Chapter IV
Listed Plant Species

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LISTED PLANT SPECIES

The purpose of this chapter of this biological assessment (BA) is to determine and document how the proposed actions from the Invasive Plants Environmental Impact Statements (EIS) for the Umatilla and Wallowa-Whitman National Forests, affects the threatened plant species *Silene spaldingii* (Spalding's catchfly, or *S. spaldingii* in abbreviation) and *Mirabilis macfarlanei* (MacFarlane's four-o'clock, or *M. macfarlanei*) in accordance with legal requirements set forth under Section 7 of the Endangered Species Act (19 USC 1536(c)). The Biological Assessment process ensures that Forest Service actions would not jeopardize the continuation of the species. Threatened, Endangered, and Proposed species to be considered for this project were provided by the U.S. Fish and Wildlife Service (USFWS). Habitat descriptions were assembled from professional experience and available literature including the USFWS Conservation Strategy for Spalding's catchfly (Hill & Gray 2004), and the Recovery Plan for *S. spaldingii* (Spalding's catchfly) (USFWS 2007).

On December 3, 1999 the USFWS published a proposed rule to list Spalding's catchfly as Threatened (64 FR 67814). The final rule for listing was published October 10, 2001 to list Spalding's catchfly as threatened (66 FR 51597). The Recovery Plan for *Silene spaldingii* (Spalding's Catchfly) was published September 2007 (USFWS 2007). Critical habitat has not been designated for this species.

MacFarlane's four-o'clock was originally listed as endangered by the U.S. Fish and Wildlife Service (1979). At the time of listing, only three populations were known, with a total of 20-25 individual plants. A recovery plan was developed in 1985. Since the species was first listed, nine additional populations have been discovered in Idaho and Oregon. As part of the recovery plan objectives, one new population was established at Lucile Caves along the Salmon River Canyon in 1988. Also, improved livestock management by the Forest Service and Bureau of Land Management have reduced impacts from livestock grazing on Federal lands. As a result of recovery efforts and the discovery of additional populations, MacFarlane's four-o'clock was downlisted to threatened on March 15, 1996. A revised recovery plan was signed in 2000. Critical habitat has not been designated for this species.

Consultation to Date

Biological Assessments (USDA, 2005) and Biological Opinions (USFWS, 2005b- Ref No 1-07-05-7-0653) for all federally listed species including *S. spaldingii* and *M .macfarlanei* related to the Pacific Northwest Region programmatic FEIS and ROD have been completed. These documents evaluated effects analyses for regional FEIS Plan amendments that contained management direction to the Forests specific to prevention, treatment (including new herbicides), inventory, and monitoring of invasive plants, and the subsequent restoration of affected habitats. No site specific analyses were conducted for these documents which is the purpose of this document.

Silene spaldingii

Life History and Habitat Requirements

S. spaldingii is an herbaceous long-lived perennial plant (over 20 years and up to 50 years or more) occurring in bunchgrass grassland type habitat in the inland Pacific Northwest, ranging from the northeast corner of Oregon northwards into eastern Washington, east-central Idaho and western Montana (Tisdale 1983). At the end of the first 5 years of a demography study, 72 percent of *Silene spaldingii* plants remained alive (Lesica 1997, p. 355 as cited in USFWS 2007), suggesting that individuals may regularly reach an age of at least 15 to 20 years. However, it is hypothesized some individuals may live up to 30 years or longer (USFWS 2007). Habitat is often characterized by high cover of perennial bunchgrasses, a relatively abundant and diverse perennial forb component, and often a minor shrub component (Tisdale 1983). Flowering stems support four to seven pairs of lance-shaped leaves and small greenish-white flowers. The species has a large taproot that may be three feet or more in length and can store water and nutrients for multiple seasons until reserves allow it to produce flowers and seed (Lesica 1997). Reproduction is by seed only (Lesica & Heidel 1996), and both that study and Lesica's (1988a) publication suggest that Spalding's catchfly is an obligate or near-obligate out-crossing species requiring insect pollination in order to set viable seed. A genetic study by Baldwin and Brunsfeld (1995) supports this hypothesis.

Observations by Lesica (1993) and Lesica and Heidel (1996) have shown a bumblebee (*Bombus fervidus*) to be the primary pollinator of this catchfly species. Across populations, it accounted for over 83 percent of all visitations (Lesica and Heidel 1996, p. 7 as cited in USFWS 2007). The ground-nesting bumble bee seems to be the most significant pollinator of this species. Other pollinators included solitary bees from the Halictidae family (*Lasioglossum ovaliceps, Halictus tripartitus, Dienoplus rugulosis, Lasioglossum spp.*), one wasp visit, and a minor contribution from a night-pollinating moth species in Oregon (Lesica and Heidel 1996, p. 7). Pesticide use, fire, and soil compaction or disturbance by large herbivores such as cattle may impact ground-nesting bees.

In Montana, seeds of Spalding's catchfly typically germinate in the spring, and the seedlings grow for about two months before going dormant until cooler temperatures and rains support an autumn growth period (Lesica 1988b). Fall growth period has not been observed elsewhere. Plants grow as rosettes only during their first year and may produce vegetative or flowering stems in subsequent years. Adult plants emerge in spring, usually May, either as a stemmed plant, a rosette, or occasionally as a plant with both rosette and stem (Hill and Weddell 2003, p. 1 as cited in USFWS 2007). The typical flowering period is from mid-July through August (Lesica 1995). Seed matures from August through September, at which time the plant senesces and becomes dormant. The growth period for the species range-wide has been described from April 1st through October 31st (USDA Forest Service 2003, Hill and Gray 2004, Lesica 1997).

S. spaldingii often exhibits prolonged dormancy (Hill and Gray 2004), with plants persisting durning the growing season underground on stored root reserves. Lesica (1995, 1999) found that most plants spend nearly half their summers in dormant condition, and that in a given year, depending on climatic conditions, between 10 and 70 percent of the individuals in a site could be dormant. Lesica also observed it to be uncommon for all individuals at a site to remain dormant in a given season, but found some percentage of individuals to be dormant in most seasons. In one study plants were found to exhibit prolonged dormancy for 1 year 76 percent of the time and for 2 years 16 percent of the time (Lesica and Crone in review, p. 10 as cited in USFWS 2007). Another demographic study in Idaho with an early and late sampling period across 5 years (2002 to 2006) found only 21 of 150 plants had dormant periods, 20 plants were dormant for 1 year, and 1 plant was dormant for 2 years (J. Hill, ICDC, in litt. 2007a, p. 2 as cited in USFWS 2007).

Inland Northwest grasslands occur outside or on the verge of regions that receive enough moisture to support forest growth, and typically get 15 inches or less of annual precipitation, coupled with pronounced summer drought (Hill and Gray 2004). Spalding's catchfly is most often found in open grasslands in association with Idaho fescue (*Festuca idahoensis*), or in Montana, with rough fescue (*Festuca scabrella*). It also occurs with some of the shrubs that grow in and adjacent to the grasslands, as well as under open-canopy ponderosa pine stands that intrude into the grassland communities as stringers.

The Spalding's Catchfly Conservation Strategy (Hill & Gray 2004) gives detailed descriptions of the many plant associations in which *S. spaldingii* has been found. Grassland communities that are not degraded have in common a late successional or "climax" status, indicating that after normal disturbance regimes such as fire, they return to the same species mix as before the alteration. However, changes in fire regime and especially the presence of numerous invasive weed species now "interrupt normal successional pathways" and preclude return of disturbed or altered sites to their original native bunchgrass communities (Hill & Gray 2004).

It is unknown how long individual *S. spaldingii* plants can endure as their native communities are lost. Two recent studies provide conflicting results. Menke (2003) found no loss of *S. spaldingii* vigor between invaded and uninvaded populations at a site in Idaho, although in 2002 Caplow found that vigor of the catchfly decreased as weed cover increased at a site in Washington. In general, very few native species can persist and compete long term with aggressive non-native species such as yellow starthistle or rush skeletonweed. Even if individual plants can survive in a weed-infested environment, recruitment of new catchfly plants is decreased or eliminated under such conditions, dooming invaded populations to eventual demise (USFWS 2005). In addition, pollinator visitation rates to the threatened catchfly have been found to drop in the presence of flowering non-native species such as St. Johnswort that compete for the attention of *Bombus fervidus* (Lesica and Heidel, 1996). A decrease in pollination may jeopardize fecundity of particular plants and the recruitment of new individuals to the catchfly population.

Umatilla National Forest Action Area

S. spaldingii is the only federally listed plant species occurring on the Umatilla National Forest. No other listed plant species are suspected to occur on the forest at this time. Massive range-wide loss of habitat for *S. spaldingii* is due to a combination of conversion of much of the habitat to agriculture plus degradation of the remainder, primarily by weed invasion. The fragmentation of habitat has left small, genetically isolated populations scattered across four states and five physiographic provinces (see USFWS 2005 for detailed descriptions of these). More than half of the remaining populations are on private land, with the majority of these unprotected (USFWS 2005).

The Conservation Strategy for Spalding's catchfly (Hill and Gray 2004) discusses in detail the causes of Spalding's catchfly rarity, the reasons for Federal Listing, and the current and future threats to this species. According to the Conservation Strategy, the threats of greatest concern to the continued existence of Spalding's catchfly currently include, in order of priority: 1) habitat degradation from weed invasion and livestock grazing; 2) habitat loss and fragmentation and associated genetic pressures of small populations, i.e., pollinator limitation, inbreeding depression, and loss of populations; 3) alteration of fire regimes, including fire suppression, increasing fire frequencies, and out-of-season fires; 4) predation by herbivores, including domestic livestock, native ungulates, and rodents and insects; 5) herbicide drift; 6) prolonged drought and global warming.

Species Occurrence for the Umatilla National Forest

S. spaldingii is known from only 124 sites in the world, with only 7 populations consisting of more than 500 individual plants and contributing 75% of the known plants of the species (USFWS 2007). One of these 7 populations is located on the Umatilla National Forest in T9N, R43E, Sections 13, 14, 15, 23, 24, and 32, within the Peola and Mackee Allotments.

The entire area where *S. spaldingii* is known to occur lies within the Peola and MacKee Allotments on the Umatilla National Forest (Figure 2). Both allotments have been surveyed (Wood 2006), as listed in Table 1, by Umatilla NF botanists, including specific searches for *S. spaldingii* in 1997 and 2000. A list of all plant species encountered in each of these surveys is on record in the Umatilla NF botanical database (Table IV - 1).

The Sourdough area where *S. spaldingii* occurs includes at least portions of four open ridges on the south side of Lick Creek (Cabin, Sheep, Sourdough, and Bracken ridges) and their intervening draws that support plant communities typical of the Canyon Grasslands (USFWS 2005, Johnson & Simon 1987, Tisdale 1986). Elevations range approximately from a low of 2800 feet to a high of 4000 feet on the upper ridges. South aspects favor bluebunch wheatgrass/Sandbergs bluegrass communities, while north aspects support Idaho Fescue communities, snowberry/rose communities of shrubs in swales and draws, and occasional stringers of ponderosa pine and Douglas fir. As elevation increases to 4500 ft. and above, especially to the southwest and west of the Sourdough area, mixed conifer forest predominates. The entire area of suitable habitat on the Umatilla National Forest has been surveyed.

Table IV - 1. Site locations of *Silene spaldingii* in the Sourdough area.

FS GIS Site	EOR Number	Section	Allotment Pasture Name	Number of Plants Reported
20	[1]49	13	Lower Sourdough	45
21	49	13	Lower Sourdough	130
831	49	13	Lower Sourdough	150
14	49	14	Upper Sourdough	490
15	49	15	Upper Sourdough	83
61	49	23	Upper Sourdough	113
832	49	23	Mackee & Upper Sourdough	10
57	49	23	Mackee	6
76 & 77	58	24	Lower Sourdough	21
[2]Not available	[2]Not available	[2]Not available	Smoothing Iron Ridge	>500

[1] EOR Numbers 50 and 56 were combined into EOR49 in 2006 (per G. Glenne, FWS)

[2]These data are not available yet as this is a new population, reported July 2008, and documentation has not

been completed yet.

Wallowa-Whitman National Forest Action Area

Within the action area, *S. spaldingii* is found on the Wallowa Plateau. The three populations (made up of eleven element occurrence records) have shared ownership between the Forest Service and private landowners; therefore the area size and plant numbers on each ownership can only be approximated. Roughly 38 percent of the plants are found on Forest Service land (1,357 out of 3,502 plants). Those element occurrences entirely on Forest Service land cover roughly 8 acres; those on shared ownership cover 60 acres. While no populations have been found, habitat modeling predicts over 24,000 acres of high probability habitat for *S. spaldingii* in the Hells Canyon National Recreation Area. About 42 percent of these acreages are located in active grazing allotments or administrative horse pastures (USDA Forest Service, 2003). Table 6 lists the currently identified *S. spaldingii* element of occurrences within the action area.

Species Occurrence

Rare plant species occurrence information is recorded by state Heritage Programs in a numbered record called an Element Occurrence Record (EOR) (Table IV – 2). Each species has a set of EORs across its range. Each EOR may include one or more sites (often called subpopulations), which are defined as distinct patches of the plant on the landscape. The Forest Service (FS) tracks each site on FS land with its own spatial database (Geographic Information System – GIS) number.

Table IV - 2. *S. spaldingii* on the WW Forest are located in the Wallowa Valley district area.

State Element of Occurrence	WW GIS #	# plants Reported	Invasive plant proximity (based on GIS mapping data)	Allotment
EOR - 016	1266, 1267	99-203	> ½ mile away	Crow creek
EOR - 014	0519,1337, 1338, 0518/new sites in 2004, 0600-0608	126-295/ 414	> ½ mile away	Crow creek
EOR - 013	0516, 0517	41-94	> ½ mile away	Crow Creek
EOR - 017	1268, 1269	58-79	Diffuse knapweed within 1/4 mile along Crow Creek	Swamp Creek
EOR - 019	1280	14-20	> ½ mile away	Swamp Creek
EOR - 020	1275-1279	659-1860	Diffuse knapweed within 1/4 mile along Crow Creek	Swamp Creek
EOR - 018	1265	91-300	> 1/2 mile away	Private
EOR -	61602-1274		Not within ½ mile on FS lands, however, population is also adjacent to private and roads	Bear-Gulch/Private
None yet	061604-2326 new population in Imnaha	25-30	within ½ mile from Yellow Star thistle and Scotch Thistle	Lone Pine T4N, R49E Sec.19, 20
None yet	061604-2328 new population in Imnaha	45-50	> than a mile away from known weed sites	Toomey T4N, R49E Sec.31
None yet	061604-2327 new population in Imnaha	5-10	within ½ mile from Yellow Star thistle and Scotch Thistle	Lone Pine T4N, R49E Sec.19

On Forest Service land, populations appear stable or increasing where multiple year (15-20 years) of inventory work was done (see Table IV - 2 for locations). Populations range from 20 to over 500 plants per population. The populations on Forest Service land in Oregon are located within grazing allotments. The Mud Duck allotment is presently closed. All remaining element of occurrences of *S. spaldingii* listed in Table 6 are within active grazing allotments. A recent environmental impact statement (Joseph Creek Rangeland Analysis, USDA 2005) and associated biological assessment (USDA 2005) and biological opinion (USFWS 1-17-05-F-0640) of *S. spaldingii* in the Swamp Creek and Crow Creek Allotments were completed in 2005. Direction from this decision continues to allow for grazing within the allotments (Crow creek and Swamp Creek) where *S. spaldingii* occur; however, an adaptive approach to grazing management will be implemented with specific protections for sensitive areas. Specifically, direction and implementation will improve range condition through monitoring, reduction of trailing through the pastures, and rotation so that spring grazing is rested. Continued improvement in range condition in the South Crow and Doe Gulch pastures (both within the Crow creek allotment) would decrease the livestock grazing pressure on Spalding's catchfly occurrences because the mid to late seral plant communities act to reduce the level of risk to direct herbivory and trampling by livestock or other herbivores (personal observation J. Hustafa).

Direction specific to *S. spaldingii* protections includes additional mitigation and monitoring. Mitigations include spring drought protections, restrictions on herding through the Doe Gulch pasture, and summer grazing protections. Effectiveness monitoring would ensure that the protective measures are working as designed.

Threats

Two populations of *S. spaldingii* within the Swamp Creek allotment are within ¼ mile of diffuse knapweed site (~10 acres) along Crow creek. The population that spans both private and federal land, located on the terminal moraine at the north end of Wallowa Lake, is grazed plus has a diffuse knapweed problem. In one Crow Creek population, both Kentucky bluegrass and ventenata (an exotic annual grass) have been documented. Other annual grasses, yellow starthisle, and sulfur cinquefoil occur within ¼ to ½ mile of populations on the Wallowa plateau (USDA 2005, Biological Assessment). Of the three newly documented populations in the Imnaha River Basin, two that are within the Lone Pine Allotment are within ½ mile of yellowstar thistle and Scotch thistle. The third site, in the Toomey Allotment, is more than a mile from know invasive plant populations. Within potential *S. spaldingii* habitat, 2,456 acres of invasive weeds have been identified. Of this acreage, 212 acres are within proposed aerial herbicide application sites.

Effects of the Proposed Action – Spalding's catchfly

Roughly 50 percent of the all populations found in Oregon are on National Forest lands. This is a very approximate estimate since land ownerships tend to be shared for this species and separate population information by ownership is not available. Three populations were found in the Imnaha River basin in the Hells Canyon National Recreation Area in 2004 (populations 061604-2326 and 2327) and 2005 (population 061604-2328). Approximately 80% of the 24,000 acres of potential habitat determined through modeling have been surveyed. At the present time, no *S. spaldingii* populations are infested with or have invasive plants within 1000 feet; however, there are invasive plants nearby that could move closer to these areas. Future inventories may also identify newly established sites. If invasive species treatments were found to be necessary, manual, mechanical, or chemical methods would be used. Choice of method would depend on the invasive species; manual methods would be the treatment of choice in most cases, except for those species where manual

techniques are proven ineffective. Biological controls are not expected to be actively introduced, but could move into occurrence areas from outside sources.

Table IV - 3. Summary of potential effects to *Silene spaldingii* due to the use of herbicides with and without implementation of Project Design Features (PDF's). Persistent chemicals, such as Picloram, can only be used within the distance specified in the PDF.

Herbicide	Direct Effects without PDF's	Direct Effects with PDF's	Indirect Effects to *S. spaldingii* habitat – non-target plants with PDF's
Chlorsulfuron: Selective on broadleaf weeds some and grasses PDF's protect individual plants from direct spray, drift, runoff, wind erosion. No aerial application	Yes	Possible short-term effects	Possible short-term effects to habitat
Clopyralid: Extremely selective: Asteraceae, Fabaceae, Polygonaceae, Solanaceae families	No Caryohpyllaceae is not target family	No	Possible short-term effects to grasses (habitat), but grasses are very tolerant of this herbicide
Glyphosate: Non-selective; PDFs to protect from direct spray; runoff not a concern.	Yes	Possible short-term effects	Possible short-term effects to habitat
Imazapic: Selective against some broadleaves & some grasses. PDFs to protect from direct spray, drift, runoff & timing after use of other herbicides	Yes	Possible short-term effects	Possible short-term effects to habitat
Imazapyr: Non-selective. PDFs to protect plants from direct spray, drift, runoff	Yes	Possible short-term effects	Possible short-term effects to habitat
Metsulfuron methyl: Selective for some broad-leaf and woody species; can damage conifers. PDFs to protect individual plants from direct spray, drift, runoff, wind erosion. No aerial application	Yes	Possible short-term effects	Possible short-term effects to habitat
Picloram: Selective: rate and season dependant; pre-emergent and soil active. PDFs to protect from direct spray drift, runoff; buffers; fall application by TES plants & other special situations	Yes Target Families are: Compositae, Leguminosae, Polygonaceae, and Apiaceae families. Less affected families: Brassicaceae, Liliaceae, and. Scrophularaiaceae. Unknown effects assume worst case.	Possible short-term effects	Possible short-term effects to habitat
Sethoxydim: Selective for annual & perennial grasses & target invasive plants. Soil activity prevents germination of grasses. Absorbed rapidly by foliage and roots. Systemic. Broadleaf and sedges are tolerant	No. Broadleaf plants are tolerant	No	Possible short-term effects to habitat
Sulfometuron methyl: Non-selective Pre- and post-emergent. Target: annual and perennial broadleaf weeds, some grasses and some woody tree species. PDFs to protect plants from direct spray, drift, runoff, wind erosion. No aerial application	Yes	Possible short-term effects	Possible short-term effects to habitat

Short-term – 5 years or less

Manual –While accidental pulling or trampling would be the most likely damage to this plant with little risk of individual mortality. Injury would likely be limited to above ground structures and only with a low risk of individual mortality. Risk of these effects would be mitigated by such techniques as flagging areas with individuals prior to treatments (as directed by Standard #20), so workers would avoid individuals.

Mechanical –Mowing or string trimming (the most likely methods used) could sever or crush plants or plant parts. Injury would likely be limited to structures above the root crown and only with a low risk of individual mortality. Risk of these effects would be reduced by such techniques as flagging areas with individuals prior to treatments and careful hand pulling of invasive plants closer to the populations (as directed by Standard #20), so equipment could avoid individuals.

Chemical – Individual plants could be damaged or killed from the accidental application or drift of the herbicide from ground based applications. The risk of impact would be reduced with implementation of required mitigation PDF's. Risk of effects would be reduced by such techniques as timing of application during dormancy, flagging individuals, hand pulling of invasive plants closer to the populations or through selective application such as defined spot spray, shielding spray or hand wiping(as directed under Standard #20) and PDF's.

Aerial herbicide application is not proposed within 5 miles of the nearest *S. spaldingii* occurrence. PDF's require surveys prior to treatment of unsurveyed potential habitat.

Treatment of invasive weed populations, forest wide and in this area specifically, has been variable in the past. Effectiveness at controlling invasive weeds forest wide is estimated to be approximately 35% (Erickson 2006). This low level of effectiveness is attributed to forest direction to use herbicides as last method of control and does not include herbicide treatment of any new sites after the '95 Environmental Assessment for Weeds without additional NEPA analysis. On the UNF, recent aggressive chemical control of populations along Lick Creek Road and up Sourdough Gulch has contained and/or reduced the most easily accessible infestations, helping to reduce seed sources. However, not all populations have been eliminated and Scotch thistle in particular has escaped up several side draws. Small stands of it are increasing fast in areas that are less accessible for treatment. No *S. spaldingii* were affected from herbicide and herbicide drift.

Herbicide Effects on Pollinators of *S. spaldingii*

Uncertainty exists regarding the effects of herbicides on non-target plant species and pollinators because native species are not the usual test species for EPA toxicity studies. The EPA performs studies predominantly on pollinators of crop species (honeybees). Boutin et al. (2004) concluded that it was likely that the current suite of tested species was not representative of the habitats found adjacent to agricultural treatment areas, and suggested the current suite of tested species might cause an unacceptable bias and underestimated risk. Given all the uncertainties related to pollinators the risks must be weighed in relation to impacts to native plant communities and ecosystem processes as a whole in relation to the ability of the proposed alternative to control, eradicate, and/or contain invasive species.

Over the past two decades, the threat of invasive species has become broadly recognized (Blossey et al 2001) with the majority of studies focused on larger scale issues related to invasive species establishment in areas such as native plant population structure and alteration of native plant communities, competitiveness of invasive plants and invasibility of certain plant communities (Levine et al. 2004). Limited research is available that addresses impacts from invasive plants on mutualistic relationships between plant pollinators and native plant communities. One study has

indicated that exotic plants may compete better for native plant pollinators by producing more desirable nectar and therefore increasing fitness and reproductive ability of the non-native plant (Levine et al 2004). Presently, little is known about native plant pollinators. It is estimated that there may be between 130,000 and 200,000 invertebrate and vertebrate species that regularly visit the flowers of higher plants, which depend on these animals to assure cross-pollination. The majority of flowering plants in the world (88 percent) are pollinated by beetles, followed by wasps (18 percent) and bees (16.6 percent of flowering plants) (Buchman and Nabhan, 1996). Research efforts are just beginning to investigate basic aspects of plant-pollinator interactions and how these relationships impact management decisions for plant conservation in natural systems (Kearns et al. 1998). .

The primary pollinator of *S. spaldingii* is the bumblebee *Bombus fervidus* (Lesica 1993; Lesica and Heidel 1996; Baldwin and Brunsfeld 1995). Very little information is available on the effect of herbicides on native pollinators. Most information is about the non-native honey bee. It is known that pollinators can be directly affected by spray or indirectly when plants needed as food for adults or larvae are eliminated by herbicides. Effects on pollinators were derived from risk assessment information regarding direct spray on honey bees (USDA, 2005) (Table IV - 4). Herbicide labels were also used for more species-specific information. By using label information about controlled species, effects to closely related species can only be extrapolated. Table 8 shows the active ingredients used in the proposed action are not expected to have toxic effects when directly sprayed on honey bees at the typical Forest Service application rate. Glyphosate and triclopyr, may have some toxic effects if applied at the maximum application rate proposed by the Forest Service (SERA, 2003-glyphosate; SERA, 2003-Triclopyr).

Table IV - 4. Potential doses for bees in a direct spray scenario

Herbicide	Typical Application Rate	Potential Dose for Bee	Toxic Level for Bee
Chlorsulfuron	0.056 lb/ac	8.98 mg/kg	>25 mg/kg (LD50)
Clopyralid	0.35 lb/ac	56.1 mg/kg	909 mg/kg (no mortality)
Glyphosate	2.0 lb/ac	321 mg/kg	540 mg/kg (NOAEC)
Imazapic	0.13 lb/ac	16 mg/kg	387 mg/kg (no mortality)
Imazapyr	0.45 lb/ac	72.1 mg/kg	1000 mg/kg (no mortality)
Metsulfuron Methyl	0.03 lb/ac	4.81 mg/kg	270 mg/kg (NOEC)
Picloram	0.35 lb/ac	56.1 mg/kg	1,000 mg/kg (no mortality)
Sethoxydim	0.3 lb/ac	60.1 mg/kg	107 mg/kg (NOAEL)
Sulfometuron Methyl	0.045 lb/ac	7.21 mg/kg	1,075 mg/kg (NOEC)
Triclopyr BEE	1.0 lb/ac	160 mg/kg	>1,075 mg/kg (LD50)
Triclopyr TEA	1.0 lb/ac	160 mg/kg	>1,075 mg/kg (LD50)
NP9E (main generic ingredient in most surfactants)	1.67 lbs/ac	268.00 mg/kg	unknown

* LD50 (lethal dose 50) = The dose of a chemical calculated to cause death in 50% of a defined experimental animal population over a specified observation period; NOAEC = No observable Adverse Effects Concentration; NOEC = No observed effect concentration; NOAEL = exposure level at which there are not statistically or biological significant differences in the frequency or severity of any adverse effect in the exposed or control.

Two population of *S. spaldingii* have invasive plants within ¼ mile. Invasive plants are greater than ¼ mile away for all other populations. It is unlikely that pollinators near *S. spaldingii* populations would be affected by herbicides and their adjuvants unless new invasive plant populations are found closer to *S. spaldingii* and are treated under the EDRR strategy. Potential impacts to pollinators that reside near and would likely be available to pollinate listed plants would be minimized by using

techniques that minimize effects to listed plants. PDFs I-1 through I-12 were developed to minimize effects to listed plants and would also minimize effects to pollinators that reside near enough to pollinate these plants.

The proposed action estimates that 0.9% (0.16% annually) of the Wallowa Whitman National Forest land base will be treated with chemicals. It projects that herbicide use will decrease over time as current infestations are treated and EDRR to newly discovered sites allow treatment with the most effective methods (see EIS). The remaining Forest Service land base not treated with herbicides should provide adequate habitats for native pollinators to survive and re-establish in areas where they might be impacted. In relation to indirect impacts to *S. spaldingii* and its habitat, it is assumed that any treatment that reduces invasive plants within a native plant community will result in a positive impact on the community as the native component is restored.

Biological

Even though control agents are reviewed and approved by APHIS prior to release in this country, there is a slight risk that an approved agent the Forest Service releases may unintentionally affect native plants (USDA 2005). There are no known direct effects to *S. spaldingii* from bio-control agents released for control of knapweed. There also remains the possibility that regardless of what the Forest Service does, unapproved agents or agents known to affect non-target plants including *S. spaldingii* will spread from neighboring lands to National Forest lands. There are very few post-release studies on the effects of bio-control introductions on non-target plants or animals (D. Simberloff and P. Stiling 1996, Howarth 2001). Perhaps the most relevant studies of direct non-target effects concern the thistle seedhead weevil, *Rhinocyllus conicus*, introduced into North America for the control of Eurasian thistles in the genus *Carduus*, primarily musk thistle, *C. nutans* (Zwolfer and Harris 1984, Turner et al., 1987, Louda et al. 1997). The original releases were made in Canada in 1968 and releases in both the U.S. and Canada continue today. Approval for the release of this insect was granted knowing that the weevil's host range included three native North American thistle genera. At that time, there was little concern for possible negative impacts on native thistles. In addition, female egg-laying behavior was expected to restrict the weevil's host range. Current evidence shows this weevil continues to expand it's geographic and host range, which now includes a close relative of the federally listed threatened Pitcher's thistle (*Cirsium pitcheri*) (Louda et al. 1997). Recent research rebuts the idea that the host-specificity of this weevil has changed since the original testing 30 years ago (Arnett and Louda, 2002). Agents known to affect non-targets with a likelihood of encountering those non-targets if introduced are no longer approved for release (USDA, 2003). APHIS continues to work on refining regulations and procedures for introducing biological control agents.

There is a slight possibility that the approved root moth *Agapeta zoegana,* a bio-control for knapweed species, may impact an associated native grass species (*Festuca idahoensis)* commonly found with *S. spaldingii*. Callaway, DeLuca and Belliveau (1999) found the reproductive out put of native *Festuca idahoensis* planted with spotted knapweed (*Centaurea maculosa*) was lower when the introduced root moth, *Agapeta zoegana*, had attacked neighboring knapweed. These results have not been confirmed in a field setting and, due to the monitoring being conducted on *S. spaldingii* subpopulations on the forest, impacts to associated native vegetation in the surrounding areas would identify any associated concerns.

Site Restoration/Revegetation

At the present time, no site restoration or revegetation from invasive plant establishment and eradication is necessary in or around known *S. spaldingii* occurrences. Unknown future situations

may occur that could require these methods. Regional standards related to these methods direct the forest to development of a long-term site strategy for restoration and/or revegetating invasive plant sites prior to treatment and use of native plant materials as first choice in revegetation for restoration and rehabilitation. Additionally, revegetation and restoration guidelines after invasive plant control (Appendix G) would be used as a tool. Direct and indirect effects to future unknown *S. spaldingii* in need of restoration/revegetation would likely have the same impacts as those described previously under manual and mechanical control methods.

Other Disturbance Factors Impacting Invasive Weed Establishment

Even though grazing allotment pastures where *S. spaldingii* occurs are either closed or actively managed to protect *S. spaldingii* populations (USDA Joseph Creek Range Allotment 2005), grazing animals can cause areas of disturbance where invasive weeds can establish. The area where *S. spaldingii* occurs is considered primarily winter range for elk, although many animals are also present in summer. Elk create obvious pockets of soil disturbance at natural salt licks, watering holes, and on steep slopes and chutes. They also maintain existing trails and create new ones up and down draws and across upper slopes and along ridges. They graze and browse along the trails and also fan out across the slopes and ridges where the native bunchgrasses and forbs are most abundant and healthy.

Elk, and/or deer, sporadically browse the flowering stalks of *S. spaldingii*, probably to the greatest extent in the late season of drier years when other plants have senesced and become unpalatable. In the process of grazing the intact native plant communities, both elk and cattle can spread the propagules of numerous weedy species into even the most pristine of the upper slopes and ridges, and they continue to do so at an unknown rate. There are also roads/trails near two of the subpopulations located in the Swamp Creek allotment and along Forest Road 129 located in the Bear Gulch allotment that continues onto private lands. Although at this time no invasive species are identified near these areas it is a well known fact that roads and trails serve as primary sources for dispersal of invasive species propagules.

Much of the area where *S. spaldingii* is found falls within terrain where fire is actively suppressed. Fire fighting activities such as fire-line construction and mop-up operations could uproot and kill plants and disrupt habitat. Fire-lines can provide pathways into otherwise intact plant communities, facilitating weed invasion and displacement of desirable species. Firefighting equipment is often driven off-road to support suppression efforts, and these vehicles could dislodge or crush plants, as well as disturb soils. It is not known how Spalding' catchfly would respond to retardant application. However, most exotic weedy species respond much more quickly to pulses of available nutrients than do native species, so the fertilizing effect of retardant would likely increase the advantage of invasive exotics over the natives.

Cumulative Effects

Cumulative effects include the effects of future State, tribal, or private actions that are reasonably certain to occur in the action area. Future federal actions that are unrelated to the proposed action are not considered because they require separate consultation pursuant to section 7 of the Endangered Species Act (Fish and Wildlife Service 1998).

Presently, 22 invasive weed sites (approximately 6,600 acres) are adjacent to or exist on other land ownerships proposed for treatment on the forest. The largest mapped area associated is the common bugloss site located on the Hells Canyon National Recreation Area district. It is likely that more invasive plant acres exist on other land ownerships. These acres likely represent identified invasive sites targeted for cooperative invasive plant treatments. Based on habitat prediction models, *S.*

spaldingii could occur on these other land ownerships and could be treated if surveys are not completed in these areas. It is hard to predict if unknown *S. spaldingii* populations exist within the modeled habitat and/or if private landowners would survey for these plants prior to treating with herbicides. If applied following label restriction, cumulative effects should not be substantial. If applied correctly, such invasive plant treatments will benefit *S. spaldingii* within its presently documented area by reducing the invasive seed source that could be distributed into *S. spaldingii* habitat.

Summary Determination of Effects - Treatments in the Proposed Action may affect, but are likely to adversely affect *S. spaldingii* individuals or habitat

Mirabilis macfarlanei

Wallowa-Whitman National Forest Action Area

MacFarlane's four-o'clock only occurs on the Wallowa-Whitman National Forest and grows in river canyon grassland habitats between 1,000 and 3,000 feet. All currently known populations occur in only two counties: Idaho County, Idaho and Wallowa County, Oregon. The twelve known populations are found in the Snake River Canyon area, the Salmon River drainage, and the Imnaha River drainage (USDA Forest Service, 2003). The total geographic range of the species occupies an area of approximately 46 by 29 kilometers (29 by 18 miles) (Kaye, 1992).

Life History and Habitat Requirements

***Mirabilis macfarlanei*. Photo credit: J. Laufmann**

MacFarlane's four-o'clock is a long-lived perennial with a deep seated, thickened root that spreads by underground roots. This species typically blooms from May through June. The bright pink flowers are conspicuous, up to 1 inch long by 1 inch wide. Each flower has the potential to produce one fruit and one seed (Kaye et al., 1990). Individual stems have been observed to live over 20 years. Seeds are typically dispersed in June and July, and seed germination probably occurs in early spring. Seed germination and establishment may be infrequent and may be dependent upon a specific suite of environmental conditions.

In addition to reproducing by seed, plants reproduce clonally from a thick, woody tuber that sends out many shoots. Some populations comprise several clones. Studies on its genetic structure show that the species has lower genetic diversity than species with a similar life history (Barnes et al., 1994, 1995; Wolf et al., 1994). The greatest level of gene flow (pollen or seed dispersal) occurred between populations that were less than 1 mile apart.

Common floral visitors to *M. macfarlanei* include long-tongues bees of several genera, such as *Anthophora, Bombus, Synhalonia,* and *Melecta* (Barnes 1996). Although *M. macfarlanei* is self-

compatible, it apparently requires a vector for pollination (Barnes 1996). It appears that sexual reproduction is not the main mode of spread for this species; but it is a critical factor for maintaining genetic diversity and may be a key to long-term survival of the species.

The population size for all MacFarlane's four-o'clock populations was previously considered to range from 1,500 to 3,000 individuals (7,500 to 15,000 stems), based on estimates of clonal size (Barnes 1996) and on population estimates (Johnson 1995). However, recent information and survey data suggest that the total population size is approximately 8,000 to 9,000 individuals (39,000 to 44,000 stems) (Craig Johnson, in litt., 1999 in U.S. Fish and Wildlife Service, 2000).

Monitoring conducted by the Bureau of Land Management from 1981 to 1998 has documented significant annual fluctuation in stem counts and foliar cover, which are influenced by annual climatic conditions such as temperature and precipitation. Population estimates are further complicated by the fact that seedlings (new individuals produced by sexual reproduction) are very difficult to distinguish from new stems produced clonally. Forest Service botanists have not observed seedling recruitment in areas of soil disturbance since these areas are subsequently invaded by weedy species (Jerry Hustafa, Wallowa Whitman NF 1999 in U.S. Fish and Wildlife Service, 2000).

Species Occurrence

MacFarlane's four-o'clock occurs in river canyon grassland habitats that are characterized by regionally warm and dry conditions. It is endemic to low to mid-elevation canyon grassland habitats in west-central Idaho and northeastern Oregon. Precipitation occurs during winter and spring. Sites are generally open, with scattered shrubs. Plants are found on all aspects as well as slopes ranging from steep to flat. Elevations range from 300 to 900 meters (1,000 to 3,000 feet). Soils vary from sandy to talus substrate.

Habitat generally consists of bunchgrass communities, most often on steep slopes. A habitat analysis study conducted in Oregon showed that distribution appeared to be influenced by slope aspect, soil development, topographic position, and the density of non-native plants (Kaye, 1992). At least two populations experienced burning from wildfire. Both populations survived with no apparent effects from burning.

Threats

High quality grassland habitat is important for the long term survival of MacFarlane's four-o'clock. Some populations within the action area are located on grazing allotments currently under varying grazing intensities. Domestic livestock grazing (cattle, sheep, and horses) likely has the greatest potential to impact populations (USDA Forest Service, 2003). Due to a lack of historical reference conditions, it is not possible to determine whether grazing has eliminated patches of MacFarlane's four-o'clock in Hells Canyon. The history of grazing at least in the Hells Canyon National Recreation Area is extensive, starting as early as the 1730's by the Nez Perce tribe. Heavy grazing occurred in the latter half of the 19th century. By the early 1900's when the Forest Service began to regulate numbers of livestock, heavy impacts lessened. In 1995, domestic sheep grazing ceased on the Oregon side of the recreation area and by 1998 only 38,620 AUMs were permitted (USDA Forest Service, 2003).

Potential negative effects from grazing include ingestion, trampling, erosion from trampling, introduction and spread of non-native plants and changes in species composition

Herbicide and pesticide spraying in areas where MacFarlane's four-o'clock occurs could also lead to adverse effects if not carefully implemented. One population is directly adjacent to a major highway

where roadside vegetation spraying is routinely conducted by the BLM after flagging to avoid the population. An unauthorized aerial herbicide spraying incident affected the species in the vicinity of the Salmon River in Idaho County, Idaho. Plants on both federal and private lands were affected. At least 2,750 stems on BLM land exhibited foliar kill as a result of spraying in 1997. Subsequent monitoring in 1998 found that most of the plants did survive, although long term effects on the population are unknown (USDA Forest Service, 2003).

Significant damage from landslides and flooding could also impact the species. Landslides in 1996/1997 and 2006 in occupied habitat led to population damage from highway repair and landslide stabilization activities. To compensate for the loss of plants, the BLM and Idaho Transportation department transplanted approximately 400 rhizomes to a nearby research natural area.

Ongoing Conservation

Besides the compensation effort mentioned above and the reintroduction effort after the original listing, some monitoring has taken place for MacFarlane's four-o'clock in the Salmon River drainage. Besides population demographic studies, some monitoring has taken place following fire and following herbicide application.

Reduction in grazing numbers in the Hells Canyon National Recreation Area has most likely provided positive improvements in populations located there. Most MacFarlane's four-o'clock populations are excluded via fencing; however, some individuals might have been missed. Therefore some risks of adverse affects, although unlikely, could occur. The portion of the West Creek occurrence, Idaho EO #006, GIS #0488, on Forest Service land has been fenced; however, plants that are part of this occurrence are on private land. The plants on private land have not been fenced. Occurrences within the Pittsburg Allotment have been fenced, and these exclosure fences are in good condition; however, the pasture fencing is in disrepair. This allotment is currently vacant. It is possible that this allotment could be stocked in the future, but this would require additional NEPA. Unless the allotment is stocked, the risk of adverse effects is very low.

To date, surveys have been conducted in Idaho and Oregon, management plans have been developed by the BLM for three sites in the Salmon River drainage and monitoring has taken place on both BLM and Forest Service lands. Seed collection and long term storage at Berry Botanic Garden has been initiated.

Conservation Needs

Actions identified in the revised recovery plan for the species include protection of essential habitat as well as management of habitat to maintain or enhance viable populations.

Distribution Status and Trends within the Action Area

Within the action area, occurrences cross into different ownerships. The Snake River occurrences are all located on Forest Service land. The Salmon River occurrences are on both BLM and private land, while one site out of two in the Imnaha drainage is about half on Forest Service land.

The best description of populations within the action area can be found in the Hells Canyon National Recreation Area Final Environmental Impact Statement Comprehensive Management Plan (USDA Forest Service, 2003). The following descriptions are from that document, but only discuss the Snake River and Imnaha populations.

The Snake River occurrences include the largest population in Oregon. This population (called Tryon Bar) is estimated at 3,000 plants. It is one continuous colony spread over approximately 300 acres. Another population, Pleasant Valley, Oregon is located in the Hells Canyon Wilderness along the lower slopes of the Snake River about one mile north of Pittsburg Landing (an area known for invasive plants). The population size is estimated at 100 plants distributed in clumps over one acre. The Island Gulch population on the Idaho side is a short distance north of Pittsburg Landing with an estimated 40 plants over 0.1 acre. The Mine Gulch site is just north and east of Island Gulch with a population estimated at 150 plants over two acres. The West Creek site in Idaho is estimated at 250 plants over two acres while a grouping of several occurrences in the same Pittsburg grazing allotment are located nearby with an estimated 1,584 plants.

The Imnaha population is on both private and Forest Service land. The population estimate does not split between ownership, but about 350 plants are located on approximately 20 acres.

Given the above distribution descriptions, roughly 6,000 plants occur on Forest Service land out of the current estimate of 8,000 to 9,000 individuals. As mentioned earlier, it is difficult to establish which stems are from which individual/clone.

Oregon Populations

Tryon Bar/Snake River Oregon EO #001 GIS #0207, 0532-0534

This population is the largest in Oregon, with at least 3,000 plants estimated. It is near (just north of) Tryon Bar on the Oregon side of the Snake River in the Hells Canyon Wilderness. The population is one continuous colony that includes an estimated several thousand plants spread over approximately 300 acres. The predominant aspect is east, and the slope angle averages over 70 percent (although a few plants are on less than 10% slope).

The Tryon Bar population is in the Canyon Cattle and Horse Allotment, which is currently vacant; livestock have not grazed this area since about 1979. After the Canyon Allotment became vacant, it was sometimes permitted for use by livestock on a temporary basis to accommodate cattle displaced from adjacent allotments by wild fire. This included use of the Mormon/Sleepy area during 1990 and 1991, after the Teepee Butte fire. However, known Mirabilis populations are several miles away from this area and it is unlikely they were impacted from grazing (Chuck Quimby direct communication undated).

There are no roads or developed recreation sites within several miles of this site. A few individual plants (<10) are near a recreation trail, but they represent a very small fraction of the population. Between 1979 and 1991, the Forest Service used portions of the vacant Canyon Allotment (including the Tryon Allotment area) for winter pasture for administrative stock. Typically 60-80 head of horses and mules used the area from November through April. The stock reportedly stayed up near Tryon Ranch and on the bench or above, which would not be in the known population (Ed Weber direct communication with Jerry Winegar undated). The area is no longer used for this purpose.

The area where this population occurs burned in the Eastside Complex fire in September of 2000. The site is composed of light fuels, mainly bunchgrass and forbs. This area burned lightly and in a mosaic pattern. Some areas were not burned. A visit to the site in May of 2001 and again in 2002 showed no apparent mortality to MacFarlane's four-o'clock, which would be expected, because the plant was dormant at the time of the fire.

The main human-related activities that could affect the site are hiking, horseback riding, and hunting. However, due to the remote location, and steepness of the terrain, these are probably not significant uses of this particular area.

Pleasant Valley/Snake Oregon EO #005 GIS #13245

Located in the Hells Canyon Wilderness, this population is situated on the lower slopes of the Snake River, about 100 meters south of Pleasant Valley Creek and about one mile north of Pittsburg Landing, on the Oregon side of the river. An Idaho Power botany crew found this population in 1997, who reported about 100 plants. This area burned in the Salt Creek fire in the summer of 1996. In May of 2001 Forest Service staff visited this site and tallied about 90 clumps or plants in a "healthy" population with no indications of disturbance. In 2002, the site was again visited in 2002 when three new clumps were located opposite Pleasant Valley Creek on a south aspect. Both were large vigorous clumps. The total population was estimated between 90 and 100 clumps. There is no domestic grazing, roads, or trails near this population.

Buck Creek/Imnaha Oregon EO #002 GIS #0495

This population of MacFarlane's four-o'clock is on private land along the Imnaha River, within the boundary of the HCNRA. This population has also been referred to as the Packsaddle and Kettle Creek sites. Two hundred plants are reported in one acre. The MacFarlane's four-o'clock plants are on a steep, rocky hill. No serious impacts from cattle have been noted, although evidence of cows has been observed within the area of the population. The Eastside fire of 2000 burned near, but not into, this population. The plants are not near any public roads or trails, so impacts from recreation are probably minimal. Delbert and Garnet Lewis, of Red Cloud, Nebraska, currently own this land; it is under consideration for a future land exchange. This land is surrounded by the Packsaddle pasture of the Log Creek allotment. The private land is mapped as fenced, and excluded from the allotment. The current status of this fence is not known. Maintenance of the boundary fence between public and private lands is the responsibility of the private landowner. It is also not known if HCNRA permitted cows ever trespass onto the private land from the Packsaddle pasture. There is visual evidence of grazing of the private land in this site. Cattle trails have been observed in the vicinity of the four-o'clock, but grazing of it or other grasses in the area have not been observed. A 1992 report speculated that cattle might have used the trails to access other areas, but did not graze in the vicinity of the four-o'clock due to the steep slopes that range from 30-50 percent. The use of this land for cattle grazing is not related directly or indirectly to any government allotment (Howard Lyman direct communication undated). This population lies entirely on private land, and there are no direct, indirect, inter-related or inter-dependent government activities that may impact this population. Therefore, the Forest Service and the USFWS have no jurisdiction over the activities of the private landowners as they relate to this population. Therefore, this population will not be discussed further in this BA, except in the context of cumulative effects.

Fall Creek/Imnaha Oregon EO #003 GIS #0496

This site has been referred to as Fence Creek and also Dug Bar, and Dug Bar Road sites. It is near Fence Creek, but is actually closer to Fall Creek. It is adjacent to the Dug Bar road, but it is nowhere near Dug Bar itself. Some of this population is on private land, owned by Bruce L. Hamm, of Moscow, Idaho. The private land is outside the congressionally designated boundary of the HCNRA, so it would be difficult for the Forest Service to acquire.

There are approximately 350 plants in 20 acres, some of which are on private land. The aspect ranges from south to east facing with the slope angle between 20-60 percent. Soil is deep sandy loam to

coarse lithosol. Plant associations are bluebunch wheatgrass and Idaho fescue types. The soil in much of the population is very loose and is easily eroded by people or animals walking on it. Long term monitoring plots had been installed in this population; however, monitoring was discontinued for a variety of reasons by the people conducting the monitoring.

A power line tower access road, constructed when the powerline was constructed in the 1960s, dissects the population. Idaho Power is the only legal user of this road, although it is not currently posted as closed to the public.

The federal portion of this population is located in the Packsaddle Pasture of the Log Creek Cattle and Horse Allotment. The permit allows for between 50 and 200 cattle in this pasture from March 1st to April 15th each year. The Annual Operating Plans from 1991 forward state "Cattle entering the Packsaddle Unit during March and April will not graze in the southern end of the unit after March 15th. This will provide protection for endangered plant species." In 2000 the WWNF constructed a fence around most of the portion of the population that lies on NFS land. The fence was built during the time of year when no plants were visible, so it was not possible to ensure the fence encompassed every plant. Natural barriers and riders are used to move cattle away form the remainder of the population after March 15th. Cattle from other allotments are permitted to trail through this site.

The Dug Bar Road (Forest Service Road #4260) goes right by the uphill edge of the Fall Creek population. In 1991, it was noted that road grading had buried several plants with dirt that had been pushed off the side of the road. Posts were erected at each end of the population along the road to alert the grader operators of the location of the population. The road between these two posts is no longer graded, and the plants adjacent to the road appear to have recovered from the dirt that was piled on them (Jerry Hustafa direct communication undated).

Recreation use is probably not a factor at this site, as it is on a steep hill, and quite distant from the Imnaha River. However, this population is locally well known, and the fence or population may be vulnerable to vandalism.

The Eastside fire of 2000 burned near, but not into, this population.

Idaho Populations

West Creek Idaho EO #006 GIS #0488

The West Creek site is a large population of 250 plants located adjacent to the Big Canyon Road (FS Road #1805). The West Creek site is in the Pittsburg Allotment, which became vacant in 2003. Up to this time, cattle had grazed this pasture through March of each year. Most of the MacFarlane's four-o'clock had been fenced in 1998 to exclude grazing by cattle. The population lies on a steep north-facing slope and had been impacted by cattle before it was fenced. It is probably not being impacted by the nearby road or Canyon visitors. The West Creek site also contains a large patch of teasel (*Dipsacus sylvestris*), an exotic weedy plant that may be impacting MacFarlane's four-o'clock plants. Yellow star-thistle, an aggressive weed is known to occur within ¼ mile and poses a threat to this site. This site is monitored at least every two years.

Pleasant Valley/Island Gulch Idaho EO #009 GIS #0490

The Pleasant Valley site lies a short distance north of Pittsburg Landing near the Snake River. This population occurs on a steep hill about 50 yards above a dirt spur road that leads to the Snake River. The part of the road that is just below the population of plants is not a "system" road. An open road (#493B) curves to the north of the population. The spur that passes under the population is legally

closed. Although not posted closed on the Idaho side of the HCNRA, roads are closed unless posted open. This site had not been fenced from cattle, but grazing impacts had not been observed. This population is in the recently vacated Pittsburg Allotment, Dam Lot pasture, where grazing was scheduled over the winter through March. This population is probably not being impacted by the nearby road or recreation area visitors because there is no evidence of driving impacts.

Mine Gulch/Snake Idaho EO #007 GIS #0487

The Mine Gulch site has been referred to as the Island Gulch site also. This population of about 150 plants is just a little north and east of the Pleasant Valley/Island Gulch site. Most of the plants are growing on a small rocky ridge and down a steep hill into a gulch. There is a closed road (jeep trail) on the northwest edge of this population. Signs designating the closure were posted at the end of the open road in the spring of 2000. In 2002, the site was visited and recent ATV use (tracks) was noted on the closed road. Some plants growing directly adjacent this road and a few that grow out of the roadbed itself showed stunted growth, believed to be a result of unauthorized off-road vehicle use. Located in the now vacant Pittsburg Allotment, this site had not been fenced from past cattle grazing and trailing impacts had been noted in the past. Although the plants are near an inactive mining claim, the area is closed to new mining claims, so mining is no longer a threat here.

Kurry Creek Idaho EO #010 GIS #0494

The Kurry Creek site is just south of Kurry Creek and just east of Pittsburg Landing. The edge of the population is adjacent to the Pittsburg Landing road. This is a small population; only 17 plants have been reported. This population is in the recently vacated Pittsburg Allotment, although it was fenced to exclude grazing in the early 1990's, when the allotment was in use. The reconstruction of the Pittsburg road in early 1993 may have impacted some plants that were adjacent to the road. A concrete barricade was placed along the edge of the road so future maintenance actions would not affect this site. Yellow star-thistle, an aggressive noxious weed, as well as Scotch thistle and puncture vine, are found nearby and threaten to invade this site.

West Kurry Divide #1 Idaho EO #011 GIS #0493

The West Kurry Divide #1 site lies about one mile east of the large West Creek/Snake population. It is a large population (1,500), with many of the plants on open, loose, almost cinder-like soil, which appears to be very prone to erosion. This population is in the Stonehouse pasture of the recently vacated Pittsburg Allotment. The permitted period of livestock use was scheduled between March 20th and April 31st. Impacts from cattle (exposed rhizomes due to erosion) were noted in 1997.

West Kurry Divide #2 Idaho EO #012 GIS #0492

The West Kurry Divide #2 is a single plant located on the ridge, west of West Kurry Divide #1 population. This population is in the Stonehouse pasture of the Pittsburg Allotment. The permitted period of livestock use is between March 20th and April 31st. Observations regarding cattle use are not available at this site. Yellow starthistle, an aggressive weed is known to occur within ¼ mile and could threaten this site.

West Kurry Divide #3 Idaho EO #013 GIS #0491

The West Kurry Divide #3 site is found growing with hackberries in some places, which is uncharacteristic for Macfarlane's four-o'clock. This population is in the Lower West Creek pasture of the recently vacated Pittsburg Allotment. The permitted period of livestock use had been scheduled between March 20th and April 31st. Evidence of cattle impacts (trails and hoof prints from when the

soil was wet) was noted here in 1997. Yellow starthistle, an aggressive weed is known to occur within 200 meters and could threaten this site.

South Kurry Divide Idaho EO #900 GIS #1359

The South Kurry Divide population, which contains 50 ramets, is near the West Kurry Divide #1 and #2 populations. This population is not well documented and would be revisited to determine its full extent and population size. This population is in the Stonehouse pasture of the recently vacated Pittsburg Allotment, where the permitted period of livestock use had been from March 20th to April 31st. The population is reported to be in a very steep area that was isolated from cattle by rim rock. Evidence of livestock impacts have not been observed at this site.

Through a cooperative venture with the Forest Service, the Oregon Natural Heritage program modeled probable habitat for MacFarlane's four-o'clock in the HCNRA (Murray 2001). The predictive model identified 39,090 acres of habitat in the HCNRA that may support MacFarlane's four-o'clock. This model further classified MacFarlane's four-o'clock habitat into "moderate," "high," and "very high" probability ranks. The model was compared with known sites of MacFarlane's four-o'clock on the WWNF. Known sites fall within each of the probability ranks (very high: 7; high: 3; moderate: 2); however, more sites are located in very high potential habitat, consistent with the development of the model.

Thirteen percent of MacFarlane's four-o'clock potential habitat is located in active allotments or administrative horse pastures, but only 0.1% (7 acres) is classified as very high potential habitat. Nearly all very high potential habitats are located within the recently vacated Pittsburg Allotment, portions of which were inventoried for the presence of MacFarlane's four-o'clock in 1991. The Pittsburg Allotment went into vacant status in 2002.

Invasive weeds near *M. macfarlanei*

Based on current invasive weed mapping efforts (WW NF GIS database), five populations of *M. macfarlanei* are considered to be at risk from invasive species encroachment into known populations and associated habitats (Table 9). Recent visitation (5/2007) to sites located in Hells Canyon area indicate many of the sites are infested with cheat grass (*Bromus tectorum*) as well; however this invasive species is not tracked using weed mapping efforts. Additional invasive plants identified near *M. macfarlanei* sites include toadflax, rush skeletonweed, and Himalayan blackberry.

Invasive weed acres identified within modeled *M. macfarlanei* habitat are approximately 1,563 acres, 10 acres of which are located within proposed aerial sites. The invasive species consist of the above mentioned species (Table IV - 5).

Table IV - 5. *M. macfarlanei* site locations and proximity to invasive plants on the Wallow-Whitman National Forest, Hells Canyon National Recreation Area District.

State Element of Occurrence	WW GIS #	Invasive plant proximity (based on GIS mapping data)	Grazing/Rec/Roads
EO #001 (Oregon)	0207,0532-0534	Yellow Hawkweed ~ 1000ft down river	Allotment closed, roads hiking trails not considered primary dispersal vectors due to remoteness of area
EO #005 (Oregon)	13245	none	No grazing, roads or trails nearby
EO #002 (Oregon)	0495	Not known- private land	Private land
EO #003 (Oregon)	0496	Scotch thistle < 1500ft,	Active, populations partially fenced,

State Element of Occurrence	WW GIS #	Invasive plant proximity (based on GIS mapping data)	Grazing/Rec/Roads
		private nearby	powerline road dissects population.
EO #006 (Idaho)	0488	Yellow Starthistle located nearby and considered a threat. Teasel is also nearby	Vacant allotment, and roads and trails not considered to be dispersal vectors due to remoteness
EO #009 (Idaho)	0490	none	Vacant allotment and , roads hiking trails not considered primary dispersal vectors due to remoteness of area
EO #007 (Idaho)	0487	none	Vacant allotment, however unauthorized ATV use noted in old jeep road
EO #010 (Idaho)	0494	Yellow starthistle, puncture vine, Japanese knotweed, scotch thistle, purple loosestrife, common crupina, Aegilopsis, and teasle are nearby and considered a threat.	Vacant allotment, high use road nearby
EO #011 (Idaho)	0493	none	Vacant allotment, roads and trails not considered to be dispersal vectors
EO #012 (Idaho)	0492	none	Vacant allotment, roads and trails not considered to be dispersal vectors
EO #013 (Idaho)	0491	Yellow starthistle nearby and considered a threat	Vacant allotment, roads and trails not considered to be dispersal vectors
EO #900 (Idaho)	1359	none	Vacant allotment, roads and trails not considered to be dispersal vectors

Critical Habitat in the Action Area

This species does not have designated critical habitat in the action area.

Effects of the Proposed Action – MacFarlane's four-o'clock

The majority of MacFarlane's four-o'clock plants are known to occur on Forest Service land (6,000 out of 9,000 plants). A predictive model used for the Hells Canyon National Recreation Area Comprehensive management Plan determined that 39,090 acres of potential habitat also existed in the Hells Canyon National Recreation Area. Noxious weed treatment within the potential habitat was found to may affect, but was not likely to adversely affect MacFarlane's four-o'clock (USDA Forest Service, 2003). This was only for ground based treatments.

Populations in the action area are threatened by invasive plants. If invasive species treatments were found to be necessary manual, mechanical or chemical methods would be used. Choice of method would depend on the invasive species; manual methods would be the treatment of choice in most cases, except for those species where manual techniques are proven ineffective or access for manual treatments is impossible. Biological control, *Mecinus janthinus*, a stem-boring weevil, was released at Oregon EO#001 in 2004. This site is being monitored at least every two years to determine if the insect establishes a population and that damage to toadflax occurs. Monitoring results indicate that

the control agent is perpetuating, but a large colony is yet to establish. The insects have inflicted little damage to toadflax to date.

Manual – There is some risk that accidental pulling or trampling could damage individuals and injure above ground structures with little risk of individual mortality. Risks of these effects would be reduced by such techniques as flagging areas with individuals prior to treatments (as directed by Standard #20), so workers would avoid individuals.

Mechanical –Mowing or string trimming, the most likely methods used, could sever or crush plants or plant parts and would have the most potential for impact. Risks of these effects would be reduced by such techniques as flagging areas with individuals prior to treatments and careful hand pulling of invasive plants closer to the populations (as directed by Standard #20), so equipment could avoid individuals.

Chemical – Even though individual plants could be damaged or killed from the accidental application or drift of the herbicide from ground based applications, the risk of impact would be reduced with implementation of required PDF. Risk of effects could also be mitigated by such techniques as timing of application during dormancy, flagging individuals, hand pulling of invasive plants closer to the populations or through selective application such as defined spot spray, shielding spray or hand wiping(as directed under Regional Standard #20, USDA 2005) and PDF's.

Aerial herbicide application is not proposed within 1 mile of the nearest *M. macfarlanei* occurrence and no impacts to these individual are expected from aerial drift associated with aerial application. EDRR standards and all PDFs would apply to the application of herbicides on new invasive plants established in the future. EDRR does not allow the aerial application of herbicide; therefore other measures would be used to control new populations of invasive plants. Even though individual plants could be damaged or killed from the accidental application or drift of the herbicide from aerial application, the risk of impact would be minimized with implementation of required PDF's.

PDF's require surveys in unsurveyed potential habitat prior to treatment. If new occurrences are found within a treatment area, all PDF's will be applied.

Table 10. Potential effects to *M. macfarlanei* from herbicide and herbicide drift

Herbicide	Direct Effects without PDF's	Direct Effects with PDF's	Indirect Effects to *M. macfarlanei* habitat – non-target plants with PDF's
Chlorsulfuron: Selective on broadleaf weeds some and grasses. PDF's protect individual plants from direct spray, drift, runoff, wind erosion. No aerial application	Yes	Possible short-term effects	Possible short-term effects to habitat
Clopyralid: Extremely selective: Asteraceae, Fabaceae, Polygonaceae, Solanaceae families	No Nyctaginaceae is not target family	No	Possible short-term effects to grasses (habitat), but grasses are very tolerant of this herbicide
Glyphosate: Non-selective; PDFs to protect from direct spray; runoff not a concern.	Yes	Possible short-term effects	Possible short-term effects to habitat
Imazapic: Selective against some broadleaves & some grasses. PDFs to protect from direct spray, drift, runoff & timing after use of other herbicides	Yes	Possible short-term effects	Possible short-term effects to habitat
Imazapyr: Non-selective. PDFs to protect plants from direct spray, drift, runoff	Yes	Possible short-term effects	Possible short-term effects to habitat
Metsulfuron methyl: Selective for some broad-leaf and woody species; can damage conifers. PDFs to protect individual plants from direct spray, drift, runoff, wind erosion. No aerial application	Yes	Possible short-term effects	Possible short-term effects to habitat
Picloram: Selective: rate and season dependant; pre-emergent and soil active. PDFs to protect from direct spray drift, runoff; buffers; fall application by TES plants & other special situations	Yes Target Families are: Compositae, Leguminosae, Polygonaceae, and Apiaceae families. Less affected families: Brassicaceae, Liliaceae, and Scrophularaiaceae. Unknown effects assume worst case.	Possible short-term effects	Possible short-term effects to habitat
Sethoxydim: Selective for annual & perennial grasses & target invasive plants. Soil activity prevents germination of grasses. Absorbed rapidly by foliage and roots. Systemic. Broadleaf and sedges are tolerant	No. Broadleaf plants are tolerant	No	Possible short-term effects to habitat
Sulfometuron methyl: Non-selective Pre- and post-emergent. Target: annual and perennial broadleaf weeds, some grasses and some woody tree species. PDFs to protect plants from direct spray, drift, runoff, wind erosion. No aerial application	Yes	Possible short-term effects	Possible short-term effects to habitat

Short-term – 5 years or less

Herbicide Effects on Pollinators of *M. macfarlanei*

Common floral visitors to *M. macfarlanei* include bees of several genera. Although this species is self compatible, it apparently requires a vector for pollinator and is a critical factor for maintaining genetic diversity and may be a key to long-term survival of the species.

The effects of herbicides to pollinators of *M. macfarlanei* are the same as those described in the *S. spaldingii* section and very little information is available on the effect of herbicides on native pollinators. The effects of the proposed action on native pollinators is again, similar to those described for *S. spaldingii* in that 0.9% (0.16% annually) of the Wallowa Whitman National Forest land base will be treated with chemicals. It projects that herbicide use will decrease over time as current infestations are treated. EDRR to newly discovered sites allow treatment with the most effective methods, preventing establishment and expansion of new sites; however, EDRR does not allow aerial application of herbicide. The remaining Forest Service land base not treated with herbicides should provide adequate habitats for native pollinators to survive and re-establish in areas where they might be impacted. In relation to indirect impacts to *M. macfarlanei* and its habitat it is assumed that any treatment that reduces invasive plants within a native plant community will result in a positive impact on the community as the native component is restored.

Biological controls –Biological controls may move into areas where the species occurs or may be released in areas where invasive species presently co-exist (toadflax). Controls for toadflax, knapweed, or yellow starthisle would be the most likely bio-control agents to be released or found. These bio-control host species are not related to the MacFarlane's four-o'clock, and therefore no effects are expected

Summary of Effects Determinations - Treatments in the Proposed Action may affect, and are likely to adversely affect individuals. Project design features as required would reduce risk to populations from chemical treatments

Cumulative effects – Other non-federal actions reasonably certain to occur would be nearby invasive plant treatments applied on private lands If applied correctly such invasive plant treatments will benefit this species within the action area. Competition for resources would be reduced and more potential area for expansion of populations would be made available.