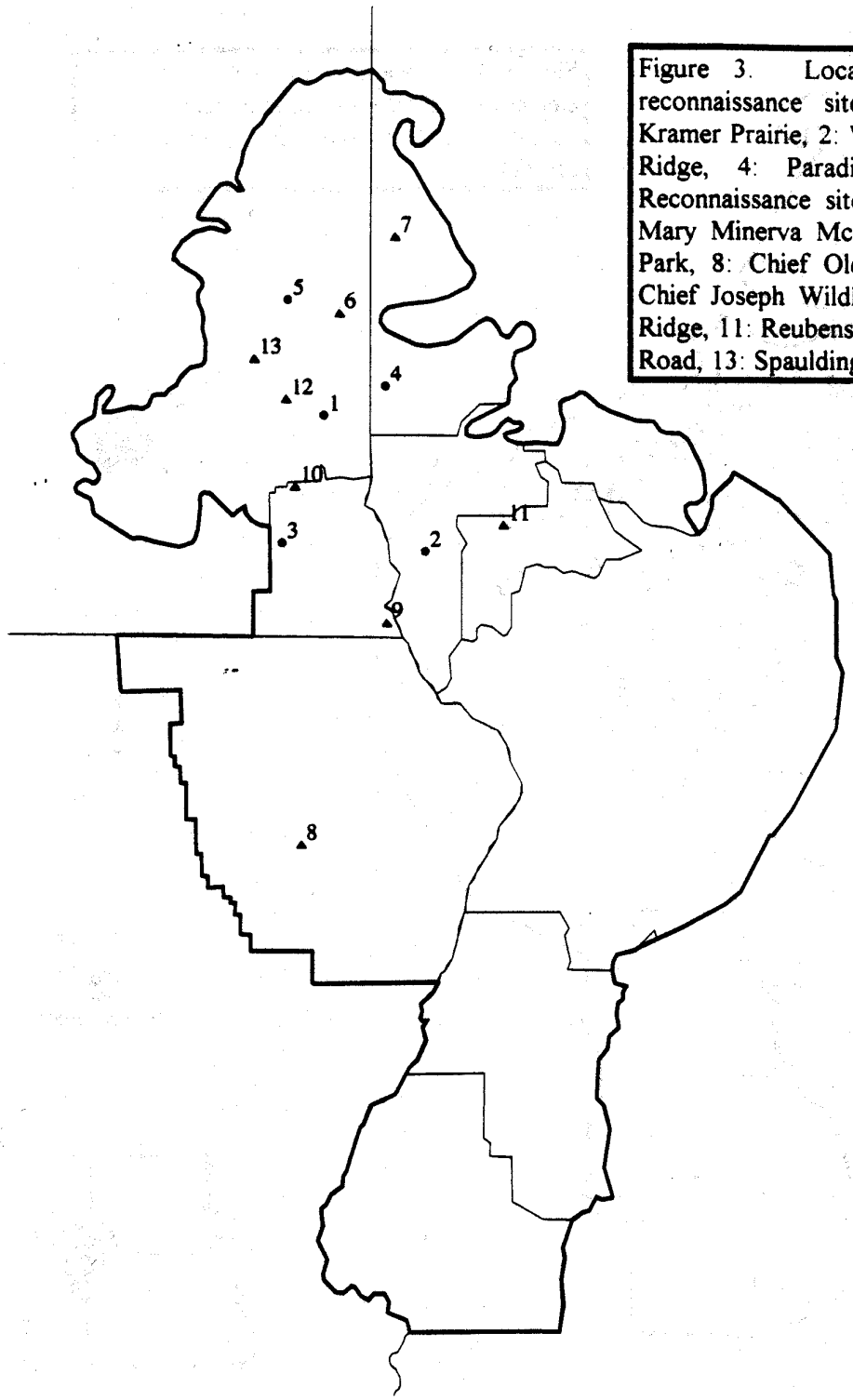
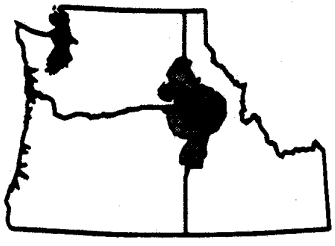


Figure 3. Locations of monitor and reconnaissance sites. Monitor sites: 1: Kramer Prairie, 2: Waha, 3: Smoothing Iron Ridge, 4: Paradise Ridge, 5: Colfax. Reconnaissance sites: 6: Kamiak Butte, 7: Mary Minerva McCroskey Memorial State Park, 8: Chief Old Joseph Monument, 9: Chief Joseph Wildlife Area, 10: Knotgrass Ridge, 11: Reubens Cemetery, 12: Wawawai Road, 13: Spaulding Road.



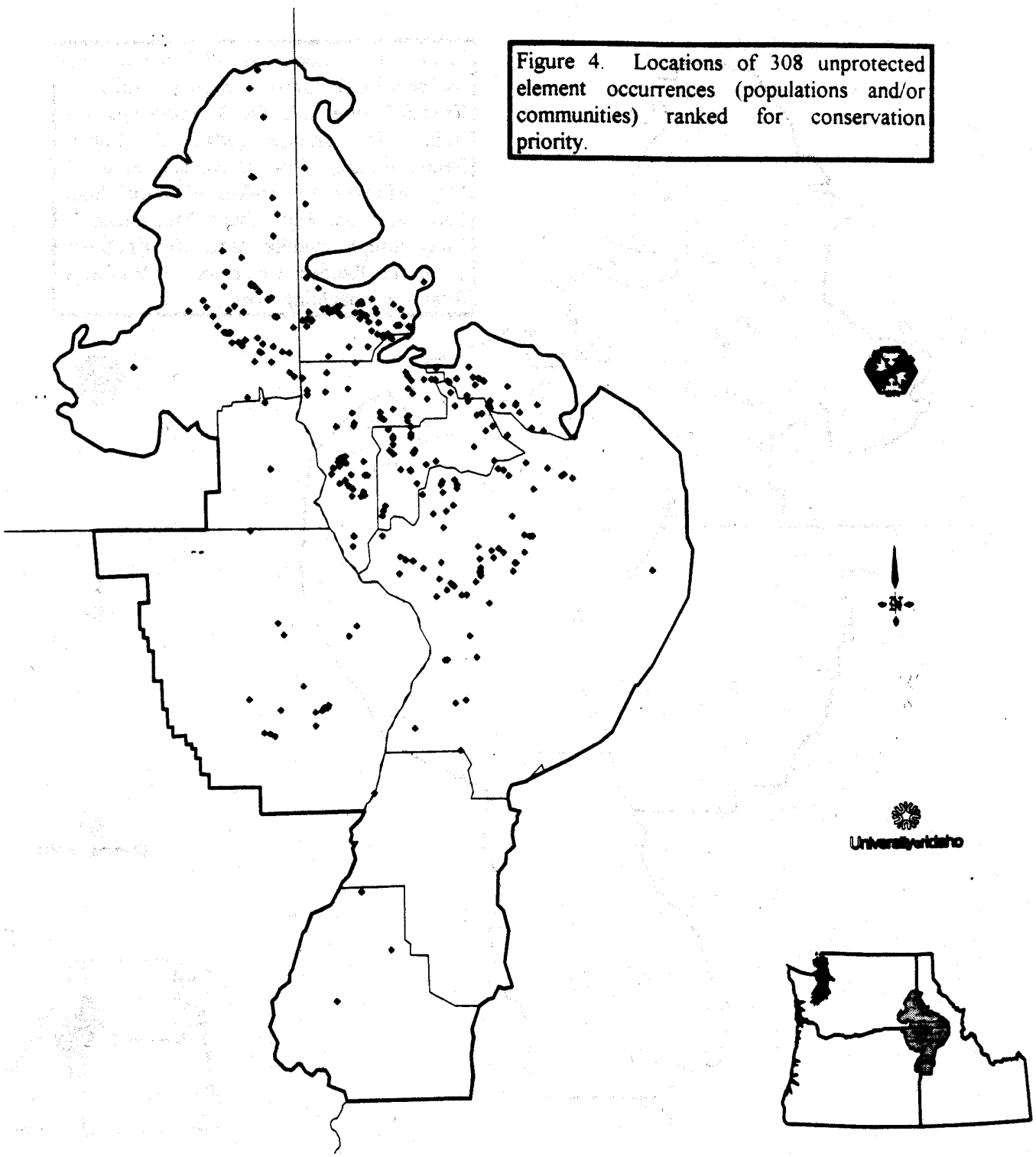


Figure 4. Locations of 308 unprotected element occurrences (populations and/or communities) ranked for conservation priority.

Site #	Elements Present	Points				Conservation Value Rank
		Distance	Area	# of EOs	Quality	
1	CREPIS BAKERI SSP IDAHOENSIS	4		1		**2.50**
2	TRIFOLIUM PLUMOSUM VAR AMPLIFOLIUM	4		1		**2.50**
3	HAPLOPAPPUS LIATRIFORMIS	4		1		**2.50**
4	FESTUCA IDAHOENSIS/SYMPHORICARPOS ALBUS FESTUCA IDAHOENSIS/ROSA NUTKANA TRIFOLIUM PLUMOSUM VAR AMPLIFOLIUM HAPLOPAPPUS LIATRIFORMIS CALOCHORTUS NITIDUS	1		5	2	**2.67**
5	FESTUCA IDAHOENSIS/SYMPHORICARPOS ALBUS HAPLOPAPPUS LIATRIFORMIS	3		2	3	**2.67**
6	FESTUCA IDAHOENSIS-KOELERIA CRISTATA CALOCHORTUS NITIDUS	2		2	4	**2.67**
7	HAPLOPAPPUS LIATRIFORMIS	3		1	4	**2.67**
8	LOMATIUM DISSECTUM VAR DISSECTUM	3		1	4	**2.67**
9	ASTER JESSICAE	3		1	4	**2.67**
10	HAPLOPAPPUS LIATRIFORMIS	3		1	4	**2.67**
11	FESTUCA IDAHOENSIS/SYMPHORICARPOS ALBUS	3		1	4	**2.67**
12	CALOCHORTUS MACROCARPUS VAR MACULOSUS	2	4	1	4	**2.75**
13	FESTUCA IDAHOENSIS/ROSA NUTKANA TRIFOLIUM PLUMOSUM VAR. AMPLIFOLIUM HAPLOPAPPUS LIATRIFORMIS CALOCHORTUS NITIDUS	2		4	3	**3.00**
14	CALOCHORTUS NITIDUS	4		1	4	**3.00**
15	FESTUCA IDAHOENSIS/SYMPHORICARPOS ALBUS	4		1	4	**3.00**
16	TRIFOLIUM PLUMOSUM VAR. AMPLIFOLIUM	4		1	4	**3.00**
17	FESTUCA IDAHOENSIS/SYMPHORICARPOS ALBUS	4		1	4	**3.00**
18	HAPLOPAPPUS LIATRIFORMIS	4		1	4	**3.00**
19	AGROPYRON SPICATUM-POA SECUNDA SCABLAND FESTUCA IDAHOENSIS-KOELERIA CRISTATA LOW ELEVATION VARIANT FESTUCA IDAHOENSIS-KOELERIA CRISTATA HIGH ELEVATION VARIANT FESTUCA IDAHOENSIS-AGROPYRON SPICATUM LUPINUS SERICEUS VARIANT AGROPYRON SPICATUM-POA SECUNDA/SCUTELLARIA ANGUSTIFOLIA	1		5		**3.00**
20	HAPLOPAPPUS LIATRIFORMIS SILENE SPALDINGII	4		2	4	**3.33**

Table 4. Unprotected sites ranked as having high conservation value. See text for explanation of ranking procedure.

All the sites identified as conservation priorities were in Idaho (Figure 5). This is primarily because most of the sites of high conservation value in the Palouse Grasslands of Washington are already registered with the Natural Areas Program, and relatively little information was available for Oregon. Most of the sites that received high conservation value rankings had high EO ranks and were located near other sites; many also contained more than one species or community of interest.

The species and communities we considered in our study vary in the degree to which they are associated with Palouse Grasslands or Canyon Grasslands. As noted above, steppe vegetation in Washington, typified by the *Agropyron spicatum-Poa secunda* and *Agropyron spicatum-Festuca idahoensis* zones, extends to the west of the Palouse Bioregion defined by Bailey. As expected, there were substantial numbers of EOs of these communities outside our study area. Similarly, the ranges of *Astragalus arrectus*, *Silene spaldingii*, and *Thelypodium laciniatum* var. *streptanthoides* extend west of the study area. In contrast to this, *Aster jessicae*, *Astragalus riparius*, *Calochortus macrocarpus* var. *maculosus*, *Calochortus nitidus*, *Crepis bakeri* spp. *idahoensis*, *Haplopappus liatriformis*, *Leptodactylon pungens* ssp. *hazeliae*, and *Mirabilis macfarlanei* are virtually endemic to the Palouse and/or Canyon grasslands; each of these taxa had fewer than six occurrences outside the study area.

The level of protection accorded to plant species within the study area varied greatly (Figure 6). For most species of interest, fewer than 15 populations in each state are protected. *Calochortus nitidus* and *Lomatium dissectum* var. *dissectum* in Idaho are exceptions, with 53 and 15 protected populations respectively. For some species the number of occurrences is fairly large, but the level of protection is very low. For example, none of the 56 occurrences of *Aster jessicae* within the study area in Idaho are protected, and only 7 of 43 occurrences of *Haplopappus liatriformis* in Idaho are protected. Although *Cirsium brevifolium* is endemic to southeast Washington, northeast Oregon, and adjacent Idaho, it is not tracked by the heritage programs in any of these states, so data were unavailable on the degree of protection it is currently receiving.

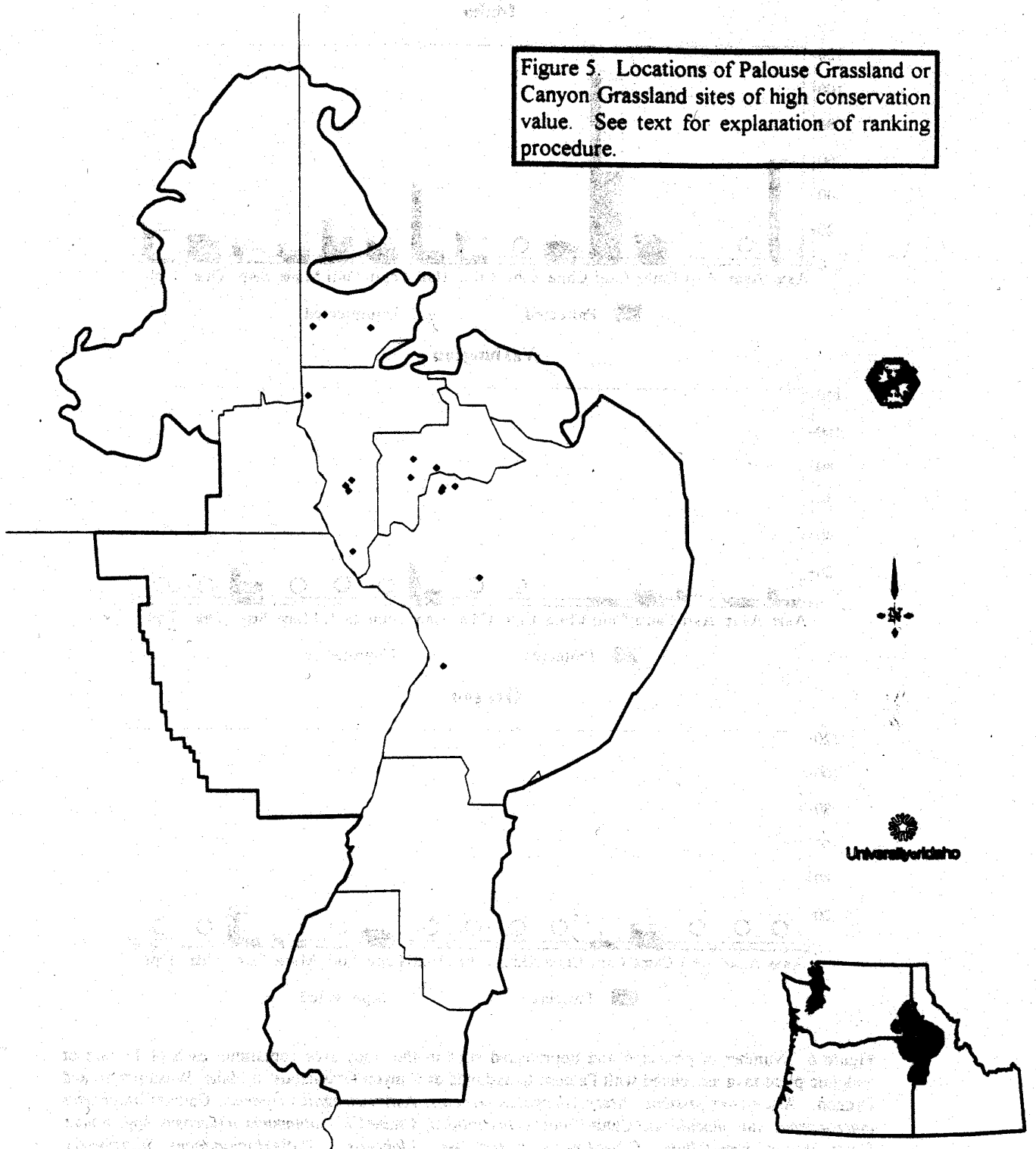


Figure 5. Locations of Palouse Grassland or Canyon Grassland sites of high conservation value. See text for explanation of ranking procedure.

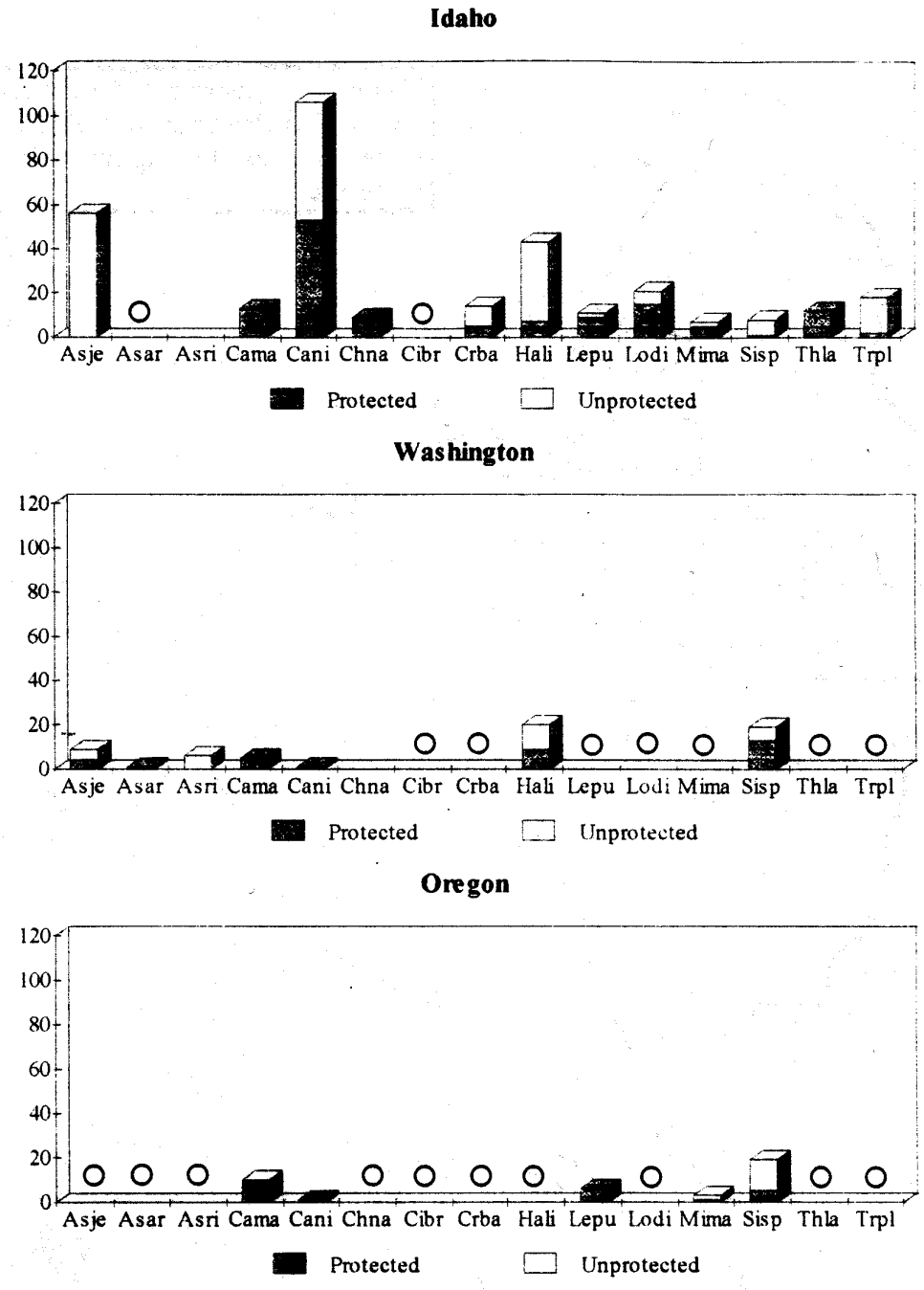


Figure 6. Number of protected and unprotected sites in the study area containing each of 15 rare or endemic plant taxa associated with Palouse Grasslands or Canyon Grasslands in Idaho, Washington, and Oregon. Asje=*Aster jessicae*, Asar=*Astragalus arrectus*, Asri=*Astragalus riparius*, Cama=*Calochortus macrocarpus* var. *maculosus*, Cani=*Calochortus nitidus*, Chna=*Chrysothamnus nauseosus* spp. *nanus*, Cibr=*Cirsium brevifolium*; Crba=*Crepis bakeri* ssp. *idahoensis*, Hali=*Haplopappus liatriformis*, Lepu=*Leptodactylon pungens*, Lodi=*Lomatium dissectum* var. *dissectum*, Mima=*Mirabilis Macfarlanei*, Sisp=*Silene spaldingii*, Thla=*Thelypodium laciniatum* var. *streptanthoides*, Trpl=*Trifolium plumosum* var. *amplifolium*. Open circles indicate that the taxon does not occur or is not considered rare in the indicated state.

Monitoring

The results of the monitoring transects are presented in Tables 5-10. We monitored two sites (Kramer Prairie and Paradise Ridge) in meadow steppe, with *Festuca idahoensis/Symphoricarpos albus* associations (*sensu* Daubenmire 1968), one site (Smoothing Iron Ridge) with true steppe vegetation (*Agropyron spicatum-Festuca idahoensis* association), and two sites (Waha and Colfax) with shallow-soil steppe associations (*Agropyron spicatum-Poa secunda* scabland or lithosol). Although we placed transects in portions of the study sites that were in relatively good condition, exotic species were present at all five sites. Smoothing Iron Ridge was in the best condition of the sites examined. At this site the coverage and diversity of exotics were low, and several of the exotic taxa were inconspicuous annual forbs such as *Draba verna*, *Alyssum alyssoides*, and *Myosotis micrantha.* At Paradise Ridge and Waha, alien annual grasses occurred at high frequencies. At Paradise Ridge, *Bromus japonicus* was the principal grass in this category, whereas at Waha we found *Ventenata dubia* in 88% of the plots. *Galium pedemontanum*, a recent invader of the Pacific Northwest, was also present at the Waha site. At Waha, 66% of the total length of the weed transects intercepted the canopies of non-native species, including yellow star-thistle (*Centaurea solstitialis*), field morning glory (*Convolvulus arvensis*), medusahead (*Elymus caput-medusae*), ventenata (*Ventenata dubia*), annual bromes (*Bromus* spp.), *Galium pedemontanum*, and erect cinquefoil (*Potentilla recta*).

Rare plants were present at three of the sites we monitored. At Paradise Ridge, approximately 300 *Haplopappus liatriformis* plants were counted on the south end of the ridge on Sept. 29. In 1990 the population size of this species at Paradise Ridge was estimated to be 101-1,000 (Gamon and Lorain 1991). At Kramer Prairie, approximately 240 *Haplopappus liatriformis* plants and 3 *Silene spaldingii* plants were counted on Aug. 14, 1998. An estimated 550 *H. liatriformis* were present in 1981 and again in 1990 (Gamon and Lorain 1991). No individuals of *Silene spaldingii* were found during a visit to the site in Aug. of 1995, although this species had previously been reported at the Kramer Prairie (WNHP record #PDCAR0U1S0*006). At the Waha site, 245 *Calochortus nitidus*, 5 *Crepis bakeri* ssp. *idahoensis*, and 47 *Haplopappus liatriformis* plants were counted on Aug. 27, 1997 (Janice Hill, personal communication). Several other populations of *Haplopappus liatriformis* are located within a few miles of this population (Gamon and Lorain 1991, Janice Hill, personal communication).

At Colfax and Kramer Prairie, a comparison with earlier data obtained at the same sites by Daubenmire allowed us to assess changes in community integrity. These data indicate substantial increases in the number and coverage of alien plants at both sites. At both transects in the Kramer Prairie, *Poa pratensis* was the most abundant exotic species in 1998, although this species was not recorded along either transect in the 1950s, and other exotics such as *Hypericum perforatum* and *Myosotis micrantha* had appeared. In addition, we found that the south-facing slope of the Kramer site is now virtually covered with yellow star-thistle. At Colfax, *Poa bulbosa* and *Vicia villosa* both appeared in over 70% of our plots, although these species had not been recorded in 1963 along a transect with similar species composition in the neighboring section.

Stand: Kramer 73; Association: *Festuca idahoensis Symphoricarpos albus* (Daubenmire 1970); T13N R44E S25, Whitman County, Washington; Ownership: Washington State University.

	Apr. 11-14, Jun. 18, 1998		May 1, Jun. 5, 1958	
MEDIUM SHRUBS	% Coverage	% Frequency	% Coverage	% Frequency
Crataegus douglasii	+	3	0	0
LOW SHRUBS				
Phlox speciosa/longifolia	+	5	0	0
Rosa nutkana/woodsii	4	23	3	21
Spiraea betulifolia	2	23	1	18
Symphoricarpos albus	10	68	6	94
PERENNIAL GRAMINOIDS				
Agropyron spicatum	6	70	56	99
Bromus carinatus var. carinatus	3	65	0	0
Carex rossii	0	0	1	18
Carex sp.	+	5		
Festuca idahoensis	19	90	58	99
Koeleria cristata	1	40	14	65
Poa ampla [=P. secunda]	0	0	3	12
Poa pratensis	**26**	**98**	**0**	**0**
PERENNIAL FORBS				
Achillea millefolium var. lanulosa	4	48	2	57
Agastache urticifolia	+	3	0	0
Balsamorhiza sagittata	7	18	12	24
Besseya rubra	2	43	2	27
Brodiaea douglasii	+	13	1	28
Calochortus macrocarpus	0	0	+	12
Castilleja lutescens	3	48	5	60
Erigeron corymbosus	0	0	1	6
Frasera albicaulis	1	13	4	30
Gaillardia aristata	5	15	+	2
Galium boreale	5	60	2	49
Gentiana affinis	+	3	0	0
Geranium viscosissimum	16	75	+	30
Geum triflorum var. ciliatum	27	90	20	64
Haplopappus liatriformis	1	18	10	57
Helianthella uniflora	2	10	2	12
Hieracium albertinum	+	10	3	15
Hypericum perforatum	+	**3**	**0**	**0**
Lithophragma parviflora	1	25	1	22
Lithospermum ruderale	1	10	+	3
Lomatium dissectum var. multifidum	4	75	0	0
Lomatium triternatum	1	28	+	5
Lupinus sericeus	+	5	4	40
Lupinus wyethii	0	0	+	2
Perideridia gairdneri	+	15	0	0
Potentilla arguta	+	3	0	0
Potentilla gracilis	9	50	46	88
Senecio integerrimus var. exaltata	5	88	1	18
Sidalcea oregana	1	10	0	0
Silene spaldingii	0	0	1	24
Sisyrinchium inflatum	2	65	2	60
Solidago missouriensis	2	30	5	21
Taraxacum officinale	**0**	**0**	**0**	**0**
Viola adunca	3	38	+	2
Zigadenus venenosus var. gramineus	0	0	1	5

Table 5. Comparison of frequency and coverage of vascular plant taxa at Kramer Prairie Transect #73, in 1958 and 1998. Taxa shown in bold type are non-native. + indicates coverage value ≤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.

	Apr. 11-14, Jun. 18, 1998		May 1, Jun. 5, 1958	
ANNUALS AND BIENNIALS	% Coverage	% Frequency	% Coverage	% Frequency
Bromus brizaeformis	+	3	0	0
Bromus japonicus	2	55	2	58
Collinsia parviflora	2	85	4	95
Draba verna	+	5	3	95
Epilobium brachycarpum	2	48	2	78
Festuca microstachys	0	0	1	5
Galium aparine	2	65	+	2
Holosteum umbellatum	+	8	0	0
Lactuca serriola	2	48	+	2
Montia linearis	+	5	1	42
Montia perfoliata	+	8	0	0
Myosotis micrantha	3	78	0	0
Phlox gracilis ssp. gracilis	+	13	0	0
Sisymbrium altissimum	+	3	0	0
Stellaria nitens	+	8	1	22
Tragopogon dubius	+	18	1	12
Veronica arvensis	+	10	0	0
Veronica sp.	+	3	0	0
Vicia villosa	+	3	0	0

Table 5. Continued.