

**Management Plans for mardon skipper (*Polites mardon* ssp. *klamathensis*) sites on Lily Glen and Howard Prairie**



**Prepared by Rich Hatfield, Scott Hoffman Black, and  
Sarina Jepsen  
The Xerces Society for Invertebrate Conservation  
March 14, 2013**

U.S.D.A. Forest Service Region 6 and U.S.D.I. Bureau of Land Management  
Interagency Special Status and Sensitive Species Program

## Table of Contents

Section 1: Status and Threats .....	3
Background .....	3
History and Taxonomy of Mardon Skipper in Southern Oregon .....	3
Species Range, Distribution, Abundance, and Trends.....	4
Species Life History.....	4
Recent Searches for Mardon Skipper in the Southern Oregon Cascades .....	6
Status of BLM sites in the southern Oregon Cascades .....	7
Howard Prairie and Lily Glen.....	8
Threats .....	8
Small Populations .....	8
Climate Change.....	9
Threats Related to Management Activities and General Recommendations.....	9
Livestock Grazing.....	9
Forest Encroachment .....	11
Prescribed fire .....	12
Off Road Vehicles.....	14
Use of Btk .....	15
Section 2: Management Plans by Site .....	16
Site Priorities .....	16
Site Name: Howard Prairie .....	17
Site Name: Lily Glen .....	19
Literature Cited .....	23
Appendix A: Report on 2012 minimum population estimates.....	25

### **List of Maps**

Map 1: Mardon skipper ( <i>Polites mardon ssp. klamathensis</i> ) sites. ....	7
Map 2: Map of the Howard Prairie Site Complex.....	16
Map 3: Map of Howard Prairie with marked core area.....	18
Map 4: Map of Lily Glen with marked core area. ....	21

### **List of Tables**

Table 1: One day population counts at Howard Prairie and Lily Glen in 2012.....	8
Table 2: Site priority of mardon skipper sites on Hunter Creek ACEC. ....	16

## Section 1: Status and Threats

### Background

The mardon skipper, *Polites mardon* (U.S. Federal Species of Concern, Washington State Endangered Species, Global Heritage Status Rank of G2G3, United States National Heritage Status Rank of N2N3, state rank of S1 in Washington and California, and S2 in Oregon, Forest Service Region 6 Sensitive Species, and a BLM Special Status Species), is a rare butterfly in the Pacific Northwest of the United States of America. Mardon skippers are grassland and open meadow obligates endemic to the states of Washington, Oregon, and California. Historic mardon skipper ranges are not known, as historical documentation of this butterfly is scarce, with most population surveys only occurring in the past decade (Black & Vaughan 2005). Mardon skippers were likely more widespread and abundant prior to the past 150 years of human development, livestock grazing, fire suppression, and invasion of grassland habitat by native and non-native vegetation.

The mardon skipper is known from four geographic areas: (1) southern Puget Sound, (2) the east side of the Cascade Mountains (Mt. Adams area and the Okanogan-Wenatchee National Forest) in Washington, (3) the Cascade Mountains in southern Oregon, and (4) Del Norte (north-coastal) California and the southern coast of Oregon.

### History and Taxonomy of Mardon Skipper in Southern Oregon

Mardon skippers were first described by W. H. Edwards (1881) from specimens taken near Tenino, Thurston County, Washington by H. K. Morrison (Dornfeld 1980). For nearly 100 years the only known populations were in Washington State. In June 1979, Sterling and Eileen Mattoon discovered a population on High Divide Ridge in Del Norte County, California. The first confirmed records for Oregon came in the late 1980's when John Hinchliff found three male specimens in collections held at the American Museum of Natural History in New York City. These specimens were collected by W.E. Lawrence in 1931 at Lake of the Woods, Klamath County. After Hinchliff's discovery, John Vernon and Mike Richard found a population on Dead Indian Road, Jackson County in 1990. Then, in 1991, Sterling Mattoon and others working on The Xerces Society Mount Ashland butterfly count added three additional populations in Jackson County, including the Soda Mountain Road population (now called the Hobart Peak complex) that eventually became the type specimen for the subspecies *Polites mardon* ssp. *klamathensis* in 1998 (Mattoon *et al.* 1998).

There are two described subspecies of mardon skipper. Mattoon *et al.* (1998) proposed that the Oregon Cascades population be given subspecies status of *Polites mardon* ssp. *klamathensis*, and that the Washington, Northern California and Southern Oregon coast populations be given the subspecies status of *P. m. mardon*. The remainder of this review focuses on the subspecies *P. m. klamathensis*.

## Species Range, Distribution, Abundance, and Trends

All confirmed *P. m. ssp. klamathensis* populations occur in a small geographic area to the east of the city of Ashland in the Cascades of southern Oregon. All of the sites are encompassed in an area that is 18 miles from north to south and eight miles from east to west, with the southern border at Hobart Peak in the Cascade Siskiyou National Monument (See Map 1). The sites range in size from 1/3 to 13 ha (¾ to 31 acres) and are high-elevation [1,372 to 1,555 m (4,500 to 5,100 ft)] grasslands within mixed conifer forests that are associated with an ephemeral or permanent water source (Beyer & Black 2007).



Figure 1: Mardon skipper (*Polites mardon ssp. klamathensis*). Photo by Donald H. Gudehus (used with permission).

## Species Life History

*Polites mardon* are part of the grass feeding butterfly family HesperIIDae, meaning the larvae feed exclusively on graminoids. Recent studies have revealed some of the ways in which mardon skippers utilize their habitats.

*P. mardon* are univoltine, completing one life cycle annually (James & Nunnallee 2011). Individuals live between five days and two weeks. Adults do not all emerge on the same date, so the duration of flight period at a given site depends in part on the population size at that site (pers. obs.). Sites with large populations may have a flight period that extends for more than a month, whereas sites with small populations may have adults present for only ten or fewer days. Weather influences emergence and flight period duration. Wet or

cold conditions delay emergence and conversely, warm, dry conditions promote earlier emergence (Potter *et al.* 2002).

In the Oregon Cascades, adult *P. m. ssp. klamathensis* eclose from late May to early July. Adults actively nectar throughout their flight period, and seek refuge from adverse weather low in the vegetative turf under grasses and forbs. Females of *P. mardon* and *P. m. ssp. klamathensis* lay eggs singly into graminoid bunches while perched, or while hovering (Beyer & Black 2007, Beyer & Schultz 2010, Henry & Schultz 2012). Eggs are thought to hatch within seven days (Black & Vaughan 2005), and larvae feed through the late summer into the fall.



**Figure 2: Mardon skipper larva in fescue. Photograph by Loni Beyer.**

It was previously believed that pupae of *P. mardon* hibernate through the winter (Potter *et al.* 1999, Dornfeld 1980 and Newcomber 1966 in Potter *et al.* 1999), but preliminary studies of flagged mardon skipper larvae in the field by Beyer and Black (2007, See Figure 2) suggests that *P.m. klamathensis* overwinter in the larval stage. Studies from lower elevation sites in the South Puget Sound also indicate that *P. mardon* overwinters as larvae (Henry and Schultz 2012). In addition, in captive rearing studies, some mardon skippers appear to enter diapause and overwinter as larvae, although some do enter diapause as pupae in captivity (Kerwin & Huff 2011; Mary Jo Anderson, pers. comm.).

Occupancy by mardon skippers in meadow habitats is patchy; distribution is rarely homogeneous across an entire site (Beyer & Black 2007). This is likely dependent upon microclimatic conditions (e.g. Ehrlich 1992), and may be associated with palatability of the host plant due to proximity with a water source. Butterfly populations are constrained by temperature (Crozier 2003, 2004) and are restricted to especially warm macro- and

microhabitats in temperate climates (Thomas *et al.* 2001). The small tufts of vegetation and open habitat structure selected by ovipositing females are likely to correspond to the warmest locations in the prairie or meadow (Forsberg 1987, Stoutjesdijk and Barkman 1992).

Female *P. mardon* have been observed ovipositing on multiple graminoid species, indicating that the larvae may be generalists (Beyer & Schultz 2010). Although *P. mardon* do not select for specific graminoids during oviposition, they do exhibit plant specificity within localities. In Washington State, for example, *P. mardon* exhibits oviposition preferences for *Carex* spp. at one location and *Danthonia* spp. at another nearby location (Beyer & Schultz 2010). Yet, when Idaho fescue (*Festuca idahoensis*) is present in the southern Puget Trough, it is generally preferred by ovipositing females (Beyer & Schultz 2010). At the two sites studied in Oregon, California oatgrass (*Danthonia californica*) was the most frequently utilized oviposition plant, although *P. m.* ssp. *klamathensis* also fed on Roemer's fescue (*Festuca idahoensis* ssp. *roemerii*) when available (Beyer & Black 2007). Variables such as graminoid structure and tree shading also influence oviposition behavior. The degree to which these preferences are shown depends on the specific habitat available to each mardon skipper population (Beyer & Schultz 2010, Henry & Schultz 2012).

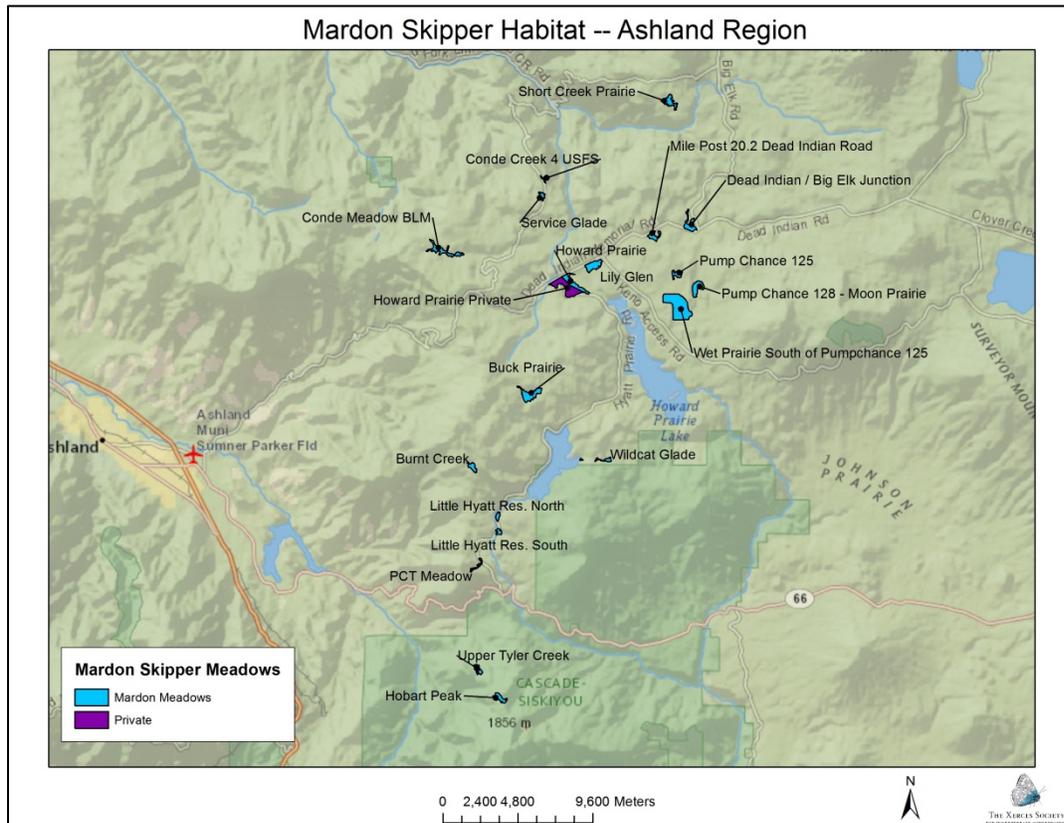
### **Recent Searches for Mardon Skipper in the Southern Oregon Cascades**

Work by The Xerces Society and others has added to our knowledge of the species distribution in southern Oregon (Vaughan & Black 2004, Black & Vaughan 2005, Ross 2005, Vaughan & Black 2005, Black 2006, Jepsen *et al.* 2007, Beyer & Black 2007, Black *et al.* 2008 a,b). Since 2004, The Xerces Society has worked with the US Forest Service and the BLM to survey over 200 potential sites in the southern Oregon Cascades. The areas surveyed are as follows:

- Ashland Resource Area, Medford District BLM;
- Klamath Falls Resource Area, Lakeview District BLM to the east side of the Cascade crest; and
- Ashland Ranger District of the Rogue River/Siskiyou National Forest north of Dead Indian Memorial Highway and around Mt. Ashland west of I-5.
- The Xerces Society completed limited surveys around Lake of the Woods on the Fremont-Winema National Forest. Xerces Staff also trained biologists on that Forest to complete a more comprehensive survey effort. To date Forest Service biologists have completed multiple surveys on the Fremont-Winema National Forest.
- At identified occupied sites the Xerces Society has completed one day population estimates at many sites in multiple years since 2005. These one day population estimates are completed as close to the peak of the adult butterfly flight period as possible. In addition, the Xerces Society completed a study to determine host plant preferences at three sites in Southern Oregon (Beyer & Black 2007).

At present, 21 confirmed current and historic sites in 13 complexes are known from Forest Service and BLM lands in the Cascade Mountains in southwestern Oregon. Of these 21 sites on public lands, 17 were found to have extant populations of mardon skippers in surveys from 2009 to 2012. Note: The number of confirmed and historic sites excludes some sites where in past years one individual was found in one survey

and subsequent surveys yielded no positive findings, as these may be errant findings and may not denote a site or population. Four known populations are located on private lands, although the status of those sites is not fully known. With over 200 potential mardon skipper sites surveyed on public lands, we believe that the vast majority of sites in the southern Oregon Cascades on public lands have been located and that subsequent searches would yield few, if any, additional sites.



Map 1: Mardon skipper (*Polites mardon ssp. klamathensis*) sites in the southern Oregon region.

### Status of BLM sites in the southern Oregon Cascades

There are fifteen sites in nine site complexes on BLM lands in the southern Oregon Cascades, which are all located in the Medford District. In 2012, no adult mardon skippers were observed at four of these sites (Conde Meadow, Hobart Peak (East), PCT – North, and the meadow SW of the PCT meadow), spanning three site complexes (Conde, Hobart Peak and PCT). No mardon skippers were found on surveys of these sites in 2010 either and it is assumed that mardon skippers have been extirpated from Wildcat glade and Conde meadows. Several mardon skippers were identified in these meadows in 2005, but none have been identified in several surveys since. Further surveys of Conde Meadow may be warranted as mardon skippers may still occur on private land close to the site (mardon skippers were observed from public land on the private property adjacent to this site in 2005, but have not resurveyed that site since). Due to construction of fences within Conde Meadow to exclude grazing in potential mardon skipper habitat, recolonization of the meadow may be possible if there are mardon skippers on the adjacent private land. The

ability of one-day counts to detect mardon skippers is particularly sensitive to reaching the site during the peak of the flight period, which can vary from site to site based on microclimatic factors. This is particularly true when trying to detect very small populations. Thus, one-day counts where no mardon skippers were observed should be interpreted with caution. Notably, in 2010, we did not find mardon skippers in the Hobart Peak (middle) site, but in 2012, we observed 6 mardon skippers at that site. The details of all one-day counts in 2012, as well as coordinates within each meadow can be found in [Appendix A](#).

## Howard Prairie and Lily Glen

The Howard Prairie Site Complex is managed by multiple agencies, and coordination between these agencies will be important for the conservation of the mardon skipper at this site complex. Howard Prairie is under the jurisdiction and generally managed by the Bureau of Reclamation; however the Bureau of Land Management manages the grazing allotment on the site (Howard Prairie Allotment). Within the site, Jackson County Parks operates and manages the Lily Glen County Park, which is primarily used for equestrian and camping activities. We monitored mardon skippers for the first time at the Howard Prairie site complex in 2012. We conducted minimum population estimates (one-day counts) on two separate days which, due to regional activity and counts at other nearby sites, we believed to be near the peak of the flight period. These estimates suggest that the population within that complex is quite large, and may be the largest population in the southern Oregon Cascades. The peak count at Howard Prairie was 116 and the peak count at Lily Glen was 221.

**Table 1: One day minimum population estimates (one-day counts) at Howard Prairie and Lily Glen in 2012.**

Management Unit	Site	Date	# Mardon 2012
<b>MU1</b>	Lily Glen	6/15/2012	203
		6/20/2012	221
	Howard Prairie	6/15/2012	15
		6/20/2012	116

## Threats

Mardon skipper populations face a variety of threats, including: issues related to small population size and stochastic events; climate change; grazing by domestic livestock; conifer, shrub, and grass encroachment; prescribed and natural fire; off road vehicle (ORV) use in meadows; recreation (including camping); and applications of Btk.

## Small Populations

Small and fragmented populations are generally at greater risk of extinction from normal population fluctuations due to predation, disease, and changing food supply; as well as, from natural disasters such as droughts (*reviewed in Shaffer 1981*). Small populations are also threatened with extinction from a loss of genetic variability and reduced fitness due to the unavoidable inbreeding that occurs in such small populations (*reviewed in Shaffer 1981*). The subspecies of mardon skipper *Polites mardon ssp. klamathensis* is known from a

total of 25 sites (4 on private land) – most separated by a distance of over two miles. During adult flight, mardon skippers avoid heavily forested habitats and are assumed to have limited dispersal abilities (Beyer & Schultz 2010; Beyer & Black 2007; Runquist 2004). Therefore, there is little opportunity for the individual populations to intermix.

## **Climate Change**

Global climate change could threaten the mardon skippers' survival. Assessment of climate change trends in North America has already revealed changes in precipitation patterns, hydrology, and plant bloom time. Overall, annual mean air temperature increased in North America from 1955-2005. The effects of global climate change are projected to include warming in the western mountains, causing snowpack and ice to melt earlier in the season (Field *et al.* 2007), which will have an impact on mardon skipper sites as all are associated with permanent, ephemeral, or subsurface water. These climatic changes may lead to drier summer conditions, particularly in arid western areas where snowmelt is important to maintaining ephemeral water sources. Spring and summer snow cover has already been documented as decreasing in the western United States, and drought has become more frequent and intense (Intergovernmental Panel on Climate Change 2007, Saunders *et al.* 2008). Because the mardon skipper is associated with wet areas, its survival may be threatened by climate change induced habitat impairments. Moreover, since fewer seedlings and saplings will die in warmer winter and spring temperatures, and models predict an increase in fall precipitation, climate change seems to improve conditions for increased shrub and tree encroachment in open meadow habitats (Widermaier & Strong 2010). Although management at the population scale cannot directly address global climate change, providing quality habitat at multiple sites across the landscape may make this species more resilient to climate change impacts.

## **Threats Related to Management Activities and General Recommendations**

Below we provide information on threats and general recommendations for managing grazing, conifer encroachment, prescribed fire, ORV use, and Btk applications. The following discussion of guidelines for management can only be understood and implemented when used in conjunction with site specific threat information that is available in Section 2. Mardon skippers persist in open prairie and meadow ecosystems. These ecosystems are naturally maintained by disturbance (Coop & Givinish 2007). Yet, a delicate balance is needed to create sufficient disturbance to restore and maintain the system without creating so much disturbance that the habitat is further degraded (Schultz & Crone 2008).

## **Livestock Grazing**

Graminoid cover, composition, and structure are important for mardon skippers (Beyer & Schultz 2010); as they provide larvae with adequate food, microclimate, and protection from predation and parasitism. Livestock grazing can adversely impact butterfly populations directly by trampling during immobile life stages (egg, larvae, pupae), or during cool temperatures when adult movement is restricted (Warren 1993). Grazing can also be detrimental to butterfly populations indirectly by altering plant community composition (Stoner & Joern 2004) and stripping habitat of vegetation, removing adult

nectar resources, introducing invasive weeds (Hayes & Holl 2003) and changing meadow hydrology (Belsky *et al.* 1999). In a study on the Dakota skipper (*Hesperia dacotae*), Dana (1997) found that grazing cattle reduced skipper numbers in direct proportion to grazing intensity. However, light-rotational grazing can maintain vegetation heights and habitat heterogeneity favorable to some butterflies (Ravenscroft 1994). For instance, the silver spotted skipper has not only shown a positive response to moderate grazing, but depends on it to maintain the structure of its host plant (Davies *et al.* 2005; Thomas & Jones 1993). In order for grazing to have a minimal impact on the mardon skipper, the combination of timing, intensity, and duration must be found that is best suited for the specific ecology of the butterfly. In some sites the correct solution may be to eliminate grazing, while in other sites some grazing at the appropriate time of the year may not negatively impact the site. The timing and frequency of livestock rotation depends on both the size of the herd and the size of the grazed area (Schtickzelle *et al.* 2007). Generally speaking, grazing periods should be short with relatively long recovery periods for the habitat, and grazing should not take place during the adult flight period since butterflies are utilizing nectar sources and looking for oviposition sites during this time.

In southern Oregon, adult mardon skippers require plentiful floral nectar for survival, successful reproduction, and adequate egg production from late-May through early July. Livestock grazing during this period reduces or altogether removes key nectar resources. Likewise, grazing when butterfly larvae are active on host plants can result in direct mortality or removal of important larval vegetation (Smallidge & Leopold 1997). In Oregon, mardon skipper larvae are believed to be active from approximately late April through October, although this window of activity varies, and is probably influenced by the microclimate of each site.

*General Recommendations (Note: See specific management plans for each site)*

- Do not allow grazing within mardon skipper habitat during the flight period of the adult mardon skipper. August 15<sup>th</sup> would be the earliest acceptable start time and ideally after October 1.
- Keep grazing periods short, with recovery periods for the habitat relatively long.



**Figure 3: Stubble height in some areas of Lily Glen County Park was very low with regions of bare soil, perhaps due to grazing, trampling, or horse browsing. Photo by Rich Hatfield.**

## Forest Encroachment

Due to the local (cluster of habitat patches) and regional (four disjunct populations in WA, OR and CA) distribution of mardon sites, there is considerable evidence that the mardon skipper exhibits metapopulation dynamics. Metapopulations are defined as regionally distributed populations that are interdependent over time. There are many models of metapopulations, but a central theme to all of them is frequent local extirpations of individual habitat patches and subsequent recolonization, or rescuing, from nearby successful populations. In order for metapopulations to survive over time, there must be some connectivity between patches of habitat. Considering changes in fire regime and land use, the connectivity of the landscape has changed significantly since 1950 (Coop & Givinish 2007; Norman & Taylor 2005). A 1995 study noted a 39% decrease in forest openings (meadow habitat) in the Klamath Mountains between 1944 and 1985 indicating significant forest encroachment in this time (Skinner 1995). Much of this forest encroachment happened along meadow connections, leading to further isolation of individual forest openings. Skinner (1995) also found that the median distance to the nearest forest break had doubled between 1944 and 1985. A similar analysis in the Oregon Cascades found that the proportion of meadows occupied by trees increased from 8% to 35% between 1950 and 2007 (Zald *et al.* 2012).

During the adult flight, mardon skippers avoid heavily forested habitats, avoid forest edges and trees during oviposition, and are assumed to have limited dispersal abilities (Beyer & Schultz 2010; Beyer & Black 2007; Runquist 2004). Large dense shrubs likely have a similar adverse impact as encroaching trees to the habitat and behaviors of this butterfly. Because of the limited dispersal abilities of mardon skippers, these changes have likely isolated remnant populations and reduced the probability of recolonization in the event of a local extirpation (Roland & Matter 2007). The lack of genetic interchange and movement of individuals between populations will likely lead to lower overall fitness and extinctions of local populations. A better understanding of the feasibility and the effects of reconnecting neighboring mardon skipper populations that have been isolated by forest and shrub encroachment is warranted (Bergman 1999; Dennis *et al.* 2006). Conifer encroachment is negatively impacting most southern Oregon Cascade sites, although some sites have higher levels of encroachment than others.



**Figure 4: Tree encroachment at Howard Prairie (left) and Lily Glen (right). Photos by Rich Hatfield**

### *General Recommendations*

In areas where tree and shrub encroachment are occurring, small trees and problematic shrubs should be removed as soon as possible, before they grow larger and reproduce. A plan should be developed that removes trees using methods that incorporate sensitivity to the butterflies' life history. Ideally, the plan would include the following:

- Remove all small trees under 4 inches Diameter at Breast Height (DBH) from the open meadow portion of the site.
- Wherever possible, cut by hand with chainsaws or handsaws.
- Remove all downed wood and branches from the meadow area.
- Take care to avoid actions that could degrade habitat and kill individual skippers as a result of heavy equipment use, people trampling meadows, scattering or piling of trees or branches in meadows, or burning of piles in or adjacent to the core area of the site.
- Maintain a buffer of large trees at the edges of meadow since they may play an important role in maintaining the microclimate and hydrology of the local habitat. If thinning is needed for fuels and/or ecosystem needs only remove small diameter trees. If additional tree removal is needed consult with someone familiar with the effects of habitat restoration, mardon skipper biology, and their distribution within the meadow.

### **Prescribed fire**

Due to the importance of fire in maintaining many native ecosystems, the use of controlled burning as a management tool has become increasingly common. The effects of fire on vegetation and vertebrate communities are more widely understood than the effects of fire on invertebrates. Fire can benefit, harm, or have no significant effect on invertebrates depending on the biology of the specific taxa (Gibson *et al.* 1992) and the intensity of the burn. Burning of meadows with populations of butterflies, such as the mardon skipper, could extirpate the population if not done with careful consideration of butterfly behavior and life stage at time of burn, and knowledge of where the skipper population is distributed across the meadow. In addition, with isolated populations, there are often no source populations available for re-colonization once a population has been locally extirpated.

A recent study on prescribed burning and the mardon skipper in California showed substantially fewer butterflies in the burned areas of meadows compared to unburned areas at one, two, and three years following the burn event (Black *et al.* 2011). Counts for all four zones across all survey dates in 2009, 2010, and 2011 showed mardon numbers that ranged from 2 to 27 times higher in unburned zones compared to burned zones on the same dates (Black *et al.* 2011).

Burning meadows that contain populations of mardon skippers may kill all butterflies within the fire area, as this species is thought to overwinter as a caterpillar at the base of its host plant, and is thus highly susceptible to ground fires.

If controlled use of fire within a mardon skipper occupied site is feasible, and there is a management goal that can be best accomplished with controlled burning, then specific steps must be employed in order to protect the mardon skipper. If prescribed burning is warranted, consult with a butterfly habitat restoration specialist, map the core area for mardon skippers, and develop a detailed burn plan for each site, specific to mardon skipper conservation.



**Figure 5: Controlled burn at a mardon skipper site in California. By Brenda Devlin**

*General Recommendations (Note: Management plans should be developed for each site before implementing a prescribed burn)*

A careful and well-researched prescribed burning regimen should provide the correct combination of timing, intensity, and size that is appropriate for the management area and will result in long-term stability of mardon skipper populations.

- Do not burn more than one-third of the core habitat in any given year, and less if possible.
- As a fire moves through an area it may leave small patches unburned. Leave these skips intact as potential micro-refuges.
- Develop a comprehensive monitoring program to accompany any plans for continuing burns to determine the immediate and long-term impacts on Mardon skipper populations. Delay additional burns until there is full re-colonization of burned areas by mardon skippers.
- While implementing a burn plan, measures must be taken to avoid actions that could degrade existing habitat and kill individual skippers, including heavy

equipment use and additional or excessive foot traffic by burn staff in mardon meadows.

- Since mardon skipper larvae are active April through October, the best time of year to conduct a burn is after October 15.



**Figure 6: Off road vehicle use to access manure pile at Lily Glen. Photo by Rich Hatfield.**

### **Off Road Vehicles**

Mardon skipper eggs, caterpillars, pupae, and adults are killed by recreational activities such as off-road vehicle (ORV) driving (Potter *et al.* 1999). These activities can also damage native host plants and may lead to an invasion of non-native plant species. ORVs aid the dispersal of invasive non-native species deep into forestlands. One study found that in just one trip on a 10 mile course, an ORV dispersed 2,000 spotted knapweed seeds (MSU 1992). In Wisconsin, a survey of seven invasive plant species along ORV routes found at least one of these (exotic) plant species on 88 percent of segments examined (Rooney 2005).

Off road vehicle use may have been one of the factors that has led to a significant decline in the mardon population at the BLM Buck Prairie site and a site on private land north of Little Hyatt Reservoir.

### *General Recommendations*

In areas with ORV traffic, close off access to mardon skipper habitat areas and providing educational signage about the detrimental impacts of this form of recreation to sensitive habitats.

## **Use of Btk**

Btk (*Bacillus thuringiensis* var. *kurstaki*), a Lepidoptera-specific insecticide, has been widely used to treat defoliators in western forests (Wagner & Miller 1995). Btk is a bacterium which, when ingested, is lethal to butterfly and moth larvae. Species such as the mardon skipper that are single-brooded with spring-active larvae that feed during the application period for the target species are especially vulnerable to Btk (Wagner & Miller 1995). Because of the mardon skipper's current patchy distribution on isolated sites and low vagility, its populations are even more threatened by Btk applications due to the decreased probability of re-colonization.

The threat of Btk is heightened because Btk has been shown to drift at toxic concentrations for distances greater than two miles from target spray areas (Barry 1993 and Whaley *et al.* 1998). As a result, aerial spraying with Btk can have significant adverse effects on mardon skippers in the general area of an aerial Btk spray project.

### *General Recommendations*

Do not spray Btk on forested areas within two miles of any mardon skipper population.

## Section 2: Management Plans by Site

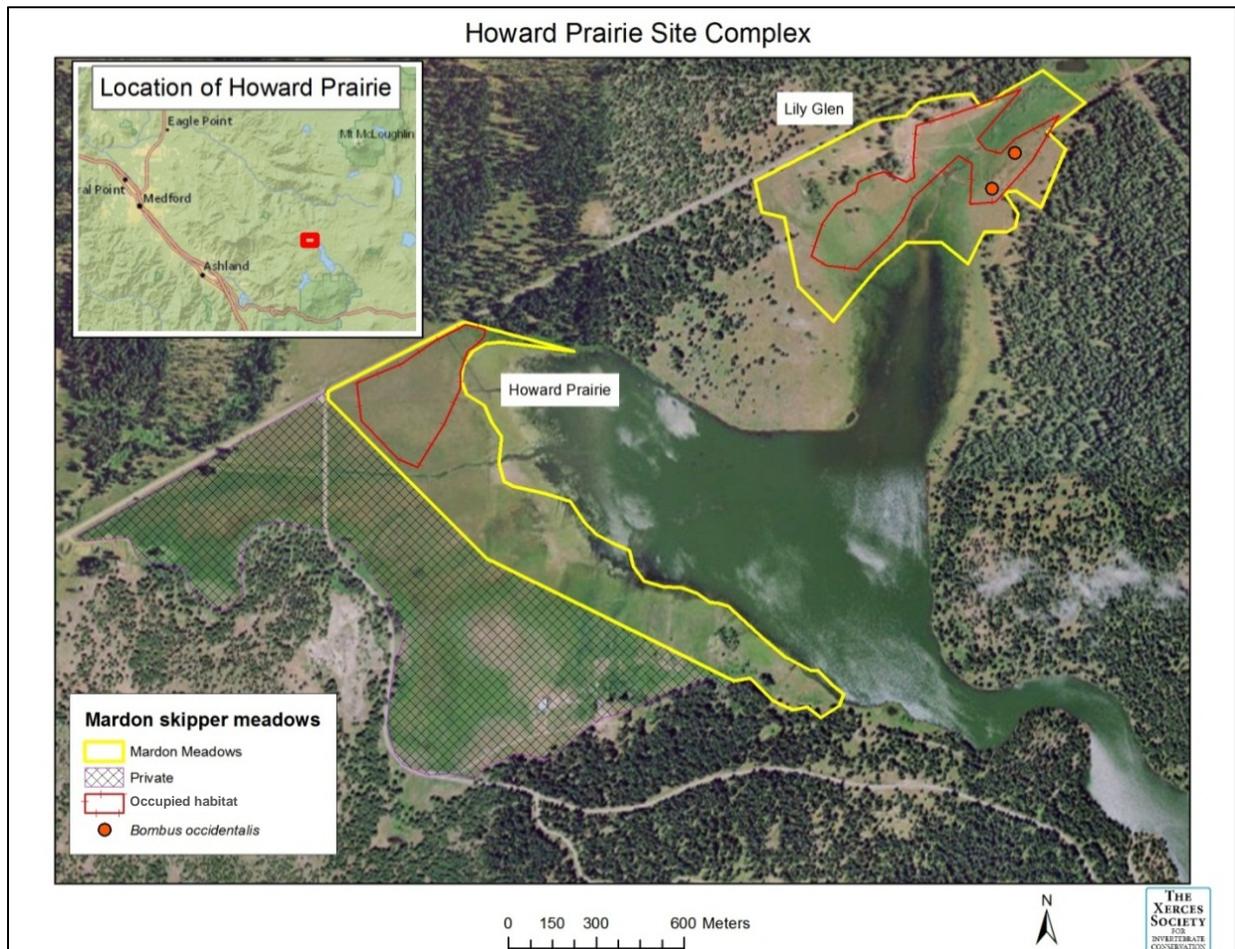
Suggested management at each site is detailed below. We did not include a no-action alternative in these plans as we believe that action at these sites will help to ensure the long-term survival of this rare butterfly.

### Site Priorities

The population at the Howard Prairie Site Complex may be the largest population in southern Oregon and both sites are considered a high priority (Table 2).

**Table 2: Site priority of mardon skipper sites at the Howard Prairie Site Complex. Sites are ranked on a scale of 1 to 4, with 1 representing the highest priority. Priority is based on population size and opportunity for management that may help populations.**

Management Unit	Site	Priority
MU1	Howard Prairie	2
	Lily Glen	1



**Map 2: Map of the Howard Prairie Site Complex.**

## **Site Name: Howard Prairie**

Coordinates (centroid of occupied area): -122.445258 W, 42.266031 N

### ***Goal of the Site Management Plan***

Sustain extant mardon skipper populations through curbing conifer encroachment and maintaining a grazing regime that takes the mardon skipper life cycle into consideration.

### ***Site Distribution, Abundance, and Trends***

Mardon skippers are distributed in small patches throughout the meadow. The area southeast of the large water trench but adjacent to private land was not searched as access was not possible without trespassing on private property, or crossing the large water trench. From afar the habitat looked similar to the occupied areas and warrants further investigation.

The population at Howard Prairie seems relatively large compared to other mardon skipper sites in the area. During the highest one day count in 2012 (the only year with a formal count), 116 mardon skippers were counted.

### ***Site Description***

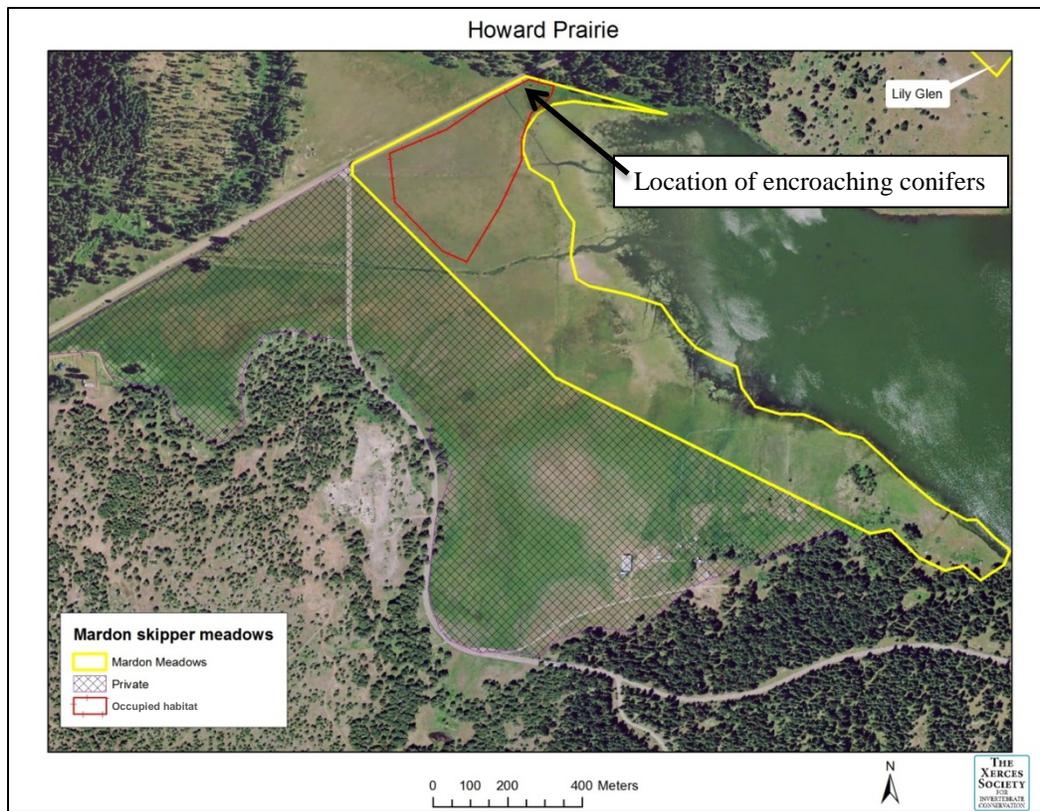
Howard Prairie is a large open meadow and much of the meadow is being utilized by mardon skippers. Two large, deep trenches carry water through the meadow, which appears to have altered the hydrology at this site from its historic condition. Whether this is a benefit or a detriment to mardon skippers is unknown, but perhaps warrants further investigation if future surveys indicate a decline in the population of mardon skippers. Because the water is confined to trenches, this site likely dries out earlier than most other sites in the region and probably has a slightly earlier flight season. There does not appear to be many sources of nectar during the adult flight season, but there are apparently plenty of host plants (such as fescue) to support what appears to be a healthy population of mardon skippers. There is an adjacent property on private land that to our knowledge has not been surveyed. As the habitat is similar, and only separated by a fence line, there are likely mardon skippers on the adjacent property as well.

### ***Site Threats***

Conifer encroachment is the main threat at this site. Conifers are encroaching in the far northern portion of the meadow, an area which also has an abundance of nectar sources (*Plectritis*, *Polygonum*, *Wyethia*) (See Map 3). Currently the timing and stocking rate of the grazing allotment appears to be compatible with the mardon skipper lifecycle; maintain low stock rates late in the year.

### ***Site Management History and Current Land Allocations***

Howard Prairie lies in the Howard Prairie grazing allotment (258 ha). Currently the allotment consists of 60 cows that graze the site from 10/16-11/15. The allotment permit was renewed in 2011 for 10 years. This area is managed by the Bureau of Reclamation (BOR), but the grazing allotment is handled by the Bureau of Land Management (BLM).



**Map 3: Map of Howard Prairie with marked area of occupancy.**



**Figure 7: Howard Prairie. Photo by Rich Hatfield.**

## *Management Needs*

### Forest Encroachment

- Remove small encroaching conifers along the NNE side of the meadow (See Map 3).
- Remove all trees under 4" Diameter at Breast Height (DBH).
- Care must be taken to avoid actions that could degrade habitat and kill individual mardon skippers as a result of heavy equipment use, people trampling meadows, piling of trees in meadows, or burning of piles in or adjacent to the mardon skipper habitat area identified on Map 3.
- Maintain a buffer of large trees at the edges of the meadow since they may play an important role in maintaining the microclimate and hydrology of the local habitat.
- If additional tree removal is desired consult with a biologist familiar with the effects of habitat restoration, mardon skipper biology, and their distribution within the meadow.

### Surveys

- Since this site has only been surveyed for one year, repeat surveys for a minimum of three consecutive years (ideally with multiple visits to the meadow within the adult flight period) to better understand the size of the population at Howard Prairie and the distribution within the site.

### Livestock Grazing

- Maintain the current grazing allotment with low stock numbers, late in the season, for a short period of time.

### **Site Name: Lily Glen**

Coordinates (centroid of occupied area): -122.429656 W, 42.270882 N

### *Goal of the Site Management Plan*

Sustain extant mardon skipper populations through curbing conifer encroachment, changing the location of the manure pile at the site, installing informative signs to ensure that recreational horses and foot traffic do not create a threat to mardon skippers, ensuring that weed free hay is used for horses, changing the stream crossing for horses and maintaining the current grazing regime.

### *The second goal is to maintain habitat for the western bumble bee*

On two separate visits (6/12/2012 and 6/15/2012) to Lily Glen we observed the western bumble bee (*Bombus occidentalis* Greene), which is a rare species that has an S1/S2 (Critically Imperiled/Imperiled) status and is considered a Sensitive Species by the US Forest Service and BLM in the state of Oregon. This indicates that this site is important for bumble bees as well as mardon skippers. The grazing regime appears to be extremely favorable to both the mardon skipper and the western bumble bee, with low stock numbers on the land for a short period of time, late in the season. This grazing regime allows both bumble bees and mardon skippers to safely complete their life-cycle, while still maintaining the open meadow conditions necessary for both of these species.

### *Site Distribution, Abundance, and Trends*

Mardon skippers are widely distributed throughout the Lily Glen site. Since this site was only discovered in 2012, detecting trends is not possible, but the population at this site appears to be quite large. A one-day count in 2012 indicated that the minimum population size at this site is 221. In the area of the meadow east of the parking area, mardon skippers were located on both sides of the stream, but avoided the areas closest to the stream and were found a bit upland where there is shorter stature grasses and suitable host plants. Mardon skippers were also found in the large meadow southwest of the parking/camping area. Throughout the site there are abundant host plants and nectar sources available during the adult flight period.

### *Site Description*

Lily glen is a large meadow with a permanent stream that bisects the site from NE to SW. The stream flows into the Howard Prairie Reservoir, which is also present on the site at the far SW portion of the meadow. The area closest to the stream has tall stature grasses and is not ideal habitat for mardon skippers. There is also vernal pool habitat on the east side of the stream. In these areas there was abundant *Plectritis congesta* as well as sporadic mardon skippers. Most of the remainder of the meadow is a mix of fescue, bare ground and a mix of forbs. Generally the habitat appears to be suitable for mardon skippers, which were found throughout much of the site (see Map 4). A wide range of recreational activities occur on this meadow (camping, horse riding, etc.) and there are signs of this activity throughout the site with trails, horse crossings of the stream, and manure piles. This site has one of the largest populations of mardon skippers in southern Oregon, yet sees high levels of use by recreationalists. Because of this, and the fact that the western bumble bee (another sensitive species) is present, this site is a high priority for conservation action and monitoring.

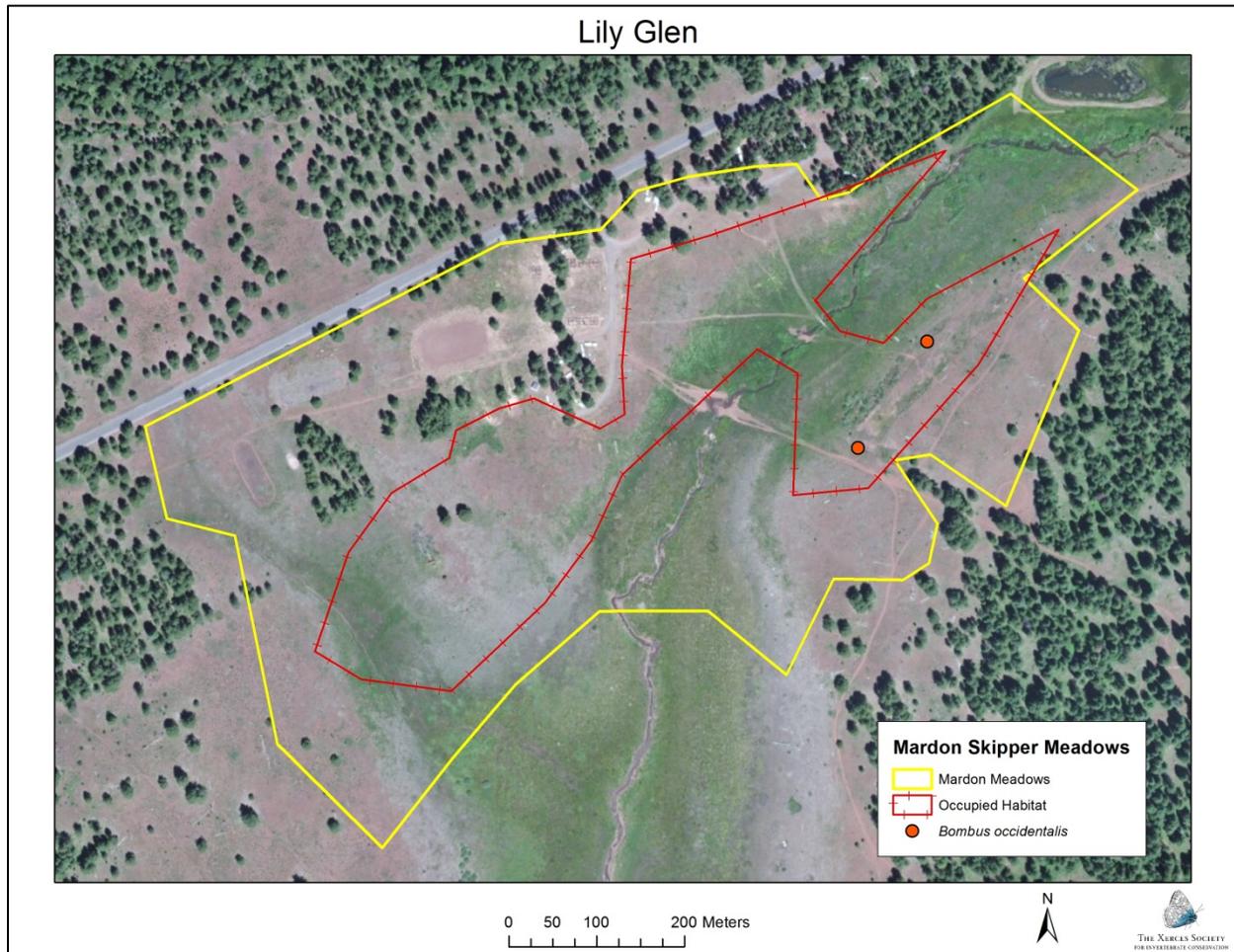


**Figure 8: Lily Glen looking E (left) and SE (right) from parking area. Photos by Rich Hatfield.**

### *Site Threats*

The biggest threat at this site is recreational use by people and horses. There is a manure pile placed directly in the middle of mardon skipper habitat. Because of this placement, there are often vehicles driving through the meadow creating both direct and indirect threats to mardon skippers. The area adjacent to the campground and the staging area for

the horses also had low stubble height, with many areas of bare ground (Figure 3 and 8). Forest encroachment is also a threat at this site.



Map 4: Map of Lily Glen with marked occupied area.

### *Site Management History and Current Land Allocations*

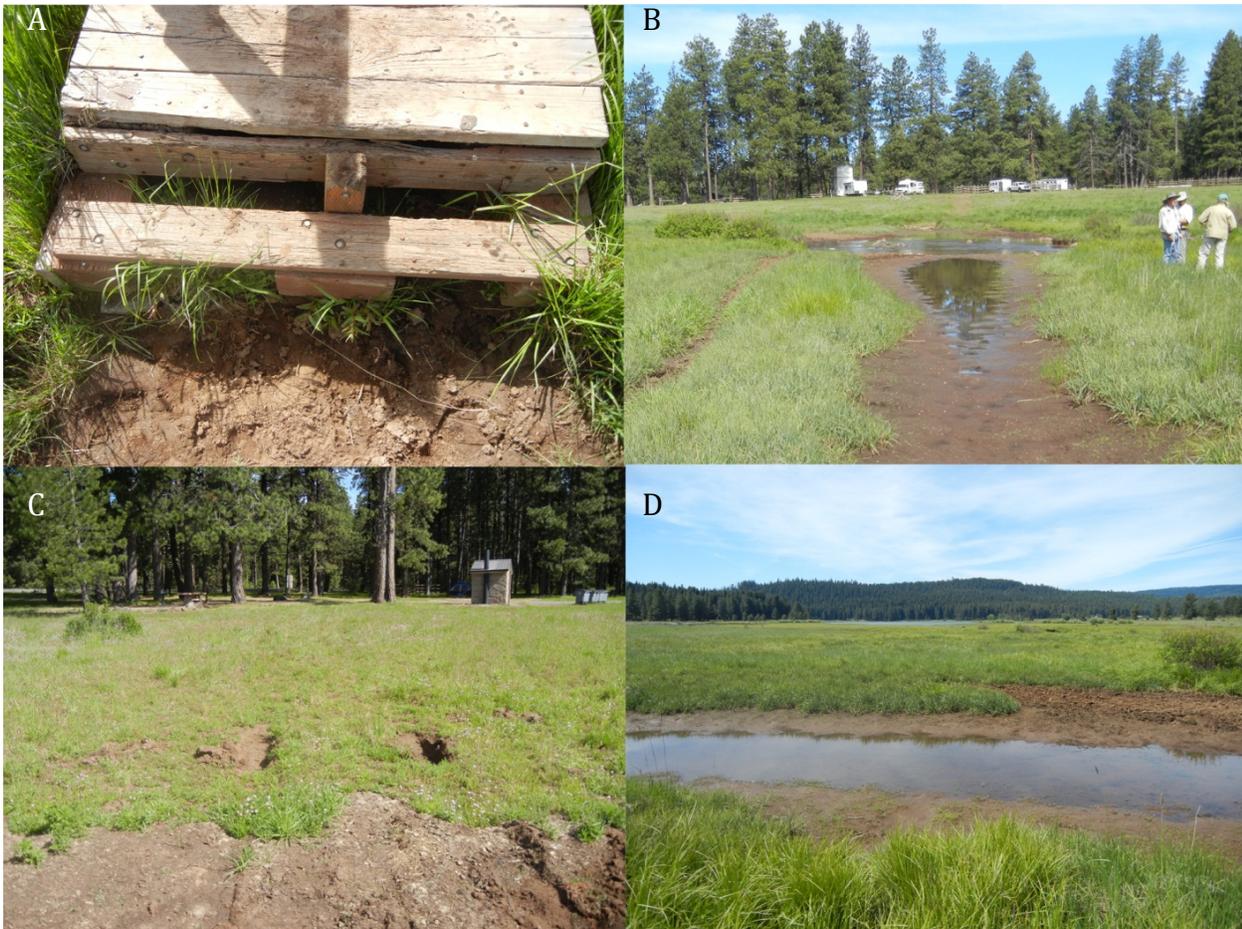
Howard Prairie lies in the Howard Prairie grazing allotment (258 ha). Currently the allotment consists of 60 cows from 10/16-11/15. The allotment permit was renewed in 2011 for 10 years. This area is owned by the Bureau of Reclamation (BOR), but the grazing allotment is managed by the Bureau of Land Management (BLM). Lily Glen County Park is also onsite and managed and maintained by Jackson County Parks.

### *Management Needs*

#### Recreation

- Do not allow camping in the mardon skipper occupied area marked in map 4.
- Install a hard crossing in the creek bottom for horses to stabilize stream channel and direct horse traffic to one crossing.
- Install a sign to direct all horses to the hard bottom crossing and pedestrians to the bridge.

- Close the smaller horse crossing near the bridge and place signs to direct horse traffic to the hard bottom crossing.
- Ensure that only Certified Weed Free Hay is used on site.



**Figure 9: Recreational issues that could be mediated with management. A) Horse bridge, with gaps too large to allow safe crossing for horses. Ideally, this bridge would be closed to horse traffic and signed to direct only foot traffic to the bridge; B) the high traffic at the main horse crossing has led to erosion and degradation of habitat. Install a hard bottom crossing and a sign to direct horses to cross only there; C) tire tracks leading to the manure pile through mardon skipper habitat. Ideally the manure pile would be moved; D) close smaller horse crossing (near bridge) to horse traffic.**

### Forest Encroachment

- Remove all trees in the open area of the meadow and along the forested edges of the meadow under 4" Diameter at Breast Height (DBH).
- Care must be taken to avoid actions that could degrade habitat and kill individual mardon skippers as a result of heavy equipment use, people trampling meadows, piling of trees in meadows, or burning of piles in or adjacent to the mardon skipper habitat area identified on Map 4.
- Maintain a buffer of large trees at the edges of meadow since they may play an important role in maintaining the microclimate and hydrology of the local habitat.

- If additional tree removal is desired consult with someone familiar with the effects of habitat restoration, mardon skipper biology, and their distribution within the meadow.

### Surveys

- Since this site has only been surveyed for one year, repeat surveys for a minimum of three consecutive years (ideally with multiple visits to the meadow within the adult flight period) to better understand the size of the population at Lily Glen and the distribution within the site.
- Also repeat surveys for the western bumble bee for at least three years to determine if there is a stable population at this site. Since only queen bumble bees are active during the mardon skipper flight season, ideally surveys would be conducted later in the season when workers are active and bumble bee abundance would be higher. Before surveys are conducted, consult with a bumble bee expert to determine the best methodology and most appropriate timing for surveys.

### Off Road Vehicles (ORVs)

- Move the manure pile outside of the mardon skipper occupied area and prevent vehicles from driving in the meadow, either with signage, or using a physical barrier (fence, boulders, logs, etc.).

### Livestock Grazing

- Maintain the current grazing allotment with low stock numbers, late in the season, for a short period of time.

## Literature Cited

- Barry, J. W. 1993. Predicting and measuring drift of *Bacillus thuringiensis* sprays. *Environmental Toxicology and Chemistry* 12:1977-1989.
- Belsky, A.; Matzke, A. & Uselman, S. *Survey of livestock influences on stream and riparian ecosystems in the western United States*. Journal of Soil and water Conservation, Soil and Water Conservation Society, 1999, 54, 419-431.
- Bergman, K. O. 1999. Habitat utilization by *Lopinga achine* (Nymphalidae : Satrinae) larvae and ovipositing females: implications for conservation. *Biological Conservation* 88: 69-74.
- Beyer, L. and S. H. Black. 2007. Site Utilization by Adults and Larvae of Mardon Skipper Butterfly (*Polites mardon*) at four sites in Washington and Oregon. Final Report to the Forest Service and BLM from The Xerces Society. Portland, OR: The Xerces Society.
- Beyer, L. and C. Schultz. 2010. Oviposition selection by a rare grass skipper *Polites mardon* in montane habitats: advancing ecological understanding for developing conservation strategies. *Biological Conservation* 143: 862-872.
- Black, S. H. 2006. Report to U.S. Forest Service: Xerces Society Surveys for *Polites mardon* in the Rogue River National Forest in Southern Oregon (Summer 2006). Portland, OR: The Xerces Society.
- Black, S. H., Jepsen, S. and L. Lauvray. 2008. Report to the U.S. Fish and Wildlife Service, Surveys for *Polites mardon* in Del Norte County of Northern California. Portland, OR: The Xerces Society.
- Black, S. H., Jepsen, S. and L. Lauvray. 2008. Report: Xerces Society *Polites mardon* surveys in southern Oregon's Mt. Ashland area (Summer 2008). Portland, OR: The Xerces Society.
- Black, S.H., C. Mazzacano and M. Blackburn. 2011. Report to the U.S. Forest Service, Oregon Zoo, and U.S. Fish and Wildlife Service: Summary of Mardon Skipper Coon Mountain Burn Site Occupancy Study Data from 2009, 2010, and 2011, Xerces Society, November 2011.

- Black, S. H. and M. Vaughan. 2005. Mardon Skipper (*Polites mardon klamathensis*) Site Locations in Southern Oregon: Status of Our Knowledge. November 2005. Portland, OR: The Xerces Society.
- Coop, J. D., and T. J. Givinish. 2007. Spatial and temporal patterns of recent forest encroachment in monane grasslands of the Valles Caldera, New Mexico, USA. *Journal of Biogeography* 34: 914-927.
- Crozier L (2003) Winter warming facilitates range expansion: cold tolerance of the butterfly *Atalopedes campestris*. *Oecologia* 135:648-656
- Crozier L (2004) Warmer winters drive butterfly range expansion by increasing survivorship. *Ecology* 85:231-241
- Dana, R. 1997. Characterization of three Dakota skipper sites in Minnesota, a report prepared for the U. S. Fish and Wildlife Service. Minnesota Department of Natural Resources.
- Davies, Z. G., R. J. Wilson, T. M. Brereton, and C. D. Thomas. 2005. The re-expansion and improving status of the silver-spotted skipper butterfly (*Hesperia comma*) in Britain: a metapopulation success story. *Biological Conservation* 124:189-198.
- Dennis, R. L. H., T. G. Shreeve, and H. Van Dyck. 2006. Habitats and resources: The need for a resource-based definition to conserve butterflies. *Biodiversity and Conservation* 15:1943-1966.
- Dornfeld, E. J. 1980. *The butterflies of Oregon*. 276 pp. Forest Grove: Timber Press. Timber Press, Forest Grove, Oregon. 276 pp.
- Ehrlich, P. R. 1992. Population Biology of Checkerspot Butterflies and the Preservation of Global Biodiversity. *Oikos* 63: 6-12.
- Field, C. B., L. D. Mortsch, M. Brklacich, D.L. Forbes, P. Kovacs, J.A. Patz, S.W. Running, and M.J. Scott. 2007. Chapter 14: North America. In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by M. L. Parry, O. F. Canziani, J. P. Palutikof, and C. E. Hanson. Cambridge: Cambridge University Press. Available at: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter14.pdf>, accessed 18 May, 2012.
- Forsberg J (1987) Size discrimination among conspecific hostplants in two Pierid butterflies: *Pieris napi* L. and *Pontia daplidice* L. *Oecologia* 72:52-57
- Gibson, C. D., V. K. Brown, L. Losito, and G. C. McGavin. 1992. The Response of Invertebrate Assemblies to Grazing. *Ecography* 15: 166-76.
- Hayes, G. F., and K. D. Holl. 2003. Cattle grazing impacts on annual forbs and vegetation composition of mesic grasslands in California. *Conservation Biology* 17:1694-1702.
- Henry, E.H. and C.B. Schultz. 2012. A first step towards successful conservation: understanding local oviposition site selection of an imperiled butterfly, mardon skipper. *Journal of Insect Conservation DOI 10.1007/s10841-012-9496-x*.
- Intergovernmental Panel on Climate Change. 2007. Summary for Policymakers. In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M. L. Parry, O. F. Canziani, J. P. Palutik, P.J. Van der Linden, and C. E. Hanson, Cambridge: Cambridge University Press. Available at: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf>, accessed 18 May, 2012.
- James, D.G., D. Nunnallee. 2011. *Life Histories of Cascadia Butterflies*. Oregon State University Press.
- Jepsen, S., S. H. Black, and L. Lauvray. 2007. Report: Xerces Society *Polites mardon* surveys in southern Oregon (Summer 2007). Portland, OR: The Xerces Society.
- Kerwin, A. E., and R. Huff. 2011. Conservation assessment for the mardon skipper (*Polites mardon*).
- Mattoon, S. O., J. F. Emmel, and T. C. Emmel. 1998. The Distribution of *Polites mardon* (Lepidoptera: HesperIIDae) in North America, and Description of a New Subspecies from Southern Oregon. *Systematics of Western North American Butterflies*. Pp. 767-774.
- MSU (Montana State University, Extension Service). 1992. Controlling Knapweed on Montana Rangeland. Circular 311, February 1992.
- Norman, S. P., and A. H. Taylor. 2005. Pine forest expansion along a forest-meadow ecotone in northeastern California, USA. *Forest Ecology and Management* 215:51-68.
- Potter, A., J. Fleckenstein, S. Richardson, and D. Hays. 1999. Washington State Status Report for the Mardon Skipper. Olympia, WA: Washington Department of Fish and Wildlife.
- Potter, A., J. Fleckenstein, and J. Feen. 2002. Mardon Skipper Range and Distribution in Washington in Relation to State and Federal Highways with a Habitat Description and Survey Method Guidelines, Final Report to Washington Department of Transportation.

- Ravenscroft, N.O.M. 1994. The Ecology of the Chequered skipper butterfly *Carterocephalus palaemon* Pallas in Scotland .1: Microhabitat. *Journal of Applied Ecology* 31:613-622.
- Roland, J., and S. F. Matter. 2007. Encroaching forests decouple alpine butterfly population dynamics. *Proceedings of the National Academy of Sciences* 104:13702-13704.
- Rooney, T. P. 2005. Distribution of ecologically-invasive plants along off-road vehicle trails in the Chequamegon National Forest, Wisconsin. *The Michigan Botanist* 44:178-182.
- Ross, D. 2005. Surveys for Mardon skipper on Public Lands in Southern Oregon. Report submitted to the US Fish and Wildlife Service and The Xerces Society. The Xerces Society. Portland, Oregon.
- Runquist, E. 2004. Unpublished Report and presentation. Workshop on the ecology and status of the mardon skipper (*Polites mardon*) An unusual Pacific Northwest butterfly. Ashland, Oregon.
- Saunders, S., C. Montgomery, and T. Easley. 2008. Hotter and drier: the West's changed climate. Prepared for The Rocky Mountain Climate Organization and Natural Resources Defense Council. 64 pp [online] URL: <http://www.nrdc.org/globalWarming/west/west.pdf>, accessed 18 May, 2012.
- Shaffer, M. L. 1981. Minimum Population Sizes for Species Conservation. *BioScience* 31:131-134.
- Schtickzelle, N., C. Turlure, and M. Baguette. 2007. Grazing management impacts on the viability of the threatened bog fritillary butterfly *Proclissiana eunomia*. *Biological Conservation* 136:651-660.
- Schultz, C. B., and E. E. Crone. 2008. Note: Using ecological theory to advance butterfly conservation. *Israel Journal of Ecology & Evolution* 54:63-68.
- Skinner, C.N. 1995. Change in spatial characteristics of forest openings in the Klamath Mountains of northwestern California, USA. *Journal of Landscape Ecology* 10(4):219-228.
- Smallidge, P. J., and D. J. Leopold. 1997. Vegetation management for the maintenance and conservation of butterfly habitats in temperate human-dominated habitats. *Landscape and Urban Planning* 38:259-280.
- Stoner, K. J. L., and A. Joern. 2004. Landscape vs. local habitat scale influences to insect communities from tallgrass prairie remnants. *Ecological Applications* 14:1306-1320.
- Stoutjesdijk P, Barkman JJ (1992) Microclimate, vegetation and fauna. Opulus Press AB, Knivsta.
- Thomas, C. D., and T. M. Jones. 1993. Partial recovery of a skipper butterfly (*Hesperia comma*) from population refuges- lessons for conservation in a fragmented landscape. *Journal of Animal Ecology* 62:472-481.
- Thomas CD, Bodsworth EJ, Wilson RJ, Simmons MT, Davies ZG, Musche M, Conradt L (2001) Ecological and evolutionary processes at expanding range margins. *Nature* 411:577-581
- USDA, NRCS. 2004. The PLANTS Database, Version 3.5 (<http://plants.usda.gov>). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.
- Vaughan, D. M., and S. H. Black 2005. Report: Xerces Society Surveys for *Polites mardon* in the Rogue River National Forest (Summer 2005). Portland, OR: The Xerces Society.
- Vaughan, D.M. and S.H. Black. 2004. Report on Xerces Society Search and Monitoring for *Polites mardon* in Southern Oregon, June 22, 2004. Portland, OR: The Xerces Society.
- Wagner, D., and J. C. Miller. 1995. Must butterflies die for the gypsy moth's sins? *American Butterflies* 3:19-23.
- Warren, M. S. 1993. A review of butterfly conservation in central southern Britain: II. Site management and habitat selection of key species. *Biological Conservation* 64:37-49.
- Whaley, W. H., J. Arnold, and B. G. Schaaleje. 1998. Canyon drift and dispersion of *Bacillus thuringiensis* and its effects on selected nontarget lepidopterans in Utah. *Environmental Entomology* 27:539-548.
- Widenmaier, Kerri J. and Wayne L. Strong. 2010. [Tree and forest encroachment into fescue grasslands on the Cypress Hills plateau, southeast Alberta, Canada](#). *Forest Ecology and Management*, 259: 10, 30 April 2010, 1870-1879.
- Zald, H. S. J., T. A. Spies, M. Huso, and D. Gatzliolis. 2012. Climatic, landform, microtopographic, and overstory canopy controls of tree invasion in a subalpine meadow landscape, Oregon Cascades, USA. *Landscape Ecology*:1-16.

**Appendix A: Report on 2012 minimum population estimates (one-day counts) at BLM sites in the Southern Oregon Cascades.**

<b>Site Name</b>	<b>Complex</b>	<b># Mardon</b>	<b>Lat</b>	<b>Long</b>	<b>Date</b>	<b>Year</b>
Buck Prairie	Buck Prairie	7	42.21783316	-122.4720378	21-Jun	2012
Burnt Creek	Burnt Creek	0	42.18542275	-122.5017167	12-Jun	2012
Burnt Creek	Burnt Creek	2	42.18542275	-122.5017167	19-Jun	2012
Conde meadow	Conde	0	42.27766614	-122.5196363	13-Jun	2012
Hobart Peak (East)	Hobart	0	42.08567638	-122.4815387	19-Jun	2012
Hobart Peak (Middle)	Hobart	1	42.08663336	-122.4848088	19-Jun	2012
Hobart Peak (West)	Hobart	6	42.08520153	-122.4822781	19-Jun	2012
Howard Prairie	HP/LG	15	42.266031	-122.445258	15-Jun	2012
Howard Prairie	HP/LG	116	42.266031	-122.445258	20-Jun	2012
Lily Glen	HP/LG	31	42.270882	-122.429656	12-Jun	2012
Lily Glen	HP/LG	203	42.270882	-122.429656	15-Jun	2012
Lily Glen	HP/LG	221	42.270882	-122.429656	20-Jun	2012
Little Hyatt Reservoir South	Little Hyatt	0	42.15810168	-122.4852594	12-Jun	2012
Little Hyatt Reservoir South	Little Hyatt	4	42.15810168	-122.4852594	19-Jun	2012
MP 20.2 Dead Indian Road	MP 20.2	43	42.285116	-122.393211	21-Jun	2012
MP 20.2 Dead Indian Road	MP 20.2	43	42.285116	-122.393211	21-Jun	2012
Meadow Southwest of PCT Meadow South	PCT	0	42.14168053	-122.4998949	19-Jun	2012
PCT Meadow N - BLM	PCT	0	42.14523599	-122.4957378	19-Jun	2012
PCT Meadow S - BLM	PCT	0	42.14334886	-122.4964489	12-Jun	2012
PCT Meadow S - BLM	PCT	8	42.14334886	-122.4964489	19-Jun	2012
Pumpchance 125	Pumpchance	77	42.26715513	-122.3833499	12-Jun	2012
Pumpchance 128 - Moon Prairie	Pumpchance	0	42.26200174	-122.3722004	14-Jun	2012
Pumpchance 128 - Moon Prairie	Pumpchance	50	42.26200174	-122.3722004	21-Jun	2012