Mardon Skipper (*Polites mardon*) Management Plan

Windy Valley Meadow

Rogue River-Siskiyou National Forest, Gold Beach Ranger District

Photo by Dana Ross

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1. MARDON SKIPPER STATUS AND LIFE HISTORY

Much of the information in section 1 was taken from management plans for southern Oregon Cascade mardon skipper sites on the Rogue River-Siskiyou National Forest, High Cascades Ranger District (Black *et al.* 2013).

History and Taxonomy of the Mardon Skipper

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 and Oregon BLM Sensitive Species) is a rare butterfly known to occur in four disjunct areas in the Pacific Northwest of the United States of America: (1) southern Puget Sound, (2) the east side of the Cascade Mountains (Mt. Adams area and the Wenatchee National Forest Washington), (3) the Cascade Mountains in southern Oregon, and (4) Del Norte (north-coastal) California and the southern coast of Oregon.

Mardon skippers are strongly associated with grasslands and open meadows endemic to the geographic areas they occupy. 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 and Vaughan 2005).

It is suggested that mardon skippers are an ancient species with wing morphology not adapted for long-distance dispersal. Therefore, in the scale of geologic time, this species was likely more widespread and abundant under more contiguous habitat conditions that have become relict over time (Runquist 2004). In the past 150 years, human development, livestock grazing, fire suppression, invasion of grassland habitat by native and non-native vegetation and damage to habitat by motor vehicle use have further diminished habitat for this species.

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 and Northern California populations be given the subspecies status of *P. m.* ssp. *mardon*. The coastal Oregon population's subspecies has not been determined, but it is most likely associated with the Del Norte population of Northern California. However *P. m.* ssp. *mardon* from Del Norte County populations have not yet been carefully compared to series of typical *P. m.* ssp. *mardon* from Washington and the use of the name *P. m.* ssp. *mardon* for Californian and southern Oregon coastal populations should be considered tentative (Warren 2005).

Coastal Oregon mardon skipper populations are closely associated with serpentine based soils that include plentiful bunchgrasses and varied nectar sources. Specimens of *Polites mardon* from coastal Oregon were first discovered at The McGuire Center for Lepidoptera and Biodiversity (Gainesville, Florida) by Andrew Warren with the label data "2 miles N of Gold Beach", suggesting the locality of collection to be the serpentine-bunchgrass hillsides to the north of the Rogue River near Wedderburn. In 2007 Dana Ross found a single male mardon skipper at the base of a bunchgrass hillside at Lone Ranch State Beach near Cape Ferrelo. The following year, in 2008, Dana Ross discovered a larger population at the Hunter Creek ACEC. In 2009, Dana Ross observed a single male in a small moist meadow at a new location on the Rogue River-Siskiyou National Forest (Road #100 Meadow). In 2010, Dana Ross discovered two additional populations on the Rogue River-Siskiyou National Forest, one in the Signal Buttes meadows adjacent to the Hunter Creek ACEC, and the other site in the Windy Valley Meadow (See Map 1).

Aside from the single sighting near Cape Ferrelo, all confirmed coastal *Polites mardon* populations occur in a small geographic area to the east of the city of Gold Beach in the coast range of southwestern Oregon. All of the sites are encompassed in an area that is approximately 12 miles (N-S) by 12 miles (E-W) (see map 1). All of the sites are relatively small [1 to 10 ha (2.5 to 25 ac)] and between the elevations of 595 and 900 m (1,952 to 2,952 ft).

Species Life History

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

Females lay eggs singly into graminoid bunches while perched (Beyer and Black 2007, Beyer and Schultz 2010). Female mardon skippers have been observed ovipositing on multiple graminoid species, indicating that the larvae may be generalists (Beyer and Schultz, 2010). Although mardon skippers do not generally select for specific graminoids during oviposition, they do exhibit plant preferences within localities. In Washington State, for example, the mardon skipper exhibits oviposition preferences for *Carex* spp. at one location and *Danthonia* spp. at another nearby location. Yet, when Idaho fescue (*Festuca idahoensis)* is present, it is generally preferred by ovipositing females (Beyer and Schultz 2010). At the two sites studied in Oregon, California oatgrass (*Danthonia californica*) was the most frequently utilized oviposition plant, although mardon skippers also fed on Roemer's fescue (*Festuca idahoensis* spp. *roemeri*) when available (Beyer and 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 and Schultz 2010). Eggs are thought to hatch within seven days (Black and Vaughan 2005), and larvae feed through the late summer into the fall.

It was previously believed that pupae hibernate through the winter (Potter *et al.* 1999, Dornfeld 1980 and Newcomber 1966 in Potter *et al*. 1999), but two studies have found larvae in the field late in the fall (October - November) and even in February (Beyer and Black 2007, Henry 2009).

Mardon skippers are univoltine, completing one life cycle annually. Individuals live between five days and two weeks. Adults typically emerge between May and July and 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. 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 ten days or less. 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). Adults actively nectar throughout their flight period, and seek refuge from adverse weather low in the vegetative turf under grasses and forbs.

Habitat Requirements

Mardon skipper habitat requirements include the larval host plants (grasses and sedges), nectar sources (flowers) for adults, and sites of adequate size and conditions to support successful reproduction and survival (USDI Fish and Wildlife Service 2012). Grassy meadow patches of at least 0.5 acre in size are capable of supporting small populations, however most large populations occur in forest-meadow or grassland complexes that provide connectivity between occupied sites (USDI Fish and Wildlife Service 2012). Mardon skippers generally disperse up to 0.25 miles and usually within their natal meadow complexes (Runquist 2004). They have not been observed flying through closed-canopy forest, but have been observed along open corridors such as powerlines or roads with nectar sources (Potter and Fleckenstein 2002).

Occupancy by mardon skippers in meadow habitats is patchy; distribution is rarely homogeneous across an entire site (Beyer and Black 2007). This is likely dependent upon microclimatic conditions (Ehrlich 1992), and may be associated with palatability of the host plant due to proximity with a water source.

2. WINDY VALLEY SITE DESCRIPTION AND SURVEY HISTORY

Site Description

The Windy Valley site is located on National Forest lands approximately 15 miles east of Cape Sebastian on the Oregon coast and is administered by the Gold Beach Ranger District of the Rogue River-Siskiyou National Forest. It is approximately a 2 mile hike to the meadow on a trail. The main meadow is approximately 13 acres but 3 acres in the northeast portion of the meadow are where the largest numbers of mardon skippers have been observed. Windy Creek, a perennial stream, runs along the east boundary of the meadow and crosses the southern end; a tributary perennial runs along the west boundary of the meadow. Much of the meadow is wetter than the area occupied by mardon skippers which is drier with small swales (Figure 1).

Figure 1. Windy Valley Meadow Mardon Skipper Site.

Photo by: Jessie Dubuque, 2014

Plant Species

A comprehensive list of plant species in Windy Valley meadow is provided in Appendix B. *Danthonia californica* is present mostly along the drier eastern side of the meadow.

Mardon skippers in the meadow have been observed nectaring on the following species:

- Achillea millefolium – common yarrow
- Aster sp.
- Camassia quamash – common camas
- Festuca occidentalis – western fescue
- Leucanthemum vulgare – oxeye daisy
- Lotus sp.
- Potentilla gracilis var. gracilis – graceful cinquefoil
- Ranunculus occidentalis – western buttercup
- Trifolium longipes var. elmeri – Elmer's clover
- Vicia sp. – vetch
- Viola adunca – hookedspur violet
- Viola glabella – pioneer violet

The forest surrounding Windy Valley meadow is primarily Douglas-fir (*Pseudotsuga menziesii*) and incense cedar (*Calocedrus decurrens*).

Soils

According to soil mapping available online from the USDA Natural Resources Conservation Service (NRCS) and soil analysis for the site by Lily Miller (Appendix A), the site is largely one soil type: Frigid Aquic Haplohumults (7D). This soil type has slow permeability and a water table within 2 feet of the surface. It is mapped on only 105 of over 1 million acres in Curry County. Miller (2014) compared Windy Valley meadow to Snow Camp meadow in the same vicinity also with Frigid Aquic Haplohumults soil and the presence of *Danthonia californica,* however no mardon skippers have been detected there. Miller hypothesizes that a higher level of soil disturbance at Snow Camp meadow from road construction and fire suppression activities and the influence of three separate types of surrounding serpentinite and peridotite soils (which lack calcium and are toxic with high levels of magnesium, nickel and chromium), may render the habitat less suitable than Windy Valley which has much less human disturbance and soil influenced by only one serpentine soil type (Miller 2014). Figures 2 and 3 display the meadow from 1940 and 2012 air photos.

Figure 2. Windy Valley meadow air photo 13 August, 1940.

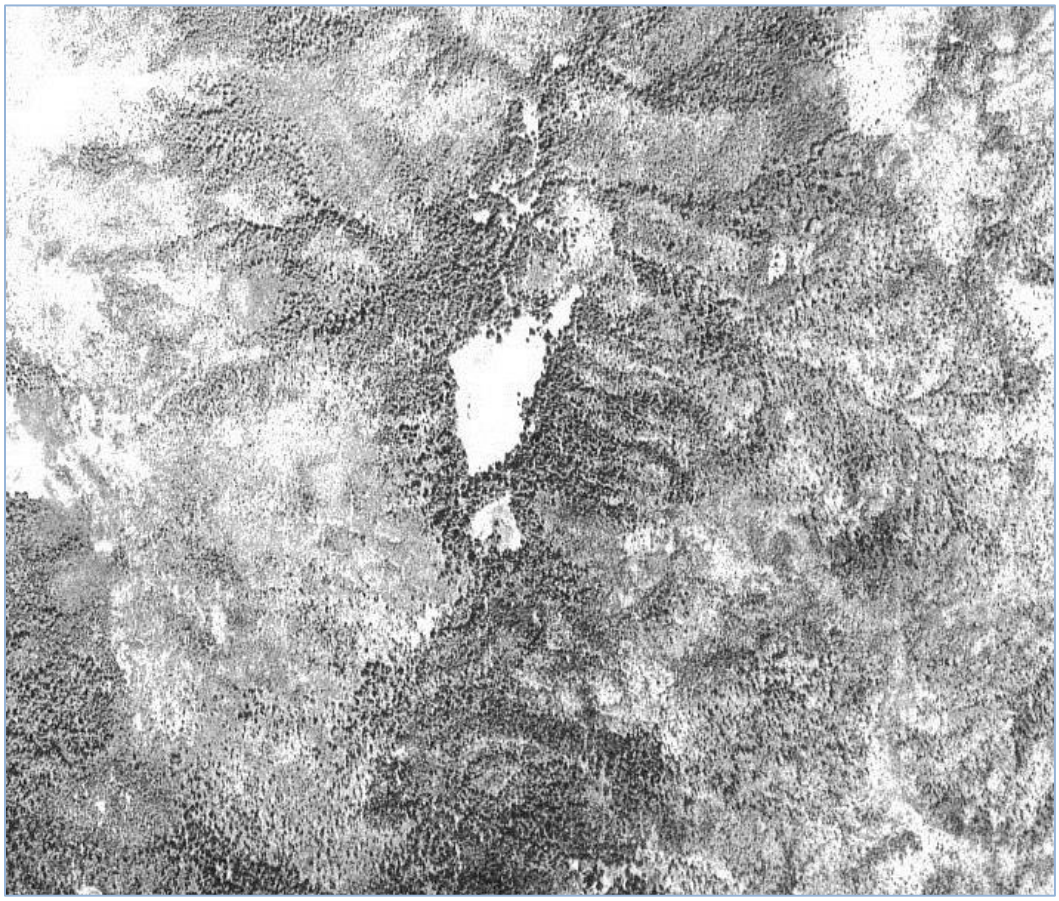
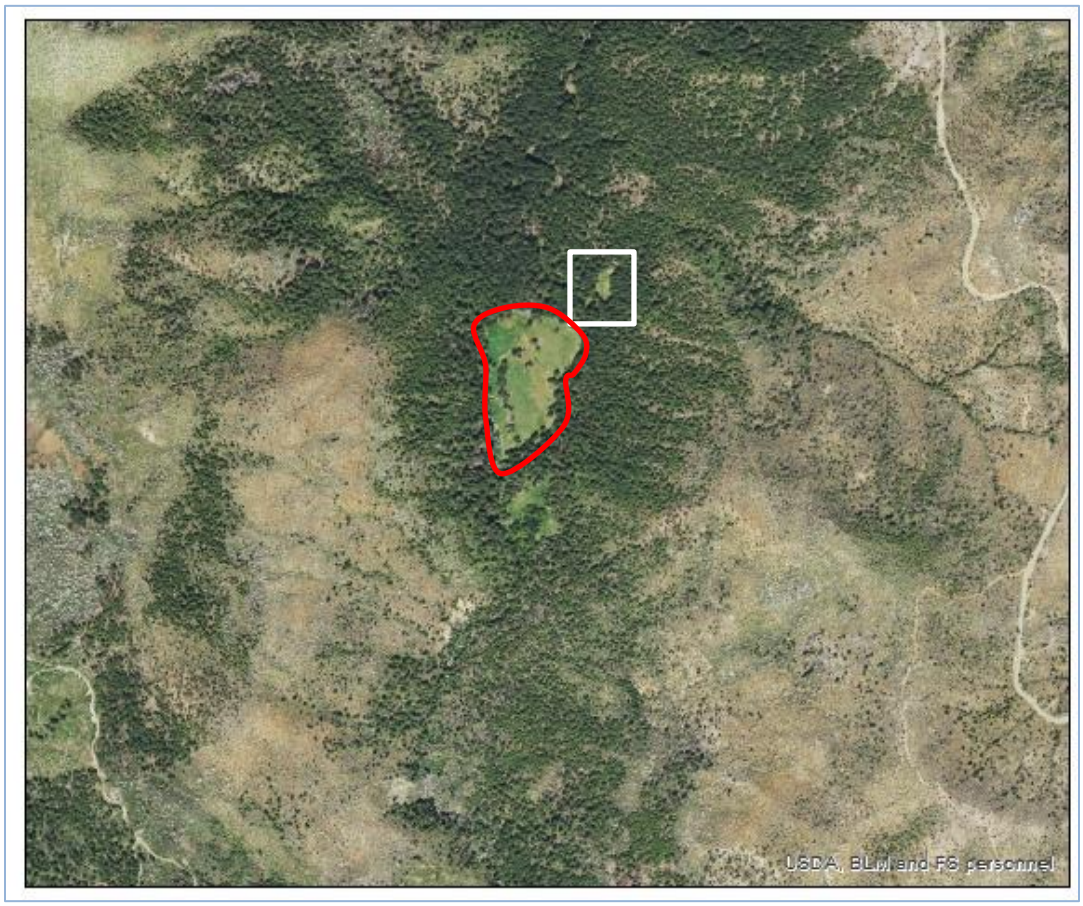


Figure 3. Windy Valley meadow from 2012 NAIP imagery (red is primary meadow; white is a segment which, since 1940, has lost its connection to the primary meadow).



Survey History

2009

In 2009, Dana Ross observed a single male in a small moist meadow at a new location on the Rogue-Siskiyou National Forest (Road #100 Meadow). The objective of the survey effort conducted in June 2009 by FS personnel was to detect adult mardon skipper presence in potential habitat with a reasonable level of confidence, conduct surveys to estimate relative abundance of adult mardon skipper at the sites being surveyed, and document survey effort and occupied sites covered during surveys. The sites listed were surveyed using the Survey Protocol for the Mardon Skipper (*Polites mardon*) (USDA 2007). No mardon skippers were detected at these locations:

> Signal area (3 meadows , #190), Saunder's Meadow, Wagon Wheel Meadow, Woodruff/Wilson Meadow, Pebble Hill Meadow, Wildhorse Lookout Meadow, Wildhorse Prairie, Sliver Meadow, FS Rd. 3318100 Meadow, FS Rd. 3318210 (#684 meadow), FS Rd. 3318220, FS Rd. , 318304 (#613 meadow), Fry Place Meadow, Snow Camp Meadow.

2010

The Windy Valley site was first surveyed in 2010 by Dana Ross and Forest Service wildlife biologists Mike Miller and Jessie Dubuque. Surveys were conducted 26 June and 9 July 2010. On 26 June, about 30 fresh male mardon skippers were observed. On 9 July, an estimated 100+ individuals of male and female skippers combined were counted by Miller, Dubuque and Ross. This site is the largest known population of coastal Oregon mardon skipper to date (Ross 2010).

2011

Meg's meadow, the FSR 3313100 meadow, and Snow Camp meadow were surveyed twice between 24 June and 16 July. There were no mardon skippers detected during this survey effort. Windy Valley was surveyed 3 times during the same survey period with peak detection and the greatest number of individuals found July 5th at > 100 individuals.

2012

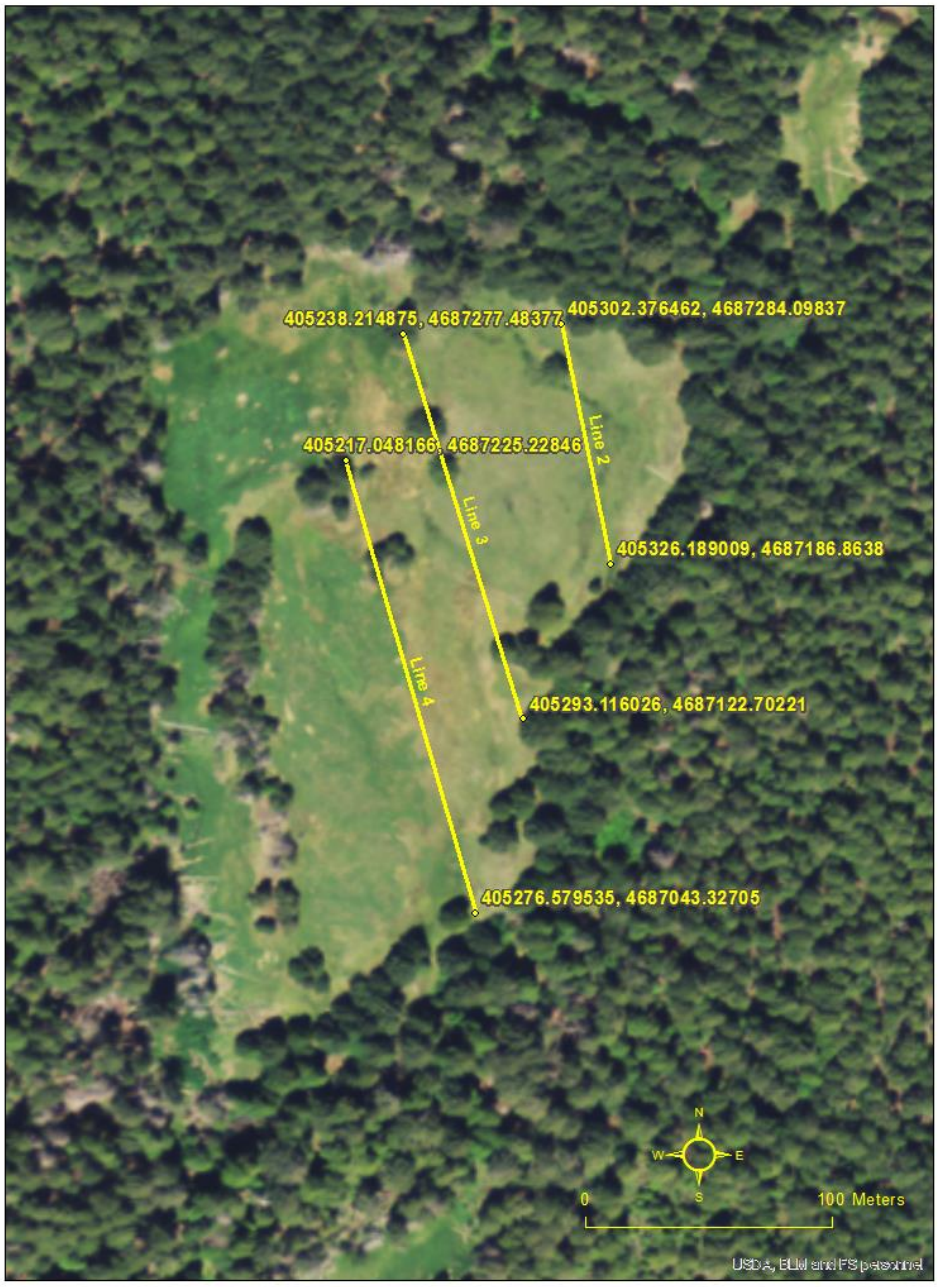
The Windy Valley site was surveyed four times in 2012 by Jessie Dubuque and Lily Miller. Survey dates were 28 June, 1 July, 9 July and 18 July. Peak detection was 54 individuals (date unknown).

2013

The Windy Valley site was surveyed five times in 2013. The first on 13 June by Jessie Dubuque and Holly Witt who surveyed the entire meadow using transects and observed 226 fresh individuals. On 18 June, Cameron Adams and Lily Miller attempted a survey in cool, rainy weather conditions; none were observed. On 20 June, Adams and Miller established three survey transects in the most suitable habitat in the meadow and observed 25 individuals in partly sunny conditions and a temperature of 50 degrees Fahrenheit (Figure 4). On 3 July, Adams and Miller observed 41 individuals on three established transects. On 17 July, Miller observed 4 individuals on the three transects.

Survey transects were installed using suggested UTM coordinates from Hatfield et al. 2013, "Range-wide strategy and monitoring protocol for the mardon skipper (*Polites mardon*, W.H. Edwards, 1881)" (Miller 2014).

Figure 4. 2013 Survey Transects at Windy Valley Site (UTM Zone 10 NAD 83)



2014

The Windy Valley site was surveyed seven times in 2014. It was first visited on 2 May by Jessie Dubuque, Lily Miller, Rich Hatfield and Candace Fallon. Weather conditions were partly cloudy with gusty winds 0-4 mph and temperature at 66 degrees Fahrenheit. No mardon skippers were observed. Transects were adjusted by Rich Hatfield as displayed in Figure 5. The next survey was 14 May by Dubuque and Miller and no mardon skippers were observed on the new transects. Surveys on 3 June by Miller and Edwin Wilder resulted in 114 individuals observed; on 9 June, 69 individuals were observed by Dubuque; on 19 June, 68 individuals were observed by Miller, Dubuque and Bonnie Allison; on 24 June, 25 Miller and Wilder observed 25 individuals; and on 8 July, none were observed by Miller, Wilder and Dustin Carter. For all surveys, a minimum of 15% of the individuals observed were captured for positive identification as mardon skippers.

Manual conifer encroachment removal and a botanical inventory of the site were conducted by Dubuque and others on July 23-24, 2014.

Population Estimates (Fallon & Hatfield, 2014)

In 2014 Rich Hatfield and Candace Fallon (Xerces Society) set up survey transects and provided distance sampling training to Forest Service biologists and biological technicians at Windy Valley meadow. Xerces staff oversaw the first day of surveys and provided guidance on survey technique. Agency staff then completed the remaining distance sampling visits over the course of the adult flight period. Hatfield and Fallon computed population and density estimates for each site **(Tables 1 and 2)**. Based on 2014 surveys, the 2014 mardon skipper population is estimated to be from 1390 to 2429 **(95% CI**). For more information about these statistics and site-specific details, see the report referenced above.

Table 1. Number of skippers detected by site and date at Windy Valley

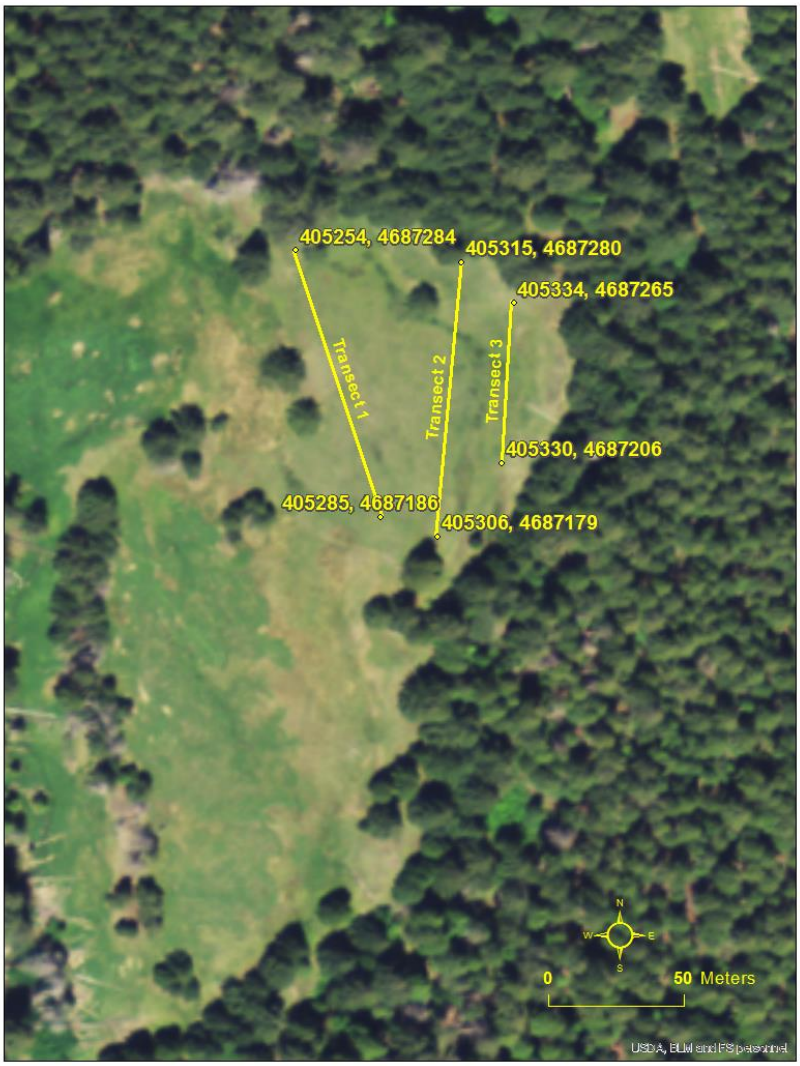
Site	Area (HA)	# Transects	Total Distance of Transects (m)	5/2/2014	5/14/2014	6/3/2014	6/9/2014	6/19/2014	6/24/2014	7/8/2014	Total Observed*
Windy Valley	0.887	3	262.33	0	0	113	69	68	25	0	275

*Note: This includes all skippers detected during distance sampling (not just mardon skippers). It is possible that the same individuals were counted on multiple site visits.

Table 2: Windy Valley population estimates

Place	Estimate	Pop. Size	% CV	95% CI	
Windy Valley	Density (N/HA)	2070.6	14.07	1566.1	2737.7
	Population (N)	1837	14.07	1390	2429

Figure 5. 2014 Survey Transects at Windy Valley Site (UTM Zone 10 NAD 83)



3. THREATS AND MANAGEMENT RECOMMENDATIONS

General Threats and Management Recommendations

Mardon skipper populations face a variety of threats; including conifer, shrub, and invasive plant species encroachment; prescribed and natural fire; recreation (including camping); applications of Btk; climate change; and issues related to small population size and stochastic events.

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*

klamathensis is known from 25 sites – 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.

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 opportunity for connectivity between patches of habitat. Considering changes in fire regime and land use, the connectivity of the landscape has changed significantly since 1950. 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. 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.

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 climactic 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 and Strong 2010). Although management at the population scale cannot directly address global climate change, providing quality habitat spread in multiple sites across the landscape is thought to insulate species from climate change.

Below we provide information on threats and general recommendations for managing conifer encroachment and prescribed fire. These can only be understood and implemented when used in conjunction with site specific threat information that is available in the detailed and site specific recommendations below. 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 and Crone 2008).

Forest Encroachment

The removal and alteration of the natural disturbance regimes (such as fire suppression), that once maintained low shrub and conifer seedling establishment rates, has led to the loss and degradation of forest-meadow ecosystems (Coop & Givinish 2007; Norman & Taylor 2005). Forest encroachment not only reduces the amount of open habitat, but closes off corridors between meadows reducing butterfly dispersal (Roland & Matter 2007). 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.

The lack of genetic interchange and movement of individuals between populations will likely lead to lower overall fitness and extirpations 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).

General Forest Encroachment 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 to remove trees using methods that incorporate sensitivity to the butterflies' life history.

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). 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. See figure 6.

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 after one, two, and three years following the burn event (Black *et al*. 2013). 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*. 2013).

Figure 6: Controlled burn at a mardon skipper site in California. By Brenda Devlin

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.

General Prescribed Fire Recommendations

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. Site specific management plans should be developed for each site before implementing a prescribed burn.

Windy Valley - Site Specific Threats

Forest Encroachment

Air photos show conifer encroachment has occurred into the meadow since 1940 (figures 2 and 3). Also a corridor has closed which previously connected the main meadow and a small segment of meadow in the northeast corner (Figure 3, white box). Potentially, the connection could be re-established if skipper habitat is present and within dispersal distances of skippers.

Fire

The most recent large-scale fire to occur in the Windy Valley meadow area was the Biscuit Fire in 2002. There are no fire-scars or burned trees to indicate that the portion of the meadow occupied by mardon skippers burned. Burn scars are present on the trunks of trees south of the primary meadow which

suggests some low to moderate intensity fire burned nearby. Because of the limited road access and the meadow's proximity to the Kalmiopsis Wilderness (one to two miles to the east), lightning-caused fires would generally be managed for resource benefits to the extent possible.

Grazing, Timber Harvest, Off-highway Vehicle Use

The Windy Valley meadow is not within a land allocation with scheduled timber harvest nor in a grazing allotment. Off-highway vehicle use is not a threat because of the meadow's distance from established roads, motorized trails or dozer lines from past fire-suppression activities.

Invasive Plants

There are no known invasive plants in the site, but several non-native species are present (Appendix B). The meadow has been surveyed by Forest Service botanists three times in the last 20 years (1995, 2012 and 2014).

Windy Valley Management Constraints

This site is only accessible by trail or air; therefore, vegetation removal is limited to cutting by manual methods. Activity-generated fuels can potentially be treated through broadcast burning, piling and burning, or scattered to decompose naturally.

Windy Valley meadow is situated within the backcountry recreation management allocation per the 1989 Siskiyou National Forest Land and Resource Management Plan. Emphasis is on light recreational use and minimal human influence on vegetation and habitat which maintains or enhances natural processes (USDA Forest Service, 1989).

Windy Valley Management Practices

Conifer Removal

Conifer removal activities would include the following.

- Removal of all trees under 4 in. diameter at breast height (DBH) from the open meadow portion of the site.
    - Wherever possible, cutting should be done by hand with chainsaws or handsaws.
    - All downed wood and branches should be removed from the meadow area.
    - Care would be taken 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 occupied, or potentially occupied portion of the site.
    - Monitoring of the site would occur every other year for additional encroachment, and treatments would be repeated, if necessary.

- 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.
- Do not alter the hydrology within and between meadows. Consult with a hydrologist during project planning.
- To remove larger trees (when re-establishing connection corridors); we would consider the use of snag creation techniques. Potential cone production and fuel loading risks would be discussed with resource specialists to determine the best method and minimize the risk of unintended consequences.

Fire Use

- A site-specific burn plan would be created for the Windy Valley meadow prior to implementing activities.
- Future fires would not burn more than one-third of the core habitat in any given year. Acreage limits would be decreased if research suggests it is needed to maintain mardon skipper numbers at a known site.
- Unburned areas during prescribed burns (skips) would be left intact as potential micro-refuges.
- A comprehensive monitoring program would be put in place to accompany any plans for burns to determine the immediate and long-term impacts on mardon skipper populations. No additional burns would be completed until there is full re-colonization of burned areas by mardon skippers.
- While implementing a burn plan, measures would be taken to avoid actions that could degrade existing habitat and kill individual mardon skippers, including heavy equipment use and additional or excessive foot traffic by burn staff in mardon meadows.
- If a controlled burn is implemented, only areas with heavy conifer encroachment would be burned.
- The moisture in the meadow would be monitored to protect it from intense fire.

Invasive Plant Control

- Monitor and treat invasive plants as they are detected to prevent establishment and protect the native species composition of the meadow.
- Continue to collect seeds from native grasses and consider seed collection from other native plants that skippers use for nectar.
- Annually monitor for invasive forbs and grasses that may alter mardon skipper habitat.
- Actively and aggressively control for invasive plant species before they spread throughout the meadow and into mardon skipper habitat.
- If used, herbicides would be selected and applied to avoid impacts to non-target plants that might be used by mardon skippers at any time; such as, while nectaring, during egg-laying or for overwintering of larvae.

Fire Suppression Activities

- Windy Valley meadow would not be used as a fire-suppression spike camp or helicopter landing area (heli-spot). Hand-lines or dozer-lines would not be created within 300 feet of the meadow. Gold Beach Ranger District fire suppression maps and decision matrixes would reflect this restriction, and updated when needed.
- Windy Valley meadow would be included in the National Retardant Avoidance maps to prevent retardant drops in the meadow. Coordination with Gold Beach RD fire personnel would occur annually.

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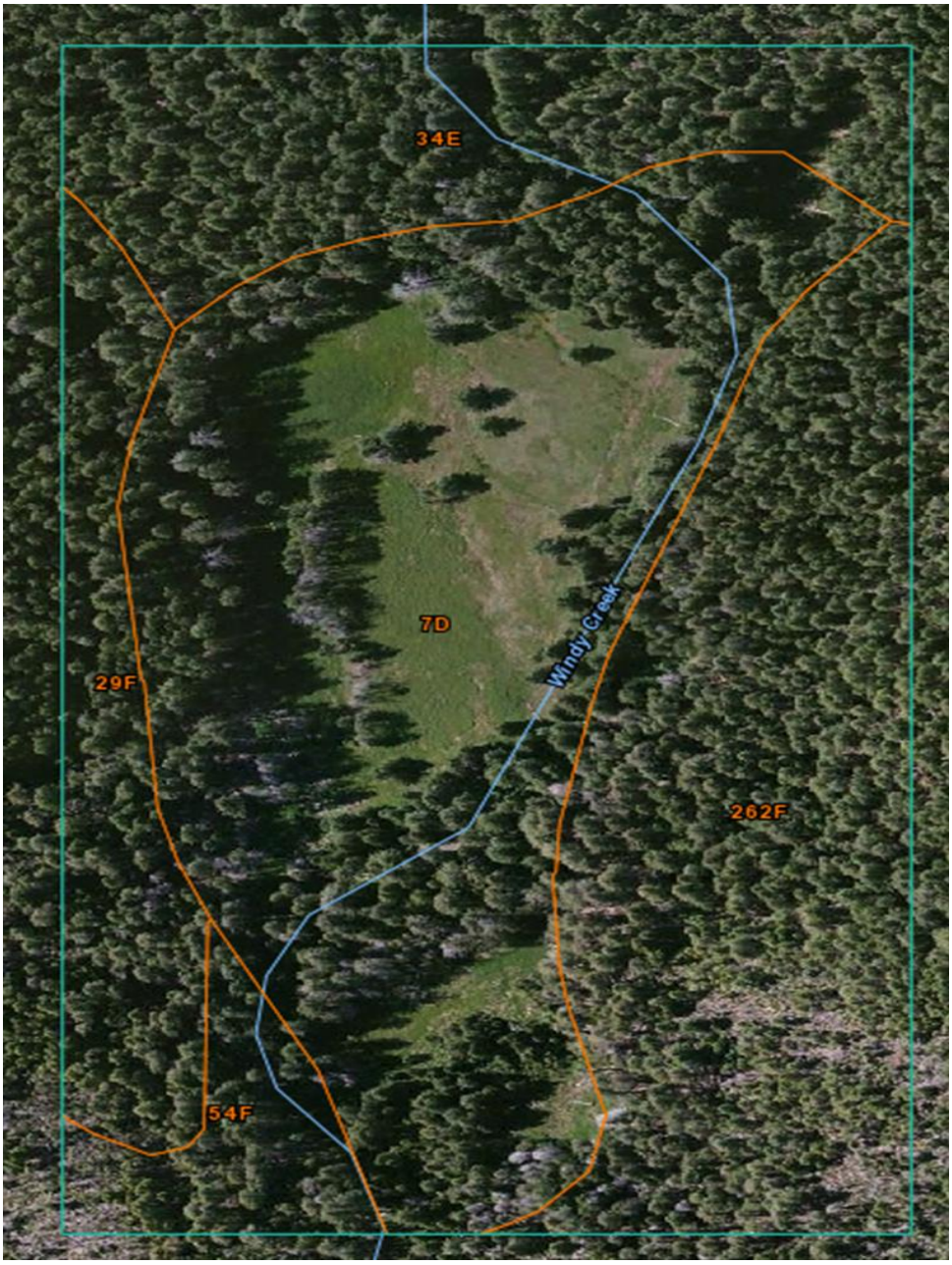
Appendix A: Windy Valley Soil Map (Miller 2014)

http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm?TARGET_APP=Web_Soil_Survey_application_300w4sm0c1mys1l5uvy0hwo1



NRCS Web Soil Survey Soil Descriptions for Windy Valley Soils.		
Symbol	**Soil Taxonomy Classification**	**Parent Material**
7D Aquic Haplohumults-Cryaquepts Complex, 0-15% slope	Frigid Aquic Haplohumults	fine and medium textured colluvium derived from igneous, metamorphic and sedimentary rock
29F Bobsgarden-Rilea-Rock outcrop complex, conglomerate substratum, 30-60% South slope	Loamy-skeletal, mixed, frigid Umbric Dystrochrepts	colluvium derived from metavolcanics and/or metasedimentary rock
34E Bobsgarden-Rilea complex, conglomerate substratum, 0-30% slope	Loamy-skeletal, serpentinitic, frigid Umbric Dystrochrepts	residuum and colluvium derived from metavolcanics and/or metasedimentary rock
54F Cedarcamp-Snowcamp-Flycatcher complex, 30-60% South slope	Loamy-skeletal, serpentinitic, frigid Dystic Eutrochrepts	colluvium and residuum derived from peridotite and/or serpentinite
262F Threetrees-Saddlepeak-Scalerock complex, 30-60% South slope	Loamy-skeletal, mixed, frigid Typic Dystrochrepts	colluvium and residuum derived from schist or phyllite

Appendix B: Windy Valley Meadow Plant Species List

Compiled by: Crystal Durbecq, Jade Paget-Seekins, and Catherine Dunn

15 August 2011. **Non-native species in bold**.

Achillea millefolium

Adenocaulon bicolor

Agrostis sp.

Aira caryophyllea

Aster sp. (foliaceus?)

Bromus vulgaris

Calocedrus decurrens

Calystegia sp.

Camassia quamash

Cardamine sp.

Carex obnupta

Carex sec. ovales

Cirsium brevistylum

Cirsium vulgare

Cynosurus echinatus

Danthonia californica

Elymus glaucus

Epilobium ciliatum

Equisetum arvense

Fragaria vesca

Festuca occidentalis

Glyceria elata

Hordeum brachyantherum ssp. brachyantherum

Juncus effuses

Leucanthemum vulgare

Lotus sp.

Mimulus moschatus

Oxalis suksdorfii

Osmorhiza sp.

Perideridia bolanderi

Plantago lanceolata

Potentilla gracilis var. gracilis

Prunella vulgaris

Pseudotsuga menziesii

Ranunculus occidentalis

Rosa nutkana ssp. nutkana

Rubus leucodermis

Rubus ursinus

Rumex acetosella

Rumex crispa

Rumex salicifolius ssp. salicifolius

Scirpus microcarpus

Sidalcea malviflora

Sisyrinchium sp.

Stellaria sp.

Tiarella trifoliate

Trifolium longipes var. elmeri

Vancouveria hexandra

Vicia sp.

Viola adunca

Viola glabella

Vulpia sp.