



Idaho Conservation Data Center
Idaho Department of Fish and Game
600 S. Walnut St.
PO Box 25
Boise, Idaho
83707



**MONITORING AND FIELD SURVEY FOR
JESSICA'S ASTER (*ASTER JESSICAE*)
IN THE DWORSHAK RESERVIOR AREA**

Karen Gray
Michael Mancuso
Juanita Lichthardt
Beth Colket

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ABSTRACT

Jessica's aster (*Aster jessicae*) is a tall rhizomatous forb endemic to the Palouse region of southeastern Washington and adjacent Idaho. Its habitat has been severely reduced by the largescale conversion of this area to agricultural uses. Known Jessica's aster occurrences are restricted almost entirely to private lands; the primary exceptions being a series of occurrences on Army Corps of Engineers (ACOE) land near Dworshak Reservoir. Occurrences on ACOE land have added conservation importance because pro-active conservation measures are often more readily implemented on public land. In addition, they occur within a relatively undeveloped landscape compared to most other known sites. In 2001, monitoring plots for Jessica's aster were established at three sites on ACOE land in the lower Dworshak Reservoir area. Monitoring plots were resampled in 2002, 2003, and 2004 (one additional plot was established the last year). This report summarizes our 2004 monitoring results and the four-year dataset. In addition to monitoring, we conducted a field survey for Jessica's aster within the ACOE's Elk Creek Meadow Stewardship Area, located approximately ten miles upriver from Dworshak Dam. Jessica's aster was not found within the project area. However, new subpopulations were discovered on ACOE land near Dent. In addition, new locations for several other plant species of conservation concern in Idaho were discovered while searching for Jessica's aster.

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INTRODUCTION

Jessica's aster (*Aster jessicae*) is a tall rhizomatous forb with lavender flowers endemic to the Palouse region of southeastern Washington and adjacent Idaho. Throughout its range, Jessica's aster is now largely restricted to fencerows, field corners, wooded draws, and other small remnants of its native habitat; the result of extensive and intensive clearing and cultivation of its dry, open forest habitat. Jessica's aster is a priority conservation concern in both Washington and Idaho due to its limited range, the loss or degradation of most of its original habitat, and the tendency for most remnant populations to be small, fragmented, and threatened by herbicide spraying, roadwork activities, weed invasion, or other disturbances (Lorain 1991).

In 2000, Jessica's aster was documented to occur at two sites on land managed by the U.S. Army Corps of Engineers (ACOE) during a biological inventory of lands adjoining Dworshak Reservoir, Clearwater County, Idaho (Bower and Nadeau 2003). The two occurrences were the first to be discovered on public land in Idaho. One occurrence was located south of lower Freeman Creek (Freeman Creek Peninsula, Element Occurrence (EO) 65), the other across the reservoir near Little Bay (Little Bay, EO 66). A third Jessica's aster occurrence discovered near Dent (West of Dent, EO 67) is located very close to the boundary between ACOE and private land. Its ownership remains unclear. During further survey work in the Dworshak Reservoir area in 2001, Jessica's aster was found on ACOE land near Merrys Bay (Lichthardt and Gray 2002). This subpopulation represented an extension of the previously known occurrence on private land at Eureka Ridge (EO 42).

The Jessica's aster occurrences along lower Dworshak Reservoir are high priority conservation targets in Idaho because they include three of the four known occurrences located fully or largely on public land. In 2001, monitoring plots were established at the Freeman Creek Peninsula and Little Bay occurrences as part of a monitoring program that also included two occurrences located elsewhere in Idaho (Lichthardt and Gray 2002). In 2004, the ACOE contracted the Idaho Department of Fish and Game's Idaho Conservation Data Center (IDCDC) to resample the Jessica's aster monitoring plots at Dworshak Reservoir. In addition, the IDCDC was contracted to conduct a field survey for Jessica's aster in the Elk Creek Meadow Stewardship Project Area. This report summarizes our results for both the monitoring and the field surveys projects.

JESSICA'S ASTER – GENERAL INFORMATION

Jessica's aster is a robust, erect, perennial forb with thick creeping rhizomes. Plants average approximately 1.0 m in height, but can be up to 1.5 m tall. Stems are leafy, with entire, broadly lance-shaped leaves (Figure 1). Stems and leaves have a grayish appearance due to a dense, soft, uniform pubescence, particularly on the upper portion of the plant. The middle stem leaves partially clasp the stem, and the lower leaves tend to dry up and wither as the season progresses. Numerous lavender flowers 2.5-3.5 cm in diameter form a broad cluster at the top of the plant (Figure 2; Lorain 1991). Flowering begins around late July, and continues into October.

Two other asters are partially sympatric with Jessica's aster - showy aster (*Aster conspicuus*) and western aster (*Aster occidentalis*). Jessica's aster is distinguished from the other leafy, lavender-flowered asters by its dense pubescence and cordate leaf bases. In contrast, showy



Figure 1. Photo of Jessica's aster (note the numerous, sessile stem leaves).



Figure 2. Photo of Jessica's aster flower heads.

aster has wide, oval- or elliptic-shaped leaves that are generally toothed. Hairs may be present, but the leaves appear green rather than gray, and are distinctly scabrous. In addition, showy aster plants are glandular in the upper part (Cronquist 1955a). Western aster differs by having smaller flowers (about half the size) and sparse or no pubescence. It generally inhabits moister microhabitats as well. However, hybrids between western aster and Jessica's aster may occur (Lorain 1991), and the two species are sometimes found growing side-by-side. Jessica's aster has traditionally been placed in the large genus *Aster*, but a revision of the group resulted in many of the species, including Jessica's aster, being moved to the genus *Symphotrichum* (Nesom 1995).

Jessica's aster is endemic to the eastern margin of the Palouse region, and the plateaus and river canyons to the east and southeast. It occurs in Whitman County, Washington, and Latah, Nez Perce, Lewis, Clearwater, and Idaho counties, Idaho (Figure 3). Two major rivers, the Snake and the Clearwater, converge within its range; it extends upstream into the canyons of the Clearwater, but not the Snake.

Although endemic to the Palouse region, Jessica's aster does not appear to have been primarily associated with open, bunchgrass prairie communities, but rather the dry, open forests of drainages and canyon breaklands, in or on the edges of the Camas and Palouse prairies. Scattered ponderosa pine (*Pinus ponderosa*) and/or Douglas-fir (*Pseudotsuga menziesii*) usually occur in close proximity. It is often associated with shrubs such as snowberry (*Symphoricarpos albus*), native roses (*Rosa nutkana* and *R. woodsii*), serviceberry (*Amelanchier alnifolia*), ninebark (*Physocarpus malvaceus*), ocean-spray (*Holodiscus discolor*), and Oregon grape (*Mahonia repens*). Commonly associated graminoids include Idaho fescue (*Festuca idahoensis*), bluebunch wheatgrass (*Pseudoroegneria spicata*), prairie junegrass (*Koeleria macrantha*), and to a lesser extent elk sedge (*Carex geyeri*) and pinegrass (*Calamagrostis rubescens*). Forbs that commonly co-occur include little sunflower (*Helianthella uniflora*), prairie smoke (*Geum triflorum*), slender cinquefoil (*Potentilla gracilis*), goldenrod (*Solidago missouriensis*), and wild strawberry (*Fragaria vesca* and *F. virginiana*). In the Dworshak Reservoir area, Jessica's aster occupies shrub openings and forest understory in Douglas fir/ninebark and ponderosa pine communities. Jessica's aster occurs between approximately 244 m - 1189 m (800 ft - 3900 ft) elevation, with most occurrences found below 975 m (3200 ft). Sites supporting Jessica's aster often support one or more other rare plant species endemic to the Palouse region, such as Palouse thistle (*Cirsium brevifolium*), Palouse goldenweed (*Haplopappus liatrifolmis*), Palouse milkvetch (*Astragalus arrectus*), broad-fruit mariposa lily (*Calochortus nitidus*), or plumed clover (*Trifolium plumosum* ssp. *amplifolium*).

Jessica's aster is a high priority conservation concern in both Idaho and Washington. It is globally rare, with a conservation rank of G2 (imperiled globally because of rarity or some other factors making it very vulnerable to extinction or elimination; NatureServe 2004). In Idaho, the species is ranked S2 (imperiled because of rarity or some other factors making it very vulnerable to extirpation from the state; Idaho Conservation Data Center 2005a), while in Washington, it has a S1 rank (critically imperiled because of extreme rarity or other factors making it especially vulnerable to extirpation from the state; Washington Natural Heritage Program 2005). Jessica's aster was a Category 2 candidate for federal listing under the Endangered Species Act in the past (Lorain 1991). It was removed from the candidate list in 1996 when the Category 2 designation was discontinued (U.S. Fish and Wildlife Service 1996).

Jessica's aster is presently known from 68 occurrences in Idaho, with all but three of them located fully or primarily on private land (Idaho Conservation Data Center 2005b). Public ownership includes two occurrences in the Dworshak Reservoir area on ACOE land, and one

occurrence on BLM property near Harper. Public ownership also comprises portions of three other occurrences, two on ACOE land and one on BLM property. Segments of a number of occurrences are located along highway right-of-ways, or in small cemeteries.

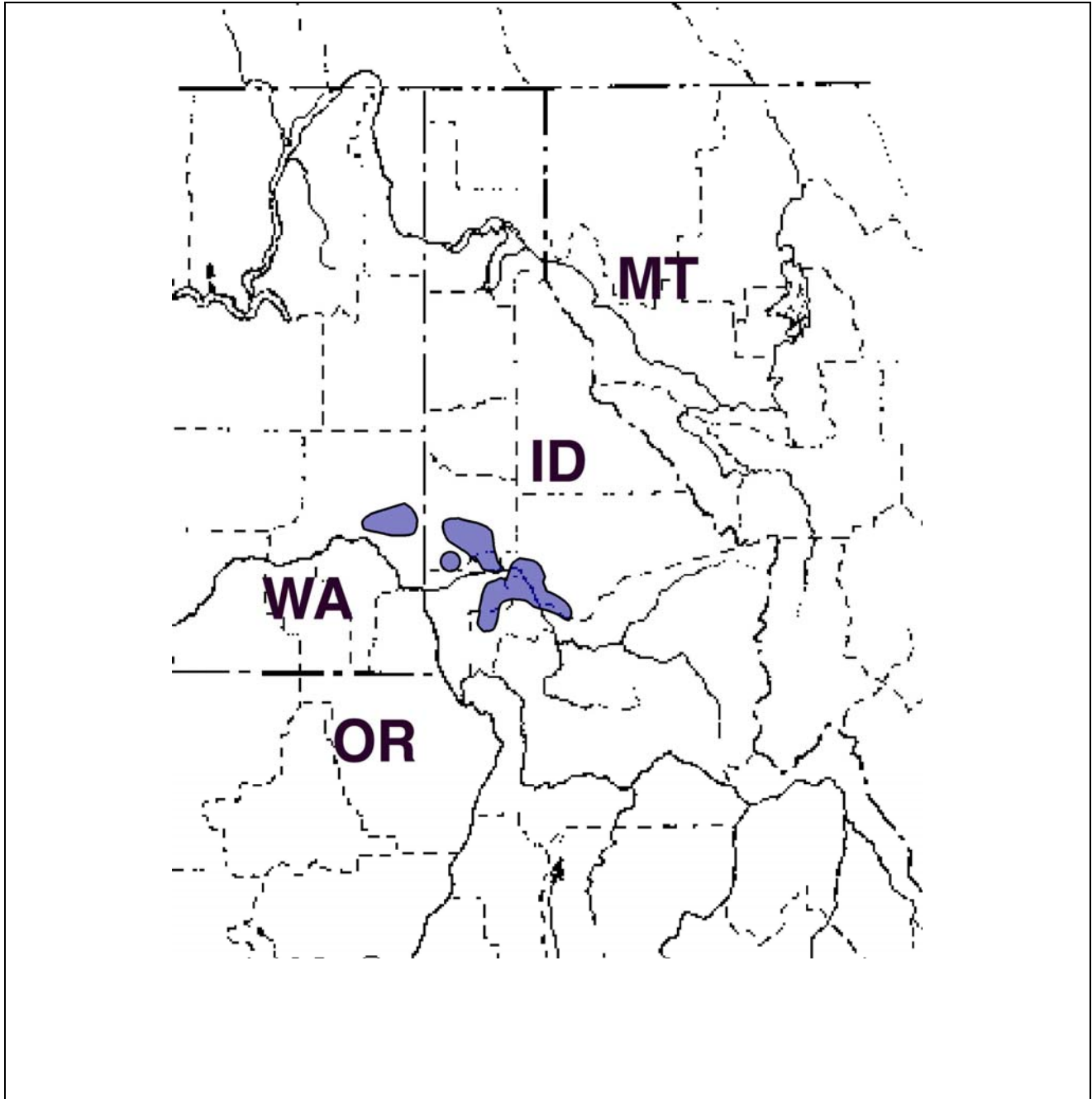


Figure 3. Global distribution of Jessica's aster.

MONITORING JESSICA'S ASTER

The IDCDC initiated a monitoring program for Jessica's aster in 2001 (Lichthardt and Gray 2002). Monitoring plots were established at four occurrences, two located on ACOE land in the lower Dworshak Reservoir area, and two on private land. Monitoring at each of these occurrences was also conducted in 2002 (Lichthardt and Gray 2003) and 2003 (Lichthardt and Gray 2005). A fourth consecutive year of monitoring information was collected at the two Dworshak Reservoir occurrences in 2004. In addition, a new monitoring plot was established and first year data collected at a third occurrence located on ACOE land near Merrys Bay. The two Jessica's aster monitoring plots on private land (EO 23 - Gold Hill, and EO 41 – Fraser Cemetery) were not sampled in 2004.

Dworshak Reservoir is located in Clearwater County, in north central Idaho (Figure 4). Filling the reservoir flooded approximately 80 km (50 mi) of the North Fork Clearwater River canyon above the town of Orofino. The Jessica's aster monitoring program at Dworshak Reservoir consists of one plot at Freeman Creek Peninsula (EO 065), two plots near Little Bay (EO 066), and one plot near Merrys Bay (EO 042). This section of the report reviews the monitoring program objectives and methods, and summarizes our 2004 results.

Objective

The primary objective of the monitoring program is to quantify trends in the abundance and condition of Jessica's aster at each occurrence over time. Abundance is measured by the number of Jessica's aster stems counted in the monitoring plot. Reproductive status and evidence of herbivory or disease are the metrics used to assess population condition. Another objective of monitoring protocol is track habitat quality trends at each occurrence.

Monitoring plots

Freeman Creek Peninsula (Plot 3): Extensive, undeveloped habitat for Jessica's aster exists at Freeman Creek Peninsula. The plot is located on a south-facing slope with patchy, widely scattered ponderosa pine of various size classes, interspersed with Idaho fescue/bluebunch wheatgrass 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 subpopulation of Jessica's aster being monitored is in a natural edge environment associated with a patch of young forest that extends into the adjoining bunchgrass community.

Little Bay North (Plot 4): The general plot area is mostly open, shrubby, and criss-crossed by old skid roads. Jessica's aster subpopulations in this area are small and widely scattered. At the plot, Jessica's aster occurs in a small dense patch 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.

Little Bay South (Plot 5): The subpopulation being monitored at this plot has high cover of mature Douglas-fir and ponderosa pine with a patchy understory of ocean-spray. Edge effects appear to be minimal.

Merrys Bay (Plot 6): The subpopulation being monitored at this plot is part of the relatively widespread Eureka Ridge occurrence. The plot is located on a broad, grassy ridge with

scattered ponderosa pine and Douglas-fir in a mosaic of bunchgrasses, hawthorn (*Crataegus douglasii*) and other tall shrubs, and patches of short shrubs such as snowberry. The open areas are very weedy, especially with the introduced grasses hedgehog dogtail (*Cynosurus echinatus*) and orchard grass (*Dactylis glomerata*).

Note that monitoring plot 1 is associated with the Jessica's aster occurrence at Gold Hill and plot 2 with the occurrence at Fraser Cemetery. Neither was sampled in 2004.

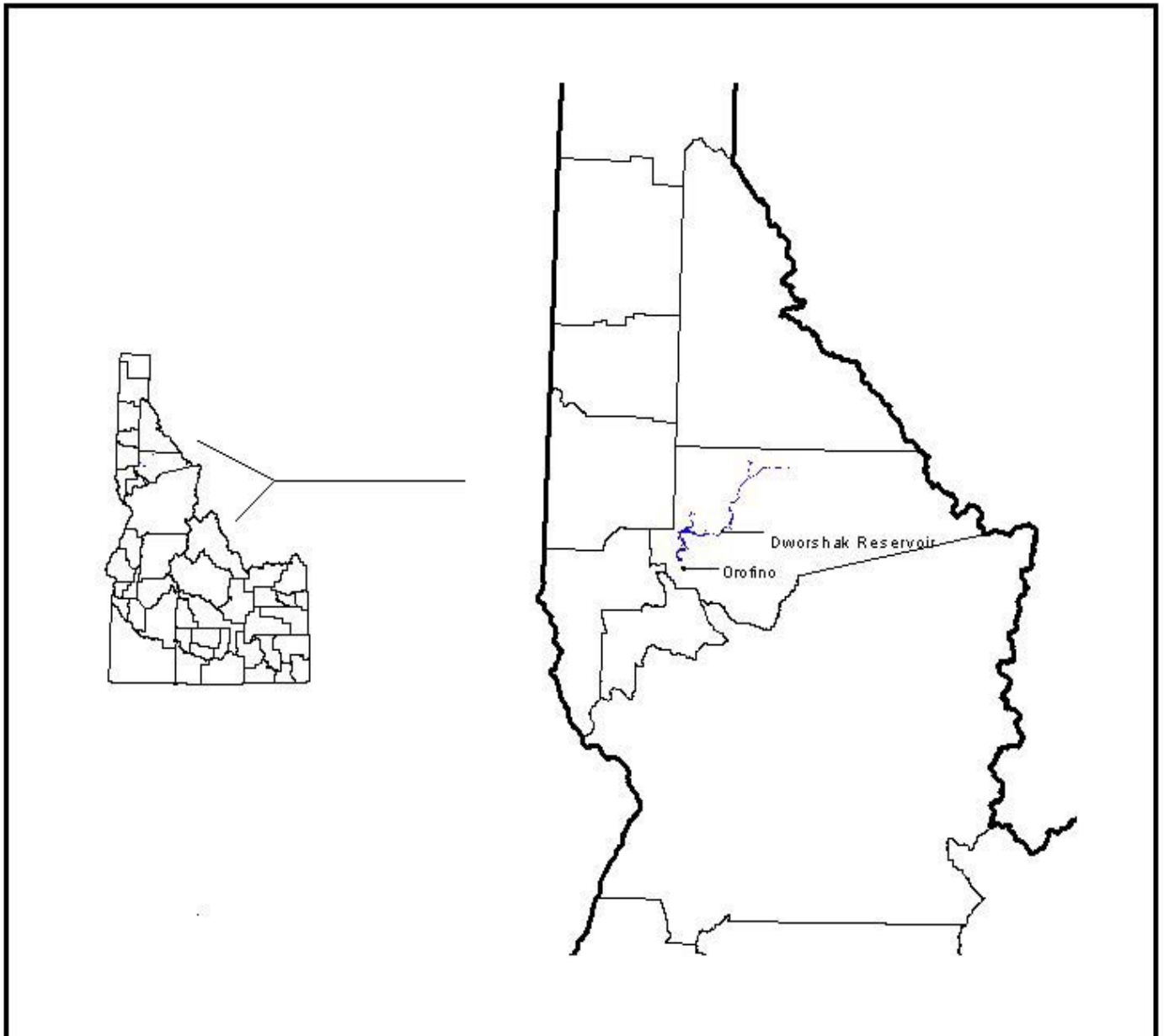


Figure 4. Location of Dworshak Reservoir in north-central Idaho.

Methods

The center of each circular, 11-m radius monitoring plot is permanently marked with a steel fencepost. We record all plot centers using a GPS unit, and map their locations on USGS 7.5' quadrangles (Appendix 1). The location of each Jessica's aster stem or cluster of stems within the plot is mapped (Appendix 2). From the centerpost, we measure distance (in meters) and azimuth (in degrees, with compass set at 19° declination) to each Jessica's aster stem or centroid of cluster of stems within the plot (Appendix 3). For each measurement point we record the total number of stems, and the number of stems that are reproductive, vegetative, or grazed. Jessica's aster spreads by rhizomes (underground stems capable of sprouting at nodes), and delimiting single plants is problematic. Because of this, we use stem number as the basic measure of abundance. Reproductive status and grazing are determined on a stem-by-stem basis.

Rosettes that appeared to be Jessica's aster were first observed in 2002 (in Plot 3), but they were difficult to identify with certainty. We mapped the location of suspected rosettes to verify their identity during future visits, but did not count them as stems because of their unconfirmed identification. The location of trees, stumps, fences and other physical landmarks within each plot were mapped in 2001 to help produce reference diagrams of each plot (Lichthardt and Gray 2002).

The plot centerpost is also used to define a circular plot for collecting plant community information. Vegetation information was collected from an 11 m radius plot at Freeman Creek Peninsula (Plot 3), and 6 m radius plots at Little Bay (plots 4 and 5) when they were established in 2001. Within each plot, canopy cover classes were estimated for each plant species using methods outlined in Bourgeron et al. (1991). Habitat type, aspect, and slope attributes were also recorded for each plot. Plant community information was collected in 2001, but has not been resampled since then. However, quantitative information concerning weed species cover was collected in 2003 for the plot at Freeman Creek Peninsula (Lichthardt and Gray 2005).

Weed information was collected for plots 3 and 6 monitored in 2004. A list of weed species occurring within one meter of each Jessica's aster stem or cluster of stems was recorded. The intent of adding this metric to the protocol is to track the proximity and frequency of weeds in the vicinity of Jessica's aster stems. Over time we will be able to assess whether the abundance of Jessica's stems located near weed plants changes, especially in comparison to stems positioned further from weed plants.

The monitoring protocol also includes photo point photographs for each plot. Plot photos are taken the centerpost with azimuths of 0°, 90°, 180°, and 270°. To aid in relocating the plots, sketches of routes and reference landmarks have been produced (Appendix 4). Monitoring data are recorded on special field forms. Using a ruler and the blank compass form in the field to quickly map aster locations helps ensure azimuths and distances are accurate.

Results

Abundance and condition: Monitoring plots were sampled the week of September 13th, 2004 (Appendix 5). A total of 161 Jessica's aster stems were counted in the four monitoring plots. Nine percent of the stems were reproductive, 37% were vegetative, and 54% were grazed. Only one plot (Plot 4) had more reproductive stems than either vegetative or grazed stems. Monitoring results for total, reproductive, vegetative, and grazed Jessica's aster stems over four monitoring years are summarized in Table 1. Because Plot 6 was not established until 2004,

data from it are included in the table, but are not used in comparing total stem counts over the four-year period.

Weed species: The majority of Jessica's aster plants in Plots 3 and all of them in Plot 6 had one or more weed species rooted within 1 m. Weed information was not collected in Plots 4 and 5. The percent of stems or stem clusters that had weeds occurring within 1 m are presented in Table 2. Canopy openings at the Freeman Creek Peninsula and Merrys Bay Jessica's aster subpopulations had non-native grasses such as orchard grass, hedgehog dogtail, and Canadian bluegrass (*Poa compressa*). Invasive forbs such as sulfur cinquefoil (*Potentilla recta*), spotted knapweed (*Centaurea maculosa*), and St. John's wort (*Hypericum perforatum*) were also often present in these openings.

Photo points: A complete set of photo point photographs were taken at each plot (Appendix 6).

Table 1. Abundance and stem class information for Jessica's aster monitoring plots, 2001-2004.

| | Total # of stems | | | |
|-------------------------|---------------------------|-------------|-------------|-------------|
| | 2001 | 2002 | 2003 | 2004 |
| Plot 3 | 132 | 121 | 111 | 70 |
| Plot 4 | 25 | 33 | 26 | 21 |
| Plot 5 | 15 | 9 | 11 | 16 |
| Totals (3, 4, 5) | 172 | 163 | 148 | 107 |
| Plot 6 | - | - | - | 54 |
| | Reproductive stems | | | |
| Plot 3 | 9 | 3 | 0 | 0 |
| Plot 4 | 13 | 15 | 9 | 15 |
| Plot 5 | 2 | 3 | 0 | 0 |
| Totals (3, 4, 5) | 24 | 21 | 9 | 15 |
| Plot 6 | - | - | - | 1 |
| | Vegetative stems | | | |
| Plot 3 | 81 | 60 | 39 | 20 |
| Plot 4 | 12 | 16 | 9 | 2 |
| Plot 5 | 12 | 4 | 4 | 7 |
| Totals (3, 4, 5) | 105 | 80 | 52 | 29 |
| Plot 6 | - | - | - | 30 |
| | Grazed stems | | | |
| Plot 3 | 42 | 58 | 72 | 50 |
| Plot 4 | - | 2 | 8 | 4 |
| Plot 5 | 1 | 2 | 7 | 9 |
| Totals (3, 4, 5) | 43 | 62 | 87 | 63 |
| Plot 6 | - | - | - | 23 |

Table 2. Percent of Jessica's aster stems within 1 meter of selected weed species, 2004.

| | Spotted knapweed | Hedgehog dogtail | Orchard grass | St. John's wort | Canadian bluegrass | Sulphur cinquefoil |
|--------|------------------|------------------|---------------|-----------------|--------------------|--------------------|
| Plot 3 | 6 | 6 | 49 | 60 | 0 | 50 |
| Plot 4 | * | * | * | * | * | * |
| Plot 5 | * | * | * | * | * | * |
| Plot 6 | 0 | 4 | 100 | 100 | 6 | 0 |

* Weed species presence was not recorded in 2004

Discussion and recommendations

It is probably misleading to interpret clusters of Jessica's aster as genets, because it is impossible to determine if stems are connected to each other underground without excavating around them. Mapped locations of Jessica's aster stems over four years illustrate the dynamic, amorphous movement of some of the "clusters" (Appendix 2). To eliminate the uncertainty associated with counting "clusters" that have a tendency to move over time, we use individual stems as the basic unit for measuring the annual abundance of Jessica's aster. The number of stems has remained relatively stable at plots 4 and 5 over the four year monitoring period. Plot 3 has had substantially more Jessica's aster plants than the other plots each year; however, the number of stems has decreased each year. The cumulative total of Jessica's aster stems for all three plots has decreased each year since 2001, on account of the decline at plot 3 (Figure 5).

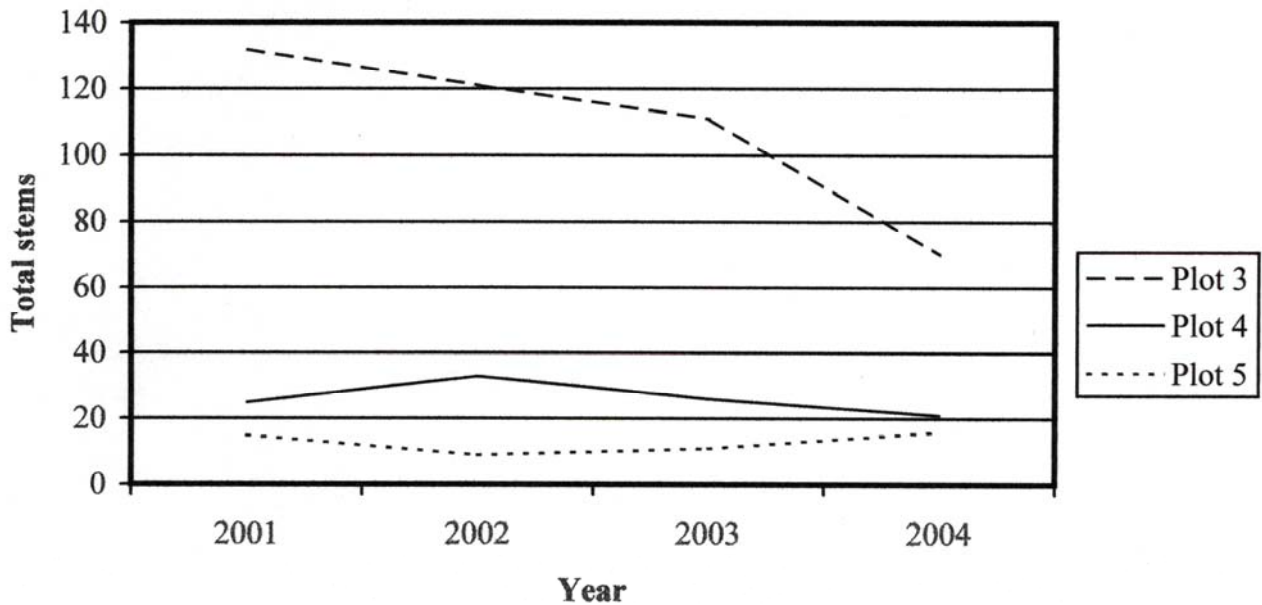


Figure 5. Jessica's aster stem abundance, 2001-2004.

In Plot 3, the 2004 stem-count was only 53% of the 2001 total. Plot 3 was a relatively weedy plot, with orchard grass, St. John's wort, and sulphur cinquefoil occurring within 1 m of half the Jessica's aster stems. Most Jessica's aster plants within the plot were at least partly under a canopy of shrubs or trees, and we speculate that plants are becoming too shaded. However, stem number has remained largely stable at plot 5 even though plants were under a nearly closed forest canopy.

Jessica's aster is subject to grazing, most likely by deer and elk. Although the absolute number of grazed stems varied, the percent of grazed stems showed a substantial increase at plots 4 and 5 in 2003, and a steady increase each year in Plot 3 (Figure 6). With the exception of plot 5 in 2002, the number of grazed stems has increased each year for each plot since 2001. These results may be partly due to the later sampling dates in 2003 and 2004. The later in the season grazing is evaluated, the more time is available for the stems to be grazed. An unknown number of stems that were or would have been reproductive are probably grazed. In addition to reducing reproductive output, grazing reduces the amount of tissue available for photosynthesis and plant carbohydrate production. It is unknown if, or to what degree the loss of stems to grazing affects local Jessica's aster populations.

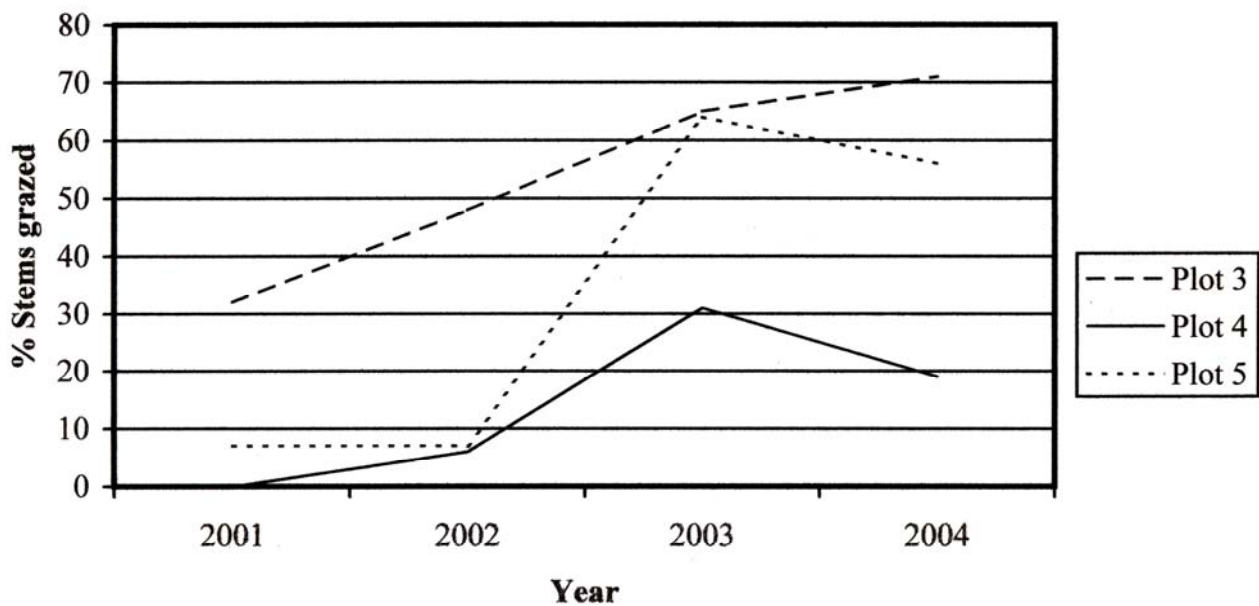


Figure 6. Percent of grazed Jessica's aster stems, 2001-2004.

Habitat loss is assumed to be the dominant factor in the rangewide decline of Jessica's aster in the past. In recent years, habitat degradation, especially the invasion of multiple noxious and other aggressive weed species, has become the major threat to the long-term conservation of Jessica's aster and its habitat. Two monitoring plots (3 and 6) are very weedy, while two others (4 and 5) presently have low weed cover. Monitoring changes in community composition, including weed species, will help provide insight into the relationship between habitat quality and the persistence of Jessica's aster over time.

The vegetation/habitat quality portion of the monitoring protocol has been a work in progress. Because modifications have been made each year, we do not have a consistent dataset to

compare annual plant community information and assess trends. Future monitoring will incorporate a protocol that can be consistently applied in each subsequent monitoring year. We have the following recommendations concerning the Jessica's aster monitoring program at Dworshak Reservoir:

- 1) The small size and weedy habitat characterizing Jessica's aster populations at Dworshak Reservoir suggest monitoring be conducted on a regular basis. A biannual schedule is recommended.
- 2) We recommend that monitoring be done near September 1 each year to minimize differences in factors such as grazing that are influenced by the date of data collection.
- 3) We recommend modifying the plant community portion of the monitoring protocol to collect quantitative data more sensitive to changes in the vegetation, including weedy species invasion. The developed plant community monitoring protocol needs to be consistently applied each monitoring year to provide comparative data. Plant community data should be collected each monitoring year. Stand-scale vegetation monitoring should be considered to augment the population-based protocol currently in place. This will allow more effective monitoring of plant community changes following prescribed burns, thinning, or other management actions.
- 4) We recommend expanding the monitoring program to include Jessica's aster occurrences located on ACOE land south of Dent, and on BLM land near Harper. Monitoring should also be extended to selected occurrences on private land if possible.

FIELD SURVEY FOR JESSICA'S ASTER

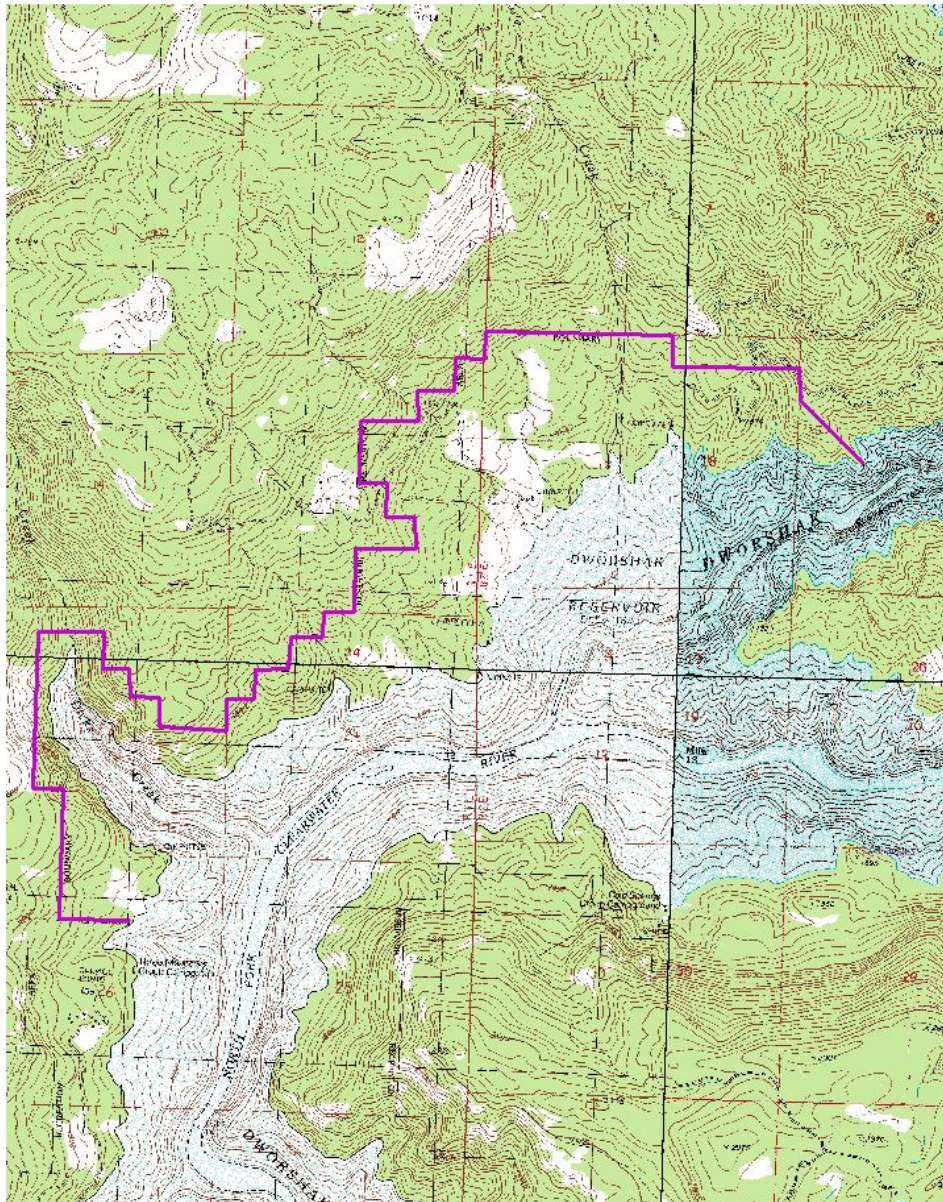
A field survey for Jessica's aster was conducted within the Elk Creek Meadow Stewardship Project Area (ECMS) in September 2004. The project area was known to contain several areas of unsurveyed habitat potentially suitable for Jessica's aster. As a pro-active conservation measure, the ACOE wanted the survey completed before fully initiating management activities scheduled for the project area. This would help ensure steps could be taken to benefit the conservation of Jessica's aster if it were discovered within the ECMS.

Elk Creek Meadow Stewardship Project Area

The ECMS is located approximately 17.7 km (11 mi) upstream from Dworshak Dam, on ACOE land. The project area extends along the north side of the reservoir, from below the mouth of Dicks Creek, upstream for roughly 5.6 km (3.5 mi) to the lower section of the Elk Creek arm, and encompasses approximately 445 ha (1,100 ac; Figure 7). Topography within the ECMS is dominated by steep to moderately steep, shallowly dissected forested slopes, and includes areas of gently rolling benchlands and rounded ridgecrests descending into the reservoir. East to southwest aspects dominate the area. Elevation ranges from approximately 488 m (1600 ft) to 732 m (2400 ft), with most of the project area below the 610 m (2000 ft) contour line.

Wildfire is a natural part of the forest ecosystem in the Dworshak Reservoir area, but periodic cool under burns and mixed severity fires have been virtually eliminated since the initiation of fire suppression in 1905. Removing fire disturbance from the ecosystem has resulted in a number of changes to the forest ecosystem, including increased tree density and a reduction in open ponderosa pine woodland communities that formally dominated many of the southerly-facing slopes and ridges; decreases in shrub distribution and recruitment; high levels of duff and

ground fuel accumulation; and overstocked conifer stands exhibiting poor health exemplified by very low crown/length ratios. Collectively, these changes have wildlife management, fire control, biodiversity, and other implications important to ACOE resource managers. The intent of the ECMS project is to begin to restore forest conditions and ecosystem processes that prevailed prior to the initiation of fire suppression efforts using control burn and thinning prescriptions (Davis 2001).



— Elk Creek Meadow Stewardship project area boundaries

Figure 7. Elk Creek Meadow Stewardship project area boundaries.

Methods

Before initiating field work, the IDCDC identified areas containing potential Jessica's aster habitat within the ECMS project area by receiving input and reviewing vegetation and orthophoto maps with ACOE biologists familiar with vegetation patterns in the area. Areas having potential habitat were also identified during a reconnaissance boat ride our first morning at Dworshak Reservoir. Recognition of potential habitat was based on our previous field experience working with Jessica's aster throughout its Idaho range. We identified four kinds of habitats within the project area potentially suitable for Jessica's aster, including: (1) forest edge, (2) open conifer woodland, (3) open shrubfields, and (4) nearly treeless balds within the forest matrix. In the study area, these patterns tended to occur on southerly aspects supporting a Douglas-fir/ ninebark habitat type (Cooper et al. 1987). The target habitats were located on USGS topographic maps and became the focal points of our survey.

We were able to survey all portions of the project area. Except for one day when a third person was available, the surveys were conducted by two people walking meandering transects. Usually, one person hiked a series of lower slope contours, while the other person walked a series of contours further upslope. Areas having the best potential Jessica's habitat received the most thorough survey. In contrast, surveys were only cursory in areas deemed to be poor potential Jessica's habitat, such as meadows dominated by monocultures of smooth brome (*Bromus inermis*), orchard grass, or other pasture grass species. Dense, mesic forest stands dominated by western redcedar (*Thuja plicata*) or grand fir (*Abies grandis*) were generally omitted from survey because of their unsuitability to support Jessica's aster.

Information regarding the vegetation and an assessment of the abundance and condition of potential Jessica's aster habitat was recorded for each of our survey areas. A standard IDCDC rare plant observation form was completed for Jessica's aster or other rare plant species encountered during our survey. GPS coordinates and other location details, as well as size, abundance, habitat, threat, and other conservation information is recorded on this form.

Results

Our field survey within the ECMS was conducted the week of 13 September, 2004. All areas having potential Jessica's aster were thoroughly searched. Areas containing marginal or poor potential habitat were searched less intensively. Geographic coverage within the ECMS was complete except for the steep, densely vegetated east-facing slope on the west side of lower Dicks Creek. No Jessica's aster was found within the ECMS.

Much of the south-facing terrain within the ECMS contained large to small patches of open conifer woodlands intermixed with shrub patches, or dry, herbaceous openings ("balds") that we judged to be potential Jessica's aster habitat. The open canopy woodlands were usually dominated by ponderosa pine, with varying amounts of Douglas-fir. Shrub patches were usually dominated by ocean spray, ninebark, serviceberry, or snowberry. Areas of scattered potential habitat were most common along lower slope positions near the reservoir. They were best developed on gentle southerly-trending, convex-shaped ridges and their adjacent slopes. We divided the ECMS into a series of polygons to help us survey more efficiently (Figure 8). A general description of the vegetation and assessment of potential Jessica's aster habitat for each polygon is provided in the next section of the report.

In addition to conducting surveys within the ECMS, we wanted to revisit and update information for the previously documented Jessica's aster occurrence located near Dent. We also wanted to

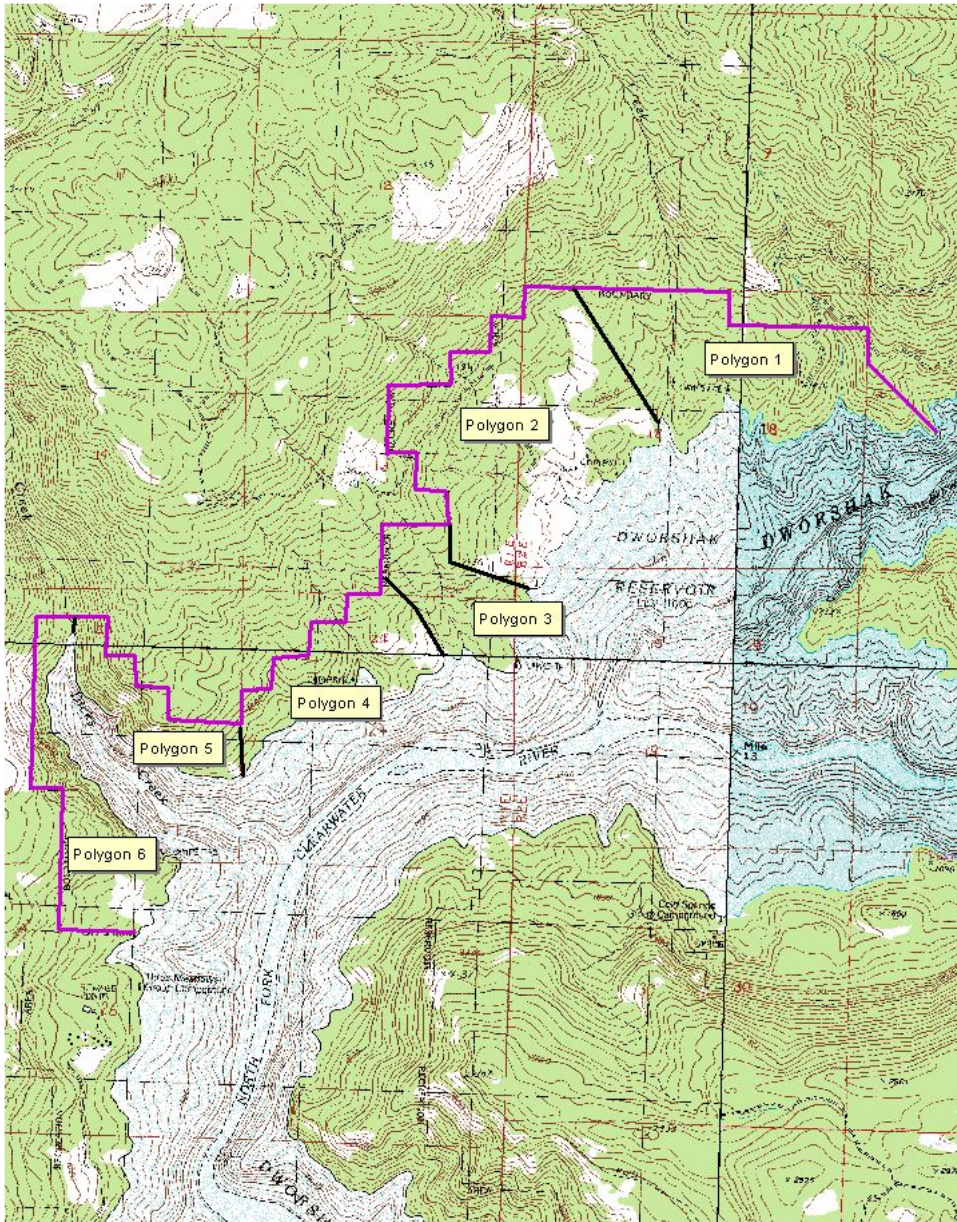


Figure 8. Jessica's aster survey area polygons.

investigate information given to us by an individual familiar with the species who reported seeing Jessica's aster along a trail near the Dent Orchards group campground.

We relocated the previously known Jessica's aster occurrence near Dent and discovered a new roadside subpopulation approximately 0.5 km (0.3 mi) further east. Both subpopulations were only a few square meters in size. The newly discovered subpopulation had nearly 100 Jessica's aster stems, the other one <20 stems. Both are vulnerable to roadside disturbances. We surveyed portions of the surrounding slopes near both subpopulations, but did not find any more

plants. These subpopulations are located very close to the boundary between ACOE and private land and their ownership needs to be confirmed.

We did not find any Jessica's aster in the immediate Dent Orchards campground area. However, two new subpopulations were discovered along the maintained hiking trail west (downriver) of the campground. They were both small in size and contained < 20 stems. Several aggressive weed species were well established along the trail area, including what we have tentatively identified as meadow knapweed (*Centaurea debeauxii*). These weedy species pose the primary threat to the two subpopulations, which are located < 0.8 km (0.5 mi) south of the Dent area. The subpopulations represent extensions to the previously documented Jessica's aster occurrence at West of Dent (EO 67). Locations of each of the four subpopulations comprising this occurrence have been mapped (Appendix 7). Location, population, habitat, and other conservation information is summarized in the IDCDC Element Occurrence Record (EOR; Appendix 8).

Survey polygon descriptions

Polygon 1. This survey area was a mosaic of closed to occasionally open canopy ponderosa pine and Douglas-fir forest (with encroaching grand-fir, intermixed open to dense shrub patches, bracken fern (*Pteridium aquilinum*) patches, and herbaceous, meadow-like openings dominated by introduced species such as orchard grass, smooth brome, sulphur cinquefoil, and English plantain (*Plantago lanceolata*). Most of the area appeared to be unsuitable for Jessica's aster due to a more or less closed forest canopy cover. Portions with an open conifer canopy had a very weedy herbaceous layer, with few native forb or grass species observed. Native plant species were nearly absent from the meadow openings as well.

Polygon 2. Dense Douglas-fir, and in some places, western red-cedar forests dominated the upper slopes of this survey area. Further downslope, a series of large, cleared, pasture meadows occurred. These meadows were dominated by introduced pasture grasses and lacked potential Jessica's aster habitat, except perhaps for a few patches along the forest-meadow interface. An area just upslope from the reservoir, southwest of a campsite, had a few bands of open ponderosa pine with a weedy understory that could be considered marginal Jessica's aster habitat.

Polygon 3. Lower slopes within this survey area had a mix of open ponderosa pine woodland, closed canopy forest, and open gaps with dense to open shrub patches. The open ponderosa pine stands and intermixed shrub patches appeared to be suitable habitat for Jessica's aster, especially in a few places where native bunchgrasses were as abundant as the pasture grasses. Upslope segments of the survey area were mostly closed canopy forest unsuitable for Jessica's aster.

Polygon 4. This survey area supported Douglas-fir forest unsuitable for Jessica's aster except in a few places. Narrow bands of open, ponderosa pine woodland and canopy gaps dominated by deciduous shrub species provided intermittent pockets of potential Jessica's aster habitat along or near the margin of the reservoir. In most cases, the herbaceous layer in these relatively open areas was dominated by introduced species. An exception was the downslope end of the ridge located approximately 0.3 km (0.2 mi) east of Campsite 11.7. The south-facing ridgecrest and adjacent slopes had bluebunch wheatgrass and Idaho fescue in the understory, and represented one of the best areas of potential Jessica's aster habitat we observed in the ECMS. However, a nearby 0.08 ha (0.2 ac) patch of dalmatian toadflax (*Linaria dalmatica*) threatens to

reduce the ecological integrity of this area. GPS coordinates and a map show the location of this local dalmatian toadflax infestation (Appendix 8).

Polygon 5. Steep, southerly-facing slopes within this survey area contained a mosaic of forested habitats, and patches of open, often rocky, shrub and herb vegetation. The herbaceous understory in these open to dense shrub patches was often dominated by weedy species, but several places had a good complement of native grasses and forbs. These openings supported some of the best potential Jessica's aster habitat we encountered in the ECMS. West-facing slopes in the survey area were forested and did not possess potential Jessica's aster habitat

Polygon 6. We did not survey the steep, densely vegetated east-facing slope characterizing the northern half of this polygon. The survey we conducted in the southern half of the polygon, combined with map information, and our views from various vantage points on the reservoir, convinced us no Jessica's aster habitat occurred in this portion of the project area. The gentle to moderately steep slopes in the southern half of this polygon were dominated by closed canopy conifer forest, largely grand fir, and unsuitable for Jessica's aster. A few small, open, dry forest inclusions contained habitat marginally suitable for Jessica's aster. A large non-forested patch (former homestead?) was dominated by smooth brome, sweetbriar rose (*Rosa eglantheria*), and other introduced species. No Jessica's aster was found within patches of suitable habitat near campsites 10.7, 10.9, and 11.0.

Other plant species of conservation concern

While conducting our Jessica's aster survey, we opportunistically encountered several other plant species of conservation concern in Idaho. Seven new subpopulations of Henderson's sedge (*Carex hendersonii*) were discovered scattered along the west and north sides of Dworshak Reservoir between Dworshak State Park campground and the Dent area. It was most common within the ECMS on the west side of lower Dicks Creek. Subpopulations ranged in size from 2 to nearly 100 plants. The largest covered nearly 0.08 ha (0.2 ac). They were added to the Henderson's sedge occurrence for Three Meadows Campground (EO 22) originally documented over a decade ago. A map showing the location of each subpopulation is included in Appendix 7. Location, population, habitat, and other conservation information for the occurrence is summarized in the EOR included in Appendix 8.

Small clusters of western starflower (*Trientalis borealis* ssp. *latifolia* = *T. latifolia*) were observed in several places within the ECMS, including with Henderson's sedge in two instances. We did not attempt to map the distribution of western starflower or estimate its abundance during our survey. A western starflower occurrence was documented from the Three Meadows Campground area (EO 18) in the early 1990s. Subpopulations we encountered within the ECMS represent extensions to this previously known occurrence.

Palouse thistle (*Cirsium brevifolium*) was documented from two areas along lower Dworshak Reservoir prior to our survey, including near Merrys Bay (EO 22) and Little Bay (EO 1). Palouse thistle was not encountered within the ECMS, but we did discover a new occurrence south of Dent. The new occurrence consists of two subpopulations, both found along the hiking trail leading downriver from the Dent Orchards area, on southwest-facing slopes under partial conifer shade. One subpopulation co-occurred with Jessica's aster and contained <100 plants. The other subpopulation had an estimated 300 plants. Several noxious and other invasive weeds were well established in the general area and pose the primary threat to the ecological integrity of the Palouse thistle occurrence. Appendix 7 includes map locations for the three Palouse thistle occurrences in the lower reservoir area, including the new south of Dent (EO 27)

site. Element Occurrence Records included in Appendix 8 have location, population, habitat, and other conservation information for the occurrences.

A small population of broad-fruit mariposa lily (*Calochortus nitidus*) was opportunistically discovered on a slope above Little Bay, in the vicinity of one of the Jessica's aster monitoring plots. Fewer than 10 plants were observed in a grassy opening. Not all potential habitat was searched and additional plants may occur in the area. A map showing the location of the new broad-fruit mariposa lily occurrence at Little Bay (EO 150) is included in Appendix 7. Location, population, habitat, and other conservation information is summarized in the EOR included in Appendix 8.

The discovery of new populations for Henderson's sedge, western starflower, Palouse thistle, and broad-fruit mariposa lily further highlight the biodiversity value of the lower Dworshak Reservoir area. A synopsis of the distribution, habitat, and conservation status for the four species is provided below.

Henderson's sedge: Henderson's sedge is a tufted perennial up to about 1 m tall with wide leaves, a distinctly triangular stem, and a loosely-flowered inflorescence subtended by a large leafy bract. Its main distribution is west of the Cascade Mountains from southern British Columbia, south to California. A series of disjunct populations occur in low elevation river canyons of the Clearwater, St. Joe, and Coeur d'Alene river basins in northern Idaho. In Idaho, it inhabits moist forest understories. Henderson's sedge is an indicator of core areas of maritime-like conditions that make the Clearwater Basin an important biodiversity center in Idaho (Lichthardt and Moseley 1994). It is often associated with western redcedar habitat types on river terraces or other gently sloping sites. In the lower Dworshak Reservoir area it occurs sporadically in moist, montane microsites (Bower and Nadeau 2003).

Western starflower: Western starflower is a low, rhizomatous forb with delicate, white, star-shaped flowers. The single stem terminates in a whorl of 4-8 ovate-elliptic leaves that subtend the flowers on slender pedicels. Western starflower is a coastal disjunct that primarily ranges from the Alaska panhandle, south to coastal central California. It is also known from scattered stations in southeastern British Columbia and the Blue Mountains in southeastern Washington. In Idaho, it is concentrated in the North Fork Clearwater River Canyon. In this area it occupies a variety of low, dry to moist forest understory habitats (Bower and Nadeau 2003).

Palouse thistle: Palouse thistle is a white-flowered, rhizomatous thistle. Its distribution is centered in the Palouse region of eastern Washington and adjacent Idaho, with outliers extending into central Oregon. Little is known about the abundance of Palouse thistle or its rangewide conservation status. It was overlooked as a possible conservation concern for many years, but added to the Idaho Native Plant Society's rare plant list in 2000 (Idaho Native Plant Society 2000). It is reported to be mainly a grassland species, but it also occurs in forest and sagebrush habitats (Cronquist 1955b). In the Dworshak Reservoir area it occurs in dry, open forest sites.

Broad-fruit mariposa lily: Broad-fruit mariposa lily is a perennial forb with a single broad, flat basal leaf and large, showy, light to rich lavender-colored flowers. It is endemic to the Palouse region of eastern Washington and adjacent Idaho, with scattered populations extending eastward as far as the lower Lochsa River, and southward to the Cold Spring Mountains in southwestern Idaho County. Many historic populations are assumed to be extirpated due to conversion of former prairie grassland habitats to crop agriculture. Most extant populations occur along grassy ridges, canyon rims and upper slopes, or openings in nearby dry conifer

woodlands, peripheral to the prairie grasslands (Mancuso 1996). Broad-fruit mariposa lily is a former candidate species for listing under the Endangered Species Act (U.S. Fish and Wildlife Service 1993). It is still on the Forest Service sensitive plant list for Regions 1 and 6, and a special status species for the Idaho BLM (Idaho Conservation Data Center 2005a).

Discussion and recommendations

Jessica's aster is known from the Freeman Creek, Little Bay, Merrys Bay, and Dent areas on ACOE land, all within 6.4 km (4 mi) of the ECMS. A few places in the ECMS had habitat that looked similar to the known, nearby Jessica's aster sites. A limiting factor that may help explain why Jessica's aster apparently does not occur in the ECMS was the pattern of pasture grasses and weedy forbs dominating the understory in openings that otherwise appeared to be potential habitat. Jessica's aster co-occurs with weedy species at most known occurrences, but typically there is also a suite of native forb and grass species present. In contrast, introduced species thoroughly dominated the herbaceous layer in many of the openings within the ECMS, to the point that native forbs and grasses were rare or absent.

Management objectives for the ECMS favor an increase in the amount of open ponderosa pine woodland habitat (Davis 2001). This may increase the amount of potential Jessica's aster habitat in the area over time. The ecological quality of any newly created potential habitat resulting from management prescriptions will likely depend on the response of the numerous weedy grass and forb species already well established in the ECMS. Jessica's aster occurrences on ACOE land have added conservation importance because pro-active conservation measures are often more readily implemented on public land. In addition, occurrences are located within a relatively natural, undeveloped landscape compared to most other known sites.

We have the following recommendations concerning the conservation of Jessica's aster in the lower Dworshak Reservoir area:

1. We recommend additional surveys targeting Jessica's aster be conducted on ACOE land. One priority area to target is the vicinity between Big Eddy and Freeman Creek. ACOE employee Joe Cannon reported finding Jessica's aster in several places along/near the trail that leads upriver from the Big Eddy area in 2004. A comprehensive survey is needed to acquire a full accounting of Jessica's aster in this area.
2. We recommend resource managers consult maps showing the location of rare plant populations prior to any herbicide spraying or other weed control measures that may be prescribed in the lower Dworshak Reservoir area. Along these lines, we recommend people responsible for carrying out weed control measures receive training that will enable them to identify Jessica's aster and the other plant species of conservation concern that occur in the area.

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Appendix 1

Map locations for Jessica's aster monitoring plots in the Dworshak Reservoir area.

Appendix 2

Diagrams showing the location of Jessica's aster in monitoring plots, 2001-2004.

Appendix 3

Azimuths and distance measurements to Jessica's aster stems and clusters.

Appendix 4

Directions to Jessica's aster monitoring plots in the Dworshak Reservoir area.

Appendix 5

Jessica's aster 2004 monitoring data sheets.

Appendix 6

Jessica's aster photo point photographs, 2004.

Appendix 7

Map locations for Jessica's aster, Henderson's sedge, Palouse thistle, and broad-fruit mariposa lily occurrences discovered or updated during the 2004 field survey.

Appendix 8

Element Occurrence Records for Jessica's aster, Henderson's sedge, Palouse thistle, and broad-fruit mariposa lily occurrences discovered or updated during the 2004 field survey.

Appendix 9

Location of large patch of Dalmatian toadflax in the Elk Creek Meadow Stewardship project area.