



## ***S. spaldingii* Monitoring at Wallowa Lake 2010-2012**

### *Nez Perce National Historical Park*

Natural Resource Data Series NPS/NEPE/NRDS—2013/524



**ON THE COVER**

*S. spaldingii* flowers and buds, August 2012, Nez Perce National Historical Park- Old Chief Joseph Gravesite.  
Photograph courtesy of National Park Service

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Natural Resource Data Series NPS/NEPE/NRDS—2013/524

Jannis L. Jocius

Natural Resource Specialist  
Nez Perce National Historical Park  
39063 U.S. Highway 95  
Lapwai, ID 83540

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Fort Collins, Colorado

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## Abstract

The mission of the National Park Service (NPS) is “to conserve unimpaired the natural and cultural resources and values of the national park system for the enjoyment of this and future generations” (NPS 1999). To uphold this goal, Nez Perce National Historical Park, along with the U.S. Fish and Wildlife Service (USFWS), the Oregon Department of Agriculture (ODA), and other partners collaborated in monitoring Spalding’s catchfly (*Silene spaldingii*). This plant is a federally listed threatened species, endemic to mesic (moist) grassland communities or sagebrush-steppe communities of the inland Pacific Northwest (USFWS 2007).

This project was initiated to provide information about *S. spaldingii* at Nez Perce National Historical Park’s (NEPE) Old Chief Joseph Gravesite and at Iwetemlaykin State Heritage Site. In late summer 2010-12, NPS staff and partners conducted population monitoring of this species to determine plant dormancy, flowering, and fruiting rates. In addition, plants were marked in the field for future site reconnaissance.

Results indicate that *S. spaldingii* plants are present at each park site and, if they are not browsed heavily, are producing flowers and fruits at varying rates. In 2010, 52 plants (including 100 stems total) developed 764 flowers, which produced 355 fruits. Thus in 2010, each plant produced an average of six fruits per plant. In 2011, 45 plants (including 63 stems total) developed 780 flowers. No data was collected on fruits. We can infer that each plant in 2011 produced an average of 17 flowers. In 2012, 64 plants (including 102 stems total) developed 1,377 flowers, which produced 405 fruits. Thus in 2012, each plant produced an average of four fruits per plant.

This report details the status of *S. spaldingii* obtained from the first three years of monitoring the Old Chief Joseph Gravesite of Nez Perce National Historical Park and a portion of Iwetemlaykin State Heritage Site. Iwetemlaykin is managed by Oregon Parks and Recreation Department (OPRD). This report is intended as a release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but thorough analysis and interpretation of the data has not been completed. More extensive analyses and discussion of *S. spaldingii* populations, demography, and habitat will occur as part of another analysis, which will be available once funding is secured.

Note that initial fieldwork for this protocol was started by ODA through a grant overseen by the USFWS. At the time this report was written, reporting for seed germination and habitat enhancement was not completed by ODA. This report serves only to summarize the population monitoring and reproductive output of *S. spaldingii* portion of the original protocol.

## Acknowledgments

Funding for part of this project was provided through the U.S. Fish and Wildlife Service. We would like to thank Gretchen Sausen for initial inspiration for the project and for diligence in acquiring funding, for the ODA staff that assisted in data collection for this study, for the park service staff who participated in monitoring, and for Jerry Hustafa of the US Forest Service for his many contributions to the project. We would also wish to thank the numerous volunteers who spent time at the two park sites censusing the catchflies. These partners' willingness to collaborate will greatly contribute to the understanding of *S. spaldingii* throughout the region.

## Introduction and Background

*S. spaldingii* is an herbaceous perennial plant in the pink family (Caryophyllaceae). It is a regional endemic found predominantly in bunchgrass grasslands and sagebrush-steppe, and occasionally in open pine communities in eastern Washington, northeastern Oregon, west-central Idaho, western Montana, and barely extending into British Columbia, Canada.

Oregon Department of Agriculture (ODA) was funded in 2010 and 2011 by USFWS Section 6 Recovery funds to monitor *S. spaldingii* populations and to conduct habitat assessments for this species at Old Chief Joseph Gravesite and Iwetemlaykin State Heritage Site in the Wallowa Lake area. During these years, an interagency group made up of staff from the Oregon Parks and Recreation Department (OPRD), U.S. Fish and Wildlife Service (USFWS), National Park Service (NPS), The Nature Conservancy (TNC), U.S. Forest Service (USFS), and ODA located and marked all visible *S. spaldingii* plants present in the study sites.

Due to lack of funding, habitat research and more extensive surveys for this species on nearby private lands was not completed in 2012. Instead, in 2012, only population data was collected by the NPS, USFWS, USFS, OPRD, and several partners and volunteers.

The need to inventory and monitor natural resources stems from NPS policy that states:

*The National Park Service will assemble baseline inventory data describing the natural resources under its stewardship and will monitor those resources at regular intervals to detect or predict changes. The resulting information will be analyzed to detect changes that may require intervention and to provide reference points for comparison with other, more altered environments (NPS Management Policies, Chapter 4:4, 1988).*

Partly in response to this directive, Nez Perce National Historical Park has been working with USFWS in inventorying rare, threatened, and endangered plants such as *S. spaldingii*. There is currently a multi-state, multi-agency team working on the recovery strategy of this species. The objective of the recovery program is to recover *S. spaldingii* by protecting and maintaining reproducing, self-sustaining populations in each of the five distinct physiographic regions where it resides (USFWS 2007).

The overall goal of the recovery program is to recover *S. spaldingii* to the point where it can be delisted (i.e., to remove the species from threatened status). Delisting will be considered when these criteria, as listed in USFWS 2007) have been met:

1. Twenty-seven populations, with at least 500 reproducing *S. spaldingii* individuals in each and with intact habitat, occur rangewide at key conservation areas and are distributed throughout the 5 identified physiographic provinces as follows: 5 within the Blue Mountain Basins, 7 within the Canyon Grasslands, 8 within the Channeled Scablands, 4 within the Intermontane Valleys, and 3 within the Palouse Grasslands.
2. All 27 key conservation areas of *S. spaldingii* are composed of at least 80 percent native vegetation (by canopy cover), have adjacent habitat sufficient to support pollinating insects, and are not fragmented (i.e., intact).

3. Populations of *S. spaldingii* at key conservation areas demonstrate stable or increasing population trends (less than a 10 percent chance that the population is declining) for at least 20 years. To address this criterion, consistent range-wide monitoring methodologies that identify what parameters will be monitored, how, and at what frequency need to be developed.
4. Habitat management plans have been developed and implemented for all key conservation areas. These management plans will provide for the protection of *S. spaldingii* habitat, and will also protect the ecosystem by addressing conservation of other rare species, reducing the identified threats, protecting pollinators, enacting monitoring strategies, incorporating integrated pest management strategies, and incorporating appropriate fire management activities.
5. Invasive nonnative plants with the potential to displace *S. spaldingii* have been continually controlled or eradicated within a 100-meter radius of all *S. spaldingii* populations within key conservation areas. Certain invasive plants that are established and difficult to eradicate, as detailed for each physiographic province may be controlled within 25 meters of *S. spaldingii* populations.
6. Prescribed burning is conducted, whenever possible, to mimic historical fire regimes within a particular physiographic region in *S. spaldingii* habitat. Prior to burning, presence/absence surveys for the plant will be completed. Prescribed burning of more than 30 percent of the individuals at *S. spaldingii* population should not occur at any one time and should not take place when it may exacerbate invasive nonnative plant populations unless invasive nonnative plant control measures, monitoring, and a management strategy are in place prior to the prescribed burn. Where *S. spaldingii* is present, monitoring is enacted prior to and following the prescribed burn. Historical fire regimes are carefully analyzed utilizing the best available technology.
7. Seed banking occurs *ex situ* first at all smaller *S. spaldingii* populations and second at all largest *S. spaldingii* populations to preserve the breadth of genetic material across the species' range.
8. A post-delisting monitoring program for the species will be developed and ready for implementation. This program will be developed through coordination with the Bureau of Land Management, U.S. Forest Service, U.S. Fish and Wildlife Service, Tribes, States, The Nature Conservancy, and other interested parties.

The primary objectives of the *S. spaldingii* monitoring program have been to:

1. Describe the distribution and relative abundance of this species on NPS (13 acres) and state (62 acres) lands.
2. Provide the baseline information needed to develop a general management plan that can be implemented for *S. spaldingii* in the Wallowa Lake key conservation area.

## **Objectives**

The overarching programmatic goal of the *S. spaldingii* monitoring program is to obtain information that will aid management and restoration decisions pertaining to property within Nez Perce National Historical Park and Iwetemlaykin State Heritage Site. The primary objective of current site management in the NPS and OPRD is to prevent extensive changes from that of historic conditions, to restore plant communities, and to maintain a system with biotic integrity and good function.

## **Population Monitoring**

Given the lack of available data on *S. spaldingii* populations at Old Chief Joseph Gravesite and Iwetemlaykin State Heritage Site, the following fundamental questions drove much of the field crew's inquiry.

- What is the status (baseline number) of individuals of *S. spaldingii* present at the sites?

In light of that question and the broader goals outlined above, the *S. spaldingii* monitoring program addresses the following specific measurable monitoring objective:

1. Estimate the distribution and abundance (population size) of *S. spaldingii* in the two parks by censusing.

## **Reproductive Output Estimation**

Given the lack of available data on *S. spaldingii* reproductive output at Old Chief Joseph Gravesite site and Iwetemlaykin State Heritage Site, the following fundamental questions drove much of the field crew's inquiry.

- How many fruits are produced by each plant?
- What is the estimated reproductive capacity of this species at these sites?

In light of these questions and the broader goals outlined above, the *S. spaldingii* monitoring program addresses the following specific measurable monitoring objectives:

1. Determine the number of flowers produced by each plant every year.
2. Determine the number of fruits produced by each plant every year.

## Study Species

The following plant description is adapted from Schassberger (1988), Gamon (1991), Lesica and Heidel (1996), Lichtardt (1997), Hill and Gray (2004), and Fish and Wildlife Service (2007).

*S. spaldingii* is a member of the Caryophyllaceae family (the pink or carnation family).

Henry Spalding first collected the plant around 1846 near the Clearwater River in Idaho (near the Spalding site of Nez Perce National Historical Park) (Oliphant 1934) and later described by Sereno Watson in 1875, based on the Spalding material (Watson 1875). Common names include *S. spaldingii*, Spalding's silene, and Spalding's campion. *S. spaldingii* overlaps in range and is somewhat similar in appearance with several other species in the genus (Figure 1): *S. scouleri* (Scouler's catchfly), *S. douglassii* (Douglas' catchfly), *S. csereii* (Balkan catchfly, not included in figure), *S. oregona* (Oregon catchfly), and *S. scaposa scaposa* var. *scaposa* (scapose silene).

*Silene spaldingii* is an herbaceous perennial, emerging in spring and dying back to below ground level in the fall. Plants range from 20 to 61 centimeters (8 to 24 inches) in height, occasionally up to 76 centimeters (30 inches). There is generally one distinctively yellow-green stem per plant, but sometimes there may be multiple stems. Each stem bears up to four to 7 (up to 12 or more) pairs of leaves that are 5 to 8 centimeters (2 to 3 inches) in length, and has swollen nodes where the leaves are attached to the stem. All green portions of the plant (leaves, stems, calyx) are covered in dense sticky hairs that frequently trap dust and insects, hence the common name "catchfly". The plant has a persistent caudex (underground stem tissue) atop a long taproot (1 meter [3 feet] or longer in length). The long taproot makes transplanting the species difficult at best, and perhaps impossible. Typically, *S. spaldingii* blooms from mid-July through August, but it can bloom in September.

Three to 20 (sometimes over 100) flowers are horizontally positioned near the top of the plant in a branched arrangement (inflorescence). Flowers are approximately 1.5 centimeters (0.6 inch) long; however, the majority of the flower petal is enclosed within a leaf-like tub, the calyx, which resembles green material elsewhere on the plant and has 10 veins running from the flower mouth to the base of the flower. The visible portion of the five flower petals is small (2 millimeter [0.02 inch]) appendages, the same color as the blades. The flowers are perfect (have both male and female parts). Each fertilized flower matures vertically and becomes a many-seeded (up to 150 seeds) cup-like fruit capsule. Fruits mature from August until September and one stem may have both flowers and mature fruit capsules at the same time. Seeds are small (2 millimeter [0.08 inch]), wrinkled, flattened, winged, and light brown when mature.

Seedlings generally sprout in spring, form rosettes the first year, and occasionally flower the second year (Lesica 1995). Adult plants emerge in spring, usually May, as either a stemmed plant, a rosette, or occasionally as a plant with both rosette(s) and stem(s) (Hill and Weddell 2003). Stemmed plants may remain vegetative or may become reproductive in July or August. Plants senesce or wither in fall (September or October), reappearing the next spring (Hill and Gray 2004).

In a study in Montana, Lesica and Steele (1994) and Lesica (1997) found that *S. spaldingii* exhibits prolonged or summer dormancy; that is, plants can remain below the ground, without leaves, for up to 6 years when conditions are unfavorable. Lesica and Crone found that plants exhibited prolonged dormancy for 1 year 76 percent of the time and for 2 years 16 percent of the time.

## Study Area

### Old Chief Joseph Gravesite

The Old Chief Joseph Gravesite (UTM, WGS84:11T 482651 5020367) consists of 5.35 hectares (13.21 acres). The site is located on the western side of Oregon highway 351, north of Wallowa Lake. The cemetery proper (5.12 acres) is held in trust by the Department of the Interior for the Nez Perce and Umatilla Tribes, but managed by the National Park Service. Nonnative cultivated plants, including lilacs and bearded irises are still found on site.

The remaining 8.09 acres north of the cemetery were acquired from WGK Develop Corp. and Silver Lake Ditch Company and are owned and managed by the NPS. This area was not planted with cultivars in the past. Wallowa Lake is to the south of the entire site, the Wallowa Mountains are towards the south and west, and the NPS site sits on a terminal glacial moraine. There are lateral moraines immediately to the east and west of the sites.

This NPS site is where Old Chief Joseph of the Wallowa band of the Nez Perce is buried. Joseph died in 1870 and was later reinterred at this site in 1926. The cemetery is sacred for the Nez Perce people. A tall stone marker marks Old Chief Joseph's grave. There is a cobble wall and gateposts at the entrance built by the Umatilla Tribal Civilian Conservation Corps (CCC). This site marks the beginning of the Nez Perce Trail. The site was also a traditional Nez Perce campsite.

Since this site contains a small population of *S. spaldingii*, the NPS must manage the land for its preservation. The grasses are the result of longstanding grazing practices and consist of cheatgrass (*Bromus tectorum*), barnyard grass (*Echinochloa crus-galli*), fescue (*Festuca ssp.*), and timothy (*Phleum pratense*) (Ambrose et al. 2002).

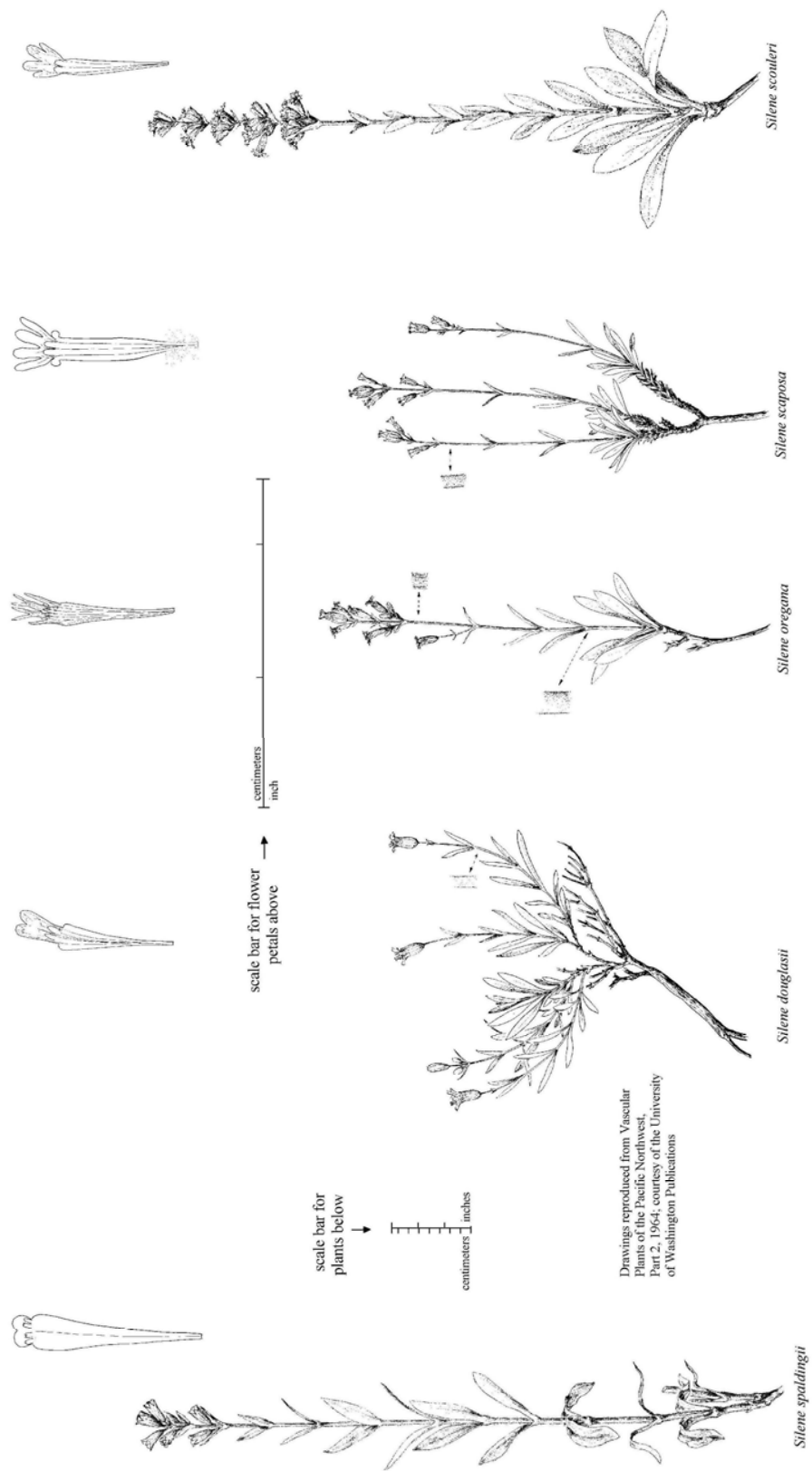


**Figure 1.** *S. spaldingii* and a few of its closest look-alikes.

### ***Iwetemlaykin State Heritage Site***

Iwetemlaykin State Heritage Site is a 62 acre parcel of land. The land comprising the site was purchased from a private individual during the summer of 2007 through a coalition of the Oregon Parks and Recreation Department (OPRD), the Nez Perce Tribe, the Confederated Tribes of the Umatilla Reservation, the Confederated Tribes of the Colville Reservation, and the Oregon State Parks Trust. The goal of the purchase was to protect the cultural resources and prevent development of the site into intense residential or commercial purposes. A byproduct of the purchase was to preserve and maintain the natural setting and overall appearance of the area.

### ***Study Site Vegetation***

Both Old Chief Joseph's Gravesite and Iwetemlaykin State Heritage Site are in the Middle Rocky Mountain Steppe-Coniferous Forest-Alpine Meadow ecoregion (Bailey 1995, 1998). Both properties share a highway as one boundary and the Wallowa River as another boundary. Iwetemlaykin State Heritage Site also borders the city of Joseph and Old Chief Joseph's Gravesite. The Gravesite borders ditch company land on one of its sides. Generally, the property surrounding the park sites is mostly grassy fields with conifers bordering the river area. There are a few invasive plants. The shrub dominated riparian community consists of species such as Douglas fir (*Pseudotsuga menziesii*), prickly rose (*Rosa acicularis*), common snowberry (*Symphoricarpos albus*), red-osier dogwood (*Cornus sericea*), black cottonwood (*Populus balsamifera*), and willow (*Salix* spp.). The disturbed grassland includes diffuse knapweed (*Centaurea diffusa*), Canada thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), houndstongue (*Cynoglossum officinale*), and common mullein (*Verbascum Thapsus*). Because of years of settlement and ranching, forage grasses, particularly Kentucky bluegrass (*Poa pratensis*) now cover much of the surrounding landscape. The cemetery, the NPS site, and Iwetemlaykin State Heritage Site are unique and have unique vegetation because of their individual land histories.

Wallowa County Resources has a robust invasive species management plan for the area, but since the park sites receive many out-of-town visitors, there are many vectors for the spread of weeds. In addition, the social trails created through the sites to the lake contribute to disturbance and the spread of weeds.



## Old Joseph Spalding's catchfly Monitoring 2010-12

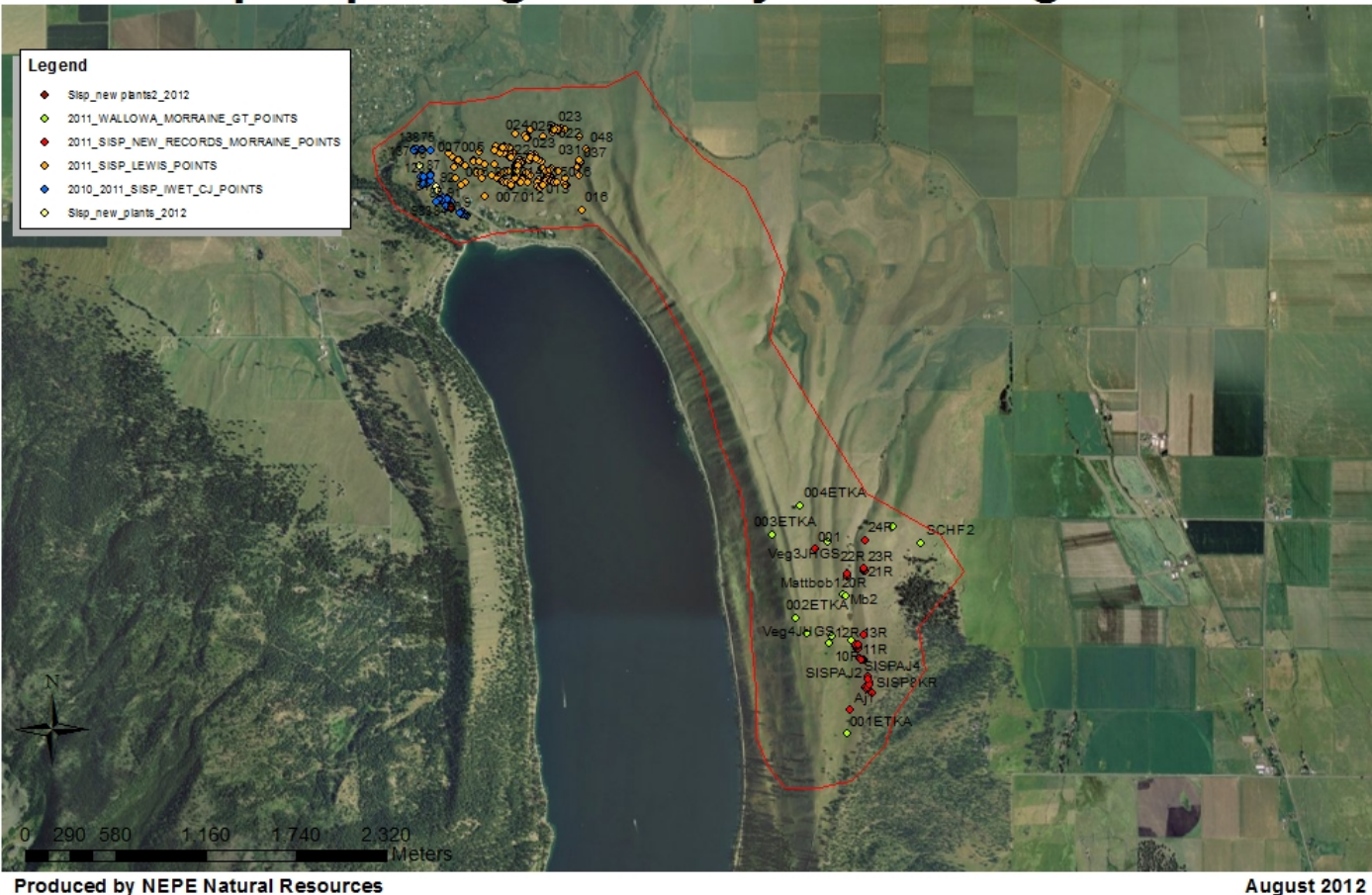


Figure 2. *S. spaldingii* populations near Wallowa Lake, Oregon.



## Old Joseph Spalding's catchfly Monitoring 2010-12

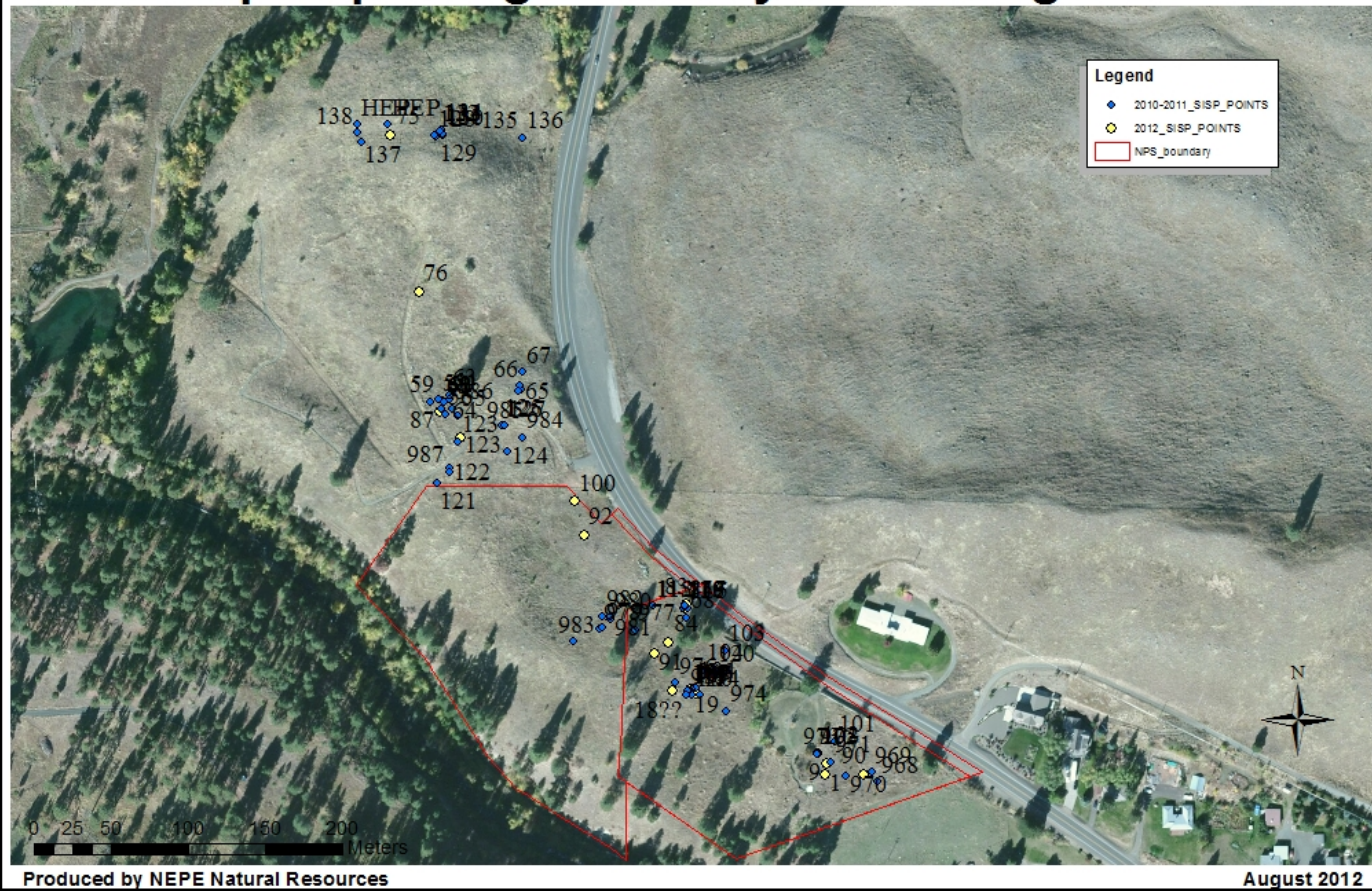


**Figure 3.** *S. spaldingii* monitoring points and areas near Wallowa Lake, Oregon. The southeastern red polygon indicates the historic cemetery boundary while the northeastern red lines indicate the rest of the NPS-managed property.



## Iwetemlaykin: Spalding's catchfly Monitoring 2010-12; Northwest Corner

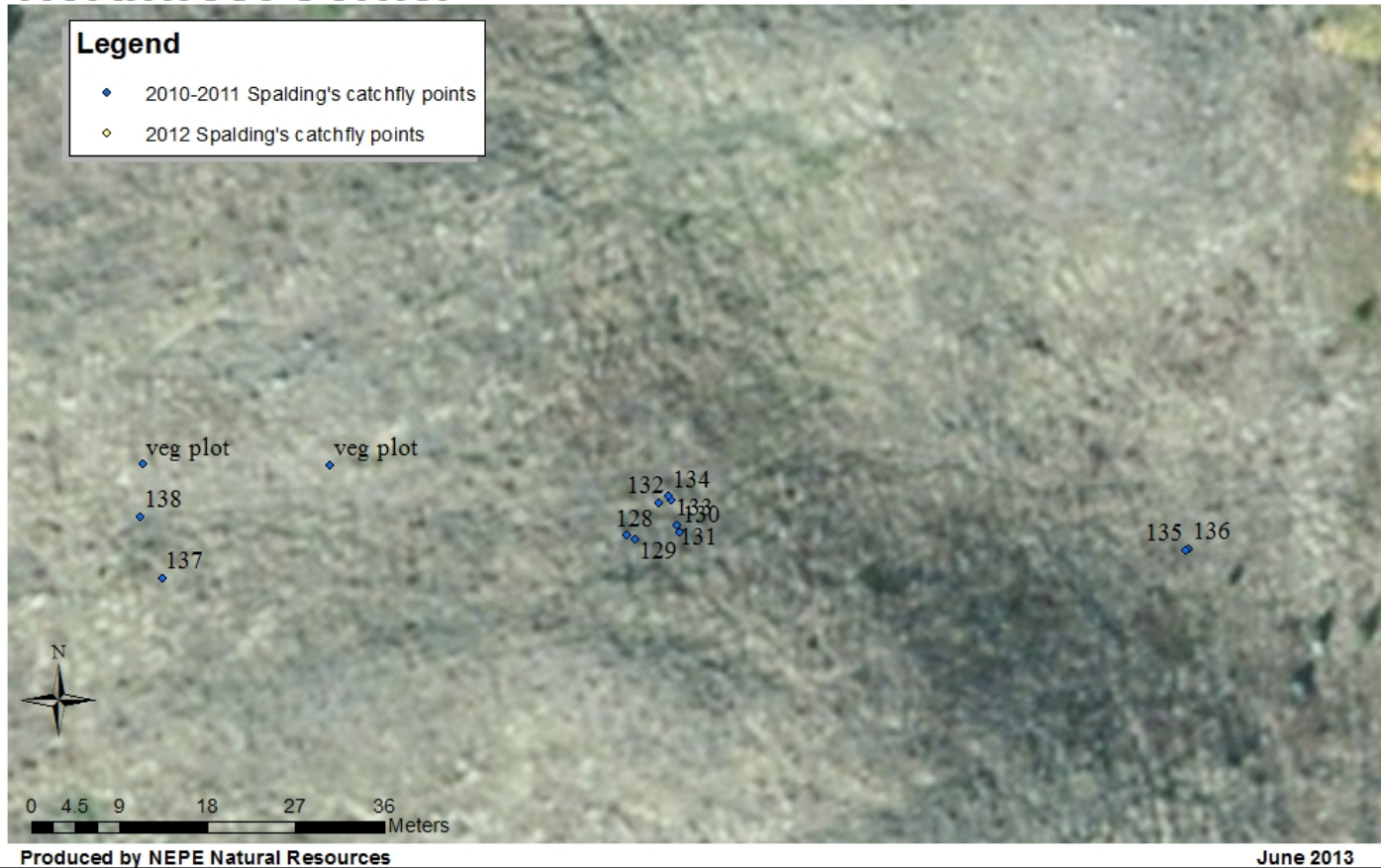


**Figure 4.** Zoom in of *S. spaldingii* monitoring points in northwest corner of Iwetemlaykin State Heritage Site.



## Iwetemlaykin: Spalding's catchfly Monitoring 2010-12; Central



**Figure 5.** Zoom in of *S. spaldingii* monitoring points in central part of Iwetemlaykin State Heritage Site.



## Iwetemlaykin and Old Joseph: Spalding's catchfly Monitoring 2010-12

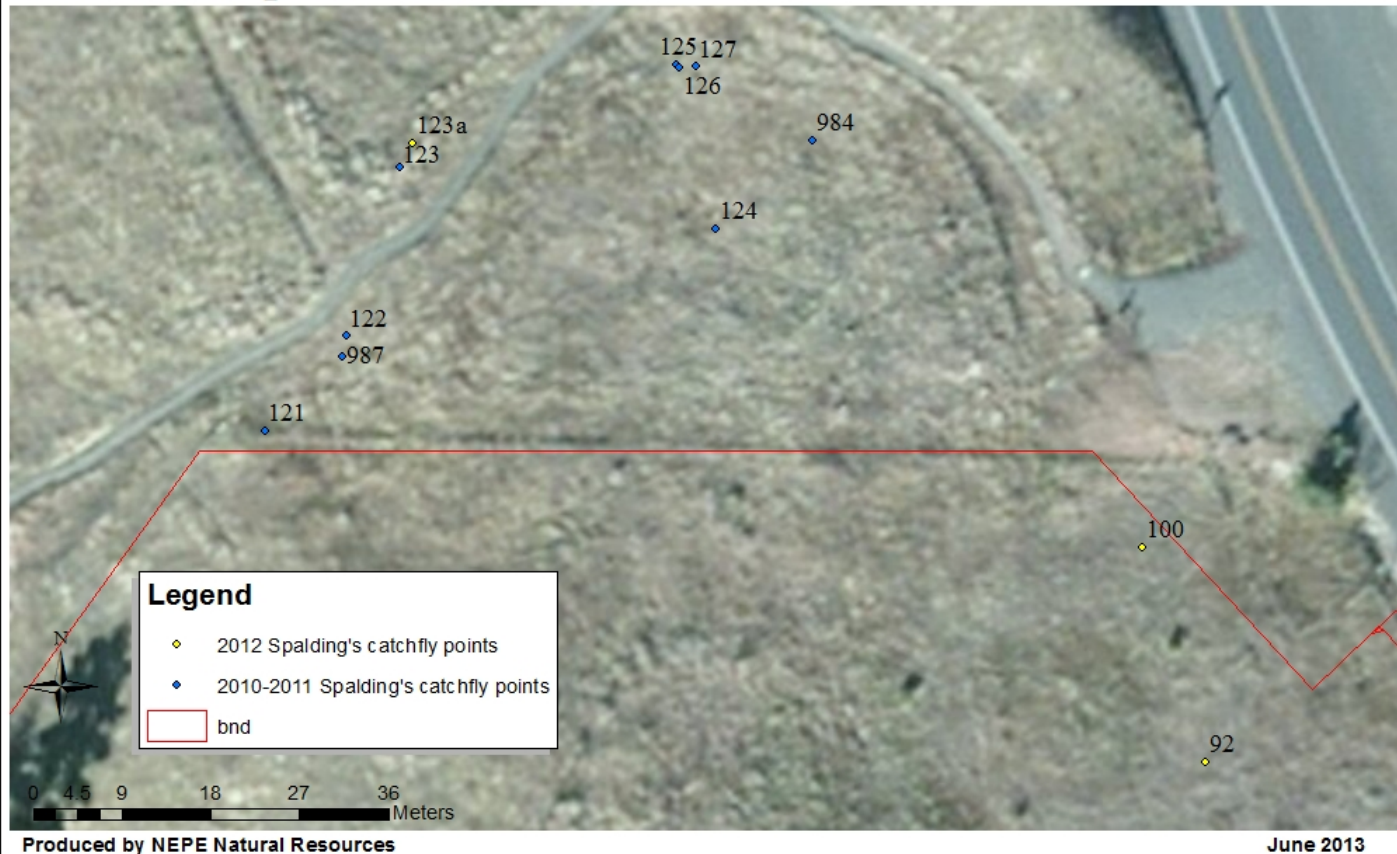
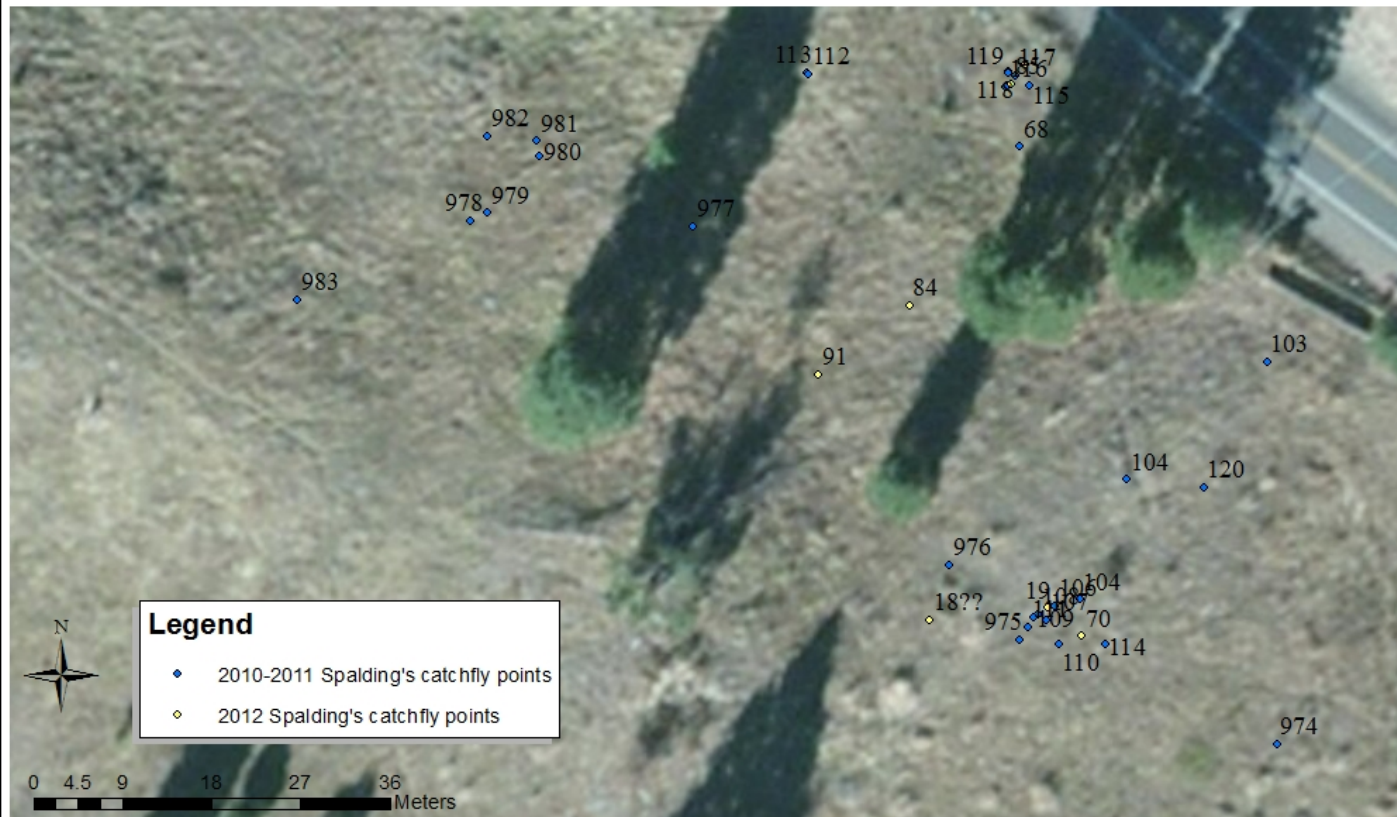


**Figure 6.** Zoom in of *S. spaldingii* monitoring points in southeast corner of Iwetemlaykin State Heritage Site and north of Old Chief Joseph's Gravesit



## Old Joseph: Spalding's catchfly Monitoring 2010-12; Northwest of Grave



FILE: Untitled.mxd

**Figure 7.** Zoom in of *S. spaldingii* monitoring points northwest of the grave at Old Chief Joseph's Gravesite.



## Old Joseph: Spalding's catchfly Monitoring 2010-12; Southeast of Grave



Produced by NEPE Natural Resources

June 2013

FILE: Untitled.mxd

**Figure 8.** Zoom in of *S. spaldingii* monitoring points southeast of the grave at Old Chief Joseph's Gravesite.

## Methods

### **Data Collection**

Data was collected August 6 in 2010, late September in 2010, August 23 in 2011, August 7 in 2012, August 14 in 2012, and October 2 in 2012. This meant that not all seedlings, which generally sprout in the spring, were counted. We decided to count only the flowering (i.e., mature and established) plants because it was easier for our broad range of field personnel to recognize these plants amongst the look-alike catchflies and to accurately distinguish *S. spaldingii* through the tall grasses. Since flowering generally does not occur until during or after the third season (Lesica 1997), that meant we did not count first-year rosettes either. We made this decision based upon the objectives of the recovery plan—wherein we were most concerned with documenting and sustaining *reproductive* populations of *S. spaldingii*, not susceptible seedling populations.

Data collection began on the southeastern side of the 13-acre National Park Service property. Inventory participants were spaced approximately five meters apart. The five meter-spaced transects were then walked approximately parallel to the highway from southeast to northwest. Upon completion of this transect, the inventory team turned around and moved over to cover the next section southwest. The team reestablished a new series of transects approximately five meters from the westernmost transect on the previous run. This new sweep was conducted from the northern fence to the southern fence also spaced five meters apart (Figure 9).

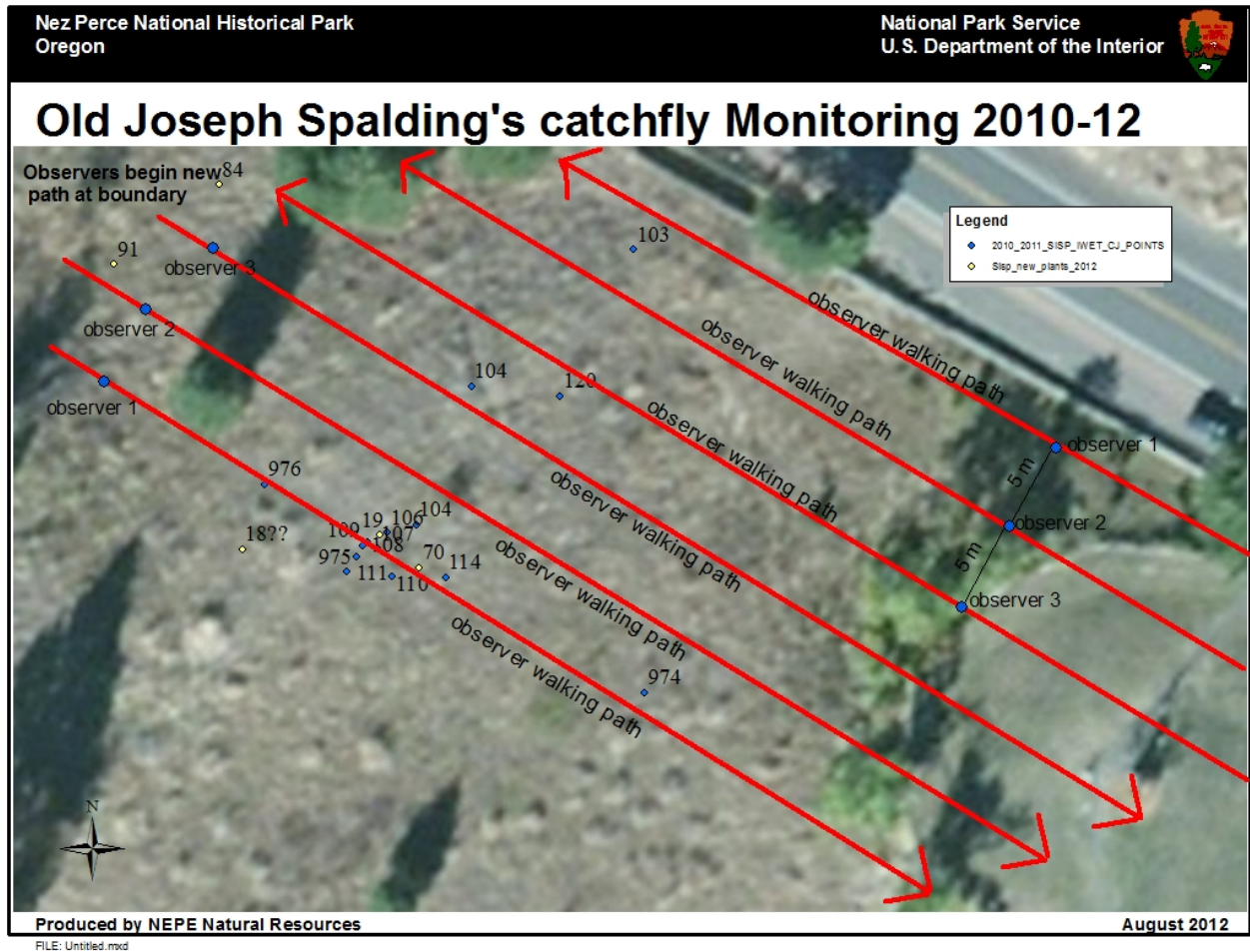


**Figure 9.** Data collection methodology showing observer walking paths and distance from one another.

The same survey was completed on the Iwetemlaykin State Heritage Site property. Crews walked transects from south to north in the same pattern as described above, marking *S. spaldingii* sites accordingly.

When *S. spaldingii* plants were encountered, they were marked with pin flags, recorded on paper datasheets and marked as GPS waypoints on Garmin 76 CSx units. Whenever a plant was observed at least two other observers, including one botanist would verify that the plant was, in fact, *S. spaldingii* and not another *Silene* species. Some, *S. spaldingii* plants were photographed during the survey, but not all. NPS staff were worried that visitors may tamper with some visible plant tags, so in instances where plants were found very close to the Old Chief Joseph monument mound on the NPS site, plants were only documented with a GPS point. This included plants 102, 105, 972, and 973.

Individual plants were counted by recording their numbers of stems. A plant was defined as one or more stems within 20 cm of one another and greater than 20cm from any other stem. Notes about plant characteristics and invasive weeds were written on field datasheets. Upon completion of the GPS and photo documentation, the pin flags were removed and replaced with permanent metal rods and numbered tags.

Because prolonged dormancy of *S. spaldingii* can make population estimates and monitoring difficult, it was important to mark the plants at the NPS and state park sites so that surveys could check dormancy year after year.

### **Data Analysis**

Data was gathered on field datasheets into Microsoft excel. Stem counts were totaled and averaged, evidence of browsing and flowers for 2010, 2011, and 2012. Totals were also gathered for fruits from 2010 and 2012. No data was collected for fruits in 2011. In addition, graphs were made through excel to provide a preliminary understanding of the relationship between total plants observed, flowering, and fruiting.



## Results

The estimated total number of mature *S. spaldingii* plants across both Old Chief Joseph Gravesite and Iwetemlaykin State Heritage site is based on the census surveys in 2010-2012. In 2010, 52 plants were found, including 100 stems total (Figure 5). In 2011, 45 plants were found, including 63 stems total. In 2012, 64 plants were encountered, including 102 stems total.

Throughout the study, browsing by both insects and large herbivores was monitored. In 2010, 38 stems were browsed. In 2011, a mere 14 stems were browsed. In 2012, 42 stems were browsed (Figure 6).

In 2010, 764 flowers bloomed on the 52 plants, producing 355 mature fruits. Thus in 2010, each plant produced an average of 6 fruits per plant. In 2011, 780 flowers bloomed on the 45 plants. Thus, we can infer that each plant in 2011 produced an average of 17 flowers. No data was collected on fruits during that year. In 2012, 1,377 flowers bloomed on 64 plants, producing 405 fruits. Thus in 2012, each plant produced an average of 4 fruits per plant (Figure 7 and Figure 8).

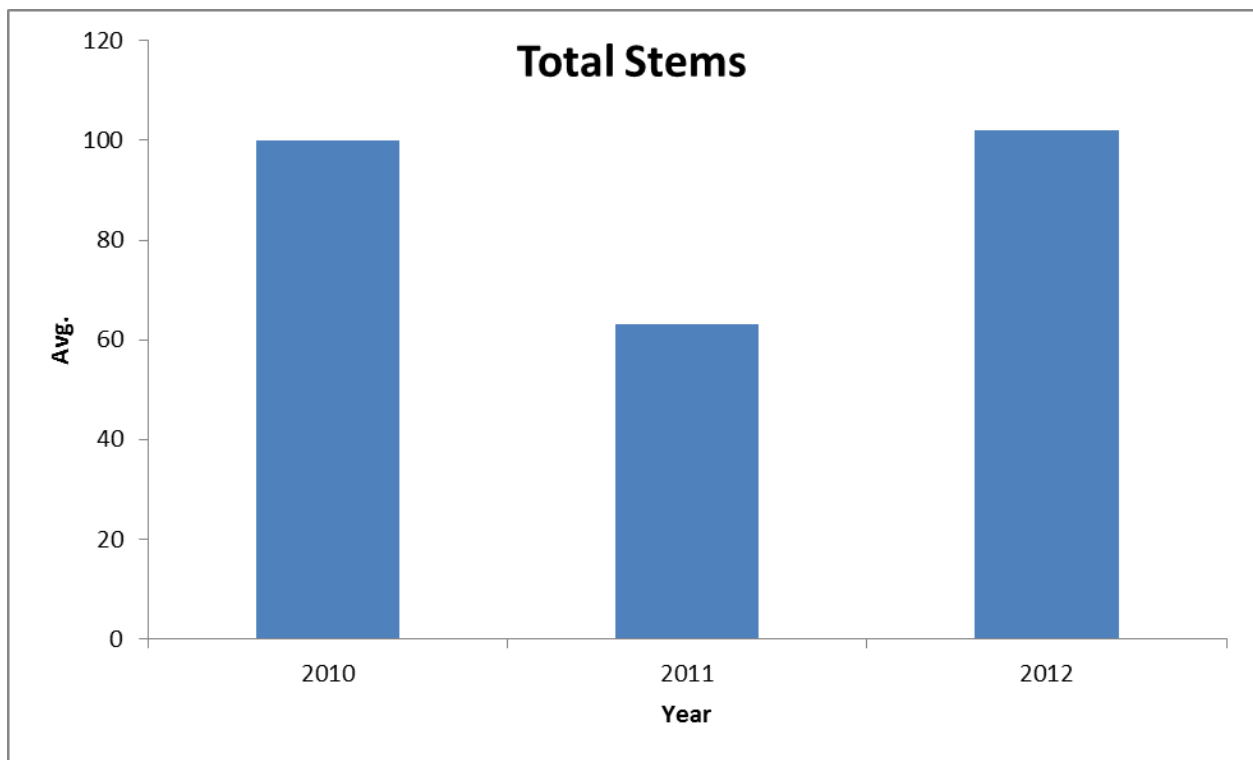


**Figure 10.** Bar graph showing total number of stems counted in 2010, 2011, and 2012.

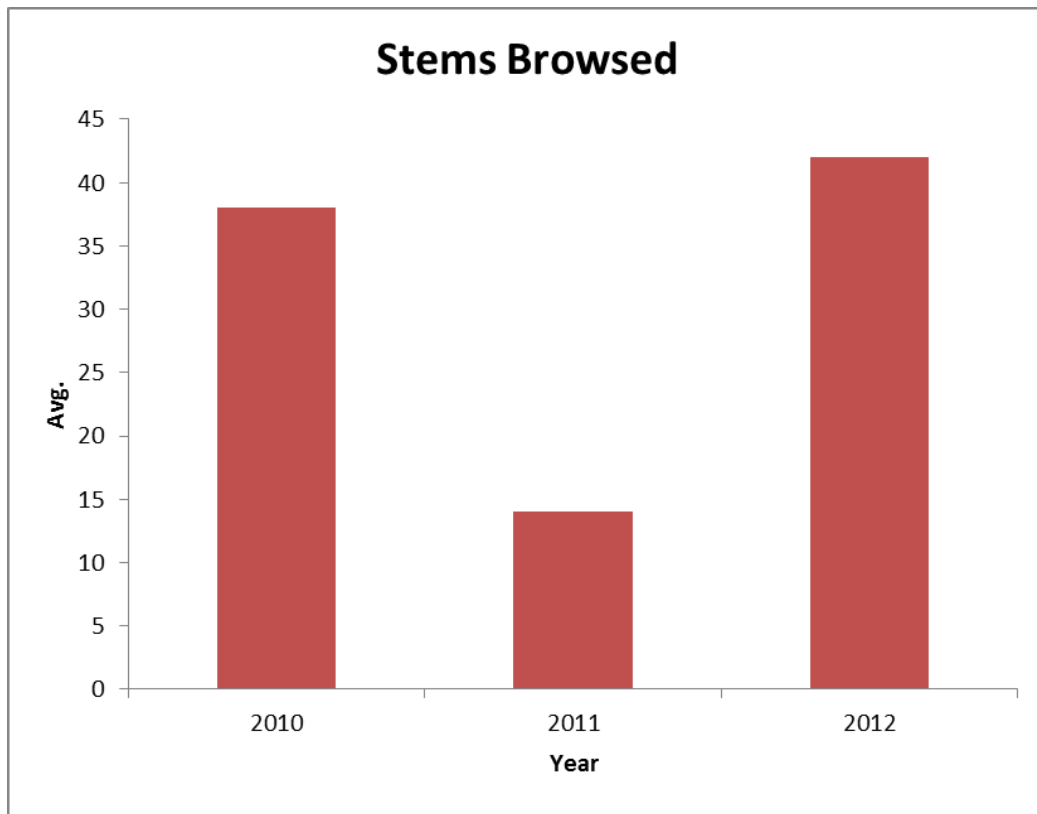


**Figure 11.** Bar graph showing total number of stems browsed in 2010, 2011, and 2012.

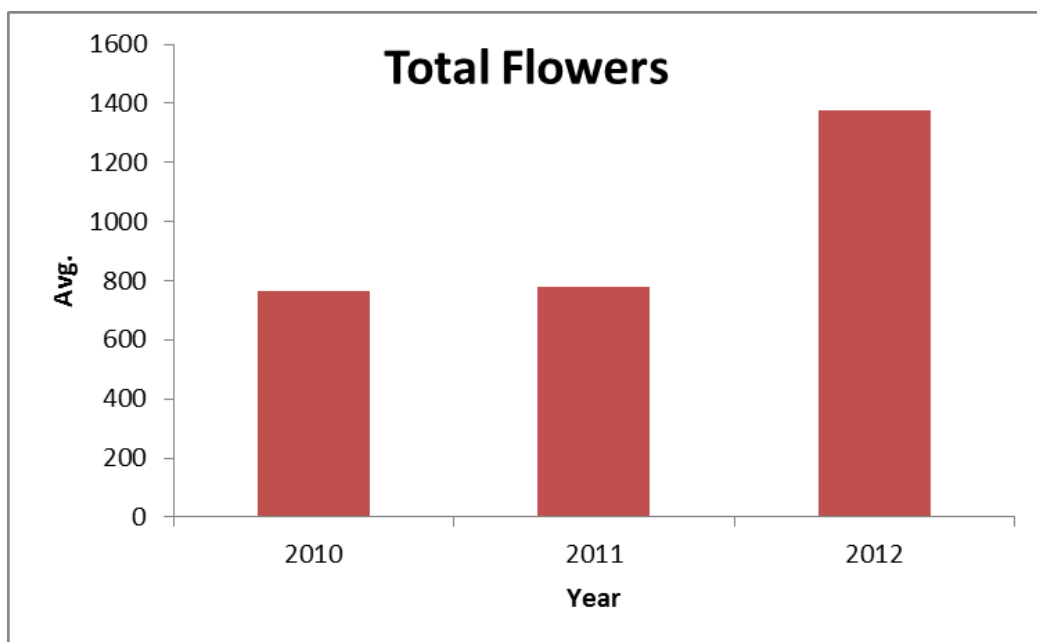


**Figure 12.** Bar graph showing total number of flowers counted in 2010, 2011, and 2012.

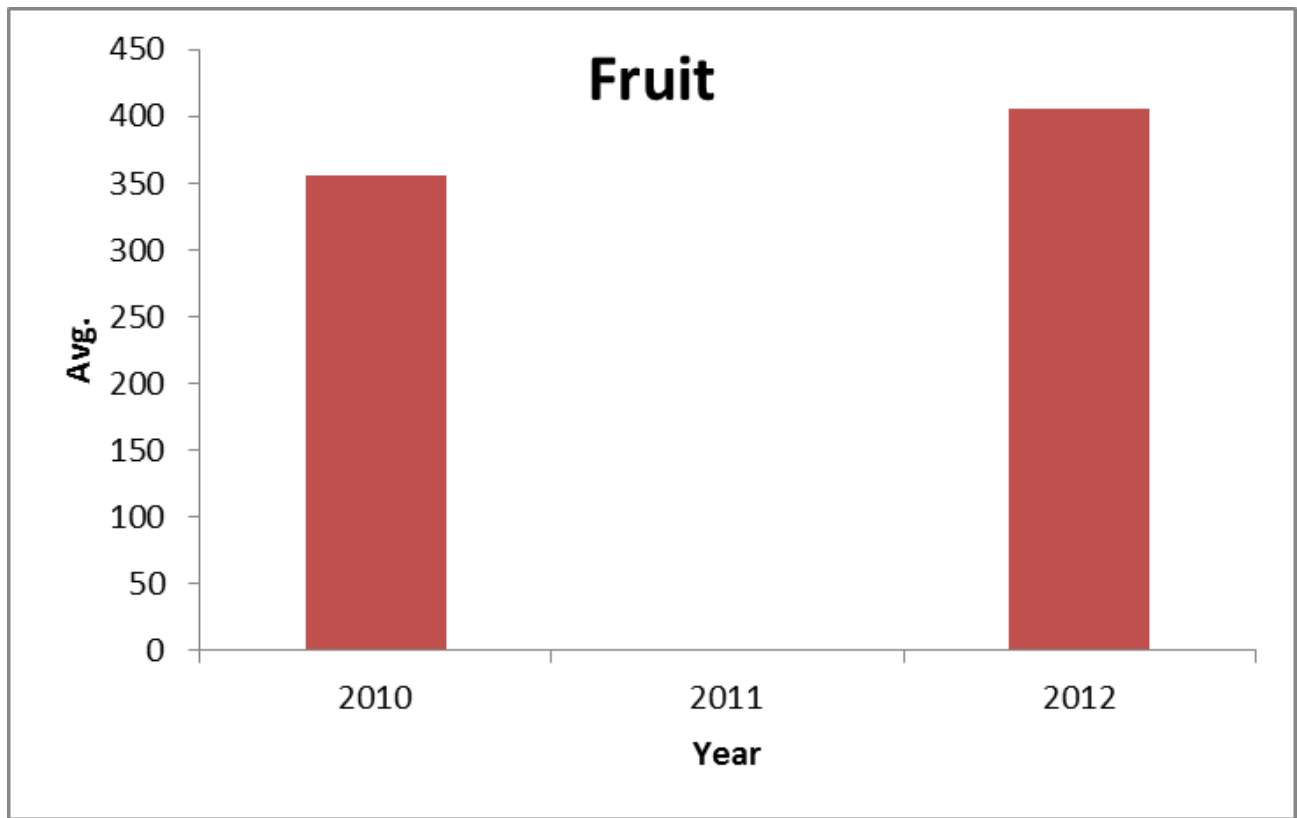


**Figure 13.** Bar graph showing total number of mature fruit counted in 2010 and 2012. No data was collected on fruits in 2011.



## Discussion

The *S. spaldingii* monitoring program has begun to characterize both the baseline of *S. spaldingii* abundance as well as the variability in that abundance across the NPS' Old Chief Joseph's Gravesite and Iwetemlaykin State Heritage Site. It has been observed that each of these park sites have unique vegetation and land use histories relating to where the *S. spaldingii* plants grow.

The methodology of this study has provided adequate information for park staff to understand the population dynamics from year to year. It has been difficult to relocate some plants since GPS units did not always function properly in the field, but paper maps assisted with tasks. In addition, some tags were pulled or moved by visitors which made relocation of some plants (primarily those by park trails) hard.

It has been hypothesized that annual precipitation patterns and weather contributes greatly to the dormancy and reproductive capacities of *S. spaldingii*. This may prove to be the case after a few more years of data at Old Chief Joseph's Gravesite and Iwetemlaykin State Heritage Site. A Montana study concluded that prolonged dormancy increases *S. spaldingii*'s fitness and may be a way to obtain below-ground resources that limit the production of flowers or fruits (Lesica and Crone in review). Through a discriminant function analysis, the study showed that prolonged dormancy was dependent on both "external (precipitation) and internal (life history stage) factors; that is, prolonged dormancy was associated with the plant having flowered the previous year and following high summer precipitation and lower fall precipitation the previous year" (Lesica and Crone in review; U.S. Fish and Wildlife Service 2007).

This project is expected to continue in 2013 through an Oregon Watershed Enhancement Board (OWEB) grant submitted by the USFWS, the NPS, and Wallowa Land Trust. The data gained from this 2010-2012 study will be used by a hired contractor in 2013 to 1) continue population trend and habitat monitoring of *S. spaldingii* at the Wallowa Lake area; 2) survey suitable habitat for occurrences of *S. spaldingii* plants in 2013 and note invasive species on private lands; and 3) develop a draft management plan for the species in the Wallowa Lake key conservation area (part of the national recovery goals for this species).



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## Appendix A. *S. spaldingii* reproductive output data 2010-2012

| Tag ID | Stems |      |      | Stems Browsed |      |      | Flowers |      |      | Fruits |      |      |
|--------|-------|------|------|---------------|------|------|---------|------|------|--------|------|------|
|        | 2010  | 2011 | 2012 | 2010          | 2011 | 2012 | 2010    | 2011 | 2012 | 2010   | 2011 | 2012 |
| 1      |       |      | 1    |               |      | 0    |         |      | 6    |        |      | 4    |
| 9      |       |      | 1    |               |      | 0    |         |      | 51   |        |      | 14   |
| 18?    |       |      | 2    |               |      | 0    |         |      | 13   |        |      | 1    |
| 19     |       |      | 1    |               |      | 0    |         |      | 8    |        |      | 3    |
| 28     |       |      | 1    |               |      | 0    |         |      | 11   |        |      | 2    |
| 29     |       |      | 1    |               |      | 1    |         |      | 26   |        |      | 15   |
| 38     |       |      | 1    |               |      | 0    |         |      | 7    |        |      | 3    |
| 55     | 4     | 1    | 0    | 1             | 1    | 0    | 0       | 0    | 0    | 0      | 0    | 0    |
| 56     | 1     | 1    | 1    | 0             | 0    | 0    | 3       | 5    | 6    | 3      | 0    | 0    |
| 57     | 2     |      | 0    | 0             |      | 0    | 54      |      | 0    | 29     |      | 0    |
| 58     | 1     |      | 0    | 0             |      | 0    | 13      |      | 0    | 12     |      | 0    |
| 59     | 3     | 3    | 0    | 2             | 0    | 0    | 30      | 60   | 0    | 16     | 0    | 0    |
| 60     | 1     |      | 0    | 0             |      | 0    | 9       |      | 0    | 5      |      | 0    |
| 61     | 3     |      | 1    | 3             |      | 1    | 1       |      | 21   | 0      |      | 2    |
| 62     | 3     |      | 1    | 2             |      | 0    | 26      |      | 47   | 18     |      | 5    |
| 63     | 1     | 1    | 0    | 0             | 0    | 0    | 10      | 10   | 0    | 7      | 0    | 0    |
| 64     | 1     |      | 1    | 0             |      | 0    | 7       |      | 13   | 6      |      | 4    |
| 65     | 4     |      | 0    | 0             |      | 0    | 77      |      |      | 64     |      | 0    |
| 66     | 1     |      | 0    | 0             |      | 0    | 13      |      |      | 0      |      | 0    |
| 67     | 1     |      | 0    | 0             |      | 0    | 0       |      | 0    | 0      |      | 0    |
| 68     | 1     | 1    | 1    | 0             | 0    | 0    | 11      | 7    | 8    | 2      | 0    | 0    |
| 70     |       |      | 1    |               |      | 0    |         |      | 22   |        |      | 3    |
| 75     |       |      | 2    |               |      | 0    |         |      | 47   |        |      | 18   |
| 76     |       |      | 2    |               |      | 2    |         |      | 0    |        |      | 0    |
| 83     |       |      | 1    |               |      | 0    |         |      | 15   |        |      | 5    |
| 84     |       |      | 2    |               |      | 0    |         |      | 34   |        |      | 10   |
| 85     |       |      | 1    |               |      | 0    |         |      | 9    |        |      | 4    |
| 87     |       |      | 1    |               |      | 0    |         |      | 13   |        |      | 6    |
| 90     |       |      | 1    |               |      | 1    |         |      | 24   |        |      | 18   |
| 91     |       |      | 1    |               |      | 0    |         |      | 44   |        |      | 9    |
| 92     |       |      | 1    |               |      | 1    |         |      | 0    |        |      | 0    |
| 99     |       | 1    | 1    |               | ?    | 0    |         | ?    | 29   |        |      | 0    |
| 100    |       |      | 4    |               |      | 0    |         |      | 36   |        |      | 1    |
| 101    | 1     | 1    | 1    | 0             | 2    | 1    | 50      | 2    | 0    | 8      | 0    | 0    |
| 102    | 1     | 1    | 0    | 1             | 0    | 0    | 13      | 2    | 0    | 0      | 0    | 0    |
| 103    | 1     | 1    | 2    | 0             | 1    | 0    | 11      | 3    | 16   | 2      | 0    | 0    |

|        | Stems |      |      | Stems Browsed |      |      | Flowers |      |      | Fruits |      |      |
|--------|-------|------|------|---------------|------|------|---------|------|------|--------|------|------|
| Tag ID | 2010  | 2011 | 2012 | 2010          | 2011 | 2012 | 2010    | 2011 | 2012 | 2010   | 2011 | 2012 |
| 104    | 1     |      | 2    | 0             |      | 0    | 28      |      | 48   | 13     |      | 32   |
| 105    | 1     |      | 0    | 1             |      | 0    | 3       |      | 0    | 0      |      | 0    |
| 106    | 2     |      | 2    | 0             |      | 1    | 37      |      | 46   | 15     |      | 35   |
| 107    | 1     | 1    | 1    | 0             | 0    | 1    | 10      | 12   | 12   | 6      | 0    | 0    |
| 108    | 1     |      | 1    | 0             |      | 1    | 10      |      | 0    | 0      |      | 0    |
| 109    | 2     |      | 2    | 0             |      | 0    | 24      |      | 29   | 13     |      | 26   |
| 110    | 1     |      | 1    | 0             |      | 0    | 9       |      | 0    | 4      |      | 0    |
| 111    | 1     | 1    | 1    | 1             | 0    | 1    | 24      | 12   | 14   | 4      | 0    | 11   |
| 112    | 1     | 1    | 1    | 0             | 0    | 1    | 30      | 13   | 4    | 7      | 0    | 0    |
| 113    | 2     | 1    | 2    | 0             | 1    | 1    | 17      | 0    | 27   | 6      | 0    | 5    |
| 114    | 1     |      | 1    | 0             |      | 0    | 4       |      | 18   | 4      |      | 13   |
| 115    | 1     |      | 1    | 0             |      | 0    | 17      |      | 18   | 13     |      | 13   |
| 116    | 1     | 1    | 1    | 0             | 0    | 0    | 0       | 10   | 10   | 14     | 0    | 7    |
| 117    | 1     |      | 1    | 0             |      | 0    | 19      |      | 2    | 7      |      | 0    |
| 118    | 1     | 1    | 1    | 0             | 0    | 0    | 14      | 7    | 5    | 0      | 0    | 0    |
| 119    | 1     | 1    | 1    | 0             | 0    | 0    | 15      | 15   | 23   | 9      | 0    | 11   |
| 120    | 1     |      | 0    | 0             |      | 0    | 13      |      | 0    | 0      |      | 0    |
| 121    | 2     | 2    | 2    | 2             | 0    | 1    | 3       | 26   | 63   | 1      | 0    | 2    |
| 122    | 2     | 1    | 0    | 1             | 0    | 0    | 3       | 5    | 0    | 2      | 0    | 0    |
| 123    | 3     |      | 0    | 0             |      | 0    | 0       |      | 0    | 0      |      | 0    |
| 124    | 3     |      | 0    | 0             |      | 0    | 1       |      | 0    | 1      |      | 0    |
| 125    | 1     |      | 0    | 0             |      | 0    | 1       |      | 0    | 0      |      | 0    |
| 126    | 1     | 2    | 0    | 0             | 0    | 0    | 8       | 52   | 0    | 2      | 0    | 0    |
| 127    | 4     | 4    | 3    | 0             | 4    | 3    | 37      | 42   | 0    | 32     | 0    | 0    |
| 128    | 1     |      | 0    | 1             |      | 0    | 0       |      | 0    | 0      |      | 0    |
| 129    | 15    |      | 0    | 14            |      | 0    | 0       |      | 0    | 0      |      | 0    |
| 130    | 5     | 3    | 3    | 0             | 0    | 0    | 67      | 36   | 33   | 17     | 0    | 7    |
| 131    | 1     |      | 2    | 0             |      | 1    | 0       |      | 30   | 0      |      | 11   |
| 132    | 1     | 1    | 2    | 1             | 0    | 0    | 1       | 64   | 71   | 0      | 0    | 9    |
| 133    | 2     |      | 0    | 0             |      | 0    | 8       |      | 0    | 7      |      | 0    |
| 134    | 2     |      | 0    | 2             |      | 0    | 0       |      | 0    | 0      |      | 0    |
| 135    | 1     | 1    | 5    | 1             | 0    | 2    | 1       | 6    | 0    | 0      | 0    | 0    |
| 136    | 2     | 2    | 4    | 2             | 0    | 2    | 2       | 0    | 50   | 0      | 0    | 10   |
| 137    | 1     | 2    | 2    | 0             | 0    | 1    | 30      | 46   | 37   | 6      | 0    | 11   |
| 138    | 3     | 3    | 0    | 3             | 0    | 0    | 0       | 45   | 0    | 0      | 0    | 0    |
| 968    |       | 1    | 1    |               | 0    | 1    |         | 2    | 0    |        | 0    | 0    |
| 969    |       | 1    | 2    |               | 0    | 2    |         | 11   | 5    |        | 0    | 5    |
| 970    |       | 1    | 1    |               | 1    | 4    |         | 16   | 0    |        | 0    | 0    |
| 971    |       | 2    | 0    |               | 0    | 0    |         | 43   | 0    |        | 0    | 0    |

|          | Stems |      |      | Stems Browsed |       |      | Flowers |       |      | Fruits   |      |      |
|----------|-------|------|------|---------------|-------|------|---------|-------|------|----------|------|------|
| Tag ID   | 2010  | 2011 | 2012 | 2010          | 2011  | 2012 | 2010    | 2011  | 2012 | 2010     | 2011 | 2012 |
| 972      |       | 1    | 0    |               | 0     | 0    |         | 8     | 0    |          | 0    | 0    |
| 973      |       | 1    | 0    |               | 0     | 0    |         | 2     | 0    |          | 0    | 0    |
| 974      |       | 1    | 1    |               | 0     | 1    |         | 5     | 4    |          | 0    | 0    |
| 975      |       | 1    | 1    |               | 0     | 1    |         | 6     | 0    |          | 0    | 0    |
| 976      |       | 1    | 1    |               | 0     | 0    |         | 28    | 61   |          | 0    | 36   |
| 977      |       | 1    | 1    |               | 0     | 1    |         | 6     | 6    |          | 0    | 0    |
| 978      |       | 1    | 1    |               | 0     | 0    |         | 7     | 10   |          | 0    | 1    |
| 979      |       | 1    | 1    |               | 0     | 0    |         | 15    | 13   |          | 0    | 3    |
| 980      |       | 1    | 2    |               | 1     | 1    |         | 3     | 30   |          | 0    | 0    |
| 981      |       | 3    | 5    |               | 1     | 2    |         | 12    | 33   |          | 0    | 2    |
| 982      |       | 1    | 3    |               | 0     | 3    |         | 6     | 17   |          | 0    | 7    |
| 983      |       | 1    | 0    |               | 0     | 0    |         | 10    | 0    |          | 0    | 0    |
| 984      |       | 3    | 1    |               | 0     | 1    |         | 86    | 36   |          | 0    | 0    |
| 985      |       | 1    | 3    |               | 0     | 0    |         | 19    | 116  |          | 0    | 21   |
| 986      |       | 1    | 0    |               | 0     | 0    |         | 15    | 0    |          | 0    | 0    |
| 987      |       |      | 2    |               | 2     | 2    |         | 0     | 0    |          |      | 0    |
| Averages | 1.92  | 1.41 | 1.12 | 0.73          | 0.27  | 0.46 | 14.77   | 17.73 | 15.5 | 6.83     | 0    | 4.45 |
| Averages | 1.923 | 1.4  |      | 0.730         | 0.311 |      | 14.69   | 17.33 |      | 6.826923 | 0    |      |
|          | 1     |      |      | 769           | 1     |      | 231     | 33    |      |          |      |      |
| Total    | 100   | 63   | 102  | 38            | 14    | 42   | 764     | 780   | 1377 | 355      | 0    | 405  |



## Appendix B. Comparison Photos of Catchflies



Spalding's catchfly (*S. spaldingii*)



Oregon catchfly (*Silene oregana*)



Scouler's catchfly (*Silene scouleri*)



The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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