Jessica's Aster (*Aster jessicae*) Population Monitoring: Third-year Results

Idaho Conservation
Data Center
Idaho Department of
Fish and Game
PO Box 25
Boise, Idaho
83707

Juanita Lichthardt
Karen Gray

2005

Report prepared for the
U.S. Fish and Wildlife Service

ABSTRACT

Jessica's aster (*Aster jessicae*) is a tall, rhizomatous aster endemic to the Palouse region of southeastern Washington and adjacent Idaho. Its habitat has been severely reduced by conversion of this region to intensive agricultural uses. It is restricted almost entirely to private lands, and because of this, little was known of its distribution and abundance until a 1991 status survey was conducted. Five permanent monitoring plots were established in 2001, to track and compare populations occupying contrasting sites. Monitoring sites differ in amount of edge, degree of isolation from other populations, habitat extent, and amount of forest cover. This report summarizes three consecutive years of monitoring data.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

Jessica's aster (*Aster jessicae*) is a tall, rhizomatous aster with lavender flowers, that is endemic to the Palouse region of southeastern Washington and adjacent Idaho (Figure 1). Within this region, Jessica's aster occurs in dry forest habitat of river breaklands. As a result of the intensive clearing and cultivation of the Palouse region, Jessica's aster is now largely restricted to fencerows, field corners, wooded draws and other small remnants of its native habitat. Because it occurs almost entirely on private lands, it received little attention in terms of survey and monitoring until 1991, when a conservation status report was written (Lorain 1991). During a biological inventory of Army Corps of Engineers (ACOE) lands adjoining Dworshak Reservoir (Bowers and Nadeau 2000), three new occurrences of Jessica's aster were found, essentially representing the only populations known on public land. In 2001, the Idaho Conservation Data Center (IDCDC) took part in a Challenge Cost-share project to do further survey in these areas and to establish a monitoring program for Jessica's aster. Surveys in 2001 expanded the extent of the distribution on ACOE land, and found the first known occurrence on Bureau of Land Management (BLM) land. In addition, five permanent monitoring plots were established (Lichthardt and Gray 2002). Those plots were revisited in 2002 (Lichthardt and Gray 2003) and 2003. Data collected in all three years are presented here along with recommendations for future research and monitoring needs.

GENERAL SPECIES INFORMATION

Description and taxonomy

Jessica's aster is a robust, erect, perennial herb with thick creeping rhizomes (Figure 2). Plants can grow to 1.5 m, but average 1 m tall. Stems and leaves, particularly on the upper portion of the plant are covered with a dense, soft, uniform pubescence, giving them a grayish appearance. Stems are leafy with entire, broadly lance-shaped leaves. The middle stem leaves partially clasp the stem and the lower leaves tend to dry up and wither as the season progresses. Flowers are numerous on each stem, lavender in color, 2.5-3.5 cm in diameter, and form a broad cluster at the top of the plant (Lorain 1991).

Two other asters are partially sympatric with Jessica's aster: showy aster (*Aster conspicuus*) and western aster (*Aster occidentalis*). Jessica's aster is distinguished by its dense foliar pubescence and cordate leaf bases. In contrast to Jessica's aster's lance-shaped leaves, the leaves of showy aster are wide, with an oval or elliptic shape, and plants are glandular in the upper part (Cronquist 1955). Hairs may be present, but the leaves appear green rather than gray, and are distinctly scabrous. Western aster, which generally inhabits moister microhabitats, has smaller flowers (about half the size), has sparse to lacking pubescence, and lacks cordate leaf bases. However, hybrids between it and Jessica's aster may occur (Lorain 1991).

Jessica's aster has historically been placed in the large genus *Aster*. However, the genus has been revised by Nesom (1995) who placed many of the species, including *Aster jessicae*, into the genus *Symphyotrichum*. Members of *Symphyotrichum* have a chromosome number of x = 8, lack glands, and have stem hairs in lines.

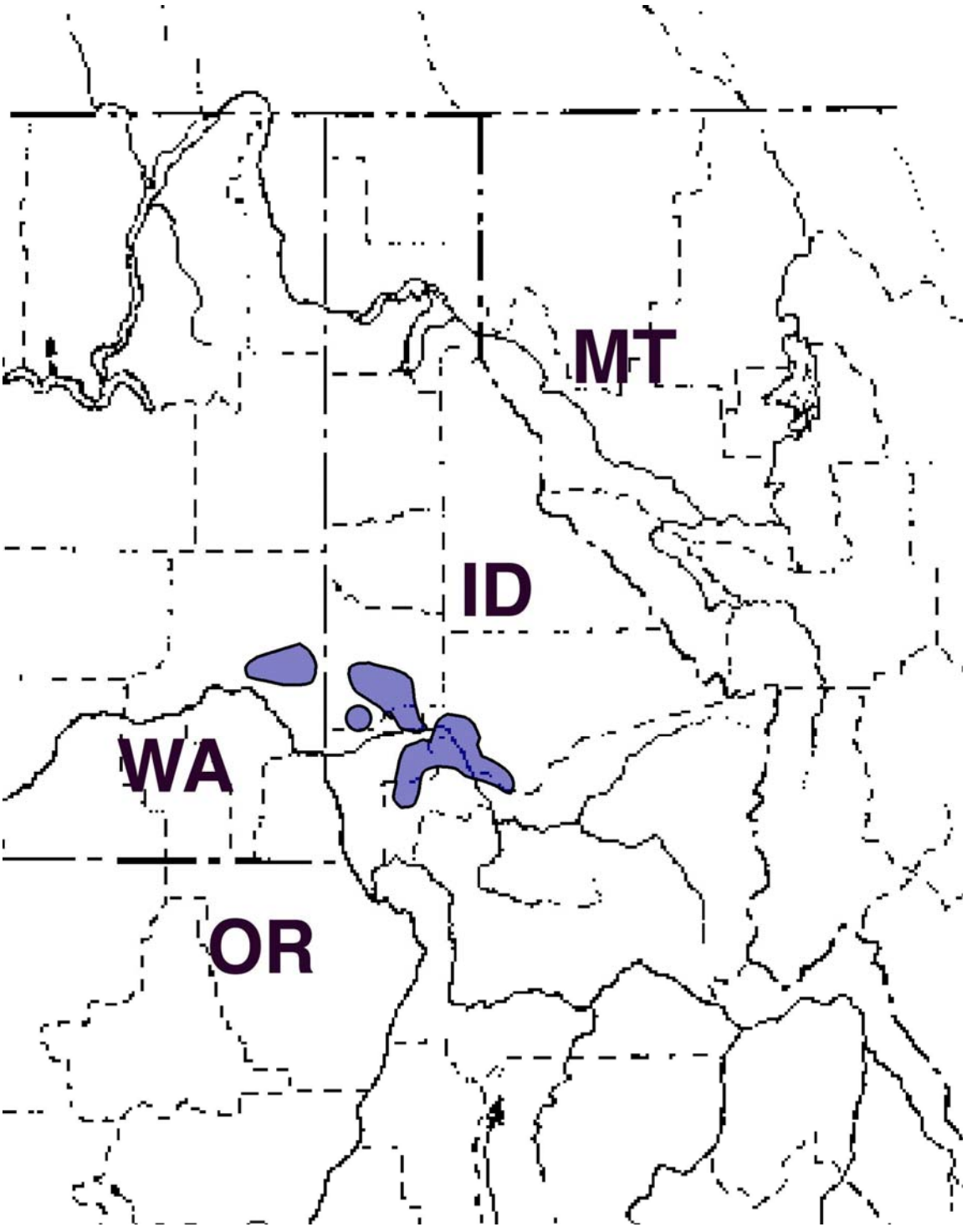

Figure 1. Global range of Jessica's aster

Figure 2. Photos of Jessica's aster.

Conservation status

Globally, Jessica's aster is ranked G2 (imperiled globally because of rarity or because of other factors making it very vulnerable to extinction or elimination). In Idaho, Jessica's aster is ranked S2 (imperiled because of rarity or because of other factors making it very vulnerable to extirpation from the state), and in Washington it is ranked S1 (critically imperiled because of extreme rarity or because of other factors making it especially vulnerable to extirpation from the state; NatureServe 2003).

Jessica's aster has no formal conservation status with the USFWS. It is on the Idaho BLM's special status plant list.

Distribution and habitat

Jessica's aster is endemic to the eastern margin of the Palouse region, extending into the lower Clearwater River canyon to the east (Figure 1). It's entire range would fit into Whitman County, Washington (5,638 km^2 or 2,177 mi^2).

Although endemic to the Palouse region, Jessica's aster does not appear to have been associated with open, bunchgrass communities but rather the dry, open forest of drainages and canyon breaklands at the eastern edge of the Palouse. It is usually associated with shrubs, often growing up through the branches; however, it can occur in the open, where it is among the tallest plants present. Jessica's aster occurs between 300 and 1,200 m (1,000 to 4,000 ft) elevation.

Jessica's aster is associated with the following habitat types (Cooper et al. 1992) as well as shrub and grassland inclusions within these types:

Ponderosa pine/snowberry (*Pinus ponderosa/Symphoricarpos albus)*
Douglas-fir/ninebark (*Pseudotsuga menziesii/Physocarpus malvaceus)*
Ponderosa pine/ninebark (*Pinus ponderosa/Physocarpus malvaceus)*

Table 1 contains a list of frequently associated species, compiled from those mentioned in the element occurrence records (EOR) for Jessica's aster, and those occurring with high constancy in monitoring plots. Four other Palouse endemics, Palouse thistle *(Cirsium brevifolium*), Palouse goldenweed (*Haplopappus liatriformis*), Palouse milkvetch (*Astragalus arrectus*), and plumed clover (*Trifolium plumosum* ssp. *amplifolium*) occur at some Jessica's aster sites.

Phenology

Jessica's aster flowers from late July through mid-September. Fruit and seed maturation occur in September and early October, with seed dispersal likely in mid- to late October (Lorain 1991).

Land ownership

All but four of the 68 known occurrences of Jessica's aster are on, or primarily on, private land. Public land ownership includes Army Corps of Engineers (ACOE; three occurrences at Dworshak Reservoir) and Bureau of Land Management (BLM; one occurrence). Small areas of public land are part of occurrences 5 (BLM) and 42 (ACOE). Minor amounts and portions of populations occur on highway or railroad right-of-ways and several are associated with small cemeteries.

Table 1. Species most frequently associated with Jessica's aster.

Scientific name	Common name
Trees	
Pinus ponderosa	Ponderosa pine
Pseudotsuga menziesii	Douglas-fir
Shrubs	
Amelanchier alnifolia	Serviceberry
Berberis repens	Creeping Oregon grape
Crataegus douglasii	Hawthorn
Holodiscus discolor	Oceanspray
Philadelphus lewisii	Syringa
Physocarpus malvaceus	Ninebark
Prunus virginiana	Chokecherry
Rosa nutkana	Nootka rose
Spiraea betulifolia	Birch-leaved spiraea
Symphoricarpos albus	Snowberry
Graminoids	
Bromus inermis	Smooth brome
Calamagrostis rubescens	Pinegrass
Carex geyeri	Geyer's sedge
Dactylis glomerata	Orchardgrass
Festuca idahoensis	Idaho fescue
Phleum pratense	Timothy
Poa compressa	Canada bluegrass
Poa pratensis	Kentucky bluegrass
Pseudoroegneria spicata	Bluebunch wheatgrass
Forbs	
Achillea millefolium	Yarrow
Fragaria vesca	Wild strawberry
Geum triflorum	Prairie smoke
Helianthella uniflora	Little sunflower
Hypericum perforatum	Common St. John's-wort
Lomatium dissectum var. dissectum	Fern-leaved desert parsley
Perideridia gairdneri	Yampa
Potentilla gracilis	Slender cinquefoil
Mosses	
Brachythecium albicans	
Rhytidiadelphus triquetrus	

MONITORING

Many occurrences of Jessica's aster are in small patches and strips of land surrounded by roads and fields. Sites include fencerows, field corners, cemeteries, and slopes within stream breaklands. Assuming that population vigor and persistence may be affected by degree of isolation, edge effects, and habitat characteristics such as tree cover and weediness, we proposed to monitor populations at sites differing in these respects.

Objective

Our primary monitoring objective was to quantify abundance and changes in abundance over time. Because Jessica's aster spreads by long rhizomes, stem number had to be our basic measure of abundance. We assume stem number is an indication of population vigor and growth. Secondarily, we sought other measures of population status such as reproductive output and evidence of herbivory or disease. The plant community context in which the populations occurred was also characterized in order to track trends in the context of the nature and condition of the habitat.

Sites

The five plots selected for monitoring differ in degree of isolation, extent of habitat, and threats. Accessibility was also a consideration in site selection. All of the monitoring sites are in dry forests. All but one are in Douglas-fir/ninebark (*Pseudotsuga menziesii/Physocarpus malvaceus*) habitat types. The other (Gold Hill) is apparently a ponderosa pine/ninebark habitat type. Seral stage varies from mid- to late-seral.

Gold Hill (Element Occurrence 23): Plot 1 represents forest habitat with a high degree of edge effect. The main weed directly affecting the sampled stand is orchardgrass. The plot is on a short, forested slope at a drainage head, in an isolated stand of medium-sized (25-45 cm dbh) ponderosa pine, in what appears to be a ponderosa pine/ninebark habitat type. Although a large habitat remnant by Jessica's aster standards (approximately 0.1 ha), adjoining areas have been either cultivated, grazed, or logged, resulting in sharp edges on most of the perimeter. This site is part of an extensive, discontinuous metapopulation in the upper Potlatch River drainage (EO 023). There are other additional, smaller groups of plants nearby.

Fraser Cemetery (Element Occurrence 41): Plot 2 is in a small, approximately 400 m^2, forested "island" adjoining a cemetery on one side and surrounded on others by access roads. The stand is made up of fairly dense, mostly pole-sized, Douglas-fir with a shrub understory. The entire stand represents an edge environment. Prior to monitoring in 2003, the entire population was mowed at a height of 30 to 40 cm.

Freeman Creek Peninsula (FCP; Element Occurrence 65): On ACOE ownership, FCP and Little Bay monitoring sites represent the most natural (i.e., unfragmented) conditions with the least edge effects, and have the most potential for continued monitoring and protection. One plot was established at FCP (plot 3). Extensive, undisturbed habitat for Jessica's aster exists at FCP. The habitat is south-facing and very patchy, with widely scattered ponderosa pine of a variety of size classes, interspersed with Idaho fescue–bluebunch wheatgrass (*Festuca idahoensis–Pseudoroegneria spicata*) balds and rock outcrops. Bunchgrass openings have a large non-native component. Jessica's aster is found in and near clumps of shrubs with scattered trees. The sampled subpopulation of Jessica's aster is in a natural edge environment, associated with a patch of young forest, and extending into the adjoining bunchgrass community. Additional, smaller groups of plants occur in the area, especially down slope.

Little Bay (Element Occurrence 66): The general area is mostly open, shrubby, and criss-crossed by old skid roads. Little Bay is an area being evaluated for possible selective logging and/or prescribed burning. The several subpopulations of Jessica's aster in this area are small and widely scattered. Plot 4 (Little Bay North) is a small, dense patch of Jessica's aster on the exposed western edge of a small fragment of late-seral Douglas-fir, above a road cut. This is an edge situation, but mostly in the open.

Plot 5 (Little Bay South) has high cover of mature Douglas-fir and ponderosa pine with a patchy understory of ocean spray. Edge effects are probably minimal. This may be an example of habitat where stand closure has reduced vigor of Jessica's aster. It is a small subpopulation of possibly only two or three genets (maybe only one).

Methods

At each site, a circular, 11-m radius plot was marked at the center using a fencepost or rebar stake. The center post was located in such a way as to include as much as possible of the local subpopulation. This plot size is standard in describing forest vegetation (Bourgeron et al. 1991) and is an area that can be searched reasonably thoroughly for inconspicuous, vegetative stems. As it turned out, this plot size encompassed an entire subpopulation, or highly aggregated group of plants at most of the monitoring sites.

From the centerpost, we measured the distance and azimuth to the center of each cluster of Jessica's aster stems (the declination used may differ for different plots and is indicated in Appendices 5 and 6. A back-azimuth was actually taken to avoid magnetic interference from the steel post. Stems generally grow in loose clusters which probably represent a genet or a portion of a genet. The number of clusters identified is somewhat subjective. Some clusters have merged over the course of monitoring and have been combined. At the scale we were mapping (1 cm:1 m) it was impractical to separate stems less than 2 dm apart. Stems growing within 5 dm of one another were generally mapped as part of the same genet unless they appeared to belong to two separate, previously mapped clusters. We numbered each cluster and recorded the number of stems (ramets), the number of flowering stems, and the number of stems with the top nipped off ("grazed"). In 2002, we first observed rosettes (plot 3) that appeared to be Jessica's aster. We documented and mapped them in order to verify their identity in future visits. In 2003 we began placing stems in two height classes, under 30 cm and over 30 cm, as a rough measure of vigor. Grazed plants were not placed in a height class.

In order to provide reference points and quantify tree density, we also mapped trees within each plot in 2001. We recorded the distance and azimuth to the inside face of each tree inside and near the plot. Other physical landmarks such as fences and stumps were also documented. The distances and azimuths measured were used to make a diagram of each plot (Appendix 1).

The plot centerpost was also used to define a circular plot for describing the plant community. An 11-m radius plot was used where the community accommodates this size. At Fraser Cemetery, Little Bay North, and Little Bay South, a 6-m radius was used (113 m^2), making 1 m^2 of cover approximately 1%. In 2001, baseline plant community information was collected by estimating canopy cover for all plant species in the plot. At that time, habitat type, slope, and aspect were also recorded.

All plot center locations were recorded using a GPS unit. Locations were mapped on USGS 7.5-minute quads (Appendix 2), and sketches were made to help relocate plots in the future (Appendix 3).

Results

Data on total, reproductive, and grazed stems, over three monitoring years, are summarized in Tables 2-4. Tables showing 2003 data for each cluster can be found in Appendix 4, and tables showing data by cluster, over all three years, in Appendix 5. Grazed stems cannot be classified as to reproductive status, so total stems are the sum of reproductive, vegetative, and grazed. Vegetative stems include rosettes.

Stems generally occur in clusters of one to ten. However, a large cluster at Gold Hill (#4) had more than 150 stems in a 3 m^2 area in 2002, and 151 in 2003. These constituted nearly half of the stems in the monitoring plot. The maps in Appendix 1 show how clusters become less distinct over time. In other cases, new stems have been found more than 0.5 m away from any previously mapped cluster, resulting in an increase in the number of clusters.

Exotic weeds are thought to threaten Jessica's aster through competition and degradation of habitat. In 2003 we attempted a quantitative assessment of weeds in plot 3, although the annuals were completely senesced. Exotics and their cover estimates, within the 11-m radius plot, are shown in Table 5.

Discussion

It is tempting, but probably misleading, to interpret clusters as genets. With long-rhizomatous plants like Jessica's aster, it is difficult to estimate numbers of genets, because without excavating them it is impossible to determine whether stems are connected to each other underground without excavation.

The stems of Jessica's aster can also be referred to as ramets. Ramets are genetically identical shoots arising from a rhizome or other perennating organ of a vegetatively spreading plant. We began substituting "stem" for "ramet" in these monitoring reports because it is a more familiar term and has a similar meaning. However, the discovery of rosettes complicated this somewhat because, while rosettes are ramets, some might not consider them stems.

All populations appear to be stable in terms of stem numbers and cluster numbers. Plants seemed depauperate at FCP in 2003, and at Gold Hill many had senesced by the sampling date.

FCP and Gold Hill are characterized by a very small proportion of reproductive stems. This does not appear to be related to the amount of tree canopy cover, because the two sites have contrasting amounts of canopy cover, with Gold Hill's much the higher. The highest overhead cover is at Little Bay South.

One of the most striking contrasts in the data is in the number of reproductive stems between 2002 and 2003 (Table 3); the number was much lower in 2003. This may be related to an increase in the number of grazed stems overall (Table 4). Grazed stems cannot be classified as to reproductive status. The Gold Hill plot is primarily responsible for the large decrease in reproductive stem numbers. This plot was read a month later in 2003, which could have contributed to the greater number of grazed stems. The late monitoring date is also likely responsible for the large portion of senesced stems at Gold Hill (50%).

Table 2. Total numbers of stems over three years.

Plot		**Total number of stems**		
		2001	**2002**	**2003**
1	Gold Hill	314	351	278
2	Fraser Cemetery	28	38	32
3	Freeman Ck. Peninsula	132	121	111
4	Little Bay North	25	33	26

5	Little Bay South	15	9	11
	Total	514	552	458

Table 3. Numbers of reproductive stems.

Plot		**No. of reproductive stems (% of total)**		
		2001	**2002**	**2003**
1	Gold Hill	No data[1]	75 (21)	10 (4)
2	Fraser Cemetery	13 (46)	18 (47)	1 (3)
3	Freeman Ck. Peninsula	9 (7)	3 (2)	0
4	Little Bay North	13 (52)	15 (45)	9 (35)
5	Little Bay South	2 (13)	3 (33)	0
	Total	[1]	114 (21)	20 (0.2)

[1] Reproductive stems were not counted at Gold Hill in 2001.

Table 4. Numbers of grazed stems over three years.

Plot		**No. of grazed stems (% of total)**		
		2001	**2002**	**2003**
1	Gold Hill	86 (27)	49 (14)	220 (79)
2	Fraser Cemetery	0	0	28[1] (87)
3	Freeman Ck. Peninsula	42 (32)	58 (48)	72 (65)
4	Little Bay North	0	2 (6)	8 (31)
5	Little Bay South	1 (7)	2 (22)	7 (64)
	Total	129 (25)	111 (20)	306[2] (67)

[1] Mowed at 30 to 40-cm height.

[2] Plot 2 not included in this total because stems were mowed rather than grazed.

Table 5. Cover of weeds in plot 3 (Freeman Creek Peninsula).

Species	Common name	Percent cover
Bromus spp.	Annual bromes	*
Centaurea maculosa	Spotted knapweed	5-15
Cynosurus cristatus	Dogtail grass	*
Dactylis glomerata	Orchardgrass	1-5
Hypericum perforatum	St. Johnswort	0.1
Phleum pratense	Timothy	<1
Plantago lanceolata	Narrowleaf plantain	0-1
Potentilla recta	Sulfur cinquefoil	0-1
Ventenata dubia	Ventenata	*

*Could not be estimated so late in growing season.

In 2001, 25% of total stems were grazed; in 2002, 20%; and in 2003, 72%. The 2003 figure does not include Fraser Cemetery where 28 of the 31 stems had been mowed. In previous years, no grazing was observed at Fraser Cemetery, whereas grazing has been prevalent at Gold Hill and FCP in all three years. The Gold Hill plot is primarily responsible for the increased percentage of grazed stems in 2003. Grazers are assumed to be deer or elk.

Rosettes have only been observed at Freeman Creek Peninsula (plot 3), where 45 were recorded in 2002. In 2003, all four of the ramets at cluster 2 were rosettes, although it had previously produced elongate stems.

In Appendix 1 we mapped both 2002 and 2003 clusters to look for evidence of their spreading or converging. The diagrams illustrate that many of the clusters come up in approximately the same spot over one or more years. This is the reason we are able to track them in this way. From our map of plot 1, it appears that 10 of the 14 clusters that had been mapped previously were within about 2 dm of the previous location. At plot 3, this is true for only 12 out of 37 clusters. If you look only at the changes in distance between the two years (Appendix 5), assuming the azimuth is less accurate, for plots 3 you find that 35 out of a total of 36 relocated clusters differed by only 2 dm from the previously recorded distance. Keep in mind that it is the center of a loose cluster of stems that is being mapped, so in some cases the change could be indicating an extension of a cluster, rather than a shift in location. Even if many of the clusters are not separate genets they appear to represent some point of active stem or rhizome production within the genet.

Other clusters appear to be "moving" as much as 1 m over the course of a year. However, this is usually detected by a change in azimuth, so such instances are suspect because of the error involved in taking an azimuth. As evidence for this, consider cluster 8 at Gold Hill. It has had the same distance measure every year, but the azimuth has varied 6 degrees, which, at 10 m out is the equivalent of about 1.3 m of change.

The weed data (Table 5) are very similar to those collected in 2001 (Lichthardt and Gray 2002) with a few exceptions. Narrowleaf plantain (*Plantago lanceolata*) and sulfur cinquefoil (*Potentilla recta*) were each placed one cover class higher in 2001. A change of two or more cover classes is required to detect change using this method, therefore it cannot be used to detect small changes in weed abundance. Also, ventenata (*Vententata dubia*) was not noted in 2001.

RECOMMENDATIONS

Our recommendations relate primarily to monitoring and the needs and adequacy of the monitoring program. We recommend the following:

1) That monitoring plots be revisited again in 2004, after which an appropriate monitoring interval would be proposed.

2) That monitoring be conducted no later than the first week of September, in order to minimize the number of grazed and senescent stems.

3) That each Jessica's aster location in a plot be characterized with respect to the presence of weeds.

4) That the current population monitoring at Dworshak reservoir be augmented with monitoring on the stand and landscape level. If Jessica's aster populations are affected by either wildfire or prescribed fire, effects may be indirect, through alteration of the plant community.

5) That Jessica's aster locations be protected from the direct effects of fire fighting, fire management (fire breaks etc.), and weed control, and that monitoring be continued to assess the effects of fire on Jessica's aster.

REFERENCES

Bourgeron, P.S., R.L. DeVelice, L.D. Engelking, G. Jones, and E. Muldavin. 1991. Western Heritage Task Force site and community survey manual. Version 91C. Western Heritage Task Force, Boulder, CO. 24 p.

Bowers, D. and S. Nadeau. 2000. Inventory of fungi, plants, and wildlife in the Dworshak Reservoir Project Area, Idaho. Interim report. Idaho Department of Fish and Game, Region 2, Lewiston, ID. 75 p.

Cooper, S.V., K.E. Neiman, and D.W. Roberts. 1991. Forest habitat types of northern Idaho: A second approximation. USDA Forest Service General Technical Report INT-236. Intermountain Research Station, Ogden, UT. 143 p.

Cronquist, A. 1955. Part 5: Compositae. In C.L. Hitchcock, A. Cronquist, M. Ownbey, and J.W. Thompson, Vascular Plants of the Pacific Northwest. University of Washington Press. Seattle, WA. 343 p.

Lichthardt, J. and K. Gray. 2002. Survey for Jessica's aster (*Aster jessicae*) and establishment of demographic monitoring plots. Idaho Department of Fish and Game, Idaho Conservation Data Center, Boise, ID. 13 p. plus appendices.

Lichthardt, J. and K. Gray. 2003. Demographic monitoring of *Aster jessicae* (Jessica's aster): second-year results. Idaho Department of Fish and Game, Idaho Conservation Data Center, Boise, ID. 12 p. plus appendices.

Lorain, C.C. 1991. Report on the conservation status of Jessica's aster, in Idaho and Washington. Idaho Department of Fish and Game, Idaho Conservation Data Center, Boise, ID. 57 p. plus appendices.

NatureServe. 2003. NatureServe Explorer: An online encyclopedia of life [web application]. Version 1.6. Arlington, VA, USA: NatureServe. Available: http://www.natureserve.org/explorer.

Nesom, G.L. 1995. Review of the taxonomy of *Aster sensu lato* (Asteraceae: Astereae), emphasizing the New World species. Phytologia 77(3):141-297.