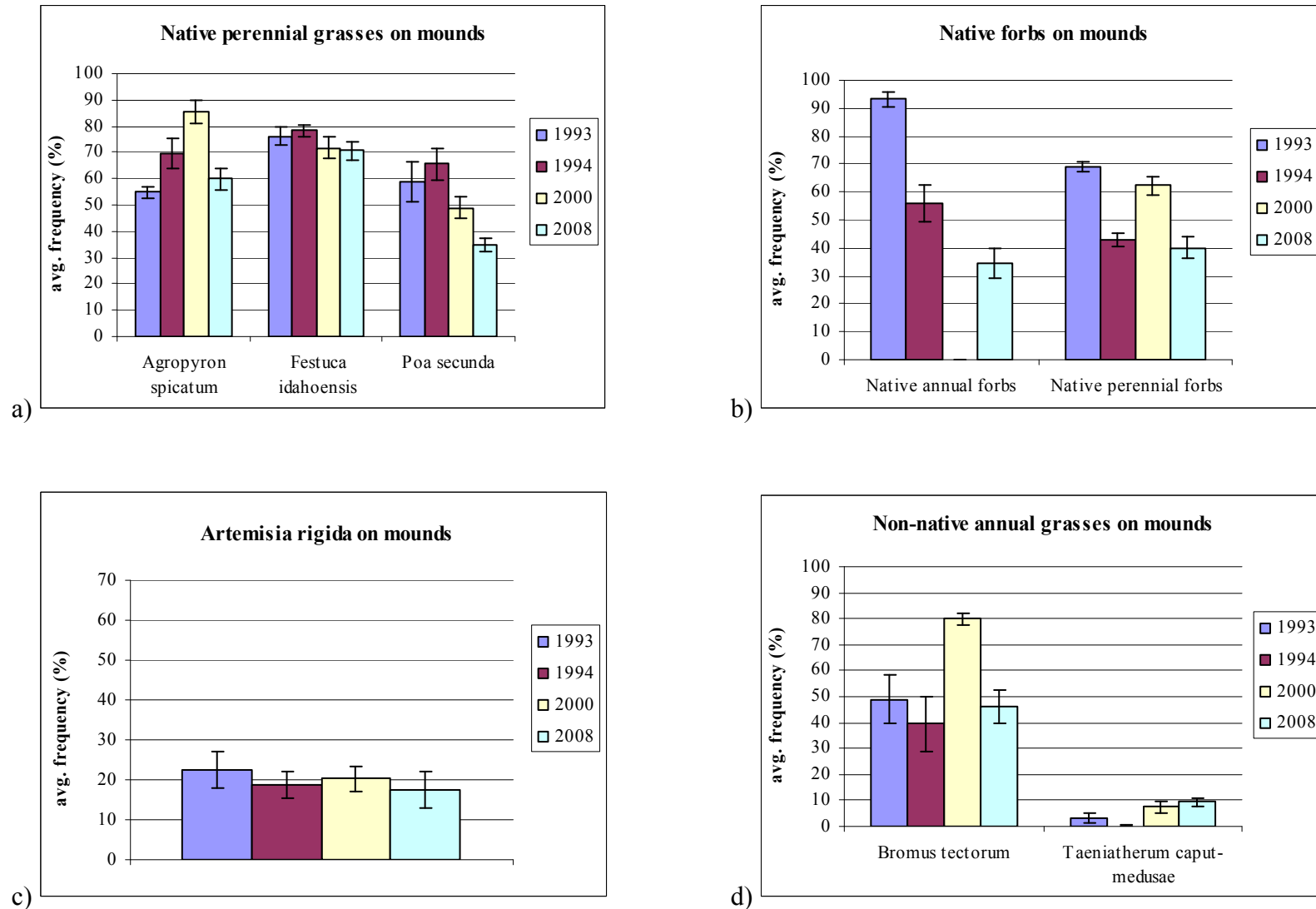


Figure 2. Average frequency (\pm SE) of a) dominant native perennial grasses (in 1m² quadrats for *Agropyron spicatum*, and 0.1m² quadrats for *Festuca idahoensis* and *Poa secunda*); b) native forb guilds (in 0.1m² quadrats); c) *Artemisia rigida* (in 1m² quadrats); and d) dominant non-native annual grasses (in 1m² quadrats) on mound plots at Lawrence Memorial Grasslands Preserve (n=4).

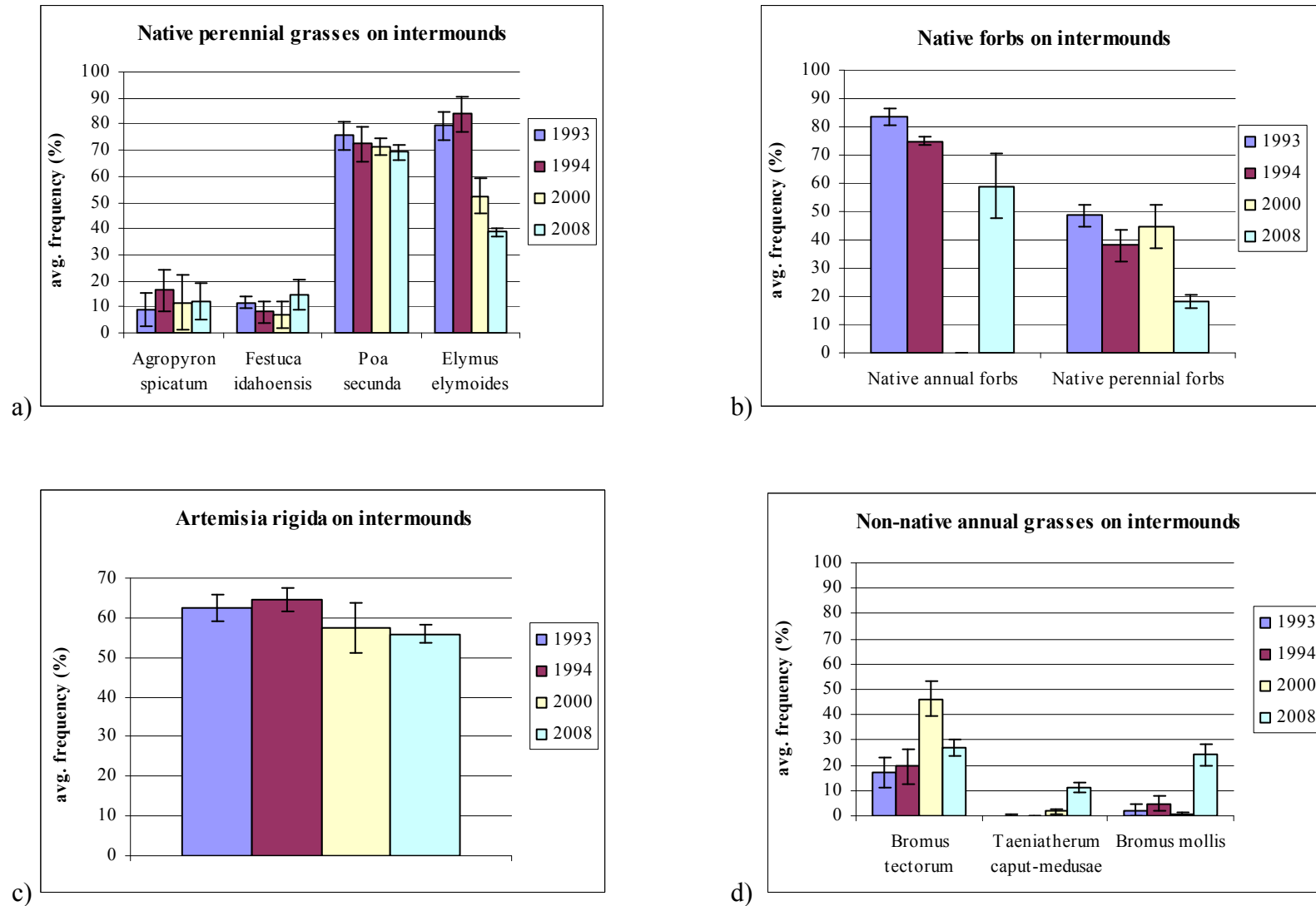


Figure 3. Average frequency (\pm SE) of a) dominant native perennial grasses (in 1m^2 quadrats for all species except 0.01m^2 quadrats for *Poa secunda*); b) native forb guilds (in 0.1m^2 quadrats for annuals and 0.01m^2 quadrats for perennials); c) *Artemisia rigida* (in 1m^2 quadrats); and d) dominant non-native annual grasses (in 1m^2 quadrats) on intermound plots at Lawrence Memorial Grasslands Preserve (n=4).

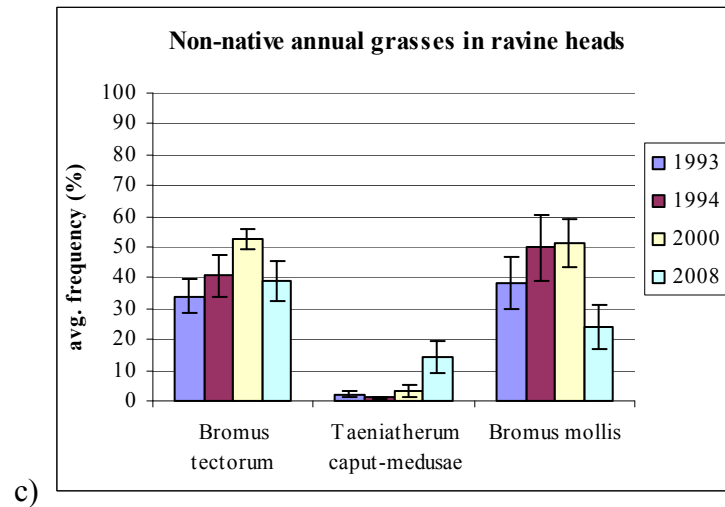
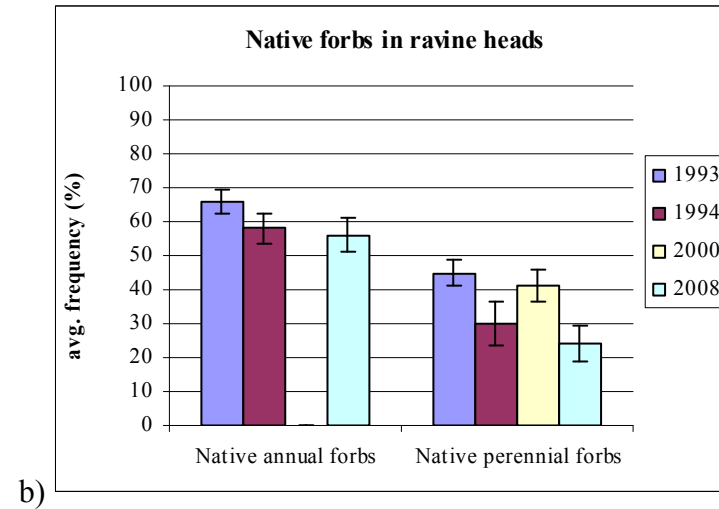
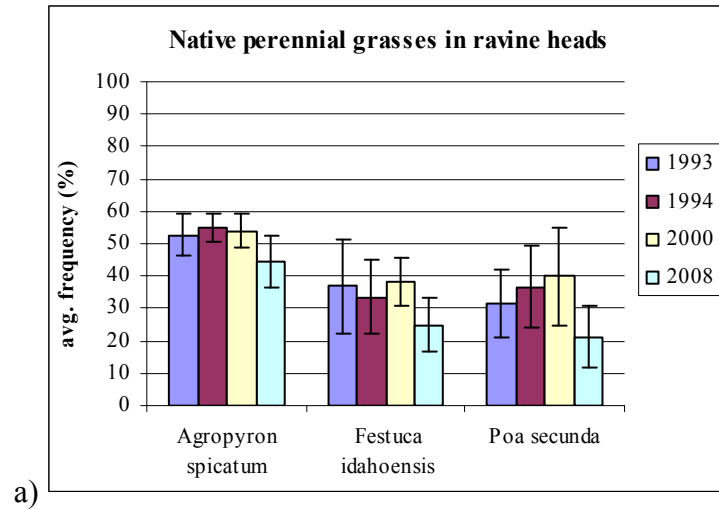


Figure 4. Average frequency (\pm SE) of a) dominant native perennial grasses (in 0.1m^2 quadrats); b) native forb guilds (in 0.01m^2 quadrats); and c) dominant non-native annual grasses (in 0.01m^2 quadrats for *Bromus tectorum*, and 1m^2 quadrats for *Taeniatherum caput-medusae* and *Bromus mollis*) on ravine head and sidewall plots at Lawrence Memorial Grasslands Preserve ($n=4$).

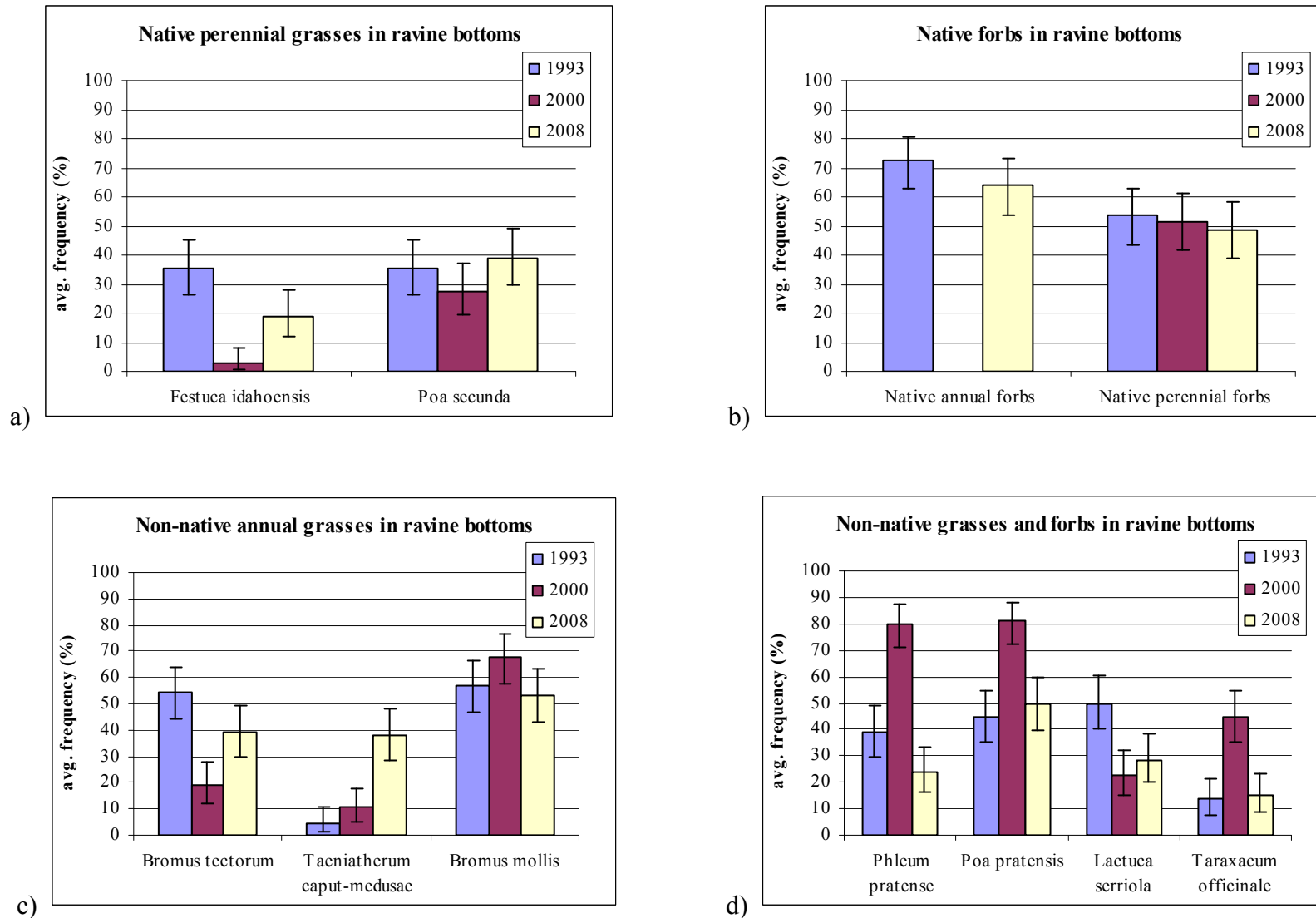


Figure 5. Average frequency (\pm 95% confidence interval) of a) dominant native perennial grasses (in 1m² quadrats); b) native forb guilds (in 0.01m² quadrats); c) dominant non-native annual grasses (in 1m² quadrats for *Bromus tectorum* and *Taeniatherum caput-medusae* and 0.1m² quadrats for *Bromus mollis*); and d) dominant non-native perennial grasses and annual forbs (in 1m² quadrats) on ravine bottom plots at Lawrence Memorial Grasslands Preserve (n=1).

Table 2. Macroplot setup and sampling information for Lawrence Memorial Grasslands Preserve. Modified from Soll (1994).

Macro-plot	Plant community	Baseline transect layout	Side transect layout	Quadrat placement along side transects	Location description	Sampling notes
1	Mound/ Intermound	Transect end is 100m and 260° from origin (parallel to fence).	Transects are 50m long, oriented north of baseline. Place 10 transects* perpendicular to baseline, after random start between 0m and 10m on baseline.	Place quadrats every 2m on mounds and every 3m on intermounds, alternating sides of transect, after random start between 0m and 1m. Need 100 mound and 100 intermound quadrats total.	Located just inside the stile. As you go over the stile, go about 10m and just to the left.	
2	Mound/ Intermound	Transect end is 100m and northeast from origin.	Transects are 50m long, oriented north of baseline. Place 10 transects* perpendicular to baseline, after random start between 0m and 10m on baseline.	Place quadrats every 2m on mounds and every 3m on intermounds, alternating sides of transect, after random start between 0m and 1m. Need 100 mound and 100 intermound quadrats total.	Located between the two main branches of the east ravine system. Find aerial photo-point #9 and look to the north, the end of the macroplot is nearby.	
3	Mound/ Intermound	Transect end is 100m and 180° from origin.	Transects are 50m long, oriented east of baseline. Place 10 transects* perpendicular to baseline, after random start between 0m and 10m on baseline.	Place quadrats every 2m on mounds and every 3m on intermounds, alternating sides of transect, after random start between 0m and 1m. Need 100 mound and 100 intermound quadrats total.	Located between the east fence and the large intermound area. From the lone juniper tree in that section of the preserve, near a single large <i>Artemisia tridentata</i> (most of the way to the corner), go about 75m at 227°. Northern half of area doesn't have much intermound, and the south half is dominated by intermounds. In south half, rock rings are pronounced. Many mounds have cheatgrass patches.	
4	Mound/ Intermound	Transect end is 100m and 114° from origin.	Transects are 50m long. In 2008, oriented northeast of baseline. Place 10 transects* perpendicular to baseline, after random start between 0m and 10m on baseline.	Place quadrats every 2.5m on mounds and every 2m on intermounds, alternating sides of transect, after random start between 0m and 1m. Need 100 mound and 100 intermound quadrats total.	Located on big plateau between the two ravine systems. Walk through narrow area between the ravines, contour to the left, then cross area with large rocks. From aerial photo-point 69 on top of large rock area go 150m at 12°. Baseline origin is next to a small juniper. Intermounds not distinct here, and rocks are much larger for the most part. AGSP and FEID are occasionally present in the intermound.	Avoid mound/ intermound transition. Few intermounds in the first 30m or so, but more the last 30m.
5	Ravine head/ sidewall	Transect end is 100m and 134° from origin (up canyon, towards the road).	Transects are 20m long. In 2008, oriented northeast of baseline. Place 10 transects perpendicular to baseline, after random start between 0m and 10m on baseline.	Place quadrats every 2m, alternating sides of transect, after random start between 0m and 1m. Need 100 quadrats total.	Located in head area of west fork of east ravine system. Park between the two ravine systems and follow fence to the west fork of the east ravine (it comes almost all the way to the fence). Follow big intermound area downhill to rebar (located ~150m from fence).	

6	Ravine head/sidewall	Transect end is 100m and 276° from origin (transect parallels the creek bed just above the rock ledges).	Transects are 50m long, oriented uphill of baseline. Place 10 transects perpendicular to baseline, after random start between 0m and 10m on baseline.	Place quadrats every 5m, on alternate sides of transect, after random start between 0m and 4m. Need 100 quadrats total.	Located in bigger of the two side canyons in east ravine system (furthest south). Baseline origin is just below patch of <i>Artemisia tridentata</i> and just downstream from patch of <i>Elymus cinereus</i> . Head up valley, staying out of creek bottom, and look for rock ledges. Many grasses here: <i>Koeleria cristata</i> , <i>Poa nevadensis</i> , <i>pratensis</i> and <i>scabrella</i> ; <i>Danthonia unispicata</i> and <i>californica</i> and <i>Phleum pratense</i> .	In 2008, combined the native Poas (<i>sandbergii</i> , <i>nevadensis</i> , <i>juncifolia</i> , and <i>scabrella</i>) to <i>Poa secunda</i> .
7	Ravine head/sidewall	Transect end is 100m and 76° from origin (just past where fence makes downhill turn).	Transects are 20m long. In 2008, oriented uphill of baseline. Place 10 transects perpendicular to baseline, after random start between 0m and 10m on baseline.	Place quadrats every 2m, on alternate sides of transect, after random start between 0m and 1m. Need 100 quadrats total.	Located in the head of the small ravine at the back of the preserve. Baseline transect origin is near the west corner of the strip of fence which cuts across the ravine.	
8	Ravine head/sidewall	Transect end is 50m along a contour.	Transects are 50m long. In 2008, oriented downhill of baseline. Place 5 transects perpendicular to baseline, after random start between 0m and 4m on baseline.	Place quadrats every 5m, on alternate sides of transect, after random start between 0m and 4m. Need 100 quadrats total.	Located near top of head of northern most side ravine in the west ravine system. There are no obvious landmarks, but origin located just below where mounds end near patch of balsamroot. Look for juniper clump on north side of ravine then head uphill and south a short distance. Macroplot rockier to north.	Don't sample from 45-50m along baseline, instead use random transect from 1m-40m.
10	Ravine bottom	Transect end is 45m upstream from origin.	No side transects	Place quadrats every meter along baseline, alternating sides of baseline. Need 45 quadrats total.	Located at the mouth of middle side branch of the west ravine. Baseline transect makes a small bend near the beginning to follow the creek bed.	
11	Ravine bottom	In 2008, metal post marked "Transect 16" used as origin. Ran baseline downslope 50m at 232°.	No side transects	Place quadrats every meter along baseline, alternating sides of baseline. Need 50 quadrats total.	Located in the main side branch of the west ravine just above the junction with the main ravine bottom.	
12	Ravine bottom	Transect end is 10m from origin.	No side transects	Place quadrats every meter along baseline, alternating sides of baseline. Need 10 quadrats total.	Located above and below the junction of the west branch of the west ravine with the main branch. Baseline transect makes a bend in the middle to follow the creek bed.	

* Additional side transects may be needed to end up with 100 mound and 100 intermound quadrats. Use random numbers to determine where to place additional transects along the baseline transect.

Table 2. GPS locations of vegetation monitoring macroplots at Lawrence Memorial Grasslands Preserve in NAD 1983 UTM Zone 10. Shown are locations of rebar marking each end of the baseline transect. Locations of plots 1-8 were collected in 2008, and locations of plots 10-12 collected in 2000.

Plot number	X	Y	Transect end
1	673205	4979361	0m
1	673102	4979359	100m
2	674030	4979497	0m
2	674125	4979533	100m
3	674388	4979943	0m
3	674361	4979846	100m
4	673473	4980076	0m
4	673544	4980014	100m
5	673720	4979644	0m
5	673761	4979563	100m
6	674152	4979797	0m
6	674059	4979820	100m
7	673233	4980304	0m
7	673334	4980317	50m
8	673228	4980088	0m
8	673227	4980131	50m
10	672962	4979907	0m
10	672971	4979917	middle
10	672974	4979941	45m
11	672939	4980056	50m
11	672943	4980058	middle
11	672983	4980076	0m
12	673003	4979828	0m
12	673003	4979852	middle
12	672997	4979864	10m

Table 3. Plant species and guild frequencies (%) in mound macroplots at Lawrence Memorial Grasslands Preserve from 1993-2008.

Scientific name	Quadrat size	Mound-1				Mound-2				Mound-3				Mound-4			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
<i>Achillea millefolium</i>	1.0m ²	33	40	65	48	35	42	36	33	53	42	73	49	58	58	81	55
<i>Agoseris grandiflora</i>	1.0m ²	0	0	3	0	0	0	1	0	0	0	5	0	0	2	5	0
<i>Agoseris heterophylla</i>	1.0m ²	27	14	0	7	12	7	0	10	12	14	0	9	5	8	0	19
<i>Agropyron interrupta</i>	1.0m ²	0	0	0	0	0	0	0	1	1	1	0	5	0	1	0	2
<i>Agropyron spicatum</i>	1.0m ²	49	56	85	54	57	83	95	67	53	68	73	52	60	71	89	67
<i>Allium acuminatum</i>	1.0m ²	1	0	1	1	12	0	13	8	9	1	8	3	1	0	1	1
<i>Allium macrum</i>	1.0m ²	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0
<i>Allium sp.</i>	1.0m ²	0	0	0	0	0	0	4	0	0	2	0	0	0	0	0	0
<i>Allium tolmiei</i>	1.0m ²	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Amsinckia lycopsoides</i>	1.0m ²	0	1	2	5	0	0	0	0	0	0	0	0	0	0	0	0
Annual Forb	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
<i>Antennaria dimorpha</i>	1.0m ²	24	28	7	1	9	8	0	0	10	18	2	2	9	6	4	1
<i>Arabis cusickii</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
<i>Artemisia rigida</i>	1.0m ²	35	28	19	25	24	17	29	24	15	16	14	15	16	14	19	6
<i>Balsamorhiza serrata</i>	1.0m ²	1	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0
<i>Blepharipappus scaber</i>	1.0m ²	10	0	0	0	8	3	0	0	14	13	0	0	0	5	0	0
BOXX	1.0m ²	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bromus mollis</i>	1.0m ²	0	0	0	2	0	0	0	0	0	0	0	6	2	1	0	5
<i>Bromus tectorum</i>	1.0m ²	37	35	79	34	30	17	74	39	69	68	85	64	60	38	82	47
<i>Calochortus macrocarpa</i>	1.0m ²	15	6	14	16	25	14	23	21	36	18	29	33	27	13	26	22
<i>Chrysothamnus nauseosus</i>	1.0m ²	0	0	3	1	0	0	0	0	3	4	0	2	5	4	4	3
<i>Chrysothamnus viscidiflora</i>	1.0m ²	0	0	2	1	0	0	1	0	4	4	10	5	8	2	4	5
<i>Collinsia parviflora</i>	0.1m ²	86	7	0	4	85	5	0	3	77	22	0	4	72	19	0	10
<i>Collomia linearis</i>	1.0m ²	16	0	0	5	0	0	0	0	1	0	0	0	0	0	0	2
<i>Collomia sp.</i>	1.0m ²	16	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
<i>Crepis atrabarbera</i>	1.0m ²	0	2	1	1	0	0	1	0	0	0	1	1	4	0	1	6
<i>Crepis intermedia</i>	1.0m ²	1	0	1	0	0	1	3	0	23	16	4	0	11	18	9	0
<i>Crepis modocensis</i>	1.0m ²	2	2	0	3	0	2	5	1	0	1	12	10	6	1	10	6
<i>Crepis sp.</i>	1.0m ²	3	4	2	0	0	3	7	0	23	18	17	0	21	19	20	0
<i>Crocidium multicaule</i>	1.0m ²	16	7	0	3	4	0	0	1	7	4	0	0	3	4	0	0
<i>Cryptantha intermedia</i>	1.0m ²	0	1	0	0	0	0	0	0	8	10	0	3	0	2	0	1
<i>Cryptantha sp.</i>	1.0m ²	8	0	0	1	16	0	0	0	18	0	0	0	1	0	0	0
<i>Descurainia pinnata</i>	1.0m ²	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0
<i>Draba verna</i>	0.1m ²	88	32	0	0	95	23	0	0	81	33	0	0	78	26	0	0
<i>Elymus elymoides</i>	1.0m ²	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Epilobium minutum</i>	1.0m ²	13	39	0	37	14	30	0	54	29	57	0	72	15	23	0	57
<i>Erigeron linearis</i>	1.0m ²	0	1	0	0	0	0	0	0	2	2	3	5	1	0	1	0

Table 3 (cont.)

Scientific name	Quadrat size	Mound-1				Mound-2				Mound-3				Mound-4			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
Eriogonum douglasii	1.0m ²	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0
Eriogonum heracleoides	1.0m ²	1	0	2	4	1	0	2	1	2	0	2	0	21	19	18	22
Eriogonum strictum	1.0m ²	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	0
Erodium cicutarium	1.0m ²	0	2	0	5	0	0	0	1	15	0	3	7	0	0	0	0
Festuca idahoensis	0.1m ²	84	80	74	76	71	77	78	75	69	73	59	61	81	83	76	71
Festuca microstachys	1.0m ²	33	36	19	23	37	35	43	31	29	39	13	21	18	20	3	14
Fritillaria pudica	1.0m ²	1	0	26	1	0	0	14	1	1	1	3	0	3	0	13	1
Galium aparine	1.0m ²	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	2
Holosteum umbellatum	0.1m ²	85	19	0	0	80	11	0	0	71	24	0	0	72	10	0	0
Juniperus occidentalis	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Lactuca serriola	1.0m ²	0	0	11	2	0	1	2	3	0	1	10	14	3	0	0	1
Lagophylla ramosissima	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Lithophragma bulbifera	1.0m ²	65	2	0	0	59	1	0	0	38	4	0	0	30	1	0	0
Lithophragma parviflora	1.0m ²	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	1
Lomatium cous	1.0m ²	12	10	19	2	0	0	2	3	10	7	5	7	3	2	3	0
Lomatium gormanii	1.0m ²	0	0	5	0	4	1	12	0	1	0	3	0	0	0	3	0
Lomatium leptocarpum	1.0m ²	1	0	0	50	9	4	9	53	2	1	0	49	0	0	0	47
Lomatium macrocarpum	1.0m ²	8	11	9	10	0	1	4	1	7	6	4	4	0	1	4	2
Lomatium minus	1.0m ²	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lomatium nudicaule	1.0m ²	1	0	2	0	1	0	0	0	0	1	1	0	0	2	8	3
Lomatium triternatum	0.1m ²	33	18	24	0	37	22	30	0	39	16	37	0	24	9	24	0
Lupinus caudatus	1.0m ²	24	11	10	1	3	4	3	0	17	26	18	8	35	24	28	15
Madia gracilis	1.0m ²	1	30	0	28	0	19	0	22	15	29	0	35	1	1	0	3
Microseris troximoides	1.0m ²	20	7	3	1	21	4	5	1	5	6	2	0	19	8	8	0
Microsteris gracilis	1.0m ²	35	63	0	0	65	69	0	0	44	42	0	3	47	37	0	0
Montia linearis	1.0m ²	11	2	0	0	76	13	0	0	46	10	0	0	0	25	0	7
Montia perfoliata	1.0m ²	0	0	0	1	1	0	0	17	1	0	0	9	47	0	0	17
Myosotis discolor	1.0m ²	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0
Nemophila pedunculata	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
Phlox hoodii	1.0m ²	1	4	2	0	2	0	0	0	0	0	0	0	1	2	0	1
Plectritis macrocera	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Poa bulbosa	1.0m ²	0	0	2	4	3	0	0	0	0	0	0	1	1	0	0	0
Poa secunda	0.1m ²	73	78	56	40	70	74	56	38	42	53	39	33	50	58	45	29
Polemonium micranthum	1.0m ²	1	0	0	0	24	0	0	0	19	0	0	0	43	0	0	0
Polygonum douglasii	1.0m ²	0	9	0	0	0	0	0	0	1	2	0	9	0	1	0	1
Rigiopappus leptocladus	1.0m ²	7	25	0	2	0	6	0	0	5	2	0	0	2	0	0	0
Rose spp.	1.0m ²	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Table 3 (cont.)

Scientific name	Quadrat size	Mound-1				Mound-2				Mound-3				Mound-4			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
<i>Sisymbrium altissimum</i>	1.0m ²	0	0	0	0	5	0	0	0	2	3	2	2	0	0	0	0
<i>Taeniatherum caput-medusae</i>	1.0m ²	0	1	11	8	8	0	11	10	2	0	7	14	3	0	1	6
<i>Taraxacum officinale</i>	1.0m ²	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Tetradymia canescens</i>	1.0m ²	0	0	1	0	0	0	1	0	0	0	1	2	0	2	3	6
<i>Thysanocarpus curvipes</i>	1.0m ²	0	3	0	0	0	0	0	0	7	2	0	0	0	0	0	0
<i>Tragopogon dubius</i>	1.0m ²	0	1	7	2	0	0	8	0	2	1	21	7	0	0	11	2
<i>Trifolium macrocephalum</i>	1.0m ²	19	4	5	5	11	12	7	8	5	5	3	1	0	0	0	0
Unknown forb	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Plant guilds																	
Forb, Introduced Annual	0.1m ²	97	40	6	9	98	28	0	1	93	43	11	9	86	32	3	1
Forb, Native Annual	0.1m ²	97	66	0	28	96	43	0	29	95	68	0	50	85	46	0	31
Forb, Introduced Perennial	1.0m ²	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Forb, Native Perennial	0.1m ²	68	45	62	38	67	40	57	34	74	49	72	51	67	38	58	37
Graminoid, Introduced Annual	0.1m ²	24	21	43	21	19	8	50	17	52	48	72	44	26	21	55	29
Graminoid, Native Annual	1.0m ²	33	36	19	23	37	35	43	31	29	39	13	11	18	20	3	14
Graminoid, Introduced Perennial	1.0m ²	0	0	2	4	3	0	0	0	0	0	0	1	1	0	0	0
Graminoid, Native Perennial	0.01m ²	62	81	63	53	75	74	67	62	62	66	53	54	66	78	65	53
Shrubs, Native Perennial	1.0m ²	36	28	26	31	25	17	31	25	24	23	26	24	41	36	40	37

Table 4. Plant species and guild frequencies (%) in intermound macroplots at Lawrence Memorial Grasslands Preserve from 1993-2008.

Scientific name	Quadrat size	Intermound-1				Intermound-2				Intermound-3				Intermound-4			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
<i>Achillea millefolium</i>	1.0m ²	0	0	0	3	2	1	0	3	6	6	0	0	4	9	5	3
<i>Agoseris grandiflora</i>	1.0m ²	0	0	0	0	2	0	0	0	0	0	0	1	0	1	1	0
<i>Agoseris heterophylla</i>	1.0m ²	16	9	0	2	3	4	0	11	3	4	0	7	8	5	0	5
<i>Agropyron interrupta</i>	1.0m ²	0	0	0	0	0	0	0	3	3	0	0	0	0	2	0	1
<i>Agropyron spicatum</i>	1.0m ²	4	12	0	4	0	8	3	8	4	6	0	4	28	40	44	33
<i>Allium acuminatum</i>	1.0m ²	15	0	0	8	44	1	28	21	37	0	23	32	9	0	9	7
<i>Allium macrum</i>	1.0m ²	22	1	26	0	0	0	1	0	3	0	1	0	0	0	0	0
<i>Allium sp.</i>	1.0m ²	0	0	0	0	0	0	10	0	0	3	2	0	0	0	0	0
<i>Allium tolmiei</i>	1.0m ²	4	3	24	6	0	0	1	0	10	11	15	2	0	0	0	0
<i>Antennaria dimorpha</i>	1.0m ²	9	15	5	1	13	11	3	3	1	5	1	0	14	14	7	3
<i>Antennaria microphylla</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0
<i>Arabis cusickii</i>	1.0m ²	3	0	0	0	0	0	0	0	11	21	0	1	3	2	0	0
<i>Arabis holboellii</i>	1.0m ²	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0
<i>Arabis sparsiflora</i>	1.0m ²	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Arenaria franklinii</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	4	4	6	1
<i>Artemesia rigida</i>	1.0m ²	54	60	47	52	67	69	60	57	61	59	48	52	68	70	74	62
<i>Balsamorhiza serrata</i>	1.0m ²	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0
<i>Blepharipappus scaber</i>	1.0m ²	16	0	0	0	2	4	0	0	13	9	0	0	1	2	0	0
<i>Bromus japonicus</i>	1.0m ²	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
<i>Bromus mollis</i>	1.0m ²	0	1	0	32	0	1	0	15	0	4	0	19	9	13	2	31
<i>Bromus tectorum</i>	1.0m ²	16	13	47	27	4	6	31	19	33	37	43	35	15	22	64	27
<i>Calochortus macrocarpa</i>	1.0m ²	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0
<i>Chrysothamnus viscidiflora</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
<i>Collinsia parviflora</i>	1.0m ²	56	9	0	2	84	10	0	8	82	39	0	4	68	46	0	5
<i>Collomia linearis</i>	1.0m ²	28	9	0	8	0	0	0	0	1	0	0	0	2	1	0	6
<i>Collomia sp.</i>	1.0m ²	28	9	0	0	0	0	0	0	1	0	0	0	2	1	0	0
<i>Cordylanthus racemosa</i>	1.0m ²	0	2	0	0	0	0	0	0	3	2	0	7	0	1	0	0
<i>Crepis intermedia</i>	1.0m ²	1	0	0	0	0	0	0	0	0	0	0	0	3	5	1	0
<i>Crepis modocensis</i>	1.0m ²	2	1	0	9	0	0	0	5	0	0	0	15	7	0	3	1
<i>Crepis sp.</i>	1.0m ²	3	1	0	0	0	0	0	0	0	0	0	0	10	5	4	0
<i>Crocidium multicaule</i>	1.0m ²	4	5	0	0	1	0	0	0	0	3	0	0	0	0	0	0
<i>Cryptantha intermedia</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
<i>Cryptantha sp.</i>	1.0m ²	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1
<i>Delphinium nuttalianum</i>	1.0m ²	1	0	3	0	5	2	11	0	1	2	4	0	0	0	0	0
<i>Dodecatheon conjugens</i>	1.0m ²	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
<i>Draba verna</i>	0.1m ²	90	51	0	0	88	41	0	0	76	44	0	0	96	62	0	0
<i>Elymus elymoides</i>	1.0m ²	77	82	36	39	91	94	65	38	84	94	46	43	66	66	63	35
<i>Erigeron linearis</i>	1.0m ²	3	1	1	2	0	0	0	0	18	20	17	6	9	7	9	12

Table 4 (cont.)

Scientific name	Quadrat size	Intermound-1				Intermound-2				Intermound-3				Intermound-4			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
<i>Erigeron poliospermus</i>	1.0m ²	3	6	1	0	0	0	0	0	8	8	2	0	0	0	0	0
<i>Eriogonum douglasii</i>	1.0m ²	1	1	0	0	0	0	1	1	0	0	0	0	23	13	16	7
<i>Eriogonum heracleoides</i>	1.0m ²	1	0	0	0	0	0	0	0	0	0	0	0	2	1	3	1
<i>Eriogonum strictum</i>	1.0m ²	9	9	1	0	0	1	1	0	0	0	0	0	2	1	2	1
<i>Festuca idahoensis</i>	1.0m ²	6	6	1	7	14	4	3	16	10	2	1	5	17	20	22	30
<i>Festuca microstachys</i>	1.0m ²	59	54	41	28	0	34	44	53	68	82	60	51	2	5	2	17
<i>Fritillaria pudica</i>	1.0m ²	0	0	2	0	0	0	8	0	0	0	1	0	0	0	5	0
<i>Galium aparine</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<i>Holosteum umbellatum</i>	1.0m ²	45	20	0	0	42	14	0	0	49	12	0	0	59	24	0	0
<i>Hordeum jubatum</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
<i>Idahoia scapigera</i>	1.0m ²	28	4	0	0	1	0	0	0	12	2	0	0	1	0	0	0
<i>Juniperus occidentalis</i>	1.0m ²	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Lactuca serriola</i>	1.0m ²	0	0	9	0	0	0	5	0	0	0	0	0	1	0	0	0
<i>Lithophragma bulbifera</i>	1.0m ²	50	12	0	0	63	9	0	0	70	15	0	0	62	5	0	0
<i>Lithophragma parviflora</i>	1.0m ²	4	0	0	1	0	0	0	1	0	0	0	0	3	3	0	0
<i>Lomatium cous</i>	1.0m ²	69	73	96	47	37	42	48	14	71	74	88	40	43	25	50	18
<i>Lomatium dissectum</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
<i>Lomatium gormanii</i>	1.0m ²	14	0	18	0	21	2	31	0	12	1	12	0	0	0	2	0
<i>Lomatium leptocarpum</i>	1.0m ²	1	0	0	0	69	52	82	70	12	6	5	10	0	1	0	2
<i>Lomatium macrocarpum</i>	1.0m ²	57	38	52	68	18	15	23	14	59	73	81	87	75	63	82	63
<i>Lomatium minus</i>	1.0m ²	5	18	15	10	0	2	1	0	27	29	30	0	0	0	0	0
<i>Lomatium nudicaule</i>	1.0m ²	2	1	2	2	2	0	1	0	0	0	0	1	34	33	49	50
<i>Lupinus caudatus</i>	1.0m ²	0	0	1	0	1	1	0	0	0	1	0	2	8	21	7	0
<i>Madia gracilis</i>	1.0m ²	6	4	0	4	0	2	0	4	0	2	0	7	0	0	0	3
<i>Microseris troximoides</i>	1.0m ²	23	22	47	21	50	36	58	33	26	11	29	1	55	31	64	17
<i>Microsteris gracilis</i>	1.0m ²	50	55	0	0	49	60	0	0	31	35	0	3	20	13	0	0
<i>Montia linearis</i>	1.0m ²	1	0	0	0	11	1	0	0	0	0	0	0	1	0	0	0
<i>Myosotis discolor</i>	1.0m ²	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	0
<i>Orobanche corymbosa</i>	1.0m ²	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<i>Penstemon gairdneri</i>	1.0m ²	0	0	0	0	0	0	0	0	10	7	2	3	0	0	0	0
<i>Phlox hoodii</i>	1.0m ²	3	4	1	3	0	0	0	0	0	0	0	0	70	65	38	14
<i>Phoenicautis cheiranthoides</i>	1.0m ²	5	0	2	2	0	0	0	0	3	1	2	1	6	6	5	5
<i>Poa bulbosa</i>	1.0m ²	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Poa secunda</i>	0.01m ²	70	73	65	67	88	87	79	70	64	55	67	63	80	75	75	77
<i>Polemonium micranthum</i>	1.0m ²	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
<i>Polygonum douglasii</i>	1.0m ²	0	22	0	3	0	0	0	4	15	12	0	3	0	1	0	0
<i>Polygonum polygaloides</i>	1.0m ²	0	0	0	3	0	0	0	5	0	0	0	13	0	0	0	1
<i>Rigiopappus leptocladus</i>	1.0m ²	26	35	0	1	0	6	0	0	0	6	0	0	0	1	0	1

Table 4 (cont.)

Scientific name	Quadrat size	Intermound-1				Intermound-2				Intermound-3				Intermound-4			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
<i>Sedum lanceolatum</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
<i>Taeniatherum caput-medusae</i>	1.0m ²	0	0	1	12	0	0	5	17	0	0	0	9	1	0	1	7
<i>Thysanocarpus curvipes</i>	1.0m ²	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Tragopogon dubius</i>	1.0m ²	0	0	3	0	0	0	3	0	0	0	1	2	0	0	1	0
<i>Trifolium macrocephalum</i>	1.0m ²	59	63	46	34	81	76	82	63	39	41	33	39	4	4	0	1
Plant guilds																	
Forb, Introduced Annual	0.01m ²	77	34	0	0	71	24	0	0	67	21	1	0	84	44	0	0
Forb, Native Annual	0.1m ²	84	71	0	38	91	78	0	83	81	75	0	74	78	75	0	41
Forb, Native Perennial	0.01m ²	45	46	45	16	55	33	54	22	55	49	57	23	40	24	23	12
Graminoid, Introduced Annual	1.0m ²	16	14	47	50	4	7	36	39	37	39	43	52	25	35	65	47
Graminoid, Native Annual	1.0m ²	59	54	41	28	0	34	44	53	68	82	60	51	2	5	2	17
Graminoid, Introduced Perennial	1.0m ²	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Graminoid, Native Perennial	0.01m ²	73	76	66	68	88	90	79	72	67	57	68	64	82	78	80	84
Shrubs, Native Perennial	1.0m ²	55	60	47	52	67	69	60	57	61	59	48	52	68	71	74	63

Table 5. Plant species and guild frequencies (%) in ravine head and sidewall macroplots at Lawrence Memorial Grasslands Preserve from 1993-2008.

Scientific name	Quadrat size	RH-5				RH-6				RH-7				RH-8			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
<i>Achillea millefolium</i>	0.1m ²	40	49	35	29	40	52	37	23	5	14	17	4	23	27	33	7
<i>Agoseris grandiflora</i>	1.0m ²	0	18	39	3	0	2	4	25	1	3	0	0	4	8	28	0
<i>Agoseris heterophylla</i>	1.0m ²	24	17	0	0	16	9	0	9	18	19	0	1	37	24	0	12
<i>Agropyron spicatum</i>	0.1m ²	71	66	43	67	44	55	66	43	45	44	60	35	51	55	47	33
<i>Agrostis interrupta</i>	1.0m ²	2	16	0	10	43	44	0	21	54	66	0	10	12	11	0	8
<i>Allium acuminatum</i>	1.0m ²	16	0	12	3	28	0	10	13	18	1	8	3	66	5	56	28
<i>Allium macrum</i>	1.0m ²	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Alyssum alyssoides</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Amelanchier alnifolia</i>	1.0m ²	0	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0
<i>Amsinckia lycopsoides</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	5	10	4
<i>Antennaria dimorpha</i>	1.0m ²	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
<i>Antennaria luzuloides</i>	1.0m ²	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0
<i>Antennaria microphylla</i>	1.0m ²	2	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0
<i>Arabis cusickii</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
<i>Arabis holboellii</i>	1.0m ²	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
<i>Arabis sparsiflora</i>	1.0m ²	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
<i>Artemesia rigida</i>	1.0m ²	0	0	1	0	2	1	1	0	1	0	0	0	3	3	2	3
<i>Balsamorhiza saggitata</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	2
<i>Blepharipappus scaber</i>	1.0m ²	12	10	0	0	1	0	0	1	2	2	0	0	37	32	0	31
<i>Bromus carinatus</i>	1.0m ²	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
<i>Bromus mollis</i>	1.0m ²	54	62	47	43	34	50	66	26	49	68	60	11	17	19	32	15
<i>Bromus tectorum</i>	.01m ²	46	58	58	49	19	26	47	23	35	43	47	49	36	36	58	35
<i>Calochortus macrocarpa</i>	1.0m ²	1	0	0	0	11	3	13	8	6	3	8	8	2	0	2	0
<i>Castilleja chromosa</i>	1.0m ²	0	0	0	0	0	1	5	0	0	0	0	1	0	0	0	0
<i>Chrysothamnus nauseosus</i>	1.0m ²	11	13	9	8	4	11	6	4	8	9	11	7	5	2	7	1
<i>Chrysothamnus viscidiflora</i>	1.0m ²	11	16	9	6	36	29	27	15	18	10	12	10	0	0	0	0
<i>Collinsia parviflora</i>	0.1m ²	82	62	0	9	50	37	0	11	76	54	0	11	68	56	0	1
<i>Collomia grandiflora</i>	1.0m ²	14	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0
<i>Collomia linearis</i>	0.1m ²	0	20	0	23	41	34	0	47	29	32	0	65	42	26	0	28
<i>Collomia sp.</i>	1.0m ²	30	0	0	0	81	0	0	0	75	0	0	0	78	0	0	0
<i>Crepis atrabarbera</i>	1.0m ²	11	2	3	1	45	43	10	5	23	40	7	35	1	2	0	0
<i>Crepis intermedia</i>	1.0m ²	9	0	6	0	0	0	64	0	8	0	62	0	4	1	1	0
<i>Crepis modocensis</i>	1.0m ²	10	2	2	0	0	0	4	2	2	0	6	0	3	0	5	2
<i>Crepis sp.</i>	1.0m ²	29	4	11	0	45	43	69	0	33	40	69	0	8	3	6	0
<i>Crocidium multicaule</i>	1.0m ²	6	5	0	0	13	6	0	0	25	16	0	0	28	14	0	0
<i>Cryptantha intermedia</i>	1.0m ²	25	15	0	0	2	1	0	0	1	3	0	0	41	33	0	0
<i>Cryptantha sp.</i>	1.0m ²	0	0	0	3	0	0	0	4	0	0	0	6	3	0	0	36
<i>Danthonia californica</i>	1.0m ²	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Table 5 (cont.)

Scientific name	Quadrat size	RH-5				RH-6				RH-7				RH-8			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
Danthonia unispicata	1.0m ²	0	0	0	0	4	4	2	1	0	0	0	0	0	0	0	0
Delphinium nuttalianum	1.0m ²	4	0	5	0	1	0	2	1	0	0	0	0	1	0	1	0
Dodecatheon conjugens	1.0m ²	7	7	6	0	4	0	1	0	0	0	1	0	1	1	1	0
Draba verna	1.0m ²	32	21	0	0	32	34	0	0	24	36	0	0	63	23	0	0
Elymus elymoides	1.0m ²	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0
Epilobium minutum	1.0m ²	13	31	0	42	9	17	0	40	4	9	0	36	26	30	0	36
Erigeron linearis	1.0m ²	0	1	1	0	0	1	0	0	0	0	0	0	5	10	7	5
Eriogonum douglasii	1.0m ²	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Eriogonum heracleoides	1.0m ²	3	2	7	15	63	62	74	74	73	69	89	89	26	22	33	20
Eriogonum strictum	1.0m ²	3	11	9	4	1	0	0	1	1	1	0	0	15	11	8	8
Erodium cicutarium	1.0m ²	0	0	0	0	0	0	0	1	0	0	0	0	4	1	4	8
Festuca idahoensis	0.1m ²	2	4	33	4	72	59	58	45	43	38	38	25	31	33	24	25
Festuca microstachys	1.0m ²	20	20	4	12	11	6	6	4	13	13	3	2	38	35	28	18
Fritillaria pudica	1.0m ²	0	0	1	0	0	0	4	1	1	0	4	0	1	0	5	0
Galium aparine	1.0m ²	16	2	0	48	27	6	0	47	32	5	0	38	10	0	0	14
Geum triflorum	1.0m ²	0	0	0	0	1	0	1	2	0	0	0	0	0	0	0	0
Hieracium cynoglossoides	1.0m ²	0	0	0	0	19	12	0	12	5	4	0	5	0	0	0	0
Hieracium spp.	1.0m ²	0	0	0	0	0	0	19	0	0	0	6	0	0	0	0	0
Holosteum umbellatum	1.0m ²	55	67	0	0	75	52	0	0	60	57	0	0	65	17	0	0
Hordeum jubatum	1.0m ²	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydrophyllum capitatum	1.0m ²	0	0	2	1	4	2	8	6	0	2	0	0	16	0	14	6
Idaho scapigera	1.0m ²	13	5	0	0	0	0	0	0	0	0	0	0	10	2	0	0
Juniperus occidentalis	1.0m ²	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Koeleria cristata	1.0m ²	0	0	0	0	15	12	4	11	0	0	0	0	0	0	0	0
Lactuca serriola	1.0m ²	16	15	1	31	0	3	1	5	1	6	1	1	4	11	7	8
Lagophylla ramosissima	1.0m ²	0	62	0	0	0	9	0	0	0	4	0	0	0	13	0	0
Lithophragma bulbifera	1.0m ²	45	18	0	0	52	2	0	2	23	5	0	2	39	1	0	2
Lithophragma parviflora	1.0m ²	8	2	0	1	39	25	0	57	45	18	0	77	28	2	0	1
Lithospermum ruderales	1.0m ²	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Lomatium cous	1.0m ²	8	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
Lomatium dissectum	1.0m ²	0	25	0	0	0	30	0	0	0	5	0	0	0	0	0	0
Lomatium gormanii	1.0m ²	1	0	0	0	0	0	0	0	1	1	0	0	0	0	2	0
Lomatium leptocarpum	1.0m ²	0	0	3	57	0	0	0	63	0	0	0	60	0	0	0	13
Lomatium macrocarpum	1.0m ²	3	1	1	1	0	1	0	1	0	1	1	0	2	3	1	4
Lomatium minus	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1
Lomatium nudicaule	1.0m ²	28	19	19	11	5	6	9	2	0	1	5	0	68	66	74	67
Lomatium triternatum	1.0m ²	43	6	4	0	86	10	21	0	82	4	3	0	19	0	2	0
Lupinus caudatus	1.0m ²	82	79	63	48	74	71	58	56	51	49	44	20	48	36	54	44

Table 5 (cont.)

Scientific name	Quadrat size	RH-5				RH-6				RH-7				RH-8			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
<i>Madia citriodora</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
<i>Madia gracilis</i>	1.0m ²	56	0	0	94	9	1	0	7	7	1	0	7	35	30	0	52
<i>Microseris troximoides</i>	1.0m ²	19	1	0	0	26	2	3	0	29	0	1	0	14	7	6	2
<i>Microsteris gracilis</i>	1.0m ²	22	16	0	0	17	6	0	12	24	10	0	12	5	2	0	4
<i>Montia linearis</i>	1.0m ²	17	6	0	0	18	14	0	34	22	5	0	25	2	1	0	2
<i>Montia perfoliata</i>	1.0m ²	25	3	0	0	57	37	0	41	23	6	0	24	0	0	0	1
<i>Myosotis discolor</i>	1.0m ²	0	0	0	0	0	0	0	6	7	0	0	0	4	0	0	1
<i>Navarretia intertexta</i>	1.0m ²	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
<i>Nemophila pedunculata</i>	1.0m ²	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0
<i>Orthocarpus hispidus</i>	1.0m ²	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0
<i>Penstemon gairdneri</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	1	1	4	1
<i>Penstemon richardsonii</i>	1.0m ²	0	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0
<i>Perideridia gairdneri</i>	1.0m ²	0	0	66	0	0	10	89	0	0	19	97	0	0	0	32	0
<i>Phacelia hastata</i>	1.0m ²	2	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0
<i>Phleum pratense</i>	1.0m ²	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Plectritis macrocera</i>	1.0m ²	12	9	0	38	55	45	0	54	68	61	0	45	35	44	0	13
<i>Poa bulbosa</i>	1.0m ²	0	0	2	2	1	0	0	0	1	0	0	0	0	0	0	0
<i>Poa pratensis</i>	1.0m ²	0	0	0	0	1	1	6	7	0	0	0	1	17	0	0	16
<i>Poa secunda</i>	0.1m ²	45	58	62	32	12	15	23	6	15	14	6	4	54	59	69	43
<i>Polemonium micranthum</i>	1.0m ²	35	6	0	0	37	11	0	0	77	8	0	0	4	1	0	0
<i>Polygonum douglasii</i>	1.0m ²	57	56	0	23	35	35	0	23	45	45	0	7	14	12	0	9
<i>Potentilla gracilis</i>	1.0m ²	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
<i>Prunus virginiana</i>	1.0m ²	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
<i>Purshia tridentata</i>	1.0m ²	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
<i>Ribes cereum</i>	1.0m ²	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0
<i>Rigiopappus leptocladus</i>	1.0m ²	6	4	0	0	4	1	0	0	0	0	0	0	15	14	0	3
<i>Rosa woodsii</i>	1.0m ²	0	0	0	0	0	11	6	9	0	2	1	1	0	2	2	1
<i>Rose spp.</i>	1.0m ²	0	0	0	0	9	0	0	0	0	0	0	0	1	0	0	0
<i>Sanguisorba occidentalis</i>	1.0m ²	0	5	0	3	0	0	0	0	0	0	0	0	0	0	0	0
<i>Sitanion hystrix</i>	1.0m ²	7	12	1	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Stipa thurberiana</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Symphoricarpos oreophilus</i>	1.0m ²	0	0	0	0	9	18	22	35	5	9	9	5	1	0	0	5
<i>Taeniatherum caput-medusae</i>	1.0m ²	4	2	2	19	1	1	2	5	3	0	0	7	1	1	9	27
<i>Taraxacum officinale</i>	1.0m ²	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0
<i>Tetradymia canescens</i>	1.0m ²	0	0	0	0	0	0	1	3	9	0	4	4	0	0	0	0
<i>Thysanocarpus curvipes</i>	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	11	9	0	1
<i>Tragopogon dubius</i>	1.0m ²	15	26	67	3	2	3	18	1	1	0	29	0	2	10	35	3

Table 5 (cont.)

Scientific name	Quadrat size	RH-5				RH-6				RH-7				RH-8			
		1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008	1993	1994	2000	2008
Trifolium macrocephalum	1.0m ²	1	0	0	0	0	0	1	0	0	0	0	0	15	7	8	7
Trifolium microcephalum	1.0m ²	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0
Veronica arvensis	1.0m ²	0	0	0	0	0	0	0	2	0	3	0	0	1	0	0	0
Plant guilds																	
Forb, Introduced Annual	1.0m ²	76	85	67	33	84	68	19	13	68	67	30	1	86	48	39	23
Forb, Native Annual	0.01m ²	75	67	0	70	57	50	0	48	66	51	0	56	65	64	0	50
Forb, Introduced Perennial	1.0m ²	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0
Forb, Native Perennial	0.01m ²	47	41	54	20	54	41	34	30	36	17	43	35	42	21	34	11
Graminoid, Introduced Annual	0.01m ²	53	63	64	53	26	36	62	24	43	56	56	50	40	43	66	36
Graminoid, Native Annual	1.0m ²	20	20	4	12	11	6	6	4	13	13	3	2	38	35	28	18
Graminoid, Introduced Perennial	1.0m ²	0	1	4	2	2	1	6	7	1	0	0	1	17	0	0	16
Graminoid, Native Perennial	0.01m ²	58	57	54	46	56	56	50	30	41	38	38	23	56	46	57	41
Shrubs, Native Perennial	0.1m ²	3	5	6	6	31	38	48	48	58	48	72	67	9	5	13	5

Table 6. Plant species and guild frequencies (%) in ravine bottom macroplots at Lawrence Memorial Grasslands Preserve from 1993-2008.

Scientific name	Quadrat size	1993	2000	2008
Achillea millefolium	1.0m ²	55.45	66.67	61.90
Agoseris grandiflora	1.0m ²	24.55	7.62	10.48
Agoseris heterophylla	1.0m ²	8.18	0.00	5.71
Agropyron caninum	1.0m ²	50.00	59.05	35.24
Agropyron interrupta	1.0m ²	12.73	10.48	21.90
Agropyron spicatum	1.0m ²	5.45	12.38	11.43
Agrostis alba	1.0m ²	5.45	30.48	0.00
Allium acuminatum	1.0m ²	2.73	0.95	0.00
Alyssum spp.	1.0m ²	16.36	0.00	7.62
Amsinckia lycopsoides	1.0m ²	0.91	0.95	0.95
Antennaria microphylla	1.0m ²	0.91	0.00	0.00
Arabis cusickii	1.0m ²	0.00	0.00	2.86
Arabis glabra	1.0m ²	10.91	3.81	0.95
Barbarea orthocera	1.0m ²	0.00	31.43	17.14
Boisduvalia densiflora	1.0m ²	11.82	0.00	0.00
BOXX	1.0m ²	27.27	0.00	0.00
Brodiaea hyacintha	1.0m ²	23.64	24.76	32.38
Bromus carinatus	1.0m ²	10.91	17.14	1.90
Bromus japonicus	1.0m ²	0.91	0.00	0.00
Bromus mollis	0.1m ²	57.27	67.62	53.33
Bromus tectorum	1.0m ²	54.55	19.05	39.05
Calochortus macrocarpa	1.0m ²	0.91	0.00	0.00
Camassia quamash	1.0m ²	45.45	47.62	47.62
Carex microptera	1.0m ²	11.82	0.00	7.62
Carex nebrascensis	1.0m ²	0.00	0.00	3.81
Carex spp.	1.0m ²	5.45	40.00	0.95
Chrysothamnus nauseosus	1.0m ²	1.82	2.86	0.00
Cimicifuga lacinata	1.0m ²	5.45	0.00	0.00
Cirsium canovirens	1.0m ²	2.73	3.81	0.95
Cirsium vulgare	1.0m ²	0.91	0.00	0.00
Collinsia parviflora	1.0m ²	40.00	0.00	26.67
Collomia linearis	1.0m ²	18.18	0.00	24.76
Collomia sp.	1.0m ²	4.55	0.00	0.00
Crepis atrabarbera	1.0m ²	1.82	0.00	0.95
Crepis sp.	1.0m ²	1.82	0.00	0.00
Cryptantha intermedia	1.0m ²	10.91	0.00	0.00
Cryptantha sp.	1.0m ²	3.64	0.00	8.57
Danthonia californica	1.0m ²	0.00	0.00	16.19
Danthonia unispicata	1.0m ²	7.27	1.90	0.00
Delphinium burkei	1.0m ²	46.36	58.10	45.71
Deschampsia danthonioides	1.0m ²	54.55	9.52	0.00
Dodecatheon conjugens	1.0m ²	10.00	3.81	0.00
Draba verna	1.0m ²	12.73	0.00	0.00
Elymus cinereus	1.0m ²	0.00	1.90	2.86
Epilobium minutum	1.0m ²	48.18	0.00	52.38
Eriogonum heracleoides	1.0m ²	1.82	3.81	3.81
Eriogonum strictum	1.0m ²	2.73	0.95	1.90
Erodium cicutarium	1.0m ²	9.09	0.00	4.76

Table 6 (cont.)

Scientific name	Quadrat size	1993	2000	2008
Festuca idahoensis	1.0m ²	35.45	2.86	19.05
Festuca microstachys	1.0m ²	8.18	2.86	41.90
Galium aparine	1.0m ²	21.82	0.00	26.67
Galium boreale	1.0m ²	9.09	0.00	5.71
Heterocodon rariflorum	1.0m ²	0.00	0.00	17.14
Holosteum umbellatum	1.0m ²	50.91	0.00	0.00
Hordeum jubatum	1.0m ²	0.91	0.00	0.00
Hypericum formosum	1.0m ²	0.00	5.71	0.00
Iris missouriensis	1.0m ²	0.00	1.90	0.00
Juncus balticus	1.0m ²	26.36	30.48	18.10
Juncus spp.1	1.0m ²	6.36	12.38	12.38
Juncus spp.2	1.0m ²	0.91	2.86	0.00
Koeleria cristata	1.0m ²	4.55	9.52	6.67
Lactuca serriola	1.0m ²	50.00	22.86	28.57
Lithophragma bulbifera	1.0m ²	5.45	0.00	0.00
Lithophragma parviflora	1.0m ²	35.45	0.00	9.52
Lomatium dissectum	1.0m ²	0.91	0.00	0.00
Lomatium grayii	1.0m ²	21.82	23.81	0.00
Lomatium leptocarpum	1.0m ²	10.91	14.29	65.71
Lomatium macrocarpum	1.0m ²	0.00	0.95	10.48
Lomatium minus	1.0m ²	0.00	0.00	3.81
Lomatium nudicaule	1.0m ²	0.00	1.90	0.00
Lomatium triternatum	1.0m ²	47.27	0.00	0.00
Lotus purshiana	1.0m ²	44.55	0.00	44.76
Lupinus lepidus	1.0m ²	1.82	0.00	0.00
Madia citriodora	1.0m ²	0.91	0.00	0.00
Madia gracilis	1.0m ²	70.91	0.00	65.71
Medicago lupulina	1.0m ²	0.00	13.33	8.57
Microseris troximoides	1.0m ²	3.64	0.00	0.00
Microsteris gracilis	1.0m ²	19.09	0.00	27.62
Mimulus guttatus	1.0m ²	22.73	23.81	15.24
Montia linearis	1.0m ²	18.18	0.00	31.43
Montia perfoliata	1.0m ²	0.91	0.00	0.00
Myosotis discolor	1.0m ²	20.91	0.00	17.14
Navarretia intertexta	1.0m ²	17.27	0.00	11.43
Nemophila pedunculata	1.0m ²	29.09	0.00	16.19
Orobanche spp.	1.0m ²	0.91	0.95	0.00
Orobanche uniflora	1.0m ²	0.00	0.00	1.90
Orthocarpus hispidus	1.0m ²	32.73	0.00	23.81
Penstemon gairdneri	1.0m ²	12.73	0.00	0.00
Perideridia gairdneri	1.0m ²	0.00	70.48	0.00
Perennial grass	1.0m ²	0.00	0.00	8.57
Phacelia hastata	1.0m ²	1.82	0.95	7.62
Phleum pratense	1.0m ²	39.09	80.00	23.81
Plectritis macrocera	1.0m ²	50.91	0.00	49.52
Poa bulbosa	1.0m ²	2.73	1.90	8.57
Poa pratensis	1.0m ²	44.55	80.95	49.52
Poa secunda	1.0m ²	35.45	27.62	39.05
Polemonium micranthum	1.0m ²	0.91	0.00	0.00

Table 6 (cont.)

Scientific name	Quadrat size	1993	2000	2008
Polygonum douglasii	1.0m ²	16.36	0.00	14.29
Potentilla glandulosa	1.0m ²	22.73	26.67	21.90
Potentilla gracilis	1.0m ²	15.45	26.67	20.00
Purshia tridentata	1.0m ²	0.91	0.95	0.00
Ranunculus uncinatus	1.0m ²	0.00	2.86	0.00
Rigiopappus leptocladus	1.0m ²	0.91	0.00	0.00
Rosa woodsii	1.0m ²	0.00	2.86	0.95
Rose spp.	1.0m ²	1.82	0.00	0.00
Rumex crispus	1.0m ²	3.64	20.95	10.48
Sanguisorba occidentalis	1.0m ²	0.00	0.00	5.71
Scutellaria angustifolia	1.0m ²	8.18	7.62	20.00
Senecio serra	1.0m ²	0.91	0.95	2.86
Sidalcea oregana	1.0m ²	0.00	0.00	8.57
Symphoricarpos oreophilus	1.0m ²	0.00	1.90	0.95
Taeniatherum caput-medusae	1.0m ²	4.55	10.48	38.10
Taraxacum officinale	1.0m ²	13.64	44.76	15.24
Tragopogon dubius	1.0m ²	8.18	14.29	0.95
Trifolium cyathiferum	1.0m ²	0.00	6.67	19.05
Trifolium microcephalum	1.0m ²	11.82	0.00	0.00
Trifolium variegatum	1.0m ²	31.82	19.05	20.00
TRXX	1.0m ²	9.09	1.90	0.00
Unknown	1.0m ²	0.00	0.00	4.76
Unknown forb 3	1.0m ²	0.00	5.71	0.00
Unknown forb 4	1.0m ²	0.00	13.33	0.00
Unknown forb 5	1.0m ²	0.00	4.76	0.00
Unknown forb 5 (2008)	1.0m ²	0.00	0.00	15.24
Unknown forb 6 (2008)	1.0m ²	0.00	0.00	14.29
Unknown forb 7 (2008)	1.0m ²	0.00	0.00	0.95
Verbascum thapsus	1.0m ²	0.00	0.95	2.86
Veronica arvensis	1.0m ²	56.36	0.00	70.48
Viola adunca	1.0m ²	0.00	0.00	8.57
Vulpia myuros	1.0m ²	20.00	10.48	0.00
Plant guilds				
Forb, Introduced Perennial	1.0m ²	17.27	56.19	33.33
Forb, Introduced Annual	0.1m ²	69.09	9.52	71.43
Forb, Native Annual	0.01m ²	72.73	8.57	63.81
Forb, Native Perennial	0.01m ²	53.64	51.43	48.57
Graminoid, Introduced Annual	0.1m ²	66.36	69.52	74.29
Graminoid, Introduced Perennial	0.1m ²	42.73	89.52	34.29
Graminoid, Native Annual	1.0m ²	56.36	11.43	41.90
Graminoid, Native Perennial	0.1m ²	70.91	78.10	63.81
Shrub, Native Perennial	1.0m ²	3.64	11.43	5.71