

Stand: Kramer 71; Association: *Festuca idahoensis*-*Symphoricarpos albus* (Daubenmire 1970);
T13N R44E S25, Whitman County, Washington; Ownership: Washington State University.

LOW SHRUBS	Apr. 14, Jun 11-12, 1998		Apr. 12, Jun. 15, 1959	
	% Coverage	% Frequency	% Coverage	% Frequency
<i>Rosa nutkana</i> /woodsii	27	95	2	22
<i>Spiraea betulifolia</i>	1	5	0	0
<i>Symphoricarpos albus</i>	8	70	15	92
PERENNIAL GRAMINOIDS				
<i>Agropyron spicatum</i>	3	55	57	88
<i>Bromus carinatus</i>	+	8	0	0
<i>Calamagrostis rubescens</i>	3	13	0	0
<i>Carex sp.</i>	1	8	0	0
<i>Carex rossii</i>	0	0	1	25
<i>Festuca idahoensis</i>	+	5	30	72
<i>Koeleria cristata</i>	+	13	3	28
<i>Poa ampla</i> [= <i>P. secunda</i>]	0	0	53	92
<i>Poa pratensis</i>	39	100	0	0
<i>Stipa columbiana</i>	1	18	0	0
PERENNIAL FORBS				
<i>Achillea millefolium</i> var. <i>lanulosa</i>	8	70	10	82
<i>Agastache urticifolia</i>	1	28	0	0
<i>Arnica soraria</i>	1	23	5	85
<i>Besseyia rubra</i>	2	38	2	20
<i>Calochortus elegans</i>	0	0	+	18
<i>Fraseria albicaulis</i>	0	0	1	12
<i>Gaillardia aristata</i>	+	15	+	2
<i>Galium boreale</i>	3	63	11	72
<i>Gentiana affinis</i>	+	5	+	2
<i>Geranium viscosissimum</i>	14	83	21	78
<i>Geum triflorum</i> var. <i>ciliatum</i>	29	100	14	48
<i>Hieracium albertinum</i>	9	60	+	10
<i>Hypericum perforatum</i>	+	10	0	0
<i>Iris missouriensis</i>	4	83	29	92
<i>Lithophragma parviflora</i>	+	3	+	2
<i>Lithospermum ruderale</i>	0	0	1	8
<i>Lomatium dissectum</i> var. <i>multifidum</i>	-	15	0	0
<i>Lomatium triternatum</i>	+	10	0	0
<i>Lupinus sericeus</i>	2	15	1	15
<i>Microseris nutans</i>	0	0	+	2
<i>Pendendia gairdneri</i>	0	0	1	5
<i>Potentilla arguta</i>	1	3	2	4
<i>Potentilla gracilis</i>	10	48	21	82
<i>Senecio integerrimus</i> var. <i>exaltata</i>	2	43	0	0
<i>Senecio serra</i>	+	15	0	0
<i>Sidalcea oregana</i>	1	18	8	50
<i>Taraxacum officinalis</i>	0	0	+	5
<i>Viola adunca</i>	10	68	2	35
<i>Zigadenus venenosus</i> var. <i>gramineus</i>	0	0	+	2
ANNUALS AND BIENNIALS				
<i>Bromus mollis</i>	1	25	0	0
<i>Cerastium sp.</i>	+	3	0	0
<i>Collinsia parviflora</i>	1	48	1	52
<i>Draba verna</i>	+	3	+	8
<i>Epilobium brachycarpum</i>	1	35	+	10
<i>Galium aparine</i>	4	80	1	12

Table 6. Comparison of frequency and coverage of vascular plant taxa at Kramer Prairie Transect #71, in 1958 and 1998. Taxa shown in bold type are non-native. + indicates coverage value $\leq 0.5\%$. N=40 subplots for 1958 and 1998 data. Information on 1958 coverage is from Daubenmire (1970) and field notebooks of Rexford Daubenmire, housed in Washington State University's Manuscripts, Archives, and Special Collections.

Stand: Colfax; Association: *Agropyron spicatum-Poa secunda* lithosol (Daubenmire 1970); T16N R43E S11 and T16N R43E S2, Whitman County, Washington; Ownership: Washington Department of Transportation.

	T16N R43E S11		T16N R43E S2	
	May 1, Jun. 13, 1998		Apr. 30, May 28, 1963	
	% coverage	% frequency	% Coverage	% Frequency
LOW SHRUBS				
<i>Eriogonum heracleoides</i>	1	4	1	10
<i>Eriogonum niveum</i>	+	4	+	2
PERENNIAL GRAMINOIDS				
<i>Agropyron spicatum</i>	21	88	70	99
<i>Poa bulbosa</i>	13	72	0	0
<i>Poa secunda</i>	10	92	18	99
PERENNIAL FORBS				
<i>Allium acuminatum</i>	2	60	5	70
<i>Balsamorhiza sagittata</i>	5	8	+	2
<i>Lithophragma bulbifera</i>	1	28	2	70
<i>Lomatium</i> sp.	+	20	0	0
<i>Lupinus</i> sp.	1	4	0	0
ANNUALS AND BIENNIALS				
<i>Agoseris heterophylla</i>	0	0	1	28
<i>Amsinckia retrorsa</i>	+	8	0	0
<i>Arabidopsis thaliana</i>	0	0	1	30
<i>Bromus brizaeformis</i>	+	20	1	22
<i>Bromus japonicus</i>	0	0	+	18
<i>Bromus mollis</i>	3	76	0	0
<i>Bromus tectorum</i>	8	60	3	99
<i>Descurainia</i> sp.	+	16	0	0
<i>Draba verna</i>	9	100	10	99
<i>Epilobium brachycarpum</i>	1	40	0	0
<i>Erodium cicutarium</i>	+	8	0	0
<i>Festuca microstachys</i>	5	56	1	30
<i>Idahoia scapigera</i>	0	0	-	2
<i>Lactuca serriola</i>	+	4	1	28
<i>Lithospermum arvense</i>	+	8	+	2
<i>Madia gracilis</i>	+	8	0	0
<i>Myosotis micrantha</i>	+	8	0	0
<i>Polygonum</i> sp.	+	4	0	0
<i>Tragopogon dubius</i>	+	8	+	8
<i>Vernanata dubia</i>	+	4	0	0
<i>Vicia villosa</i>	7	88	0	0

Table 7. Frequency and coverage of vascular plant taxa at Colfax site in spring 1998 with coverage along Daubenmire transect in adjacent section in 1963. Taxa shown in bold type are non-native. + indicates coverage value $\leq 0.5\%$. N=25 subplots for 1998 data and 40 subplots for 1963 data. Information on 1963 coverage is from Daubenmire (1970) and field notebooks of Rexford Daubenmire, housed in Washington State University's Manuscripts, Archives, and Special Collections.

Stand: Waha, Association: *Agropyron spicatum*-*Poa secunda* [=sandbergii] scabland (Johnson and Simon 1987); T33N R4W S4, Nez Perce County, Idaho; Ownership: Private.

	Apr. 20, Jun. 8, 1998	
	% Coverage	% Frequency
LOW SHRUBS		
<i>Symphoricarpos albus</i>	1	4
PERENNIAL GRAMINOIDS		
<i>Agropyron spicatum</i>	47	96
<i>Danthonia intermedia</i>	5	48
<i>Festuca idahoensis</i>	+	4
<i>Poa secunda</i>	1	28
PERENNIAL FORBS		
<i>Astragalus sheldonii</i>	3	32
<i>Balsamorhiza incana</i>	2	12
<i>Brodiaea douglasi</i>	+	8
<i>Lithophragma bulbifera</i>	3	84
<i>Lomatium cous</i>	4	72
<i>Lupinus sericeus</i>	4	8
<i>Orobanche uniflora</i> var. <i>purpurea</i>	+	4
<i>Ranunculus glaberrimus</i>	+	4
<i>Scutellaria angustifolia</i>	3	48
<i>Sisyrinchium inflatum</i>	27	92
ANNUALS		
<i>Amsinckia retrorsa</i>	+	4
<i>Arabidopsis thaliana</i>	+	16
<i>Arenaria serpyllifolia</i>	+	20
<i>Bromus</i> sp.	+	4
<i>Collinsia parviflora</i>	1	28
<i>Draba verna</i>	1	48
<i>Epilobium brachycarpum</i>	+	20
<i>Galium pedemontanum</i>	+	4
<i>Lactuca serriola</i>	+	8
<i>Myosotis micrantha</i>	1	56
<i>Phlox gracilis</i> ssp. <i>gracilis</i>	1	36
<i>Polygonum</i> sp.	2	40
<i>Stellaria</i> sp.	1	4
<i>Tragopogon dubius</i>	+	8
<i>Ventenata dubis</i>	9	88

Table 8. Frequency and coverage of vascular plant taxa at Waha site in spring 1998. Taxa shown in bold type are non-native. + indicates coverage value $\leq 0.5\%$. N=25 subplots.

Stand: Smoothing Iron Ridge; Association: *Agropyron spicatum-Festuca idahoensis*; (Daubenmire 1970); T9N R43E S36, Asotin County, Washington; Ownership: Washington Department of Natural Resources.

	May 5, Jun. 19, 1998	
	% Coverage	% Frequency
LOW SHRUBS		
<i>Erigonum heracleoides</i>	4	24
<i>Phlox speciosa</i>	1	12
PERENNIAL GRAMINOIDS		
<i>Agropyron spicatum</i>	40	100
<i>Festuca idahoensis</i>	9	72
<i>Poa cusickii</i>	5	40
<i>Poa secunda</i>	8	88
PERENNIAL FORBS		
<i>Achillea millefolium</i>	+	4
<i>Astragalus sheldonii</i>	4	52
<i>Balsamorhiza sagittata</i>	3	8
<i>Balsamorhiza serrata</i>	9	60
<i>Brodiaea</i> sp.	+	4
<i>Calochortus elegans</i>	+	8
<i>Castilleja thompsonii</i>	1	8
<i>Crepis</i> sp.	+	12
<i>Delphinium nuttalianum</i>	1	36
<i>Fritillaria pudica</i>	+	4
<i>Lithophragma bulbifera</i>	1	40
<i>Lomatium cous</i>	3	56
<i>Lomatium triternatum</i>	5	56
<i>Lupinus sulphureus</i> var. <i>sulphureus</i>	4	28
<i>Lupinus</i> sp.	+	4
<i>Sedum</i> sp.	+	8
<i>Senecio integerrimus exaltata</i>	1	4
<i>Sisyrinchium</i> sp.	+	4
ANNUALS AND BIENNIALS		
<i>Alyssum alyssoides</i>	1	40
<i>Bromus brizaeformis</i>	1	48
<i>Bromus mollis</i>	1	28
<i>Bromus tectorum</i>	+	4
<i>Clarkia pulchella</i>	4	48
<i>Collinsia parviflora</i>	2	72
<i>Draba verna</i>	2	72
<i>Galium aparine</i>	+	4
<i>Holosteum umbellatum</i>	1	32
<i>Lactuca serriola</i>	+	8
<i>Myosotis micrantha</i>	2	96
<i>Phlox gracilis</i> ssp. <i>gracilis</i>	1	44

Table 9. Frequency and coverage of vascular plant taxa at Smoothing Iron Ridge site in spring 1998. Taxa shown in bold type are non-native. + indicates coverage value $\leq 0.5\%$. N=25 subplots.

Stand: Paradise Ridge; Association: *Festuca idahoensis* *Symphoricarpos albus*
 Daubenmire (1970); T38N R5W S4, Latah County, Idaho; Ownership: Private.

Jul. 27, 1998		
MEDIUM SHRUBS	% Coverage	% Frequency
<i>Crataegus douglasi</i>	4	4
<i>Prunus virginiana</i>	2	20
LOW SHRUBS		
<i>Eriogonum heracleioides</i>	1	8
<i>Rosa nutkana/woodsii</i>	4	24
<i>Spiraea betulifolia</i>	21	64
<i>Symphoricarpos albus</i>	30	92
PERENNIAL GRAMINOIDS		
<i>Agropyron spicatum</i>	19	48
<i>Carex</i> sp.	2	4
<i>Poa secunda</i>	+	4
PERENNIAL FORBS		
<i>Achillea millefolium</i> var. <i>lanulosa</i>	3	28
<i>Balsamorhiza sagittata</i>	3	4
<i>Besseyia rubra</i>	1	4
<i>Helianthella uniflora</i> var. <i>douglasii</i>	12	36
<i>Lomatium dissectum</i> var. <i>multifidum</i>	2	8
<i>Lomatium</i> sp.	1	4
<i>Solidago missouriensis</i>	5	24
<i>Zigadenus venenosus</i> var. <i>gramineus</i>	+	8
ANNUALS		
<i>Agoseris heterophylla</i>	+	4
<i>Agrostis interrupta</i>	+	20
<i>Alyssum alyssoides</i>	+	4
<i>Bromus japonicus</i>	14	96
<i>Collomia linearis</i>	+	12
<i>Cryptantha</i> sp.	2	24
<i>Epilobium brachycarpum</i>	16	100
<i>Galium aparine</i>	3	24
<i>Lactuca serriola</i>	+	8
<i>Madia gracilis</i>	1	24
<i>Phlox gracilis</i> ssp. <i>gracilis</i>	+	4
<i>Polygonum convolvulus</i>	+	4
<i>Tragopogon dubius</i>	+	4
<i>Vernanata dubia</i>	+	20

Table 10. Frequency and coverage of vascular plant taxa at Paradise Ridge site in July 1998. Taxa shown in bold type are non-native. + indicates coverage value $\leq 0.5\%$. N=25 subplots.

Reconnaissance surveys

The results of our reconnaissance surveys (Table 11, Appendix 2) also indicate that exotic species are widespread and varied in Palouse and Canyon grasslands. The alien taxa are primarily annual grasses—such as rattlesnake brome (*Bromus brizaeformis*), cheatgrass (*B. tectorum*), other annual bromes, ventenata, and interrupted apera (*Agrostis interrupta*)—or forbs, such as yellow star-thistle, common St. John's-wort (*Hypericum perforatum*), Canada thistle (*Cirsium arvense*), field morning-glory, prickly lettuce (*Lactuca serriola*), erect cinquefoil, and hairy vetch (*Vicia villosa*). On mesic sites, such as Spaulding Road, Reubens Cemetery, and Chief Old Joseph Monument, Kentucky bluegrass (*Poa pratensis*) is widespread, whereas on drier sites such as Knotgrass Ridge, Chief Joseph Wildlife Area, and Wawawai Canyon, annual bromes and yellow star-thistle are problematic. Relatively recent invaders such as white bryony, *Bryonia alba* (Engle 1988), yellow star-thistle, and bur chervil (*Anthriscus caucalis*) are of particular concern.

At Kamiak Butte County Park we were able to compare species lists from 1933, 1979, and 1998 (Table 12). These data indicate that new alien taxa continue to appear at Kamiak Butte. In 1933 Mullen listed 17 alien taxa present at "Kamiak Mountain"; an additional 23 non-native taxa were reported at Kamiak Butte by Fiely in 1979. Twenty-four additional alien taxa have since been recorded in the park (Table 12, Jim Croft and Jim Roberts, personal communications). These lists include both the forest and the grassland habitats of the butte; however, most of the exotic species occur in the grassland.

Recommendations

Conservation sites

The Palouse Land Trust has begun contacting landowners of priority conservation sites we identified. We recommend that this work be continued. Using the information provided by this study, land trust members should discuss the unique values that give the landowner's property its high conservation value, inform the landowner of options for voluntary protection (e.g., establishment of a conservation easement restricting development rights, donation of property to a land trust) and the tax benefits of such agreements to the landowner, and offer assistance to landowners who wish to consider private conservation agreements.

Some sites that were not identified as priority conservation sites in our analysis because of their small size nevertheless merit consideration because of the presence of two or more rare plant taxa. Two of our reconnaissance sites, Spaulding Road and Reubens Cemetery, are in this category. The Spaulding site was recommended for protection by Gamon and Lorain (1991).

A. Kamiak Butte County Park

Date: Jul. 28, 1998	Stand #: Association		
	1: Syal phase	2: Agsp-Feid	3: Agsp-Pose
SHRUBS			
<i>Prunus emarginata</i>	1	0	0
<i>Spiraea betulifolia</i>	1	1	0
<i>Symphoricarpos albus</i>	5	1	0
PERENNIAL GRAMINOIDS			
<i>Agropyron spicatum</i>	0	5	3
<i>Festuca idahoensis</i>	0	2	0
<i>Poa secunda</i>	0	0	1
PERENNIAL FORBS			
<i>Achillea millefolium</i>	2	1	1
<i>Antennaria luzuloides</i>	0	0	1
<i>Arenaria capillaris</i>	0	0	1
<i>Balsamorhiza sagittata</i>	1	2	0
<i>Calochortus maculosus</i>	0	1	0
<i>Cirsium brevifolium</i>	1	0	0
<i>Geranium viscosissimum</i>	1	0	0
<i>Helianthella uniflora</i>	2	1	0
<i>Haplopappus carthamoides</i>	0	1	0
<i>Hieracium albertinum</i>	1	0	0
<i>Lithospermum ruderale</i>	1	0	0
<i>Lomatium dissectum</i>	1	2	0
<i>Lomatium grayi</i>	0	0	1
<i>Lupinus sericeus</i>	0	1	0
<i>Potentilla gracilis</i>	1	1	0
<i>Wyethia amplexicaule</i>	0	1	0
<i>Zigadenus venenosus</i>	0	1	0
ANNUALS AND BIENNIALS			
<i>Agrostis interrupta</i>	0	1	0
<i>Bromus japonicus</i>	2	1	1
<i>Bromus tectorum</i>	1	0	0
<i>Clarkia pulchella</i>	0	1	0
<i>Epilobium brachycarpum</i>	1	1	1
<i>Festuca microstachys</i>	0	0	1
<i>Lactuca serriola</i>	1	0	1
<i>Tragopogon sp.</i>	0	0	1
<i>Ventenata dubia</i>	0	1	2

Table 11. Reconnaissance plot data for selected sites. A: Kamiak Butte County Park, B: Mary Minerva McCroskey Memorial State Park, C: Wawawai Road, D: Spaulding Road, E: Knotgrass Road, F: Chief Joseph Wildlife Area. Agsp=*Agropyron spicatum*, Arri=*Artemisia rigida*, Feid=*Festuca idahoensis*, Fesc=*Festuca scabrella*, Pipo=*Pinus ponderosa*, Pose=*Poa secunda*, Rosa=*Rosa mutkana/woodsii*, Syal=*Symphoricarpos albus*. Numbers represent coverage classes (1=0-5%, 2=5-25%, 3=25-50%, 4=50-75%, 5=75-95%, 6=95-100%) in a single 5 x 5-m plot. See Appendices 1 and 2 for locations and descriptions of reconnaissance sites.