

Evaluation of Lolo NF Native Plants Reseeding Efforts

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Summary

Big game winter ranges and sites previously disturbed by roads, logging, or mining were sampled to evaluate the success of the LNF native grass reseeded program. Fourteen sites were sampled in August 2013 and eleven sites were resampled 2014. Some sites had multiple plots because trials with different seed mixes had been established there. Individual species establishments were quantified by a frequency grid method designed primarily to enumerate the emergence of seedlings of planted species in each of 100 5x5 inch frequency grid cells (Vogel and Masters 2001). Ocular estimates of species canopy covers were also made. Seeded native grass establishment was good on the few sites that had bare mineral soil and micro-topography irregularities to provide safe seed sites with good seed to soil contact. The most successful planted native grasses have been slender wheatgrass, mountain brome, and blue wild rye (*Elymus glaucus*) at two sites. Slender wheatgrass and mountain brome are short-lived and usually transitory species and may be replaced in future years. Sixteen other seeded grasses had no or only trace establishment. There was essentially no establishment of seeded grasses on sites that had significant litter, and/or a cryptogamic crust, or have smooth brome or dense spotted knapweed. Four native forbs were included in some seeding mixes. The forbs have not established well on any sites except for yarrow planted at the Mattie V mine site.

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Background

Fourteen sites were sampled. Some sites had replicated plots.

Table 1. List of the 25 sampled plots at 14 different sites.

| Plots | Type | Sample Years | |
|---------------------------|-------------|--------------|------|
| | | 2013 | 2014 |
| Center Horse 164_L1 | log landing | X | X |
| Center Horse 180_L3 | log landing | X | X |
| Center Horse 180_L4 | log landing | X | X |
| Cox 1-1 | big game | X | |
| Cox 1-2 | big game | X | |
| Cox 1-3 | big game | X | |
| Cox 2-1 | big game | X | |
| Cox 2-2 | big game | X | |
| Cox 2-3 | big game | X | |
| Horseshoe Hills 1-aerial | big game | X | X |
| Horseshoe West 11-L1 | log landing | X | X |
| Horseshoe West 32-L1 | log landing | X | X |
| Horseshoe West 5-L2 | log landing | X | X |
| Horseshoe West 6-L1 | log landing | X | X |
| Horseshoe West 6-L2 | log landing | X | X |
| Jocko Unit 101 Road decon | roadbed | X | X |
| Madison 1 | big game | X | |
| Madison 2 | big game | X | |
| Madison 3 | big game | X | |
| Mattie V 1 | mine | X | X |
| Mattie V 2 | mine | X | X |
| Mattie V 3 | mine | X | X |
| O'Brien 1 | big game | X | |
| O'Brien 2 | big game | X | |
| O'Brien 3 | big game | X | |

Six different seed mixes were used by the Forest Service at the Cox, Horseshoe Hills 1-aerial, Jocko Unit 101 Road decon, Madison, and O'Brien, sites and test plots (Appendix: Tables 5 to 11). These Forest Service mixes were comprised from 18 native grasses and forbs and 6 introduced pasture grasses (Table 2). The Center Horse and Horseshoe West log landings are legacy sites from Plum Creek. The Plum Creek seed mixes and years of seeding are unknown.

Table 2. Species used in the various seed mixes (I= introduced grass).

| | |
|--------------------------|---|
| Annual Ryegrass (I) | <i>Lolium multiflorum</i> |
| Blanket Flower. | <i>Gaillardia aristata</i> |
| Blue Wildrye | <i>Elymus glaucus</i> |
| Bluebunch wheatgrass | <i>Agropyron spicatum</i> |
| Canada Wildrye | <i>Elymus canadensis</i> |
| Clustered Field sedge | <i>Carex praegracilis</i> |
| Common Yarrow | <i>Achillea millefolium</i> |
| Crested Wheatgrass | <i>Agropyron cristatum</i> |
| Fowl Bluegrass | <i>Poa palustris</i> |
| Fowl Mannagrass | <i>Glyceria striata</i> |
| Horsemint | <i>Monarda fistulosa</i> |
| Idaho Fescue | <i>Festuca idahoensis</i> |
| Mountain Brome | <i>Bromus carinatus</i> (syn. <i>marginatis</i>) (<i>Bromar</i>) |
| Orchardgrass (I) | <i>Dactylis glomerata</i> |
| Pubescent Wheatgrass (I) | <i>Agropyron intermedium</i> (<i>Manska, Luna</i>) |
| Sheep Fescue (I) | <i>Festuca ovina</i> (<i>Covar</i>) |
| Slender Wheatgrass | <i>Agropyron</i> (syn. <i>Elymus</i>) <i>trachycaulus</i> |
| Smooth Brome (I) | <i>Bromus inermis</i> |
| Squirrel Tail | <i>Elymus elymoides</i> (syn. <i>Sitanion hystrix</i>) |
| Thickspike Wheatgrass | <i>Agropyron dasystachyum</i> (syn. <i>Elymus lanceolatus</i> (<i>Critana</i>)) |
| Timothy (I) | <i>Phleum pratense</i> |
| Tufted Hairgrass | <i>Deschampsia cespitosa</i> |
| Western Wheatgrass | <i>Agropyron smithii</i> |
| White Sagebrush | <i>Artemisia ludoviciana</i> |

Canopy cover in 2014 had increased greatly over that observed in 2013. In 2014 canopy cover averaged 60% ranging from 30% to 95%. On most sites the number and size of individual plants was so high that the canopy cover saturated the small frequency grid cells. At this stage in revegetation evaluation the frequency grid method should be discontinued and evaluations proceed by just the ocular canopy cover method.

Results & Discussion

species established

Table 3. Occurrence of species at the sites/plots.

| Species or Lifeform | # of plots | Comments |
|----------------------|------------|-------------------------------------|
| spotted knapweed | 15 | at 10 of the 14 sites |
| cheatgrass | 14 | not at CH, HW, Jocko, except HW6-L1 |
| slender wheatgrass | 8 | 6 sites: CH, HW, Jocko, Mattie V |
| mountain brome | 7 | Mattie V, HW |
| timothy | 9 | CH, HW, Jocko |
| Canada bluegrass | 6 | CH, HW, Jocko |
| yarrow | 4 | Mattie V, HW6-L2 |
| blue wildrye | 3 | Mattie V |
| white clover | 3 | Mattie V, less canopy cover in 2014 |
| Idaho fescue | 4 | Mattie V, HW32-L1 |
| bluebunch wheatgrass | 2 | Cox, O'Brien |
| tree seedlings | 3 | Mattie V 2014 |
| other grasses | 16 | only at trace (<0.5% canopy cover) |
| other forbs | 25 | only at trace (<0.5% canopy cover) |

Spotted knapweed is present on most of the sites and plots (Table 3). Frequency grid occurrence of knapweed was as high as 93% and canopy cover reached 60% (species/lifeform abundances by site/plot are detailed in Appendix Table 12). In spite of previous spraying knapweed was still found on three of the four big game range mountain grassland sites (Cox, Horseshoe Hills 1, O'Brien). Seven of the unmanaged Plum Creek forest log landings have knapweed, often at high abundance. One Plum Creek site was relatively weed free. The grasses present at the legacy log landings are a mix of introduced and native species. Reseeding these sites to convert to more native grasses would require site preparation to remove thick litter and/or breakup cryptogammic crust.

Cheatgrass (*Bromus tectorum* and *Bromus japonicus*) is present on the big game sites but was present on only one log landing site. The cheatgrass frequency grid occurrence ranged from 34 to 100% in 2013 on the big game sites. On the one cheatgrass infested log landing it was dominant or co-dominant depending on the year.

Slender wheatgrass and mountain brome were the only seeded native species that established at significant abundances on multiple sites (Table 3, Appendix Table 12). The seed mixes for the legacy Plum Creek sites are not known, but these two native grasses are not usually naturally established on sites with significant overstory in western Montana; rather they are naturally found in montane meadows and disturbance openings. Slender wheatgrass and mountain brome are short lived and usually transitory species that may be replaced in future years.

Timothy, an introduced premium horse hay species, is very widespread at trace levels along montane trails and roads as is reflected in Table 3 and Appendix Table 12. It is “weedy” in its proclivity to volunteer on disturbance sites, but does not typically obtain higher canopy cover until precipitation exceeds 16 inches. Canada bluegrass is also a widespread introduced grass with weedy tendencies. It has been used successfully to revegetate moister disturbed sites. Although present on 9 of the sampled forest habitat sites it remained at trace levels in most cases (Table 3 and Appendix Table 12).

Blue wildrye seeded at the Mattie V mine has established at low to trace levels (Table 3 and Appendix Table 12). This native is known to establish rapidly in disturbed forest areas receiving moderate levels of rainfall. Blue wildrye was also recorded in 2014 at the Jocko Unit 101 road decon site which was reportedly seeded with Lolo Mix A. Lolo Mix A does not include blue wildrye so the 2014 observation is anomalous.

None of the other species included in the various known seed mixes have established at more than trace levels ($\leq 0.5\%$ canopy cover) except white clover at the Mattie V mine (Appendix Table 12). The lifeform categories “other forbs” and “other grasses” are for species identified but not included in the seed mixes or unidentified species. Individual taxa in the “other” categories are present at only trace levels.

vegetation on specific sites

Mattie V mine had the best establishment (Table 4). Slender wheatgrass, mountain brome, and white clover had high frequency grid counts and high canopy cover. White cover was at 20% canopy cover in the first year (2013) after planting dropped to 10% canopy cover in the second year (2014). Mountain brome declined from 20% first year to 10% second year. Slender wheatgrass increased from 3% canopy cover first year to 30% in the second year. All other species are still at trace ($\leq 0.5\%$) canopy cover. Other tree seedling volunteers were mostly cottonwoods and a few Ponderosa pine and western larch.

Table 4. Species establishment at Mattie V mine as of 2014.

| Species | Frequency Grid Count 2014 Avg. | Canopy Cover 2014 Avg. |
|--------------------|---------------------------------------|-------------------------------|
| slender wheatgrass | 19 | 30 |
| mountain brome | 30 | 10 |
| white clover | 27 | 10 |
| blue wildrye | 15 | 0.5 |
| fowl bluegrass | 3 | 0.5 |
| Idaho fescue | 6 | 0.5 |
| other forbs | 15 | 0.5 |
| other wheatgrasses | 21 | 0.5 |
| sedge sp. | 2 | 0.5 |
| tree seedlings | 5 | 0.5 |
| yarrow | 13 | 0.5 |

The Jocko Unit 101 Road decon was seeded with Lolo Mix A in fall 2012. A few annual ryegrass plants were observed in the year after seeding although the density was so low that none were found in the actual frequency grid frames. The seeded slender wheatgrass reached 10% canopy cover in the second year (2014). No other Lolo Mix A species were observed on the ripped roadbed in either year. 10% canopy cover of blue wildrye was recorded in 2014. Lolo Mix A does not include blue wildrye.

The sample data does not indicate that seeding of the four big game ranges was successful. The sampling would not reveal small changes in abundance as the seeded test plots and monitoring design does not include controls that were definitely not seeded. These management units already had several of the native and introduced grasses included in the four seed mixes used. Timothy and annual ryegrass were observed at very low abundances. Bluebunch wheatgrass is common in all four of these montane grasslands but we never observed a significant flush of new seedlings in any of the frequency grid counts. Nor did we observe significant increase in bluebunch wheatgrass abundance in the O'Brien, Cox, and Madison test plots relative to other sample sets we have for these management units. None of the 3 nominal *Elymus* species (Appendix Table 10) seeded fall 2012 into the Horseshoe Hills 1-aerial site have established. The weed spray monitoring plot data at Horseshoe Hills 1 for Idaho fescue indicate that the frequency of occurrence by that sampling method has been constant at 64% and the Idaho fescue canopy cover was the similar in 2012 at 2.9% and 2014 at 2.2%.

Weed spraying could benefit most of the legacy Plum Creek log landing sites but site specific decisions would have to be made. At some of the landing the surrounding area and/or access roads are quite weedy. Also the desirable grasses, weeds, and unvegetated patches have clumped distributions on many of these sites so partial revegetation may be needed. The grasses present are a mix of introduced and native species. Reseeding these sites to convert to more native grasses would require extensive site preparation to remove thick litter and/or breakup cryptogammic crust.

Appendix

frequency grid method citation

Vogel, Kenneth P.; Masters, Robert A. 2001. Frequency grid-a simple tool for measuring grassland establishment. *Journal of Range Management*. 54: 653-655.

seed mixes

In fall of 2009 three big game winter range sites were selected on the Missoula and Ninemile Ranger Districts to test various seed mixes: Obrien, Madison, and Cox Basin. Each game range site has three plots with Obrien and Cox Basin having 2 replicas. The more extensive Madison big game site also had a supplemental aerial seeding. Horseshoe Hills 1 aerial seeding was also done in fall 2012. The Jocko Unit 101 Road decon was seeded in 2012. Mattie V placer mine was ripped and reseeded in 2011. The West and Center Horseshoe Hills landings are legacy log landings from Plum Creek. The seed mixes and years of seeding are unknown.

Table 5. Summary of seeding activities.

| Site Type | Site | Replication | Plot | Mix Seeded ¹ |
|--------------------------------|---------|-------------|------|---|
| Big Game Range 2009 Seed Trial | Obrien | 1 | 1 | Lolo Mix A |
| | | 1 | 2 | Dryland Pasture Mix |
| | | 1 | 3 | Madison Mix |
| Big Game Range 2009 Seed Trial | Obrien | 2 | 1 | Lolo Mix A |
| | | 2 | 2 | Dryland Pasture Mix |
| | | 2 | 3 | Madison Mix |
| Big Game Range 2009 Seed Trial | Madison | 1 | 1 | Lolo Mix A + Supplemental Aerial |
| | | | 2 | Dryland Pasture Mix + Supplemental Aerial |
| | | | 3 | Madison Mix + Supplemental Aerial |

| Site Type | Site | Replication | Plot | Mix Seeded ¹ |
|---|---------------------------|-------------|------|-------------------------|
| Big Game Range 2009 Seed Trial | Cox Basin | 1 | 1 | Lolo Mix A |
| | | 1 | 2 | Dryland Pasture Mix |
| | | 1 | 3 | Madison Mix |
| | | 2 | 1 | Lolo Mix A |
| | | 2 | 2 | Dryland Pasture Mix |
| | | 2 | 3 | Madison Mix |
| road bed after ripping to 4 inches, seeded 2012 | Jocko Unit 101 Road decon | none | n.a. | Lolo Mix A |
| placer mine 2011 | Mattie V | none | n.a. | Mattie V Mine Mix |

Table 6. Lolo Seed Mix A.

| <i>Species</i> | <i>Pounds PLS per Acre</i> |
|--|----------------------------|
| Annual Ryegrass (I) <i>Lolium multiflorum</i> | 4 |
| Mountain Brome (N) <i>Bromus marginatis</i> (Bromar) | 4 |
| Sheep Fescue (I) <i>Festuca ovina</i> (Covar) | 6 |
| Thickspike Wheatgrass (N) <i>Elymus lanceolatus</i> (Critana) | 4 |
| Pubescent Wheatgrass (I) <i>Agropyron intermedium</i> (Manska, Luna) | 5 |
| Slender Wheatgrass (N) <i>Elymus trachycaulus</i> (Pryor) | 9 |
| | 32 lbs acre |

Table 7. Dryland Pasture Mix.

| |
|-------------------------|
| Annual Ryegrass 9 lb |
| Smooth Brome 8 lb |
| Orchardgrass 4 lb |
| Timothy 2 lb |
| Crested Wheatgrass 6 lb |
| 29 lb / acre |

Table 8. Madison Seed Mix.

| |
|----------------------------|
| Annual Ryegrass 9 lb |
| Bluebunch Wheatgrass 6 lb |
| Thickspike Wheatgrass 4 lb |
| Slender Wheatgrass 9 lb |
| Yarrow ¼ oz |
| Blanket Flower 2 oz. |
| Horsemint 0.5 oz |
| 28.2 lb / acre |

Table 9. Madison Supplemental Aerial seed mix.

| species | lbs/ac |
|-----------------------|------------|
| Annual Ryegrass | 9 |
| Bluebunch wheatgrass | 4 |
| Thickspike wheatgrass | 3 |
| Slender wheatgrass | 9 |
| Orchardgrass | 7 |
| Timothy | 9 |
| Common yarrow | <u>0.5</u> |
| | 41.5 |

Table 10. Horseshoe Hills seed mix.

| <i>Common Name</i> | <i>Scientific Name</i> | <i>Rate (lbs/ac)</i> |
|------------------------------|-----------------------------|----------------------|
| Annual Ryegrass | <i>Elymus spp.</i> | 6 |
| Thickspike Wheatgrass | <i>Elymus lanceolatus</i> | 3 |
| Slender Wheatgrass | <i>Elymus trachycaulus</i> | 5.5 |
| Idaho Fescue | <i>Festuca idahoensis</i> | 3 |
| Common Yarrow | <i>Achillea millefolium</i> | <u>0.5</u> |
| | | 18 |

Table 11. Mattie V mine seed mix (do not have rates).

| |
|-----------------------|
| |
| Slender Wheatgrass |
| Squirrel Tail |
| Canada Wildrye |
| Western Yarrow |
| White Sagebrush |
| Bluebunch Wheatgrass |
| Idaho fescue |
| Mountain Brome |
| Tufted Hairgrass |
| Western Wheatgrass |
| Blue Wildrye |
| Clustered Field sedge |
| Fowl Mannagrass |
| Fowl Bluegrass |
| ??? lb / acre |

Table 12. Plot Data Summary.

| Site | Species/Lifeform | Frequency Grid Count | | % Canopy Cover | |
|----------|----------------------|----------------------|----------|----------------|------------|
| | | 2013 | 2014 | 2013 | 2014 |
| CH164_L1 | Canada bluegrass | 11 | ? | 0.5 | ? |
| CH164_L1 | orchardgrass | 20 | 24 | 10.0 | 3.0 |
| CH164_L1 | other forbs | 9 | 11 | 0.5 | 0.5 |
| CH164_L1 | prairie junegrass | | 1 | | 0.5 |
| CH164_L1 | sheep fescue | 8 | 21 | 0.5 | 10.0 |
| CH164_L1 | slender wheatgrass | 28 | 28 | 20.0 | 20.0 |
| CH164_L1 | snowberry | | 3 | | 0.5 |
| CH164_L1 | spotted knapweed | | 0 | | 3.0 |
| CH164_L1 | timothy | <u>1</u> | <u>1</u> | <u>0.5</u> | <u>0.5</u> |
| | sum | 77 | 89 | 32.0 | 38.0 |
| CH180_L3 | Canada bluegrass | 6 | 4 | 0.5 | 0.5 |
| CH180_L3 | crested wheatgrass | | 1 | | 0.5 |
| CH180_L3 | other forbs | 2 | 10 | 20.0 | 0.5 |
| CH180_L3 | smooth brome | 34 | 84 | 30.0 | 60.0 |
| CH180_L3 | spotted knapweed | 33 | 41 | 10.0 | 20.0 |
| CH180_L3 | timothy | <u>1</u> | <u>0</u> | <u>10.0</u> | <u>0.5</u> |
| | sum | 76 | 140 | 70.5 | 82.0 |
| CH180_L4 | other forbs | 36 | 22 | 0.5 | 0.5 |
| CH180_L4 | other grasses | 1 | 2 | 0.5 | 0.5 |
| CH180_L4 | snowberry | | 6 | | 3.0 |
| CH180_L4 | spotted knapweed | 93 | 91 | 30.0 | 30.0 |
| CH180_L4 | timothy | <u>7</u> | <u>4</u> | <u>0.5</u> | <u>0.5</u> |
| | sum | 137 | 125 | 31.5 | 34.5 |
| Cox 1-1 | cheatgrass | 98 | | | |
| Cox 1-1 | dalmatian toadflax | 32 | | | |
| Cox 1-1 | other forbs | 85 | | | |
| Cox 1-1 | other grasses | 18 | | | |
| Cox 1-1 | sheep fescue | 10 | | | |
| Cox 1-2 | cheatgrass | 100 | | | |
| Cox 1-2 | crested wheatgrass | 1 | | | |
| Cox 1-2 | dalmatian toadflax | 21 | | | |
| Cox 1-2 | other forbs | 32 | | | |
| Cox 1-2 | other grasses | 55 | | | |
| Cox 1-3 | bluebunch wheatgrass | 19 | | | |
| Cox 1-3 | cheatgrass | 90 | | | |
| Cox 1-3 | dalmatian toadflax | 46 | | | |
| Cox 1-3 | other forbs | 31 | | | |
| Cox 1-3 | other grasses | 45 | | | |
| Cox 1-3 | spotted knapweed | 1 | | | |
| Cox 1-3 | sulfur cinquefoil | 2 | | | |
| Cox 2-1 | cheatgrass | 84 | | | |
| Cox 2-1 | dalmatian toadflax | 17 | | | |

| | | | | | |
|-------------------|--------------------|-----------|-----------|------------|-------------|
| Cox 2-1 | leafy spurge | 7 | | | |
| Cox 2-1 | other forbs | 11 | | | |
| Cox 2-1 | other grasses | 75 | | | |
| Cox 2-1 | spotted knapweed | 80 | | | |
| Cox 2-1 | sulfur cinquefoil | 1 | | | |
| Cox 2-2 | cheatgrass | 92 | | | |
| Cox 2-2 | dalmatian toadflax | 26 | | | |
| Cox 2-2 | other forbs | 27 | | | |
| Cox 2-2 | other grasses | 86 | | | |
| Cox 2-2 | spotted knapweed | 59 | | | |
| Cox 2-3 | cheatgrass | 87 | | | |
| Cox 2-3 | dalmatian toadflax | 35 | | | |
| Cox 2-3 | other forbs | 26 | | | |
| Cox 2-3 | other grasses | 32 | | | |
| Cox 2-3 | spotted knapweed | 64 | | | |
| Cox 2-3 | sulfur cinquefoil | <u>3</u> | | | |
| | sum | 1498 | | | |
| | avg for 6 reps | 250 | | | |
| | | | | | |
| Horseshoe Hills 1 | Idaho fescue | 6 | 14 | 5.8 | 2.5 |
| Horseshoe Hills 1 | cheatgrass | 34 | 14 | 0.8 | 1.2 |
| Horseshoe Hills 1 | other forbs | 90 | 19 | 16.6 | 4.2 |
| Horseshoe Hills 1 | other grasses | 64 | 55 | 20.8 | 13.3 |
| Horseshoe Hills 1 | spotted knapweed | <u>1</u> | <u>2</u> | <u>0.2</u> | <u>0.1</u> |
| | sum | 195 | 104 | 44.2 | 21.3 |
| | | | | | |
| HW11-L1 | Canada bluegrass | 5 | 8 | 0.5 | 10.0 |
| HW11-L1 | elk sedge | 4 | 17 | 10.0 | 10.0 |
| HW11-L1 | mountain brome | | 4 | | 3.0 |
| HW11-L1 | other forbs | 67 | 7 | 0.5 | 0.5 |
| HW11-L1 | other grasses | 8 | 14 | 0.5 | 10.0 |
| HW11-L1 | slender wheatgrass | 1 | 7 | 0.5 | 3.0 |
| HW11-L1 | sulfur cinquefoil | 1 | 0 | 0.5 | 0.0 |
| HW11-L1 | timothy | <u>17</u> | <u>28</u> | <u>3.0</u> | <u>20.0</u> |
| | sum | 103 | 85 | 15.5 | 56.5 |
| | | | | | |
| HW32-L1 | Canada bluegrass | 40 | 56 | 3.0 | 0.5 |
| HW32-L1 | Idaho fescue | | 2 | | 0.5 |
| HW32-L1 | other forbs | 9 | 2 | 0.5 | 0.5 |
| HW32-L1 | other grasses | 1 | 1 | 0.5 | 0.5 |
| HW32-L1 | spotted knapweed | 74 | 96 | 30.0 | 30.0 |
| HW32-L1 | sulfur cinquefoil | 2 | 3 | 0.5 | 0.5 |
| HW32-L1 | timothy | <u>3</u> | <u>1</u> | <u>0.5</u> | <u>0.5</u> |
| | sum | 129 | 161 | 35.0 | 33.0 |
| | | | | | |
| HW5-L2 | mountain brome | 24 | 6 | 10.0 | 10.0 |
| HW5-L2 | other forbs | 31 | 3 | 0.5 | 0.5 |
| HW5-L2 | sedge sp. | | 1 | | 0.5 |

| | | | | | |
|--------------------------|----------------------|-----|-----|------|------|
| HW5-L2 | slender wheatgrass | 43 | 65 | 40.0 | 60.0 |
| HW5-L2 | spotted knapweed | 1 | 5 | 0.5 | 3.0 |
| HW5-L2 | timothy | 2 | 5 | 3.0 | 3.0 |
| HW5-L2 | western needlegrass | 1 | 1 | 0.5 | 0.5 |
| | sum | 102 | 86 | 54.5 | 77.5 |
| HW6-L1 | bedstraw | | 3 | | 0.5 |
| HW6-L1 | Canada bluegrass | 27 | 9 | 10.0 | 0.5 |
| HW6-L1 | cheatgrass | 50 | 20 | 30.0 | 10.0 |
| HW6-L1 | mountain brome | 6 | 1 | 3.0 | 0.5 |
| HW6-L1 | other forbs | 8 | 2 | 0.5 | 0.5 |
| HW6-L1 | slender wheatgrass | 8 | 12 | 3.0 | 3.0 |
| HW6-L1 | spotted knapweed | 4 | 29 | 3.0 | 20.0 |
| HW6-L1 | snowberry | | 12 | | 3.0 |
| HW6-L1 | timothy | 1 | 10 | 10.0 | 20.0 |
| | sum | 104 | 98 | 59.5 | 58.0 |
| HW6-L2 | bedstraw | | 3 | | 0.5 |
| HW6-L2 | bluegrass species | 8 | 9 | 0.5 | 0.5 |
| HW6-L2 | mountain brome | | 1 | | 0.5 |
| HW6-L2 | other forbs | 14 | | 0.5 | |
| HW6-L2 | other grasses | 11 | | 3.0 | |
| HW6-L2 | sedge sp. | | 12 | | 3.0 |
| HW6-L2 | snowberry | 13 | 25 | 30.0 | 30.0 |
| HW6-L2 | spotted knapweed | 69 | 84 | 40.0 | 60.0 |
| HW6-L2 | timothy | 2 | 3 | 0.5 | 0.5 |
| HW6-L2 | yarrow | | 5 | | 0.5 |
| HW6-L2 | yellow toadflax | 8 | 7 | 3.0 | 0.5 |
| | sum | 125 | 149 | 77.5 | 96.0 |
| Jocko Unit 101 Road deco | blue wildrye? | | 13 | | 10.0 |
| Jocko Unit 101 Road deco | Canada bluegrass | 15 | 20 | 0.5 | 3.0 |
| Jocko Unit 101 Road deco | other forbs | 60 | 40 | 0.5 | 0.5 |
| Jocko Unit 101 Road deco | Sandberg's bluegrass | 5 | 10 | 0.5 | 10.0 |
| Jocko Unit 101 Road deco | slender wheatgrass | 21 | 21 | 3.0 | 10.0 |
| Jocko Unit 101 Road deco | timothy | 3 | 6 | 0.5 | 0.5 |
| | sum | 104 | 110 | 5.0 | 34.0 |
| Madison 1 | cheatgrass | 99 | | | |
| Madison 1 | other forbs | 32 | | | |
| Madison 1 | other grasses | 11 | | | |
| Madison 2 | cheatgrass | 76 | | | |
| Madison 2 | other forbs | 69 | | | |
| Madison 2 | other grasses | 34 | | | |

| | | | | | |
|------------|--------------------|----------|----------|-------|------------|
| Madison 3 | cheatgrass | 92 | | | |
| Madison 3 | common mullein | 1 | | | |
| Madison 3 | other forbs | 24 | | | |
| Madison 3 | other wheatgrasses | <u>2</u> | | | |
| | sum | 440 | | | |
| | avg for 3 reps | 147 | | | |
| | | | | | |
| Mattie V 1 | blue wildrye | 2 | 2 | 3.0 | 0.5 |
| Mattie V 1 | fowl bluegrass | 2 | 3 | 0.5 | 0.5 |
| Mattie V 1 | Idaho fescue | 1 | 2 | 0.5 | 0.5 |
| Mattie V 1 | mountain brome | 5 | 14 | 30.0 | 10.0 |
| Mattie V 1 | other forbs | 19 | 16 | 0.5 | 0.5 |
| Mattie V 1 | other wheatgrasses | 19 | 12 | 0.5 | 0.5 |
| Mattie V 1 | sedge sp. | | 2 | | 0.5 |
| Mattie V 1 | slender wheatgrass | 3 | 22 | 3.0 | 30.0 |
| Mattie V 1 | tree seedlings | | 4 | | 0.5 |
| Mattie V 1 | white clover | 42 | 24 | 20.0 | 10.0 |
| Mattie V 1 | yarrow | 17 | 27 | 0.5 | 0.5 |
| Mattie V 2 | blue wildrye | 9 | 12 | 3.0 | 0.5 |
| Mattie V 2 | fowl bluegrass | | 2 | | 0.5 |
| Mattie V 2 | Idaho fescue | | 9 | | 0.5 |
| Mattie V 2 | mountain brome | 52 | 44 | 30.0 | 10.0 |
| Mattie V 2 | other forbs | 7 | 7 | 0.5 | 0.5 |
| Mattie V 2 | other wheatgrasses | 12 | 30 | 0.5 | 0.5 |
| Mattie V 2 | slender wheatgrass | 1 | 20 | 3.0 | 30.0 |
| Mattie V 2 | tree seedlings | | 6 | | 0.5 |
| Mattie V 2 | white clover | 34 | 31 | 20.0 | 10.0 |
| Mattie V 2 | yarrow | 5 | 5 | 0.5 | 0.5 |
| Mattie V 3 | blue wildrye | 13 | 32 | 3.0 | 0.5 |
| Mattie V 3 | fowl bluegrass | 2 | 4 | 0.5 | 0.5 |
| Mattie V 3 | Idaho fescue | | 6 | | 0.5 |
| Mattie V 3 | mountain brome | 39 | 32 | 30.0 | 10.0 |
| Mattie V 3 | other forbs | 5 | 23 | 0.5 | 0.5 |
| Mattie V 3 | slender wheatgrass | 9 | 14 | 3.0 | 30.0 |
| Mattie V 3 | white clover | 40 | 25 | 20.0 | 10.0 |
| Mattie V 3 | yarrow | | <u>8</u> | | <u>0.5</u> |
| | sum | 338 | 438 | 173.0 | 160.0 |
| | avg for 3 reps | 113 | 146 | 57.7 | 53.3 |
| | | | | | |
| O'Brien 1 | cheatgrass | 93 | | | |
| O'Brien 1 | houndstongue | 1 | | | |
| O'Brien 1 | other forbs | 91 | | | |
| O'Brien 1 | other grasses | 97 | | | |
| O'Brien 1 | spotted knapweed | 5 | | | |
| O'Brien 1 | tumble mustard | 2 | | | |
| O'Brien 2 | cheatgrass | 85 | | | |
| O'Brien 2 | houndstongue | 1 | | | |
| O'Brien 2 | other forbs | 97 | | | |

| | | | | | |
|-----------|-------------------------|-----|--|--|--|
| O'Brien 2 | other grasses | 67 | | | |
| O'Brien 2 | spotted knapweed | 50 | | | |
| O'Brien 3 | bluebunch wheatgrass | 34 | | | |
| O'Brien 3 | cheatgrass | 59 | | | |
| O'Brien 3 | other forbs | 47 | | | |
| O'Brien 3 | other grasses | 40 | | | |
| O'Brien 3 | spotted knapweed | 17 | | | |
| | sum | 786 | | | |
| | avg for 3 reps | 262 | | | |