Draft Habitat Management Plan for Spalding's Catchfly (*Silene spaldingii*) in the Wallowa Lake Key Conservation Area Wallowa County, Oregon

DRAFT

April 2016

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Executive Summary

Spalding's catchfly (*Silene spaldingii* S. Watson) is an herbaceous perennial plant in the pink family. This species is found predominantly in bunchgrass grasslands, sagebrush-steppe, and occasionally in open pine communities from northeastern Oregon through eastern Washington west-central Idaho, western Montana, and barely into British Columbia, Canada.

Spalding's catchfly was listed as a threatened species under the Endangered Species Act on October 10, 2001 (U.S. Fish and Wildlife Service (USFWS) 2001). Designation of critical habitat was determined to be prudent; however, it will not be designated until available resources and priorities allow (USFWS 2001). The recovery plan was finalized on September 6, 2007 (USFWS 2007).

The recovery plan's recovery strategy for this species includes protecting and maintaining reproducing, self-sustaining populations in each of the five distinct physiographic regions where it resides. Within these regions there are key conservation areas. Key conservation areas (KCAs) possess the following attributes:

Composed of intact habitat, preferably 40 acres in size or greater

Native plants comprise at least 80 percent of the canopy cover of the vegetation community

Adjacent habitat sufficient to support pollinating insects

Habitat is of the quality and quantity necessary to support at least 500 reproducing individuals of Spalding's catchfly

The Wallowa Lake KCA for Spalding's catchfly covers 3,776 acres and is located in Wallowa County, Oregon at the head of the Wallowa Valley in the glacial till soils on the terminal and east lateral moraines of Wallowa Lake. The Wallowa Valley is within the physiographic region designated as the Blue Mountain Basins (USFWS 2007). The majority of the Wallowa Lake KCA is located on privately-owned land. The public lands found within the conservation area are 13 acres held in trust by the Department of the Interior for the Nez Perce and Umatilla Tribes, but managed by the National Park Service (Old Chief Joseph Gravesite and Cemetery) and 62 acres purchased by a coalition of the Oregon Parks and Recreation Department, the Nez Perce Tribe, the Confederated Tribes of the Colville Reservation, the Confederated Tribes of the Umatilla Reservation, and the Oregon State Parks Trust (Iwetemlaykin State Heritage Site).

Delisting criteria identified in the recovery plan for this species includes the description that habitat management plans are developed and implemented for all key conservation areas. These plans will provide for the protection of Spalding's catchfly habitat, and will also protect the ecosystem by addressing conservation of other rare species, and reducing identified threats (USFWS 2007).

This Habitat Management Plan (HMP) addresses the Spalding's catchfly population and habitat at the Wallowa Lake Key Conservation Area, in Wallowa County, Oregon. This HMP outlines the specific management actions that are intended to meet the management goals and objectives which are linked to the recovery criteria for the species.

This HMP provides management actions for the protection and management of federally-listed Spalding's catchfly habitat in the Wallowa Lake KCA. It does not obligate the partners involved, including private landowners, to undertake the specific actions. The plan will be implemented as available funding permits.

I. NATURAL HISTORY

A. Species Description

Spalding's catchfly, a member of the pink family (Caryophyllaceae), is a long lived herbaceous perennial that emerges in late spring and dies back to below ground level in the fall. The plants, ranging in height from 20 to 76 centimeters (8 to 30 inches), rise from a persistent caudex atop a long taproot. Most commonly, plants are found with only one stem but often multiple stems are present. The lanceolate leaves which are 5 to 8 centimeters (2 to 3 inches) in length are opposite and attach to the stem at swollen nodes. The approximately 1.5 centimeters (0.6 inch) corollas are greenish-white with petal blades only 1-2 millimeters (0.04 to 0.08 inch) that extend only past the calyx. Normally 3 to 20, though sometimes more than 100, flowers are positioned horizontally near the top of the plant in a branched inflorescence. The leaves, stems and calyx of the plant are covered in sticky glandular-pubescent hairs. These hairs collect foreign material including insects providing the common name "catchfly" (description adapted from: Schassberger 1988, Gamon 1991, Lesica and Heidel 1996, Lichtardt 1997, Hill and Gray 2004a, Hitchcock and Cronquist 1973, and U. S. Fish and Wildlife Service (USFWS) 2007).

B. Reproductive Biology

Much of Spalding's catchfly's reproductive strategy is influenced by the plant's longevity. Studies suggest that plants live to 20 and potentially as long as 30 years of age (Lesica 1997). Spalding's catchfly's flowers are perfect (have both male and female parts). Fertilized flowers mature vertically and become a many-seeded (sometimes as few as three but up to 150 seeds) cup-like fruit capsule. However, many fruits may not mature to produce seed. Fruits mature from August to October and one plant may have flowers, fruits and mature capsules at the same time. Seeds are small (2 millimeters [0.08 inch]), wrinkled, flattened, somewhat winged, and light brown when mature (adapted from: Schassberger 1988, Gamon 1991, Lesica and Heidel 1996, Lichtardt 1997, Hill and Gray 2004a, Taylor et. al. 2012, and USFWS 2007). Plants reproduce by seed only and may be partially self-compatible. However, the male parts mature and wither prior to the female parts of the same flower greatly reducing the chances of self-pollination (Lesica 1993, Lesica 1988b). The

plant's primary source of pollination is by bumble bee especially *Bombus fervidus*, the Yellow or Golden Northern Bumble Bee (Lesica 1993, Lesica and Heidel 1996, Taylor and DeBano 2012, Tubbesing et. al., 2014). Seed dispersal studies have not yet been conducted on Spalding's catchfly. However, it is likely that short-distance dispersal is accomplished by wind or when the plant is mechanically jostled or knocked over, potentially by wildlife (USFWS 2007). It is possible that long-distance dispersal could occur if sticky parts of a plant containing seed capsules break off and stick to the fur or feathers of passing animals. If this method of seed dispersal does occur, it is likely a fairly rare event (USFWS 2007). Germination rates for Spalding's catchfly have been found to be low (Lesica 1988a, Lesica 1993, Taylor and DeBano 2012) and recruitment of this long-lived species is thought to be rare and sporadic (Lesica 1997).

II. CURRENT SPECIES SITUATION

A. Distribution and Status

Spalding's catchfly is found predominantly in bunchgrass grasslands, sagebrush-steppe, and occasionally in open pine communities from northeastern Oregon through eastern Washington, west-central Idaho, western Montana, and barely into British Columbia, Canada. Spalding's catchfly is primarily found in climax perennial grassland communities dominated by bunchgrasses especially *Festuca idahoensis* (Idaho fescue) and less often *Pseudoroegneria spicata = Agropyron spicatum* (bluebunch wheatgrass) or *F. scabrella* (rough fescue). When found in a sagebrush-steppe community, *Artemisia tridentata* (big sagebrush) or *Artemisia tripartita* (three-tip sagebrush) dominate. Pine communities, where Spalding's catchfly is occasionally found, are dominated by *Pinus ponderosa* (ponderosa pine) (adapted from USFWS 2007).

Within its range, Spalding's catchfly occurs within five physiographic (physical geographic) regions: the Palouse Grasslands in west-central Idaho and southeastern Washington; the Channeled Scablands in eastern Washington; the Blue Mountain Basins in northeastern Oregon; the Canyon Grasslands of the Snake River and its tributaries in Idaho, Oregon, and Washington; and the Intermontane Valleys of northwestern Montana (adapted from USFWS 2007).

In response to the increasing potential for extinction due to habitat loss and degradation, in 1995 the Oregon Department of Agriculture listed Spalding's catchfly as endangered in the State of Oregon. Spalding's catchfly was federally listed as a threatened species under the Endangered Species Act on October 10, 2001 (USFWS 2001). Spalding's catchfly has been assigned a recovery priority number of 8C on a scale from 1C (highest) to 18C (lowest). The 8C status indicates the plant's taxonomic status as a full species, a moderate degree of threats or impacts, high potential for recovery, and potential conflict with economic activities (USFWS 2007).

B. The Wallowa Lake Key Conservation Area

The Wallowa Lake Key Conservation Area for Spalding's catchfly, covering 3,776 acres, is located in Wallowa County, Oregon at the head of the Wallowa Valley in the glacial till soils on the terminal and east lateral moraines of Wallowa Lake (see Figure 1). In 1898, William Cusick first documented Spalding's catchfly in the Wallowa Lake area (Oregon Biodiversity Information Center 2009). The Wallowa Valley is within the physiographic region designated as the Blue Mountain Basins (USFWS 2007). The majority of the Wallowa Lake Key Conservation Area is located on privately owned land. At the present, approximately 90% of the mature Spalding's catchfly plants that have been documented in the conservation area have been found on private land (Moholt 2013, 2014). The only public lands found within the conservation area are the 13 acre Old Chief Joseph Gravesite and Cemetery and 62 acre Iwetemlaykin State Heritage Site.

The Blue Mountain Basins area historically was a contiguous Pacific Northwest Bunchgrass Grasslands. Much of the Wallowa Valley has been heavily modified by urban, rural residential and agricultural development. However, large grassland areas surrounding the valley have significantly large (greater than 500 individuals) populations of Spalding's catchfly (e.g. Clear Lake Ridge [966-1,770 (90% CI) individuals], Crow Creek [~4,500 individuals], Zumwalt Prairie [20,454-25,494 (90% CI) individuals] and the Wallowa Lake population considered here [~1,341 individuals]) (USFWS 2007, Taylor and Finnerty. 2013, Schmalz and Taylor 2012a, Schmalz and Taylor 2012b, Moholt 2014).

Spalding's catchfly in the Blue Mountain Basins region is often found on slopes, ridgebrows, and swale topography (Hill and Gray 2004a). Plants found in the Wallowa Lake Key Conservation Area are on slopes, ridges, and rolling hilly moraines with glacially tilled soils in a *Festuca idahoensis* (Idaho fescue) grassland community. The site ranges in elevation from approximately 4,400 to 5,300 feet.

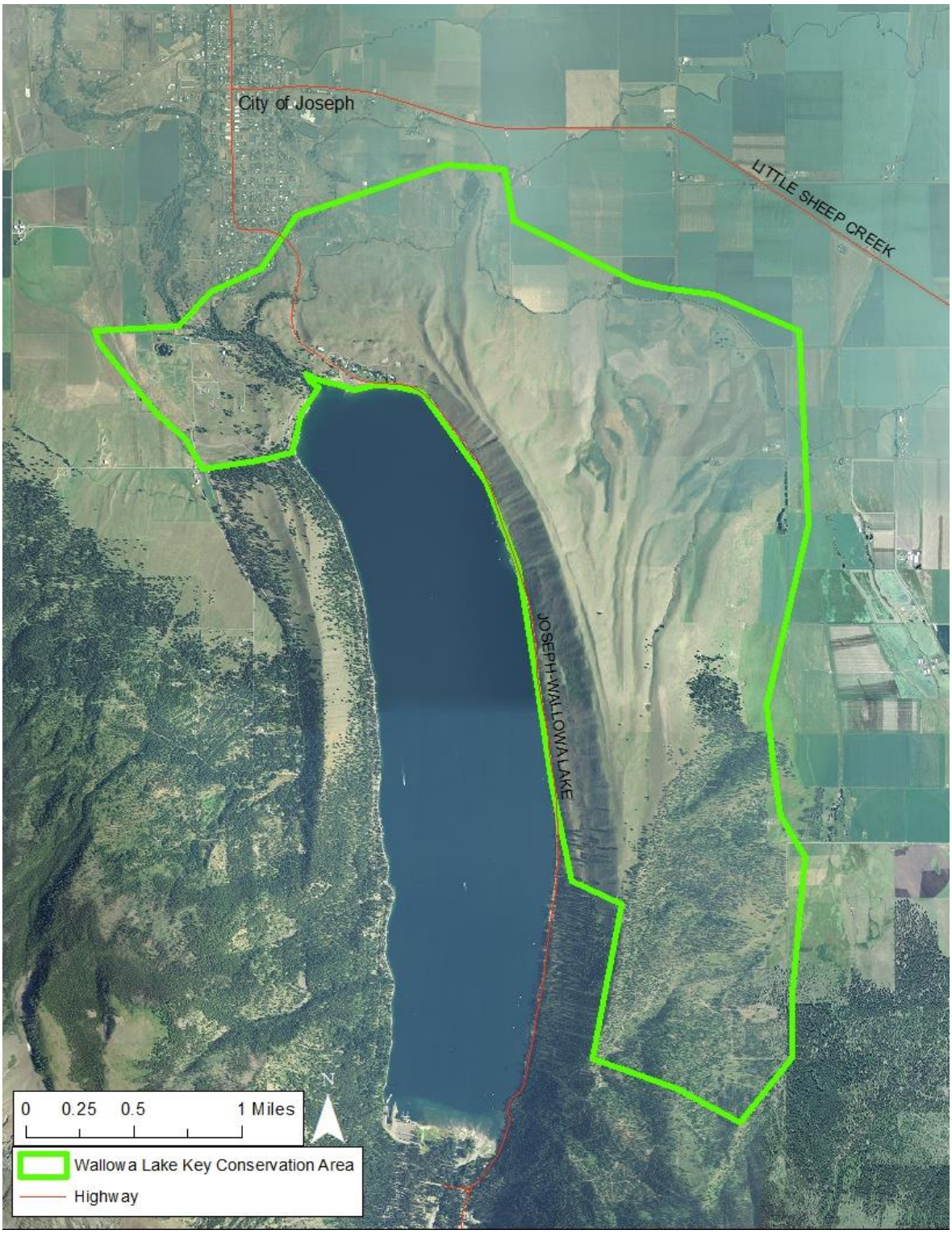

Figure 1. Wallowa Lake Key Conservation Area

III. PROBLEMS FACING SPALDING'S CATCHFLY IN THE WALLOWA LAKE KEY CONSERVATION AREA

1. Nonnative Plant Invasion

Invasive nonnative plants invade and alter native communities resulting in the exclusion of or detriment to native plants. Other than the complete eradication of Spalding's catchfly populations due to human development, the invasion of nonnative plants may be the greatest single threat to the species and its habitat (Hill and Gray 2004a). Invasive nonnative plants negatively affect Spalding's catchfly through changes in community composition, resource availability, pollinator dynamics, allelopathic chemicals reducing germination or growth, and fire frequency (Amsberry and Meinke 2008, USFWS 2007). The effects of invasive nonnative plants on Spalding's catchfly have been addressed qualitatively by a few studies, but further research is needed to determine how invasive plants may affect Spalding's catchfly in the Wallowa Lake Key Conservation Area.

Annual invasive nonnative grasses such as *Bromus japonicus* (Japanese brome), *B. tectorum* (cheatgrass), and *Ventenata dubia* (ventenata) pose a threat to Spalding's catchfly throughout the Wallowa Lake Key Conservation Area. Perennial invasive nonnative plants are difficult to control and pose the greatest threat to Spalding's catchfly habitat. Though additional surveys are needed, a number of perennial invasive nonnative plant populations have been documented in the Wallowa Lake Key Conservation Area. These include: *Cirsium arvense* (Canada thistle), *Cynoglossum officinale* (houndstongue), *Centaurea diffusa* (diffuse knapweed), *Centaurea maculosa* (spotted knapweed), *Convolvulus arvensis* (field bindweed), *Dipsacus sylvestris* (teasel), *Gypsophila paniculata* (baby's breath), Hypericum *perforatum* (St. John's wort), *Onopordum acanthium* (Scotch thistle), *Poa pratensis* (Kentucky bluegrass), *Potentilla recta* (sulfur cinquefoil), and *Verbascum thapsus* (common mullein) (Elseth et al 2012, Amsberry and Meinke 2013, Jocius 2013, Moholt 2013, 2014).

Nonnative rangeland revegetation grasses such as *Bromus inermis* (smooth brome), and the above mentioned *Poa pratensis* have been introduced into the Wallowa Lake Key Conservation Area presumably to provide forage for livestock, for erosion control, or for watershed rehabilitation. These and other rhizomatous grasses can become mat forming even to the point of becoming a monoculture and certainly compete with native plants (see Harrison *et al.* 1996). Matting *P. pratensis* is a primary concern throughout the Wallowa Lake Key Conservation Area especially in the rolling hills of the lake's terminal moraine (Elseth et al 2012, Amsberry and Meinke 2013, Jocius 2013, Moholt 2013, 2014). Patches of *B. inermis* can be found as dense monocultures on the east moraine.

2. Adverse Livestock Grazing and Trampling

Both the Spalding's catchfly Conservation Assessment (Hill and Gray 2004) and the 2007 Recovery Plan for Spalding's catchfly (USFWS 2007) identify adverse grazing and

trampling as one of the leading threats to this species. Spalding's catchfly is susceptible to livestock grazing although levels of herbivory are found to vary widely based on site specific conditions (Cullen et al. 2011, Taylor et al. 2009, and Taylor and Schmalz 2008). None of these studies evaluated grazing impacts from horses; all were grazing impacts associated with livestock, and deer and elk. Trampling and herbivory compromise the plant's ability to build and store resources as well as produce reproductive structures and eventually can lead to mortality. Spalding's catchfly is most susceptible to grazing impacts during the summer months when the grass and other forb species surrounding it are in a less desirable forage condition (older and dryer) than Spalding's catchfly, which is green, succulent, and flowering at this time (USFWS 2007).

A long life span and deep taproots have likely helped Spalding's catchfly withstand some impacts from livestock grazing and trampling. Without good historical population number estimates for comparison from the time prior to the initiation of livestock use, it is difficult to assess trends over time. Instead shorter term, more evident losses such as loss of reproductive structures, individuals, and habitat degradation are used to infer an impact to Spalding's catchfly from adverse livestock grazing and trampling (USFWS 2007).

Population number estimates prior to the initiation of livestock use are not available for the Wallowa Lake area. The foot of the lake was a heavily used traditional Nez Perce campsite. Therefore, at least horse grazing has been occurring within the Wallowa Lake Key Conservation Area since before European settlement.

Livestock grazing impacts compound already high levels of insect herbivory and wildlife herbivory (Taylor and DeBano 2012) and add to its reproductive challenges. Although Spalding's catchfly is very long lived, it delivers very little viable seed to the ground in a given year (Taylor et al. 2012, Taylor and DeBano 2012) and can little afford additional impacts to its ability to produce seed. Livestock grazing, which reduces the amount of plants that are able to produce flowers and seed heads, exacerbates this problem and poses a very high challenge to its reproductive capacity. After September most plants have dispersed most of their seed and have become firm, brown and nearly unpalatable as they enter dormancy in the fall.

Trampling by livestock may also threaten the nests of ground dwelling pollinators (USFWS 2007) and compromise the Spalding's catchfly habitat's ability to support a healthy bee population that can provide adequate pollinator services to this species. Spalding's catchfly has documented low reproductive rates and is almost incapable of producing viable seed without insect-mediated cross-pollination (Tubbesing et al. 2014). So far, two species of bumble bees have been shown to be the primary pollinator of Spalding's catchfly as reported by Tubbesing et al. 2014. The study of livestock management's effects on bee's life history is in its early stages but some trends are starting to appear. Locally it has been shown that bee species diversity and abundance decrease directly with increasing livestock grazing intensities, especially for bumble bees and especially in June (Kimoto 2010, Kimoto

et al. 2014) but with effects later in the season being less clear. Kimoto found that even levels of moderate grazing (where the utilization rates were between 22% and 40%) resulted in a decrease in bumble bee diversity and abundance (Kimoto 2010, Kimoto 2011, Kimoto et al. 2012). The two main factors likely affected by cattle grazing that seem to influence this pattern are the amount of available floral resources and safe nesting conditions for the queens (Tubbesing et al. 2014, Kimoto et al. 2012). They also note a season's weather pattern has a strong influence on bee diversity and abundance. Floral resources in general, and even the density of Spalding's catchfly plants in flower, influence bumble bee abundance. A reduction in Spalding's catchfly flowers and flowering levels in the community can further lead to reductions in bumble bee numbers in the area (Kimoto et al. 2012).

Currently, the public lands (Old Chief Joseph Gravesite and Cemetery and Iwetemlaykin State Heritage Site) within the Wallowa Lake Key Conservation Area have been removed from domestic animal grazing. However, the vast majority of the conservation area is privately owned. Grazing regimes on the private land vary from very light and intermittent cattle grazing to very intensive horse grazing throughout the growing season.

3. Changes in Wildfire Regime

Organisms adapt to disturbances, such as wildfire regimes, within which they have evolved. Fire regimes within Spalding's catchfly habitat in the western United States have been highly disrupted (USFWS 2007; Landres *et al.* 1999, Whisenant 1990, D'Antonio and Vitousek 1992, Mutch *et al.* 1993, Narolski 1996, Hilty *et al.* 2004).

No studies of the effect of wildfire on Spalding's catchfly have been conducted in the Blue Mountain Basins physiographic region. The effect of fire on Spalding's catchfly and its habitat have been studied in the Intermontane Valleys physiographic regions in Montana (Lesica 1999; Lesica and Martin 2003) and the Canyon Grasslands physiographic regions in Idaho (Hill and Fuchs 2003, Hill and Weddell 2003, Hill *et al.* 2001, Menke 2003, Hill and Gray 2004b, Menke and Muir 2004, Hill and Gray 2005, Hill 2006). At both sites, Spalding's catchfly adults were not killed by fires. At the Intermontane Valleys study site, Spalding's catchfly seedling recruitment was significantly higher after fire (Lesica 1999), whereas the Canyon Grasslands it was not (Hill and Weddell 2003, Hill and Gray 2004b, Hill and Gray 2005b, Hill 2006).

It has been suggested that the reestablishment of a traditional fire regime may benefit Spalding's catchfly. However, in a number of investigations, nonnative plant invasions have increased after fires and may deleteriously affect Spalding's catchfly (Lesica and Martin 2003, Hill *et al.* 2003, Hill and Weddell 2003, Menke 2003).

Due to temporary visual impacts in a prized scenic outdoor recreation area and the proximity of rural residences, the introduction of fire as a management tool may be extremely difficult on the private lands on the Wallowa Lake moraines as well as on state

and federal land with heavy recreation use and historic gravesite preservation. On private land, low impact, responsible grazing regimes that mimic the physical effects created by fire, especially vegetative litter layer reduction, may be an alternative.

4. Herbicide Use, Weed Control or Pesticide Use

Herbicide and insecticide spraying is a potential problem for Spalding's catchfly individuals and populations. Although herbicide effects on Spalding's catchfly have not been fully studied, it is reasonable to assume that broad spectrum herbicides that kill most herbaceous perennials will also kill Spalding's catchfly. Weed control programs, even those designed to benefit Spalding's catchfly, have a potential, if implemented improperly, to negatively impact Spalding's catchfly by decreasing seed production within a year or by killing seedling and mature plants (USFWS 2007).

Much of the Wallowa Lake Key Conservation Area is valued for its recreational opportunities such as hiking, photography and sightseeing. Hiking trails are maintained amongst patches of Spalding's catchfly at the Old Chief Joseph Gravesite and Cemetery and Iwetemlaykin State Heritage Site. Unofficial trails are used by local residents and some tourists on the private land of the lake's east moraine. Manual control of weeds and other vegetation (i.e. the use of gas powered string trimmers) along paths or the addition of new recreational paths has the potential to negatively impact Spalding's catchfly by decreasing seed production within a year or by killing plants.

Of lesser concern in the Wallowa Lake Key Conservation Area is pesticide use. This management practice is less common than herbicide application in the area. However, insect control programs that utilize broad spectrum insecticides will affect native bee species (Johansen *et al.* 1983). Because Spalding's catchfly requires insect activity for pollen movement, reduction in the number of primary pollinators of the species will translate into decreased reproductive output (from USFWS 2007, Tepedino 1996, Lesica and Heidel 1996).

5. Wildlife Herbivory and Trampling

Reports of impacts from wildlife herbivory on Spalding's catchfly within the Blue Mountain Basins physiographic regions vary and may be dependent on the site and scope of the project. Dingeldein *et al.* (2010) reported annual browse rate on Spalding's catchfly in the Zumwalt Prairie Key Conservation Area of 20 to 71%. However, Cullen *et al.* (2011) in the same area showed total signs of ungulate browse at less than 5%. It was concluded that some mule deer (*Odocoilus hemionus*) and especially Rocky Mountain elk (*Cervus elaphus*) were likely the primary consumers of Spalding's catchfly in these studies (Cullen et al. 2011).

Within the Wallowa Lake Key Conservation Area elk numbers are much lower than in the Zumwalt Prairie area. However, deer numbers can be high. Deer find protection in the urban and residential areas of the City of Joseph directly adjacent to the north end of the

Wallowa Lake Key Conservation Area as well as in the area's public lands. Population numbers of the "tame deer" in the lower elevations on the conservation area, along the north end of Wallowa Lake, have increased in the last 20 years while counts on the lake's east moraine report a decrease in deer numbers in recent years (pers. comm. ODFW biologist Pat Mathews).

Investigations in the Wallowa Lake Key Conservation Area have observed a significant amount of wildlife browsing on Spalding's catchfly plants. Plants tracked on the Old Chief Joseph Gravesite and Cemetery and Iwetemlaykin State Heritage Site, where no livestock grazing was permitted though deer numbers are high, showed 15 to 41% of stems have been browsed to a point that at least 10% of their biomass had been removed (Elseth et al 2012, Amsberry and Meinke 2013, Jocius 2013, Moholt 2013, 2014). In early August, Moholt (2013) observed that 32% of stems (37% of the plants) showed signs of herbivory early in the reproductive season when 93% of the plants were in flower and only 2% (one plant) had set fruit. Similarly in early August of 2014, 39% of stems (38% of the plants) showed signs of herbivory (Moholt 2014). Since the majority of each plant's inflorescence is found on the terminal end of a stem, a heavily browsed stem will set very little if any fruit. Thus, it can be assumed that wildlife herbivory directly affects Spalding's catchfly reproduction by the physical removal of flowers and fruits. Studies to evaluate the loss of individuals, and habitat degradation are needed to infer if there are additional impacts from wildlife trampling to Spalding's catchfly.

6. Insect Damage and Disease

Insect predation of foliage, flowers, and fruits of Spalding's catchfly has been documented many times (Heidel 1979, Lesica 1988b, Kagan 1989, Youtie 1990, Gamon 1991, Lichthardt 1997, Hill and Gray 2000, Hill and Weddell 2003, Taylor and DeBano 2012). Predation on seed capsules has been documented to be as high as 90 percent at the Kramer Prairie, Washington, site although lower percentages are more common (Heidel 1979, Taylor and DeBano 2012). Most insect predation seems to be from larva, especially Oregon gem moth (*Heliothis oregonica)* (Hill and Gray 2000, Taylor and DeBano 2012), although a seed weevil (Kagan 1989, Youtie 1990) and some other beetles (Heidel 1979) have also been implicated (from USFWS 2007). Spalding's catchfly has coevolved with native insect predation, and so some level of predation is likely well tolerated. However, cumulative effects when combined with other sources of negative impacts may exacerbate problems with insect predation.

7. Land Conversion

Land conversion is potentially the greatest threat Spalding's catchfly currently faces and has faced historically. It is almost certainly the most important single factor that led to the species listing under the Endangered Species Act and is likely the single greatest threat in the Wallowa Lake area. Within the small portion of land held publicly, the threat of land conversion is minimal to non-existent. However, the vast majority of the Wallowa Lake Key Conservation Area is privately owned. Both residential development along the scenic

east moraine and expansion of agricultural cultivation on the far eastern portion on the moraine have the potential of eliminating significant portions of the Wallowa Lake population. At the current time, the Wallowa Lake population is greater than ~1,340 individuals. One of the main objectives of the Spalding's catchfly recovery program is to establish and maintain self-sustaining populations of 500 or more individuals (USFWS 2007). Residential and agricultural development in the Wallowa Lake Key Conservation Area could reduce population numbers below the critical target level resulting in a situation that would be contrary to the goals for the species' recovery.

8. Recreation and Off-Road Vehicle Use

Damage to the caudex of Spalding's catchfly may result from off-highway vehicles, likely killing the plant (USFWS 2007). Off-road vehicle impacts are not known to occur within the Wallowa Lake Key Conservation Area. However, within the majority of the area under private management, the possibility of some vehicle impact exists. Public land management within the area does not allow off-road vehicle activity and even bicycles are excluded.

9. Geographically Isolated Populations

Genetic diversity varies across the range of Spalding's catchfly. In order to preserve genetic variability, sites throughout the species' range need to be protected in order to preserve the full array of genetic variability within the species (Baldwin and Brunsfeld 1995, USFWS 2007). For species such as Spalding's catchfly, that do not reproduce vegetatively, the only mechanisms for gene flow are pollen exchange and seed dispersal. Pollen exchange is the more likely of these two mechanisms (Fenster 1991; Richards 1997, from USFWS 2007). The Wallowa Lake Key Conservation Area is located at the southern end of the species' range. In a world facing potential effects of climate change, the genetic variations found at the southern extreme of a plant's range could contribute significantly to the species' long term survival.

IV. MANAGEMENT

A. Management Goals and Objectives

The goal of the overall recovery program for Spalding's catchfly is to reach the point where the species can be delisted as in: to remove its current status as "federally listed as threatened." Management activities in the Wallowa Lake Key Conservation Area should be targeted to help reach the goals and objectives found in the following criteria (from USFWS 2007):

Twenty-seven populations, with at least 500 reproducing Spalding's catchfly individuals in each and with intact habitat, occur range wide 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. Given the uncertainty

associated with creating new key conservation areas (*i.e.* transplanting) and the limited available habitat within the Palouse physiographic region, the delisting criteria of three key conservation areas within the Palouse Grasslands will be evaluated within 10 years (by the year 2017) based on new information. Populations with more than 500 plants will be maintained at or above current population numbers.

The number of populations/key conservation areas for each physiographic province was set at a minimum of three to preserve genetic diversity. For some regions, a greater number of key conservation areas are proposed to reflect the number of populations needed to maintain connectivity and, to the extent possible, preserve historical distribution across the remaining potential habitat estimated to be available.

All 27 key conservation areas of Spalding's catchfly 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; see criterion #1).

Populations of Spalding's catchfly 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 long-term monitoring methodologies that identify what parameters will be monitored, how, and at what frequency need to be developed. Acceptable statistical power and false-change error rates will be established at a later date when a standardized range-wide monitoring protocol is developed.

Habitat management plans have been developed and implemented for all key conservation areas. These management plans will provide for the protection of Spalding's catchfly habitat, and will also protect the ecosystem by addressing conservation of other rare species, reducing the identified threats (*e.g.*, off-road vehicle use, adverse grazing and trampling by wildlife and domestic stock, herbicide application, etc.), protecting pollinators, enacting monitoring strategies, incorporating integrated pest management strategies, and incorporating appropriate fire management activities.

Invasive nonnative plants with the potential to displace Spalding's catchfly have been continually controlled or eradicated within a 100-meter (328- foot) radius of all Spalding’s catchfly populations within key conservation areas. Certain invasive plants that are established and difficult to eradicate, as detailed for each physiographic province under Recovery Actions 1.1.4, 1.2.4, 1.3.4, 1.4.4, and 1.5.5, may be controlled within 25 meters (82 feet) of Spalding’s catchfly populations.

Prescribed burning is conducted, whenever possible, to mimic historical fire regimes within a particular physiographic region in Spalding's catchfly habitat. Prior to burning, presence/absence surveys for the plant will be completed. Prescribed burning of more than 30 percent of the individuals at a Spalding’s catchfly 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 Spalding's catchfly is present, monitoring is enacted prior to and following the prescribed burn. Historical fire regimes are carefully analyzed utilizing the best available technology.

Seed banking occurs *ex situ* (off site) first at all smaller Spalding's catchfly populations (not key conservation areas or potential key conservation areas) and second at all larger Spalding's catchfly populations (key conservation areas or potential key conservation areas) to preserve the breadth of genetic material across the species' range.

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.

B. Wallowa Lake Key Conservation Area Management Actions

The following management actions, targeted specifically for the Wallowa Lake Key Conservation Area, will be conducted in an effort to protect and maintain a self-sustaining population in the Wallowa Lake area.

1. Invasive Weed Treatment and Weed Control

Control invasive nonnative plant species within habitat and populations of Spalding's catchfly. Within the Wallowa Lake Key Conservation Area, invasive nonnative plant species of concern include: *Centaurea maculosa* (spotted knapweed), *C. diffusa* (diffuse knapweed), *C. solstitialis* (yellow starthistle), *Cirsium arvense* (Canada thistle), *Onopordum acanthium* (Scotch thistle), *Hypericum perforatum* (St. John's wort), *Potentilla recta* (sulfur cinquefoil), *Bromus inermis* (smooth brome) and *Poa pratensis* (Kentucky bluegrass).

The invasive nonnative plant species noted above and other priority noxious weeds should be controlled or eliminated within 100 meters (328 feet) of Spalding's catchfly populations. Other invasive nonnative grass species including *B. japonicus* (Japanese brome), *B. tectorum* (cheatgrass), and *Ventenata dubia* (ventenata), should be controlled using integrated pest management practices to within 25 meters (82 feet) of Spalding's catchfly populations to the extent practicable.

Invasive nonnative plant control and management are needed in Spalding's catchfly habitat. Unfortunately, control activities, such as herbicide applications, may also negatively affect Spalding's catchfly individuals. While invasive nonnative plant control is necessary, it should be done with care to minimize effects from control activities on Spalding's catchfly. Integrated pest management strategies that utilize the least aggressive tool necessary to enact control measures when economic and/or ecological values are affected should be incorporated into management activities (Bottrell 1979, Luken and Thieret 1997) to facilitate the conservation of Spalding's catchfly as well as its habitat. Integrated pest management strategies should identify all control methods available such as prevention,

manual control, biological control, and herbicide control. These integrated pest management strategies should include periodic weed surveys to detect new infestations or new invasive nonnative plant species, restore areas where weeds have been controlled to prevent reinvasion, and monitoring and evaluation to determine if control goals are being met and impacts to Spalding's catchfly minimized (from USFWS 2007).

Invasive nonnative plant control and management efforts should be coordinated with the U.S. Fish and Wildlife Service, National Park Service, County, tribal entities, Oregon Parks and Recreation Department, and other state agencies to ensure the protection of Spalding's catchfly individuals and habitat. This will minimize the opportunity for Spalding's catchfly plants to be inadvertently harmed by plant control activities. In addition, outreach is needed to inform invasive plant management agencies including the Wallowa County Weed Board, Oregon Department of Transportation, and Wallowa County road maintenance programs to prevent inadvertent spraying of Spalding's catchfly.

All agencies should be encouraged to conduct surveys in suitable Spalding's catchfly habitat prior to spraying for invasive plants. Before spraying at Spalding's catchfly sites, all individuals should be located and flagged. Herbicide applications that effect broadleaf plants should occur when wind speeds are less than 8 kilometers (5 miles) per hour to minimize herbicide drift. Aerial spraying (from airplanes or helicopters) should not occur within 305 meters (1,000 feet) of known Spalding's catchfly plants. Boom spraying should not occur within 15 meters (50 feet), and wiping or wicking should be the only herbicide application technique employed when within 15 meters (within 5-50 feet). Managers should use manual control techniques only when within 1.5 meters (5 feet) of individual Spalding's catchfly plants. Manual control of vegetation along recreational paths (e.g. Iwetemlaykin trail maintenance) should only occur after managers have reviewed known locations of Spalding's catchfly plants. Individuals conducting maintenance operations should be trained in Spalding's catchfly identification. Mechanical removal equipment (e.g. string trimmers) should be operated no closer than 10 meters (33 feet) from known individuals and vegetation to be removed closer than 10 meters should be pulled by hand.

Invasive nonnative plant control, when possible, should occur when Spalding's catchfly is dormant (late October through March), to minimize effects to the plant. When possible, applicators should use herbicides that break down in the environment quickly. Persistent chemicals such as Tordon (picloram) should not be used within 15 meters (50 feet) of existing Spalding's catchfly plants. Chemicals that do not affect members of the Caryophyllaceae family should be identified and utilized whenever possible (including Transline (clopyralid).

More research should be conducted to determine the best control and management methods to be used with invasive grasses especially *Poa pratensis*. An integrated management plan should be developed.

2. Livestock Management

The public lands (Old Chief Joseph Gravesite and Cemetery and Iwetemlaykin State Heritage Site) within the Wallowa Lake Key Conservation Area have been removed from domestic animal grazing. However, approximately 90% of the known individual Spalding's catchfly plants within the Wallowa Lake Key Conservation Area are located on lands managed under private ownership. Grazing regimes on the private land within the conservation area vary from light and intermittent cattle grazing to very intensive horse grazing.

The following management strategies will be of primary importance on private land and may be best achieved through education, encouragement, conservation easements, deed restrictions, or direct acquisition from willing landowners.

Manage livestock grazing and trailing to protect Spalding's catchfly and its habitat and use data collected to ensure livestock management practices and operations will be implemented in a way that minimizes negative affects to Spalding's catchfly.

Inform the private landowners of the need to protect Spalding's catchfly and habitat. Provide information on Spalding's catchfly and habitat identification and provide maps to aid them in avoiding these occurrences and minimizing negative effects in this habitat.

Recommend a grazing utilization standard of $\leq$ 50 percent in areas that contain Spalding's catchfly or habitat, because of the potential damage to pollinators, the chance for creating and exacerbating invasive nonnative plant problems, and the damages that Spalding's catchfly plants may incur.

Livestock grazing should not occur in Spalding's catchfly pastures where serious invasive nonnative plant populations exist unless the invasive nonnative flowers have been removed.

Responsible parties should evaluate cumulative effects of herbivory in areas where both native and domestic ungulates graze.

Recommend that livestock grazing not occur within Spalding's catchfly populations during June through September. This will benefit the pollinators to this species and protect Spalding's catchfly flowers and seeds during this time period.

Effective grazing management may include the construction and maintenance of fencing, moving watering troughs and/or salting areas away from Spalding's catchfly populations, allowing for rest years, and revising allotment plans, grazing schedules, and stocking levels to maintain Spalding's catchfly habitat. Management of livestock should be tailored to each fenced pasture based on topographic features and utilization scenarios.

Livestock grazing and associated management activities should be monitored to measure and manage impacts to Spalding's catchfly and its habitat (both implementation and effectiveness monitoring). Monitoring that can determine whether livestock grazing is

having an effect on Spalding's catchfly should occur at all grazing sites on a regular basis. If populations decline or are negatively affected (degraded habitat including overutilization of native grasses and forbes, loss of Spalding's catchfly flowers or seed, or pollinators impacted) because of adverse livestock grazing or trampling, grazing practices should be amended.

3. Wildlife Herbivory and Trampling

Herbivory occurs in all occupied and potential Spalding's catchfly habitat within the Wallowa Lake Key Conservation Area. The plant has adapted to some herbivory over the course of its evolutionary history, while other herbivory is new or may have increased as a result of human activities. As noted above, deer populations along the north end of Wallowa Lake have increased especially where animals have been sheltered in the urban and residential areas of the City of Joseph adjacent to the conservation area and in the area's public lands.

Research is needed to determine at what levels of herbivory and wildlife trampling Spalding's catchfly plants can persist, and at what levels its habitat remains intact. Federal and state agencies should monitor and evaluate the effects of wild ungulate populations on Spalding's catchfly. Insect and small mammal herbivory needs further investigation. For example, to what extent are management activities increasing or decreasing natural herbivory levels (i.e. larval microlepidopteran seed predators). Changes in wildfire regimes have been found to modify the intensity of herbivory of insects targeting rare plants (Vickery 2002).

4. Herbicide Application and Insecticide Use

Herbicide use, not related to controlling invasive nonnative plant infestations specific to protecting Spalding's catchfly and all insecticide use near any Spalding's catchfly populations should be avoided. Because of the risk of herbicides harming Spalding's catchfly and insecticides harming the pollinators of Spalding's catchfly, a 1.6 kilometer (1 mile) buffer where no insecticide use may occur should be utilized whenever possible. In sites where populations are near or adjacent to agricultural fields this buffer may not be feasible. In these instances precautionary measures should be taken to minimize the effects to Spalding's catchfly populations. These precautionary measures should include minimizing or eliminating drift, or the use of pesticides that will not harm Spalding's catchfly or its pollinators.

5. Land Conversion

Seventy-five of the 3,776 acres in the Wallowa Lake Key Conservation Area are publicly held. There is no threat of land conversion on these public lands for the foreseeable future. However the remaining 3,701 acres of private land is potentially vulnerable to land conversion for residential or permanent agricultural use.

Populations of Spalding's catchfly on private land should be protected by education and encouragement, conservation easements, deed restrictions, or possibly direct acquisition from willing landowners. Working through appropriate state, federal, local or county agencies or organizations, voluntary cooperation should be encouraged to protect Spalding's catchfly habitat on private lands. Funds for conservation activities and/or acquisitions on private lands should be sought from sources such as the U.S. Fish and Wildlife Service's Partners for Fish and Wildlife Program, Private Stewardship Grants, Recovery Land Acquisition Grants, and Landowner Incentive Program; and the Natural Resource Conservation Service's Environmental Quality Incentives Program, Wildlife Habitat Incentives Program, Conservation Reserve Program, Grassland Reserve Program, and through State of Oregon agencies that have programs that provide incentives for conservation.

6. Off-road Vehicle Use

Off-road vehicle use should be effectively controlled in all areas containing Spalding's catchfly habitat. Off-road vehicle threats, including bicycles, have been eliminated through current management plans on all public land within the Wallowa Lake Key Conservation Area. Off-road vehicle threats on private land seem minimal at this time throughout the conservation area. The current level of threat should be improved even further through education, encouragement, stipulations in conservation easements or deed restrictions, or through management plans on any land acquired from willing landowners.

7. Protecting Pollinators

Spalding's catchfly requires insect activity for pollen movement. Insect control programs that utilize broad spectrum insecticides will affect Spalding's catchfly's primary pollinators, native bee species (Johansen *et al.* 1983).

The 75 acres of public land within the Wallowa Lake Key Conservation Area should be considered potential habitat for Spalding's catchfly, though individuals have only been found within a portion of these lands. Therefore, all management plans on public land throughout the conservation area should prevent the use of insecticides. The pesticide threats to pollinators due to current agricultural practices on private land throughout the conservation area are minimal at this time. The current level of threat should be improved even further through education and encouragement. Stipulations in conservation easements or deed restrictions and management plans on any land acquired from willing landowners should include a buffer of 1.6 kilometer (1 mile) from all Spalding's catchfly plants where no insecticides can be used.

Grazing that reduces vegetation by over 50 percent, as determined by standard range analysis, should not take place at any time because of the potential damage to pollinators. This stipulation should be included in any conservation easements or deed restrictions and management plans on any land acquired from willing landowners.

Invasive nonnative plant infestations can compete for pollinators with flowering Spalding's catchfly plants and decrease fertilization rates. Invasive nonnative plant control and management practices described above should be followed to minimize this threat. However, native plants blooming outside of Spalding's catchfly's late season flowering period may provide a benefit to pollinators with no negative effects on Spalding's catchfly fertilization rates. Therefore, treatment of noxious weeds should be targeted only invasive species as closely as possible.

8. Incorporating Appropriate Fire Management or Litter Layer Reduction Activities

In the absence of some biotic and abiotic factors, bunchgrass communities can accumulate significant thatch-like layers of dead grass leaves and stems. Litter layer reduction by grazing or fire may increase seedling germination or establishment; result in warmer soil temperatures; and in the case of fire, may increase available nutrients (Lesica 1999).

In the Wallowa Lake Key Conservation Area prescribed fire may not be an option as a management tool on the public land areas (Old Chief Joseph Gravesite and Iwetemlaykin State Heritage Site) because of their small size, historic structures, and intensive recreational use. Grazing has also been removed as a management tool on these public lands. In these areas studies should be conducted to evaluate the effectiveness of alternative methods of grass removal of thatch-forming nonnative rhizomatous grasses, especially *Poa pratensis*. Within privately owned portions of the conservation area, prescribed burning may also be a very limited option due to landowner concerns, proximity to residences, and aesthetic concerns in the view shed of the Wallowa Lake recreational area. On private lands, responsible grazing regimes should be encouraged to minimize impacts to Spalding's catchfly while benefiting the plant by maintaining range conditions without a thick layer of accumulated litter. Beneficial grazing regimes (i.e. rest periods and seasonal use) should be incorporated into stipulations in conservation easements or deed restrictions, or through management plans on any land acquired from willing landowners.

If prescribed burns are used as a management tool for increasing Spalding's catchfly, all prescribed burn areas within Spalding's catchfly habitat should be surveyed for the plant prior to burning. If Spalding's catchfly plants are located, management activities should be adjusted accordingly either by not burning in the area or enacting a monitoring program to gauge the plant's response. Fire management plans should carefully assess and mimic historical fire regimes. Trend monitoring and possibly demographic monitoring studies should be done for 4 years prior to burning, whenever possible. Ideally, a control plot should be part of the monitoring scheme. Post-fire monitoring should be done for an extended period after a fire. Monitoring should measure both the abundance of Spalding's catchfly as well as habitat characteristics including invasive nonnative plant populations. In areas where invasive nonnative plants are present, control of invasives or a well formulated integrated pest management program for control of invasive nonnative plants should be accomplished prior to burning.

Because fire poses a threat to humans, fire suppression activities may sometimes be necessary in the Wallowa Lake Key Conservation Area. Suppression activities should be done so as to minimize damage to Spalding's catchfly to the extent possible. Fire management plans should clearly describe strategies to protect Spalding's catchfly populations and habitat in the event of a wildfire, during both fire-fighting activities and post-fire rehabilitation efforts.

9. Monitoring Strategies

The locations of all Spalding's catchfly subpopulations within the Wallowa Lake Key Conservation Area should be documented. Previous investigations (Elseth et al 2012, Amsberry and Meinke 2013, Jocius 2013, Moholt 2013, 2014) have accomplished this on the public land within the conservation area. However, much of the private land within the conservation area has not been adequately studied. An effort should be made to obtain permission to conduct complete surveys on all appropriate private lands. Surveys in areas where permission has been granted should be conducted during peak plant detectability (August and early September).

Once a reasonably complete survey of the entire conservation area has determined the location of plants, monitoring to determine population trends and habitat conditions should be initiated with permission from landowners. An effort should be made to develop a standardized trend monitoring procedure with other key conservation areas in the Blue Mountain Basins physiographic region (e.g. Crow Creek, Zumwalt Prairie and Clear Lake Ridge Key Conservation Areas). Also, reference should be made to the Rangewide Monitoring Guidelines developed by the FWS.

On both public and private land, the effects of adjacent land uses, such as recreation, prescribed burns, livestock grazing and trampling, and herbicide spraying on Spalding's catchfly should be monitored. Monitoring programs should be designed to evaluate the effects of invasive nonnative plants, native ungulate grazing, insect predation levels, insect pollinator levels and other impacts described above and should be able to document any declines in Spalding's catchfly numbers.

10. Preservation of Genetic Diversity

With the proper permits first secured from the U.S. Fish and Wildlife Service, Spalding's catchfly seeds should be collected according to currently accepted protocol from multiple locations in the Wallowa Lake Key Conservation Area. Arrangements should be made for long-term seed storage at a facility such as the Rae Selling Berry Seed Bank at Portland State University (formerly the Berry Botanic Garden Seed Bank for Rare and Endangered Plants of the Pacific Northwest).

C. Conservation of Other Rare Species

Western Bumble Bee

The western bumble bee (*Bombus occidentalis)* is considered "vulnerable" on the IUCN Red list, is included on the red list of bees by The Xerces Society, and is on ORBIC's List 2.

The western bumble bee was once widespread and common throughout the western United States and western Canada. However, populations have sharply declined since the late 1990s (Williams *et al.* 2014). Populations have most dramatically declined in central and western California, western Oregon, western Washington, and British Columbia. Though few historic systematically sampled records for this species exist anywhere in the state, Stephen (1957) reports the western bumble bee in the Wallowa Lake area as well as a number of other locations in northeastern Oregon. Since its decline in the 1990's, the species has been located in Wallowa County, Oregon. Rao et al. (2011) report the collection of 49 individuals on the Zumwalt Prairie Preserve indicating the species is persistent in the regions, potentially because of geographic isolation or potential resistance to the pathogens and likely still exists in Wallowa Lake Key Conservation Area for Spalding's catchfly.

Numerous threats face the western bumble bee. The greatest threat may be from the introduction, potentially from European commercial bumble bee rearing facilities, of the microsporidian *Nosema bombi* (Cameron *et al.* 2011, Cordes *et al.* 2012, Lozier *et al.* 2011, Thorp 2003). It is unknown at this time if *N. bombi* has been introduced into northeast Oregon. The western bumble bee is faced with numerous other threats including habitat loss and alteration. Habitat modification by over grazing can be particularly harmful by removing flowering plants, especially during the mid and late-summer when flowers may already be scarce. Additionally, livestock may trample nesting and overwintering sites. Insecticides pose a direct threat to foraging bumble bees. Herbicides can indirectly harm bumble bees by removing flowers. Invasive plants and insects may threaten bumble bees by directly competing with the native nectar and pollen producing plants.

Many conservation efforts such as appropriate grazing regimes and invasive species removal may have a mutual benefit for both Spalding's catchfly and the western bumble bee. As catchfly flowers are a potential food source for bees and bumble bees are important pollinators, the conservation of both species are additionally linked.

D. Management Plan Duration and Review Schedule

The life of this management plan will be ten years, after which time the objectives and management actions included in this plan will be reevaluated and if necessary extended. At three year intervals the participating parties will review progress achieved for the population at the Wallowa Lake Key Conservation Area.

Appendix A. Implementation Schedule for the Wallowa Lake KCA – Spalding's catchfly Habitat Management Plan

Implementation of the actions outlined in this schedule is subject to available funding and staff.

Conservation Action(s)	Action Item #	Action Item Description	Responsible Parties	Timing	Comments
Invasive Weed Treatment and Weed Control	1	Control invasive nonnative plant species within habitat and populations of Spalding's catchfly.	All (private landowners, Wallowa Land Trust, NRCS, Wallowa Resources, NPS, Tribes, and OPRD)	Annually, as needed	Refer to the narrative for buffer areas to protect Spalding's catchfly
Livestock Management	2	Manage all livestock activities to protect Spalding's catchfly and its habitat and use data collected to ensure livestock management practices and operations will be implemented in a way that minimizes negative affects to Spalding's catchfly.	Willing private landowners	Annually	Action item #2 is inclusive of other action #'s related to livestock management.

Wildlife Herbivory and Trampling	3	Determine at what levels of herbivory and wildlife trampling Spalding's catchfly plants can persist, and at what levels its habitat remains intact.	Federal and State Agencies	TBD	Herbivory occurs in all habitat within the Wallowa Lake Key Conservation Area.
Herbicide Application and Insecticide Use	4	Chemical use should be minimized whenever possible and proximity of use should follow strict guidelines.	All (willing private landowners, Wallowa Land Trust, NRCS, Wallowa Resources, NPS, Tribes, and OPRD)	Annually as needed	Boom spraying should not occur within 15 meters (50 feet), wiping or wicking should be the only herbicide application technique employed when within 15 meters (within 5-50 feet) and manual control techniques only when within 1.5 meters (5 feet) of individual Spalding's catchfly plants. Herbicide use, not related to protecting Spalding's catchfly and all insecticide use near any Spalding's catchfly populations should be avoided. Integrated pest management strategies should be incorporated into management activities.
Land Conversion	5	Prevent the elimination of individual plants and potential habitat through	All (willing private landowners, Wallowa	Annually	Land conversion is potentially the greatest threat Spalding's catchfly currently faces and has

		land conversion.	Land Trust, NRCS, Wallowa Resources, NPS, Tribes, and OPRD)		faced historically.
Off-road Vehicle Use	6	Prevent damage to the caudex of Spalding's catchfly from off-highway vehicles.	All (willing private landowners, Wallowa Land Trust, NRCS, Wallowa Resources, NPS, Tribes, and OPRD)	Annually	Improved level of threat through education, encouragement, stipulations in conservation easements or deed restrictions, or through management plans on any land acquired from willing landowners.
Protecting Pollinators	7	Protect Pollinators	All (willing private landowners, Wallowa Land Trust, NRCS, Wallowa Resources, NPS, Tribes, and OPRD)	Annually	Improved level of threat through education, encouragement, stipulations in conservation easements or deed restrictions, or through management plans on any land acquired from willing landowners.

Incorporating Appropriate Fire Management or Litter Layer Reduction Activities	8	Manage thatch-like layers of dead grass leaves and stems that may reduce seedling germination or establishment .	All (willing private landowners, Wallowa Land Trust, NRCS, Wallowa Resources, NPS, Tribes, and OPRD)	Annually	On private lands, beneficial grazing regimes (i.e. rest periods and seasonal use) to maintaining range conditions without a thick layer of accumulated litter should be incorporated into stipulations in conservation easements or deed restrictions, or through management plans on any land acquired from willing landowners.
Monitoring Strategies	9	Determine the location of Spalding's catchfly plants and monitor populations to determine trends and habitat conditions.	Federal and State Agencies	Annually as needed	Develop a standardized trend monitoring procedure with other key conservation areas in the Blue Mountain Basins physiographic region, and reference Rangewide Monitoring Guidelines developed by the FWS.
Preservation of Genetic Diversity	10	Preserve genetic variability in order to preserve the full array of genetic variability within the species.	Federal and State Agencies	TBD	Arrangements should be made for long-term seed storage at a facility such as the Rae Selling Berry Seed Bank at Portland State University.

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PERSONAL COMMUNICATIONS

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