

**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
January 2007**

By Loni Beyer and Scott Hoffman Black



Mardon skipper. Photographed at Pumpchance 125 on BLM land in Southern Oregon by Norm Barrett.

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Abstract

The primary purpose of this case study was to ascertain whether the *Polites mardon* utilizes *Festuca* species as its oviposition plant. We surveyed two meadow sites on the Gifford Pinchot National Forest in Southern Washington, and two on the BLM lands of the Medford District in Southern Oregon, for oviposition plant associations of *P. mardon*. We conducted population censuses and observed general adult nectar behavior. Additionally we conducted larval searches, on 2 to 3 week intervals after the adult flight period. A major finding from this study is that *P. mardon* use more than one graminoid species for oviposition. The most common oviposition plants were *Danthonia californica*, *Festuca idahoensis*, and *Carex* species. In addition, *P. mardon* adults seem to use a variety of flower species for nectar. The most common observations were on *Vicia* species (Washington sites) and *Potentilla diversifolia* (Oregon sites). In the Southern Washington sites, populations included at least 125 and 343 individuals. In the Southern Oregon sites, populations included at least 41 and 128 individuals. We located 8 individual larvae, and plan to return in the spring to determine the over-winter life stage of this species.

Introduction

The Mardon skipper (*Polites mardon*) is a small, tawny-orange butterfly (20-24 mm) with a stout body. The Mardon skipper is visually distinguishable from other similar skippers by a diagnostic pattern of rectangular white spots visible on the ventrum hind wings (Pyle 2002). Mardon skippers are currently found at four geographically disjunct areas including low elevation grasslands of northern California, prairies of the South Puget Sound in Washington State, to grasslands between roughly 500 and 1700 meters in the Cascade Mountain Range of Washington (around Mt. Adams), and Oregon (east of Ashland). All sites are small, none more than a few hectares, and most support populations of less than 50 individuals. There are only a handful of sites that maintain a population over a couple hundred individuals. The Mardon skipper is listed as endangered by the state of Washington (Black & Vaughan 2005) and is a federal candidate species under the Endangered Species Act. It is a BLM special status species and a R6 Forest Service sensitive species.

To learn how to manage extant populations of this little-studied species, we studied life history information. One of the most important, and unknown, aspects of this butterfly's life history is the habitat features it utilizes for egg laying and larval development. From May to September 2006 Xerces staff and associates conducted surveys to address these life history questions. First, oviposition surveys were conducted in conjunction with USFS botanical surveys to characterize vegetative microhabitats females use for oviposition. In addition, we conducted population censuses, nectar observations, and larval searches.

Mardon Skipper Taxonomy

The Mardon skipper (*Polites mardon*) is in the family *Hesperiidae* (skippers) and the subfamily *Hesperiinae* (grass skippers). It was first described by W. H. Edwards (1881) from specimens taken near Tenino, Thurston County, Washington by H. K. Morrison (Dornfeld 1980). Mattoon et al. (1998) recognizes two subspecies: *Polites mardon mardon* in Washington and Del Norte County in northern California, and *Polites mardon klamathensis* in Klamath and Jackson Counties of southern Oregon. Therefore all mardon skippers sampled in Oregon were *Polites mardon klamathensis* and all mardon sampled in Washington can be considered *Polites mardon mardon*.

Study Sites

This work was completed at four sites: two on the Gifford Pinchot National Forest in Southern Washington, and two on the Bureau of Land Management Lands on the Medford District in Southern Oregon. We selected the study sites based on three criteria: population size, ecological differences, and geographic separation. Sites were chosen so that they would be separated geographically (more than 10 kilometers) with no butterfly dispersal between them. See Table 1 for general descriptive characteristics.

The two sites surveyed in Oregon were Pumpchance 125 and Little Hyatt Reservoir / Pacific Crest Trail site. There are few large sites in southern Oregon, and most have daily counts of 50 butterflies or less (Black & Vaughan 2005). Pumpchance 125 is the largest known site in southern Oregon. We combined the Little Hyatt Reservoir and the Pacific Crest Trail sites into one site because there are no other large sites in southern Oregon geographically separated from Pumpchance 125. Little Hyatt Reservoir is less than 2 kilometers from the Pacific Crest Trail site, there is a possibility of dispersal between the two areas in some years. All sites in Southern Oregon occupy similar habitat and are adjacent to water sources.



**Pacific Crest Trail site on BLM land in Southern Oregon.
Photographed by Loni Beyer.**

The sites chosen in Washington were Bunny Hill and Grapefern. Unlike the Oregon sites, Grapefern and Bunny Hill have very different habitat characteristics.

Grapefern is a flat meadow surrounded by lodge pole pine; Bunny Hill is surrounded by mixed conifer forest and has a south facing aspect.



**Grapefern site on Forest Service land on Mt. Adams in Washington.
Photographed by Loni Beyer**

Table 1: Description of 4 study sites.

Site Name	Location	Size (m ²)	Elevation (m)	Aspect	Average Annual Precipitation (cm)
Grapefern	Southern Washington	109	1433	flat	152 Randle, WA
Bunny Hill	Southern Washington	164	1097	SSE	132 Trout Lake, WA
Pumpchance 125	Southern Oregon	462	1427	flat	75 Ashland, OR
Pacific Crest Trail	Southern Oregon	173	1433	NE	75 Ashland, OR
Little Hyatt Res.	Southern Oregon	200	1411	flat	75 Ashland, OR

The Grid

At each study site the entire core Mardon habitat area was considered the sample area for purposes of population estimates and oviposition surveys throughout the adult Mardon flight period. Note: core areas had already been designated for populations in Oregon. We laid out a grid with pin flags that created distinct 10 by 10 meter square cells across the entire survey areas of each site. Each 10-meter cell was given an identifiable name (i.e. C5).

Oviposition Surveys

We visited each sample area to collect data on Mardon skipper oviposition behavior. Sampling was conducted on calm (<5 on Beaufort wind scale), sunny days with temperatures above 15°C. Oviposition observations began when any individual female butterflies were observed flying.

During each survey session, the observer randomly selected a point at which to begin, within the previously established site grid transects to ensure an even distribution of sample effort. From this point, the observer walked the transect in search of female Mardon skippers. Observations were made with the aid of 8 x 42 binoculars.

When a female butterfly was located she was watched until visually lost, or for a maximum of 10 minutes. After 10 minutes if the female being observed was not

displaying oviposition behavior the surveyor terminated the observation and from this location would continue to search for another female. Females engaged in oviposition were watched for up to five individual egg laying behaviors. Often the female was lost after exhibiting oviposition as the observer had to prioritize marking the oviposition location over continuing observation on the individual. The total ovipositing behavior sample per site consisted of as many females as possible. All precise physical locations where oviposition occurred, hereafter referred to as “oviposition locations”, were temporarily marked with a pin flag immediately after oviposition was complete, then observations were resumed. At the end of the sampling period (end of each day), the field observer returned to the pin flags and marked each location with a permanent spike with attached flagging and an identifying numbered metal tag. The spike was inserted until almost flush with the ground below or near the plant where oviposition occurred. Notes and sketches were taken concerning the precise location of the egg relative to the spike. No location was marked unless either the egg was visually seen dropped from the female skipper and/or relocated after a female displayed typical ovipositing behavior.

Distances were recorded of each oviposition location to forest edge and water sources (Table 2). The transect grid allowed these distance estimations to be accurate within a few meters. As there were no direct water sources at Bunny Hill and Grapefern this measurement could not be taken. A GPS coordinate for each oviposition location was taken for relocation purposes. With a combination of the GPS coordinate and a metal detector, all oviposition locations should be able to be relocated in the following spring for larval and pupae follow up surveys.

Table 2: Number of oviposition locations recorded per site and average distance to nearest forest edge and water sources. Standard deviations given in parentheses.

Site Name	Number of Oviposition Locations	Average Distance to Forest Edge (meters)	Average Distance to Water Source (meters)
Grapefern	27	19 (9.7)	Not applicable
Bunny Hill	32	26 (10.5)	Not applicable
Pumpchance 125	26	44 (32.6)	22 (21)
Pacific Crest Trail	13	21 (11)	7 (5)
Little Hyatt Res.	13	>40 (0)	6 (2.1)

Oviposition behavior

We observed female Mardon skippers exhibiting behaviors that indicate a combination of visual and chemical cues are used for selecting oviposition locations. The most common behavior was when a female would spend a few to several minutes perched, then fly from 0.1 to 10 meters to re-perch. After exhibiting this behavior several times she would fly straight to a location and oviposit. The act of ovipositing commonly occurred from a grass or forb perch with the abdomen perpendicular to the ground. From this position the female would curl the distal segments of her abdomen and drop an egg. In Oregon females tended to climb backwards down their vertical perch until they were positioned approximately 2-5cm from the ground, drop an egg, then climb back to the top of the grass and fly off. At warmer temperatures we observed oviposition occurring more rapidly and from higher perches.

We noted two other “cueing in” behaviors. One observed behavior occurred when the female would be flying slow and low (approximately 12 cm above ground) as she would approach a grass bunch or mixed grass-forb community. She would proceed to fly figure eight patterns over the specific area then either accept the location and oviposit or reject and continue on with this same behavior until she selected a “suitable” location. The other observed behavior was to perch for several minutes then to drop to the ground and crawl along the ground wagging the distal segments of her abdomen over the ground, grass, litter, or low lying leaves. Sometimes she would drop an egg, other times she would crawl back out of the vegetative community and fly to a new location. This behavior would repeat until she finally oviposited.

At all sites most of the oviposition took place with eggs landing at the base of grasses. However, some eggs landed on forb leaves and in the litter, as well as on bare ground.

Vegetation Surveys

Methods (see Vegetation Protocol, Appendix 6, for specific methods)

USFS botanists were alerted as soon as oviposition locations were being marked so they could capture the relevant habitat conditions. Vegetation surveys were conducted in a 1m² plot centered at oviposition locations. The goal was to identify the primary oviposition plant, defined as the individual plant species on which the female deposits eggs, to genus and species. Several vegetation attributes, thought to be relevant to larvae and pupae, were measured.

There were a number of instances in which the oviposition plant could not be specified due to the overlapping coverage of multiple species of graminoids. When it was not possible to specify an oviposition plant, the botanists conducted an additional 0.1 m² plot around the oviposition location. This was performed in order to capture characteristics of the immediate graminoid community at the egg location.

Results

The data indicate that Mardon skippers use more than one graminoid species for oviposition (Table 3). In Oregon, *Danthonia californica* was the most frequently utilized oviposition plant. In Washington, all but one oviposition location at Bunny Hill occurred on *Festuca idahoensis*. At Grapefern the most common identified oviposition plants were sedges (*Carex pensylvanica*, *C. hoodii*, and *C. multicaulis*). Grasses present in the 0.1 m² plots at Grapefern occurred less often than *Carex* species and with cover $\leq 10\%$, whereas *Carex* species usually occurred with cover $\geq 20\%$ (Appendix 3). The variety of identified oviposition plants suggests that females may not always oviposit on specific host plants, but within a community of possible species that can be utilized by the larva.

Table 3: Identified oviposition plants by site.

Little Hyatt Reservoir, Oregon	Grapefern, Washington
<i>Carex species</i>	<i>Bromus carinatus</i>
<i>Danthonia californica</i>	<i>Carex hoodii</i>
<i>Festuca rubra</i>	<i>Carex multicosata</i>
	<i>Carex pensylvanica</i>
Pacific Crest Trail, Oregon	
<i>Danthonia californica</i>	Bunny Hill, Washington
	<i>Festuca idahoensis</i>
Pumpchance 125, Oregon	<i>Stipa occidentalis</i>
<i>Danthonia californica</i>	
<i>Deschampsia caespitosa</i>	
<i>Festuca roemeri</i>	
<i>Poa pratense</i> *	

* introduced species (Pojar & Mackinnon, 1994).

Bunny Hill was the only site where all oviposition locations had identified oviposition plants. At all the remaining sites roughly 50% of locations did not have an identified oviposition plant. With respect to each individual site, the locations without identified oviposition plants had at least one identified oviposition plant species occur within the 0.1 m² plots (Appendix 3). As well, identified oviposition plants tended to have the highest percent graminoid cover in the 1 m² plots (Appendix 4).

Vegetation features varied greatly across sites. Therefore we chose to analyze most of our results in the context of each site. For descriptive purposes, Table 4 lists the mean and standard deviations of the structural components of the identified oviposition plants.

Table 4: Mean oviposition plant structural characteristics within 1m² plots. All measurements are in cm; standard deviations are represented in parenthesis . ‘Nearest Neighbor’ is the distance to the nearest plant of the same species. ‘% Cover’ is the percent cover of the oviposition plant species within the 1m² plot.

Site	Nearest Neighbor	Maximum Culm Height	Maximum Basal Leaf Height	Plant Length	Plant Width	% Live Foliage	% Dead Foliage	% Cover
Bunny Hill	18 (5)	47 (12)	20 (4)	11 (5)	11 (5)	87 (8)	13 (8)	21 (6)
Grapefern	12 (5)	19 (4.3)	14 (4)	4 (3)	4 (3)	89 (13)	11 (11)	15 (8)
Pumpchance 125	12 (7)	37 (14)	11 (3)	15 (9)	13 (7)	88 (11)	12 (11)	23 (12)
PCT/Little Hyatt Reservoir	14 (6)	21 (14)	14 (4)	17 (7)	12 (6)	74 (16)	26 (16)	15 (11)

Other descriptive components concerned litter and bare ground cover. Only Bunny Hill had substantial bare ground (28.1% ± 12.7). All other sites had less than 10% bare ground in the vegetation plots. Litter cover was highest at Grapefern (56.3% ± 15.5). All other sites had less than 15% litter cover (see Appendix 1 for additional summary of structural components).

Transect Methods

Population censuses were conducted every 7-14 days while the adults were flying, between 10AM and 5PM on sunny days with low wind speeds (<5 on Beaufort wind scale) and temperatures above 15° C. On the day of the population censuses, one count was made along each transect of the previously established grid. The surveyor walked down the center of the grid cells so that s/he could see 5 meters to both the left and right edges of the cell. Total number of butterflies was recorded for each grid cell as the surveyor walked slowly along each transect line. Butterflies that entered from behind the surveyor were ignored. An effort was made to determine the sex of each individual counted, when this was not possible the individual skipper was recorded as having an unknown sex. Mardon skipper identification was made without capture and with the aid of 8x42 binoculars.

Sonora Estimates

Polities Sonora (Sonora skipper) is a morphologically similar species to the Mardon skipper. In the Oregon sites the adults co-occur late in the Mardon skipper flight period. Before each census a Mardon skipper and a Sonora skipper were captured at the opposite end of the grid that the census would start on. The individuals were viewed to calibrate the surveyor's eye to species differentiation, and then promptly released. Data were only recorded when we were 100% certain on the species identification.

Census Totals

Population counts were taken at seven-day intervals throughout the adult flight season. In Oregon two counts were taken at each site. In Washington three counts were taken at Bunny Hill and five were taken at Grapefern (Table 5).

It was not possible to conduct censuses equally among sites due to the overlap in the adult flight periods. There were differences of timing of the adult flight period within the regions. In Oregon Little Hyatt Reservoir was at the end of its adult flight period when both Pumpchance 125 and Pacific Crest Trail populations were still active. In addition, the Bunny Hill population began while the Oregon sites were still active, making it unfeasible to monitor all populations from the beginning to the end of their adult flight periods. When the flight was ending at Bunny Hill, the flight at Grapefern was just starting. Grapefern is the only site with a full spectrum of censuses depicting the entire adult flight period. Due to the combined attentions of Xerces staff and Washington state Cowitz Ranger station biologists; we can definitively say that the adult emergence at Grapefern began on either the 8th or 9th of July 2006!

Table 5: Census totals for all sites broken down into Male, Female, and Unknown sex observations.

<u>Site</u>	<u>Date</u>	<u>Male</u>	<u>Female</u>	<u>Unknown</u>	<u>Total</u>
Bunny Hill	29-Jun	39	28	58	125
Bunny Hill	4-Jul	22	22	7	51
Bunny Hill	11-Jul	2	1	1	4
Grapefern	6-Jul	0	0	0	0
Grapefern	9-Jul	88	8	39	135
Grapefern	16-Jul	126	56	161	343
Grapefern	23-Jul	39	38	51	128
Grapefern	4-Aug	0	2	0	2
Little Hyatt/PCT	19-Jun	7	5	29	41
Little Hyatt/PCT	26-Jun	3	4	3	10
Pumpchance 125	18-Jun	25	9	68	102
Pumpchance 125	25-Jun	56	37	35	128

Spatial Analysis

Census totals were distributed over a spatial grid map to convey the spatial distribution of populations at each site. Each number in the cells represents the sum of all individuals counted in each grid cell for all census days. These spatial maps help show that populations concentrate either in the center of meadows (for Grapefern and Bunny Hill) or near to water sources (for Pumpchance 125, Pacific Crest Trail, & Little Hyatt Reservoir). Note that Bunny Hill has two maps. Map 5A represents 3 census counts, one of which was conducted before the grids were set. Transects were estimated and careful notes were taken. Map 5B represents the 2 censuses taken with the grid transect in place (Figures 1-5).

Figure 1: Pumpchance 125. Sum of Mardon skipper counted in 2 surveys.

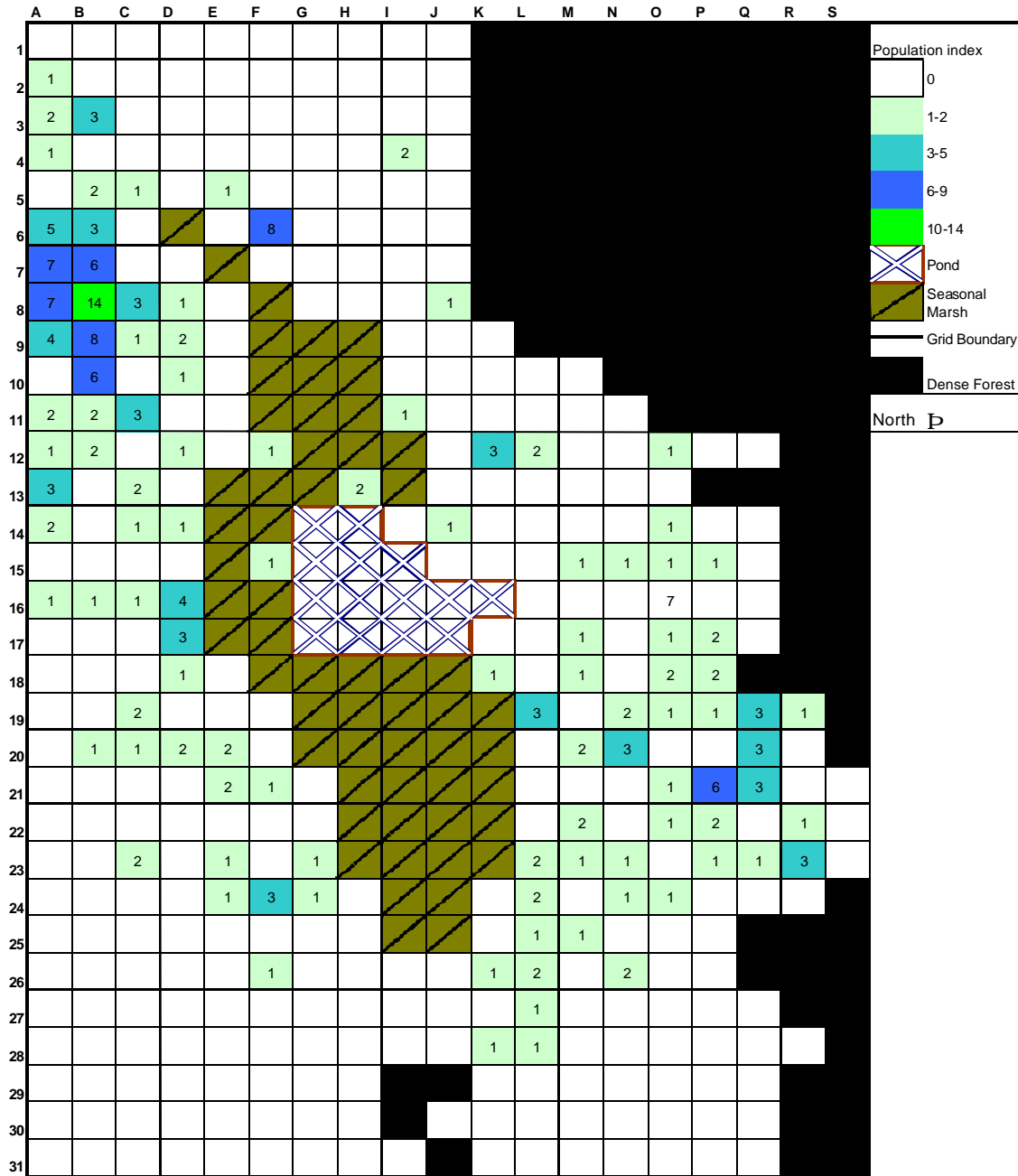


Figure 2: Pacific Crest Trail. Sum of Mardon skippers counted in 2 surveys.

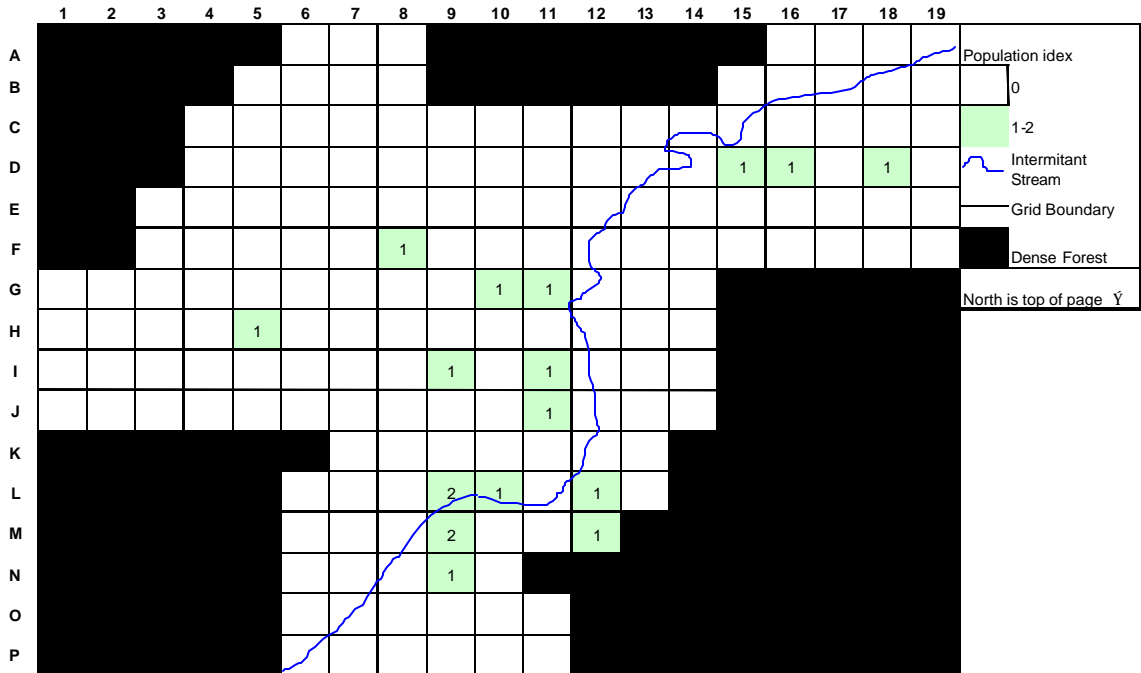


Figure 3: Little Hyatt Reservoir. Sum of Mardon skippers counted in 2 surveys.

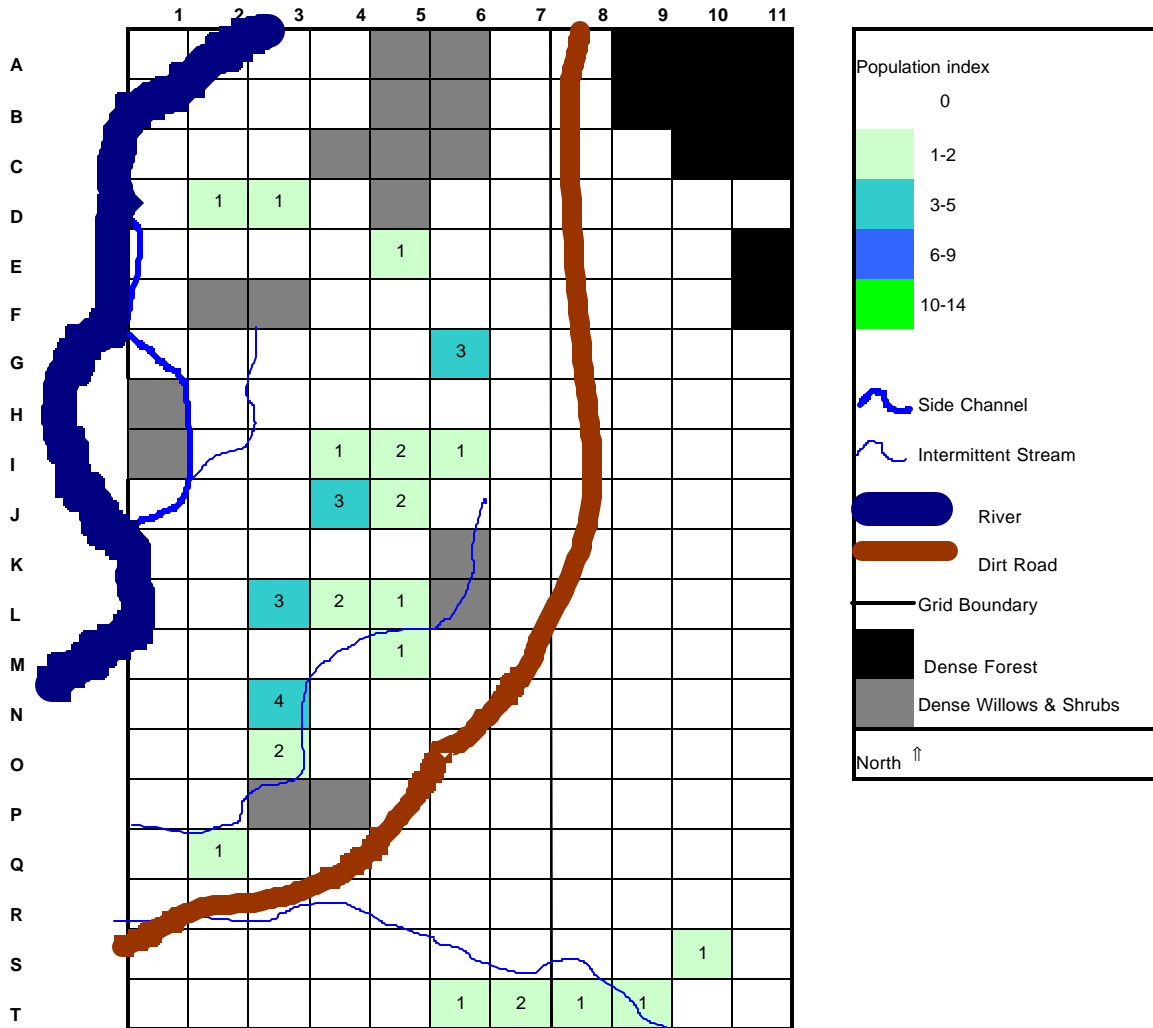


Figure 4: Grapefern. Sum of Mardon skippers counted in 4 surveys.

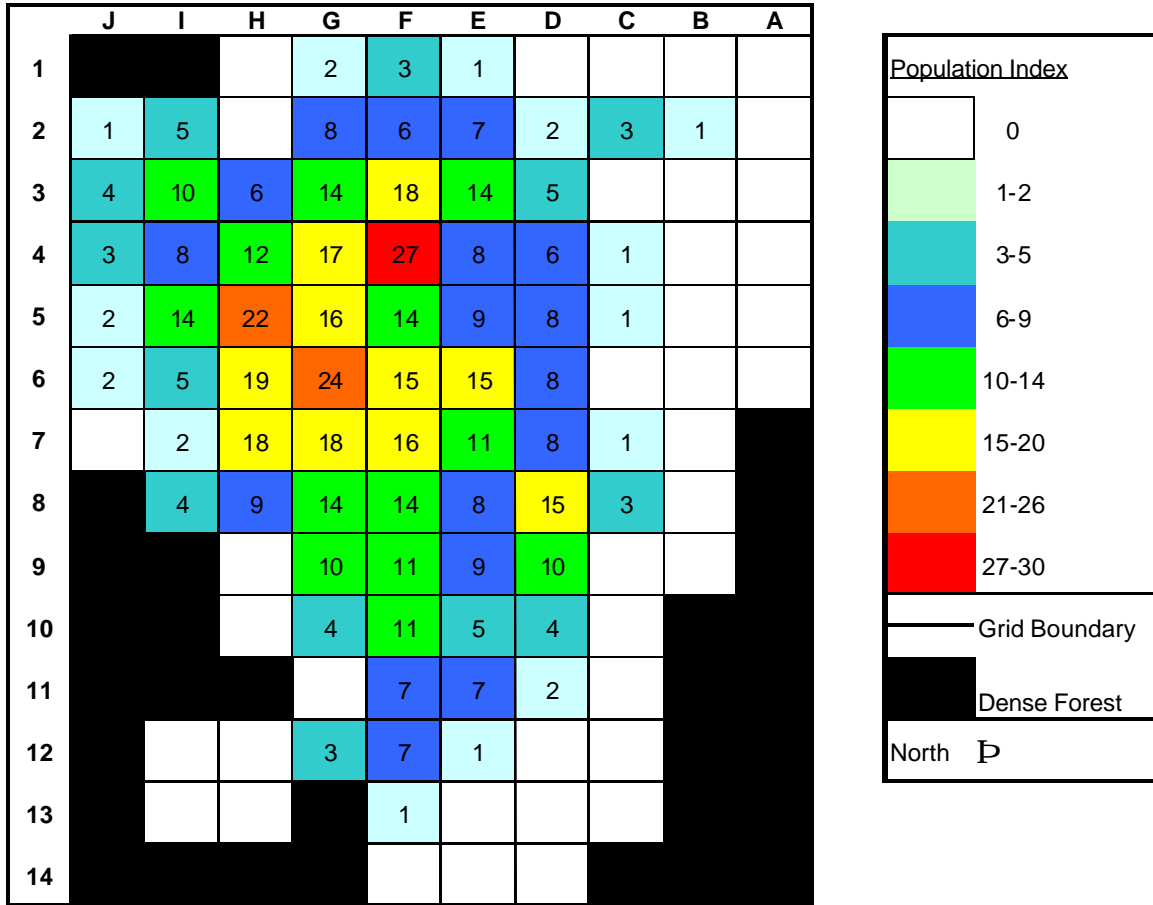


Figure 5A: Bunny Hill. Sum of Mardon skippers counted in 3 surveys. One survey conducted prior to grid.

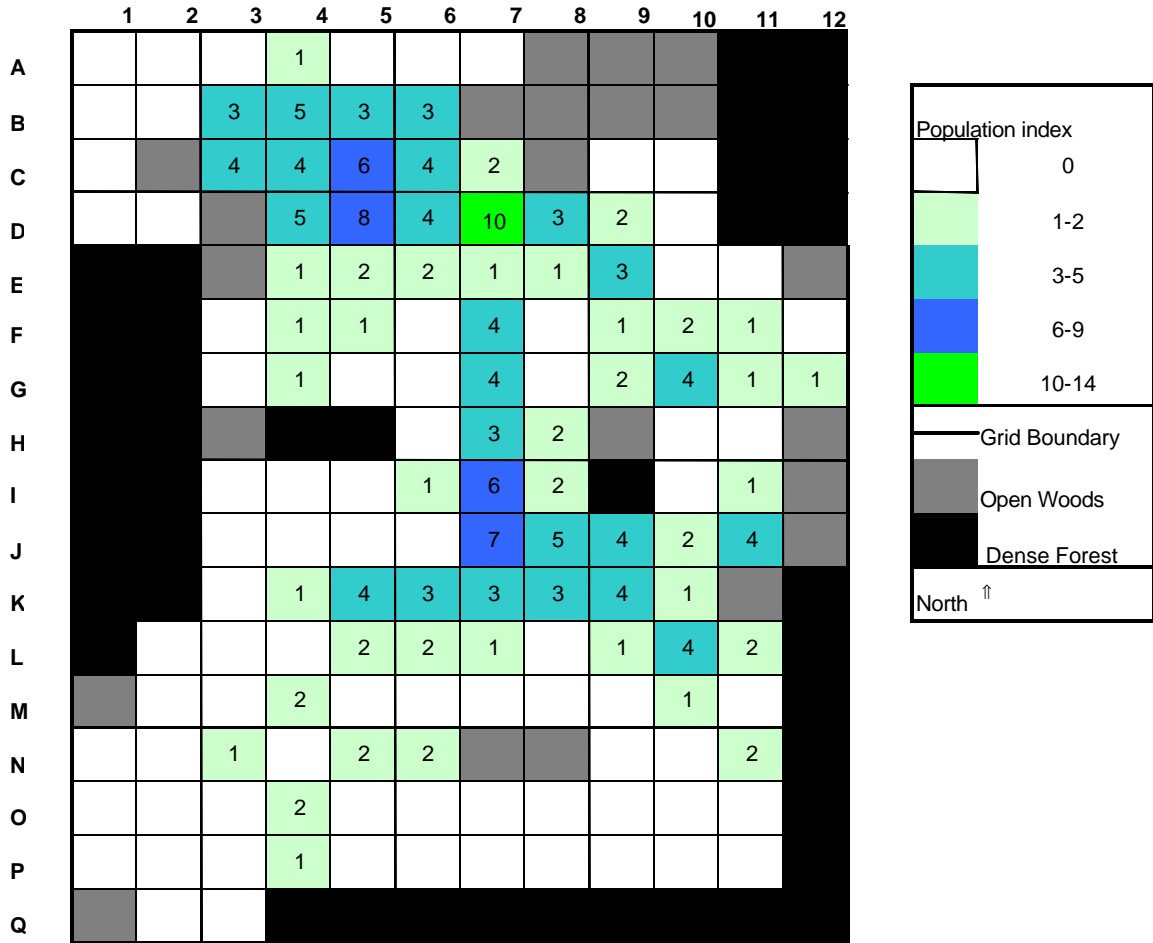
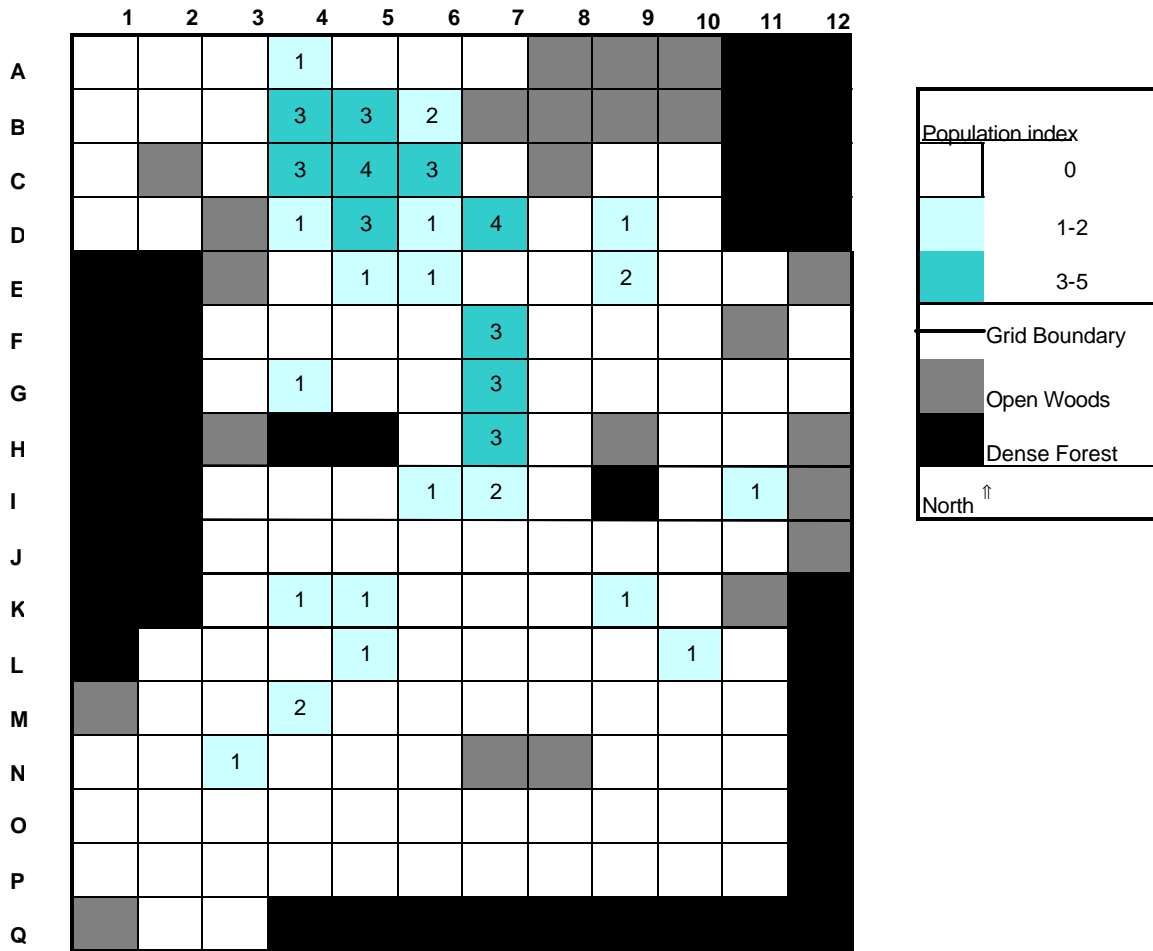


Figure 5B: Bunny Hill. Sum of Mardon skippers counted in 2 surveys.



Nectar Behavior

While conducting population censuses and oviposition surveys the observer kept a running tally of every nectar observation encountered. The sex of the skipper and the nectar plant species were recorded. A nectar observation was only recorded if the proboscis was extended into the flower. If a single individual was seen visiting multiple flowers of the same species it was only counted as one observation. If a single individual was seen visiting multiple flowers of different species it was counted once for each nectar flower species it visited.

Nectar observations for Washington sites are summarized in figure 6. In Washington 250 nectar observations were recorded, of which 184 were on *Vicia* species. Other nectar flower species visited include: *Fragaria virginiana*, *Trifolium longipes*, *Erigeron perigrinus*, and *Achillea millefolium*. The remaining *Calachortus* species, *Erysimum asperum*, *Agoseris arantiaca*, *Antennaria microphylla*, and *Potentilla drummondii* all had less than 5 total observed nectar visits per plant species.

Nectar observations for Oregon sites are summarized in Figure 7. In Oregon a total of 223 nectar observations were recorded of which 74 were on *Potentilla diversifolia*. Other observed nectar flowers included; *Wyethia angustifolia*, *Penstemon procerus*, *Plectritis congesta*, and *Vicia* species. The remaining *Zygadenus venenosus*, *Potentilla flabiofolia*, *Brodiaea* species, *Bistorta* species, *Fragaria virginiana*, *Achillea millefolium*, unknown composite, and other unknown species had less than 5 total nectar observations per plant species. See appendix 2 for a complete list of observed nectar flower species.

Figure 6: Total number of observed nectar observations at the Grape Fern and Bunny Hill sites in Washington State on the Gifford Pinchot National Forest.

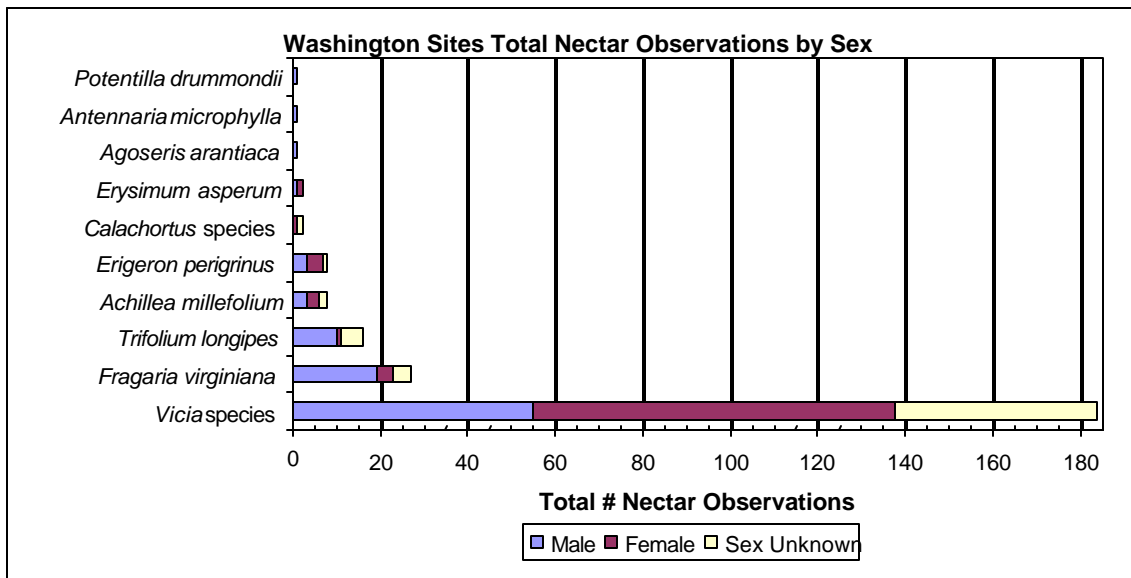
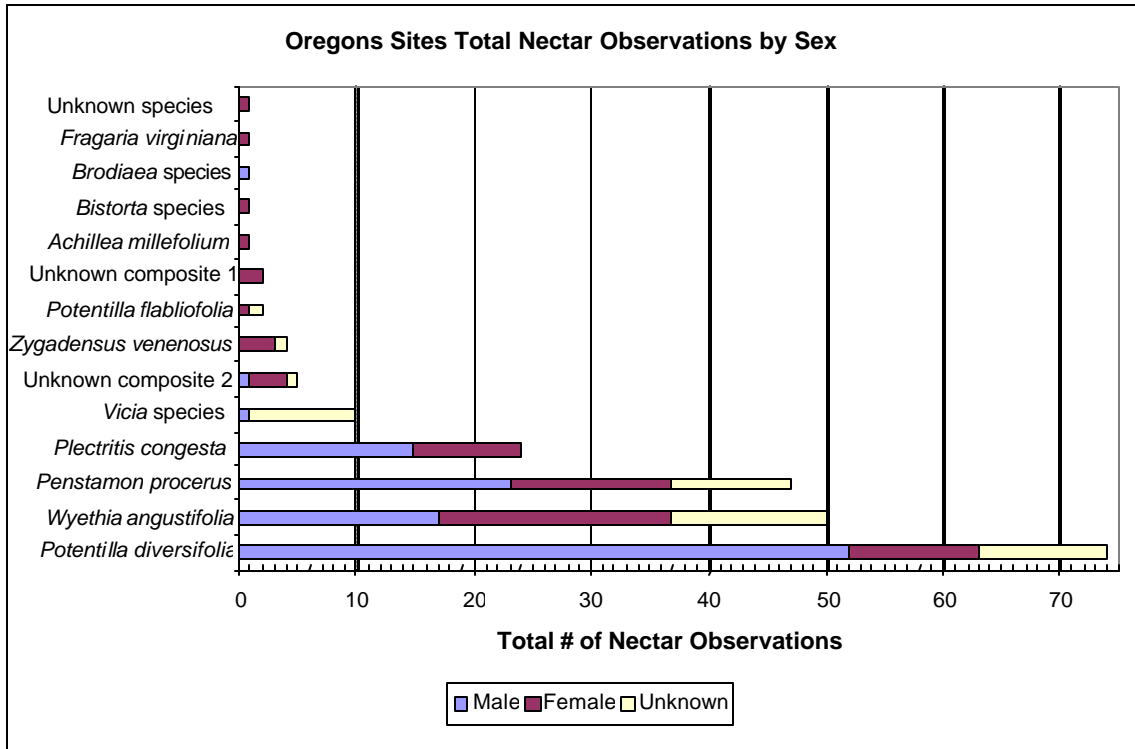


Figure 7: Total number of observed nectar observations at the Pacific Crest Trail, Little Hyatt Reservoir, and Pumpchance 125 sites in Oregon State on the Medford District BLM lands.



It is important to note that without a nectar flower abundance measurement, specific nectar host plants cannot be inferred. Therefore the nectar information herein is to depict what plant species were observed being utilized as a nectar source. As a qualitative statement, in both Oregon and Washington sites, the flowers most frequently observed for nectaring were also highly abundant.

Larval Surveys

We searched for larvae around at least 50% of oviposition locations per site, at least once. We conducted continuous larval surveys at Bunny Hill at all oviposition locations and returned at 2 to 3-week intervals following the adult flight period. To find larvae, we carefully searched through the grass at each larval survey area. We worked from the center (spike) outwards for 15-45 minutes at each location. As no larvae have ever been seen in the wild, our search image was based on photos from Lepidopterist Dave Nunnallee and the Oregon Zoo's 2004/2005 captive rearing project.

Larval Relocation Results

We focused our larval searches primarily at Bunny Hill as the oviposition plants were easily distinguishable Fescue bunch grasses and litter depths were negligible, both which facilitated larval encounters. We returned to relocate larvae every two to three weeks to document instar life stages and any pertinent behavior. Larval searches were initiated at the end of July and continued through the month of October.

Larvae of the Mardon skipper cannot be positively identified until they are in the 5th instar (Dave Nunnallee personal communication). Early instar larvae can be qualitatively identified based on markings on the head capsule. These markings however are similar to those of *Polites sonora*. We feel certain that the larvae we found in the field are Mardon skipper larvae for the following reasons: The larvae strongly resemble the photographs taken of Dave Nunnallee's captive rearing project, we did not encounter any *P.sonora* in any of our Washington study sites during the adult flight period, and all larvae located were within a few centimeters of the marked oviposition locations. Dave Nunnallee compared our images to other *Polites mardon* images and stated "While there is still a bit of doubt about possible confusion with *Polites sonora*, since you saw no sonora adults in the area I think it is safe to conclude that you have mardons" (Dave Nunnallee personal communication). He suggests that we either collect one caterpillar prior to eclosure next spring, or less intrusively perhaps place a cage around it 'in situ' until eclosure to get a positive ID.



Mardon skipper larvae. Photographed at Bunny Hill in Washington State by Mace Vaughan on July 31 2006. (4-5mm).

Clues to larval presence were often found in the form of head capsules, skin shedding, frass, and silk. At Bunny Hill we found 7 individual larvae but only a few were relocated more than once. We documented useful information on behavior and larval instar life stages up to 3rd or 4th instar. All located larvae were initially found within a few cm of the oviposition location stake indicating that dispersal from the natal site may not occur without necessity. One larva was relocated (two weeks after initial discovery) up to 16 cm away from the oviposition location stake. However, there is no way to be certain it was the same larva found two weeks earlier at the original oviposition location. Our observations are consistent with other *Polites* species in that they were found in frass-silk "nests" deep into the base of the grasses (Scott, 1986). Interestingly we observed some larvae in tunnels lined with silk and frass that were approximately 2 cm deep. These tunnels began at the base of the bunch grass and either ran vertical or horizontal to the ground. The larvae were found in these tunnels usually head facing upwards.

At Bunny Hill we estimated the percentage of green (olive) leaves retained on at the oviposition locations at which we were surveying for larvae. Up until our visit on September, 15th larval oviposition plants retained greater than 50% green leaves. In the subsequent visits we noted all host plants having less than 50% green leaves. This indicates that the oviposition plants begin to die off at this time, this may affect timing of larval diapause.

Discussion & Caveats

Our research was conducted as a pilot study to determine oviposition habitat use by the Mardon skipper. Concurrently we collected nectar data, population census data, and general habitat use data and conducted larval searches to expand our general understanding of Mardon skipper biology.

We documented twelve different graminoid species utilized by the mardon skipper for oviposition. Larvae of other *Polites* species are known to feed on a various species of graminoids. For example, *P. sabuleti* larvae have been documented feeding on genera *Distichlis*, *Cynodon*, *Poa*, *Eragrostis*, *Agrostis*, and *Festuca* (Scott, 1986). The data we collected at Grapefern indicate that the Mardon skippers there are using *Carex* species for oviposition. No *Polites* species are known to utilize *Carex* species as larval host plants. However, some Grass skipper larvae of genera *Euphyes*, *Poanes*, *Paratrytone* have been documented feeding on *Carex* species (Scott, 1986).

Bunny Hill was the only site where 100% of oviposition plants could be deciphered. It was also the only site where there were distinct bunch grasses of one predominant species. For all other sites we were not able to identify exact oviposition plants at 30-50% of the oviposition locations. These sites had a homogenous mix of various graminoid species that overlapped in their coverage. For this reason it was not always clear which exact graminoid species was being selected for. Graminoid cover within the 0.1m² plots reveal that at least one species identified as an oviposition plant, with respect to the specific study site, was present in the immediate vicinity of the egg. This may indicate that female Mardon skippers oviposit in vegetation communities rather than on specific host plants.

The habitat at Grapefern differed greatly from Bunny Hill in both vegetative composition as well as structural components. Habitat structural components in Oregon were relatively similar across oviposition locations; percent bare ground fell between 5-8%, and litter had 9-14% cover. Bunny Hill had 15% litter cover and Grapefern had 56% litter cover, in addition Grapefern had 8% bare ground cover where as Bunny Hill had 28%. Note that many of these measurements are highly variable (Appendix 1). The substantial differences in structural and vegetative components across sites indicate that further study is needed for inferences about general Mardon skipper habitat requirements.

Our spatial analysis suggests that populations tend to have higher concentrations at the centers of meadows or near water sources. Across all sites, measurements of oviposition locations to forest edge on average exceeded 20 meters. The distance of oviposition locations from water sources (Oregon sites only) were on average closer for Pacific Crest Trail and Little Hyatt Reservoir (6.5 meters) than Pumpchance 125 (22 meters). Lack of physical water sources in the Washington sites may be compensated for by the higher annual precipitation there (Table 1).

The timing of the adult flight period differed between sites within their respective regions. In Oregon Little Hyatt Reservoir was completing its flight while Pump Chance 125 was still increasing in numbers. The Pacific Crest trail had a very small population, with census counts never exceeding 8 individuals, and adult emergence seemed to occur about a week later than the other two Oregon sites. In Washington, Grapefern was beginning its flight period while the Bunny Hill flight was ending.

We were not able to conduct censuses equally across all sites due to overlap in adult flight periods between Washington and Oregon. We conducted 2 census counts for each site in Oregon, where as 3 counts were conducted at Bunny Hill and 5 counts were conducted at Grapefern. Grapefern was the only site where we were able to capture the entire adult flight period.

The flower species most selected for nectar was *Vicia* species in Washington and *Potentilla diversifolia* in Oregon. This was not surprising because these species were highly abundant at the time. Nectar surveys in conjunction with nectar flower abundance measurements are necessary for a better understanding of adult nectar behavior.

As of October 21st, 2006 we had found larvae in the field at Bunny Hill up to the 3rd or 4th instar. This indicates that Mardon skippers likely over-winter in this stage at this site. Other *Polites* species have been recorded as over-wintering as larvae (*P. mystic*), pupae (*P. sabuleti*), or both (*P. peckius*). These other *Polites* species are also known to create “grass nests” (Scott, 1986). This is consistent with what we saw of *P. mardon*. However, we found no research indicating that grass skippers create silk-frass tunnels. Further research into larval behavior is important for understanding larval-host plant relationships.

Recommendations for future oviposition research:

1. Construction of a uniform grid across the habitat proved to be very useful for surveys, census counts and spatial descriptions of the habitat. The grid also aided the relocation of oviposition sites and drawing accurate field sketches. Establishing all grids before flight period begins, with the use of survey equipment, and at least a 2-person crew, will facilitate a smooth operating field season.
2. Including more than one surveyor when there is overlap between sites in the adult flight period will facilitate a thorough and complete data set.
3. Conducting 0.1m² plots around identified oviposition plants as well as around unidentified oviposition locations will allow for cross analysis of the immediate habitat characteristics to the oviposition at all oviposition locations.
4. Conducting random vegetation plots within the oviposition survey sites. This would not only serve as a description of the meadow’s vegetative characteristics independent of oviposition locations, but also as a control for oviposition patterns.
5. Training oviposition surveyors in graminoid identification will enhance notes at the time of oviposition, and therefore aid in deciphering oviposition plants.

Areas of further research:

Projects feasible for a master's thesis:

1. A broader investigation into female oviposition plant selection. Data collected and random vegetation plots over many sites in a variety of habitats would determine general female oviposition plant preference for *P.mardon* populations.
2. *P. mardon* site usage: What aspects of the meadow seem to be most important; water sources, specific nectar sources, or suitable habitat with specific distances from forest edges? Answering these questions is critical to butterfly management.
3. Larva behavior in the field, intensive field surveys would help us understand larval habitat requirements.
4. What are the different nutrient values between possible larval host plants? Do *Carex* species have a higher nutrient content than *Festuca* species? Answering these questions would aid our understanding of larval behavior and larval foraging constraints.
5. Larva behavior, a captive rearing green house experiment would allow us to analyze larval host plant preferences and survivorship with respect to different graminoid host plants.

More areas of further research:

1. A historical to present aerial photo analysis of meadows with extant and extirpated *P.mardon* populations would reveal any major changes the meadows have undergone and possibly pinpoint reasons for the butterflies' rare status. Compiling historical management practices on the *P.mardon* regions would complement this approach.
2. A strong understanding *P. mardon* dispersal behavior may help direct management strategies for "reconnecting" isolated populations.
3. Are *P.mardon* suffering from genetic inbreeding issues? A genetic analysis may reveal if populations are lacking genetic variability.
4. How do invasive plant species affect *P.mardon*? Determining a negative or positive correlation may help management strategies.
5. How does grazing affect *P.mardon*? Determining a negative or positive correlation may help management strategies.
6. What are the over wintering conditions of *P.mardon* and how might they have changed in the face of global climate change?
7. Research the possible ways the current disjunction of populations came about; such as glaciations or fire suppression altering landscapes.

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Appendix 1: Mean and standard deviation of structural components of 1 m² vegetation plots. Standard deviation in are in parenthesis. See vegetation protocol (Appendix 6) for complete descriptions of specific fields.

	Total shrubs (<3m)	Total hardwood trees (>3m)	Total conifer trees	Rock	Bare Ground	Litter	Cryptogams	Litter >50%	Tallest Plant	Horizontal VEG 1FT	Horizontal VEG 2FT
Bunny Hill	0	0	0	1 (1)	28 (13)	15 (8)	1 (1)	0	76 (14)	7 (4)	1 (0)
Grapefern	0	0	0	0	8 (7)	56 (15)	5 (5)	1 (1)	39 (12)	1 (0)	0
Pumpchance 125	2 (6)	0	0	0	8 (8)	9 (6)	3 (3)	0	50 (11)	9 (6)	0
PCT/Little Hyatt Res.	0	0	0	0	5 (4)	13 (6)	1 (1)	0	48 (14)	6 (6)	0

Appendix 2: Necatar Plant Species By Site

Little Hyatt Reservoir, Oregon
<i>Penstamon procerus</i>
<i>Plectritis congesta</i>
<i>Potentilla diversifolia</i>
<i>Vicia species</i>
<i>Wyethia angustifolia</i>

Pacific Crest Trail, Oregon
<i>Fragaria virginiana</i>
<i>Penstamon procerus</i>
<i>Plectritis congesta</i>
<i>Wyethia angustifolia</i>

Pumpchance 125, Oregon
<i>Bistorta species</i>
<i>Brodiaea species</i>
<i>Penstamon procerus</i>
<i>Plectritis congesta</i>
<i>Potentilla diversifolia</i>
<i>Potentilla flabliofolia</i>
<i>Vicia species</i>
<i>Wyethia angustifolia</i>
<i>Zygadensus venenosus</i>

Grapefern, Washington
<i>Achillea millefolium</i>
<i>Agoseris arantiaca</i>
<i>Antennaria microphylla</i>
<i>Erigeron perigrinus</i>
<i>Fragaria virginiana</i>
<i>Trifolium Longipes</i>
<i>Potentilla drummondii</i>
<i>Vicia species</i>

Bunny Hill, Washington
<i>Achillea millefolium</i>
<i>Calachortus species</i>
<i>Erysimum asperum</i>
<i>Vicia species</i>

Appendix 3: 0.1 m² plots

These tables compare the percent cover of the identified oviposition plant with the percent cover of graminoids found in the 0.1 m² plots.

Legend

Blank field = no oviposition plant could be deciphered. Will have additional fields describing community within 0.1 m² plots.

Red text = draws attention to when an identified oviposition plant appears in the 0.1 m² plots.

Graminoid species are ordered from highest to lowest cover.

Bunny Hill is not represented because all oviposition plants were identified (99% *Festuca idahoensis*).

Forb oviposition plants were not considered.

Little Hyatt Reservoir			1/10 meter square plot											
Oviposition site.	Oviposition plant	%cover	Gram. 1	% cover	Gram. 2	% cover	Gram. 3	% cover	Gram. 4	% cover	Gram. 5	% cover	Gram. 5	% cover
10/820		0	<i>Festuca rubra</i>	20	<i>Danthonia californica</i>	3	<i>Phleum pratensis</i>	2	<i>Carex sp</i>	2	terete-pointed juncus	2	<i>Festuca pratensis</i>	2
11/820		0	<i>Festuca rubra</i>	20	<i>Phleum pratensis</i>	5	<i>Danthonia californica</i>	3	<i>Carex sp</i>	2	terete-pointed juncus	2	<i>Festuca pratensis</i>	2
12/821		0	Immature <i>Carex</i>	20	terete pointed juncus	10	<i>poa pratensis</i>	5	<i>Festuca pratensis</i>	5	<i>Festuca rubra</i>	5	<i>Danthonia californica</i>	3
2/802		0	Carex like scopulorum	15	<i>Poa pratensis</i>	10	<i>Danthonia californica</i>	5						
3/807		0	<i>Danthonia californica</i>	30	terete pointed juncus	5	<i>Festuca pratensis</i>	5	<i>Poa pratensis</i>	5				
6/809		0	<i>Festuca rubra</i>	20	Immature carex	15	terete pointed juncus	10	<i>Danthonia californica</i>	5	<i>Poa pratensis</i>	5		
9/819		0	<i>Festuca rubra</i>	30	Carex vegetative	10	<i>Danthonia californica</i>	5	<i>Phleum pratensis</i>	5	<i>Carex sp</i>	5	terete pointed juncus	3
13/822	<i>Carex species</i>	5												
8/819	<i>Carex species</i>	5												
4/808	<i>Danthonia californica</i>	10												
7/811	<i>Danthonia californica</i>	40												
1/801	<i>Festuca rubra</i>	25												
5/810	<i>Festuca rubra</i>	15												
PCT			1/10 meter square plot											
Oviposition site.	Oviposition plant	%cover	Gram. 1	% cover	Gram. 2	% cover	Gram. 3	% cover	Gram. 4	% cover				
1/836		0	<i>Danthonia californica</i>	30	<i>Carex sp "ovales"</i>									
10/843		0	<i>Danthonia californica</i>	20	<i>Poa pretensis</i>									
11/834		0	<i>Danthonia californica</i>	20	<i>Poa pretensis</i>	10	<i>Carex sp "ovales"</i>	5						
2/837		0	<i>Danthonia californica</i>	20	<i>Poa pretensis</i>	5								
4/839		0	<i>Danthonia californica</i>	15	<i>Poa pretensis</i>	10	Immature <i>Carex</i>	5						
5/840		0	<i>Poa pratensis</i>	15	<i>Danthonia californica</i>	10								
6/841		0	<i>Danthonia californica</i>	20	<i>Poa pretensis</i>	10								
8/833		0	<i>Danthonia californica</i>	10	Immature <i>Carex</i>	10	<i>Carex sp "ovales"</i>	10	<i>Carex vegetative</i>	10				
9/842		0	<i>Danthonia californica</i>	15	<i>Carex sp "ovales"</i>	10	<i>Carex sp2 "ovales"</i>	10	Immature <i>Carex</i>	10				
13/835	<i>Danthonia californica</i>	30												
7/832	<i>Danthonia californica</i>	25												
12/831	<i>Potentilla gracilis</i>	15												
3/838	<i>Potentilla gracilis</i>	20												

Pumpchance 125			1/10 meter square plot													
Oviposition site.	Oviposition plant	%cover	Gram. 1	% cover	Gram. 2	% cover	Gram. 3	% cover	Gram.4	% cover	Gram.5	% cover	Gram.6	% cover	Gram.7	% cover
12/825		0	Danthonia californica	20	Poa pratensis	15	Phleum pratense	10	Juncus ensifolius	5	Luzula comosa	5	Vegetative slender rush	5	Immature carex	5
14/826		0	Poa pratense	60	Danthonia californica	25	Phleum pratense	5								
16/824		0	Danthonia californica	30	Phleum pratense	20	Luzula comosa	5	Poa pratensis	5						
2/804		0	Danthonia californica	15	Phleum pratense	10	Vegetative slender rush	5	Poa pratensis	5	Immature Carex	2				
23/847		0	Immature Carex	20	Danthonia californica	15	Festuca roemerii	15	Phleum pratense	15	Poa pratense	5	small juncus	5		
4/805		0	Poa pratense	10	Phleum pratense	10	Vegetative slender rush	10								
5/806		0	Danthonia californica	20	Deschampsia caespitosa	10	Phleum pratense	10	Vegetative slender rush	5	Hordeum sp	1				
7/813		0	Poa pratense	10	Danthonia californica	5										
8/814		0	Poa pratense	25	Danthonia californica	15										
9/815		0	Poa pratense	15	Danthonia californica	5										
1/816	Danthonia californica	40														
10/817	Danthonia californica	5														
13/828	Danthonia californica	20														
17/823	Danthonia californica	50														
20/844	Danthonia californica	20														
3/803	Danthonia californica	35														
6/812	Danthonia californica	20														
6/812	Danthonia californica	20														
15/827	Deschampsia caespitosa	25														
18/829	Deschampsia caespitosa	20														
21/845	Deschampsia caespitosa	20														
11/818	Festuca roemerii	10														
19/830	Potentilla gracillis	15														
22/846	Poa pratense	20														

Grape Fern		1/10 meter square plot						
Oviposition site.	Oviposition plant	%cover	Gram.1	%cover	Gram.2	%cover	Gram.3	%cover
1/1		0	Carex pensylvanica	20	Carex hoodii	15	Bromus carinatus	5
12/12		0	Carex pensylvanica	30	Carex hoodii	30	Bromus carinatus	5
14/14		0	Carex pensylvanica	20	Carex hoodii	10	Bromus carinatus	10
15/15		0	Carex pensylvanica	50	Bromus carinatus	10	Luzula campes	10
17/17		0	Carex pensylvanica	35	Bromus carinatus	5	Elymus glaucus	5
2/2		0	Carex pensylvanica	50	Poa pratensis	5	Bromus carinatus	5
20/20		0	Carex pensylvanica	20	Carex halliana	10	Carex hoodii	5
25/25		0	Carex halliana	5				
26/26		0	Carex halliana	10	Carex hoodii	1	Bromus carinatus	1
5/5		0	Carex pensylvanica	50	Bromus carinatus	5	Danthonia intermedia	5
8/8		0	Carex pensylvanica	25				
10/10	Achillea millefolium	15						
19/19	Agoseris aurantiaca	10						
23/23	Bromus carinatus	10						
24/24	Bromus carinatus	5						
4/4	Bromus carinatus	10						
16/16	Carex hoodii	15						
3/3	Carex multicosata	10						
18/18	Carex pensylvanica	15						
6/6	Carex pensylvanica	25						
7/7	Carex pensylvanica	25						
9/9	Carex pensylvanica	30						
11/11	Fragaria virginiana	20						
13/13	Fragaria virginiana	35						
22/22	Fragaria virginiana	25						
21/21	Viola nuttallii	10						

Appendix 4: 1 m² plots

Tables show graminoid species and their corresponding percent cover.
Oviposition plants, when identified, are represented in red capital letters.
When oviposition plants could not be deciphered the field is blank.
Graminoid species are sorted by highest to lowest cover.

Bunny Hill, Washington

OVPsite.	Oviposition plant	% Cover	Gram1	%cover	Gram2	%cover
1/850	FESTUCA IDAHOENSIS	20	FESTUCA IDAHOENSIS	20	Stipa occidentalis	10
10/856	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Stipa occidentalis	10
11/868	FESTUCA IDAHOENSIS	30	FESTUCA IDAHOENSIS	30	Carex pensylvanica	10
12/854	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Stipa occidentalis	3
13/853	FESTUCA IDAHOENSIS	30	FESTUCA IDAHOENSIS	30	Bromus carinatus	5
15/857	FESTUCA IDAHOENSIS	20	FESTUCA IDAHOENSIS	20	Stipa occidentalis	10
16/858	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	10
17/859	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	3
18/860	FESTUCA IDAHOENSIS	20	FESTUCA IDAHOENSIS	20	Stipa occidentalis	5
19/861	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Elymus glaucus	3
2/849	FESTUCA IDAHOENSIS	20	FESTUCA IDAHOENSIS	20	Bromus carinatus	5
20/866	FESTUCA IDAHOENSIS	10	FESTUCA IDAHOENSIS	10	Stipa occidentalis	10
21/867	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	3
22/869	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	10
23/870	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Stipa occidentalis	10
24/871	FESTUCA IDAHOENSIS	30	FESTUCA IDAHOENSIS	30	Carex pensylvanica	10
25/873	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Carex pensylvanica	5
26/872	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Bromus carinatus	5
27/876	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	15
28/874	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	10
29/875	FESTUCA IDAHOENSIS	30	FESTUCA IDAHOENSIS	30	Stipa occidentalis	10
3/851	FESTUCA IDAHOENSIS	20	FESTUCA IDAHOENSIS	20	Stipa occidentalis	5
30/878	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Stipa occidentalis	10
31/	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	7
32/879	FESTUCA IDAHOENSIS	20	FESTUCA IDAHOENSIS	20	Stipa occidentalis	5
4/852	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	5
5/848	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Stipa occidentalis	10
6/864	FESTUCA IDAHOENSIS	15	FESTUCA IDAHOENSIS	15	Stipa occidentalis	10
7/865	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Stipa occidentalis	5
8/862	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Stipa occidentalis	5
9/863	FESTUCA IDAHOENSIS	25	FESTUCA IDAHOENSIS	25	Bromus carinatus	3
14/855	STIPA OCCIDENTALIS	20	STIPA OCCIDENTALIS	20	Poa pratensis	5

Bunny Hill, Washington

OVPsite.	Gram3	%cover	Gram4	%cover	Gram5	%cover
1/850	Carex pensylvanica	3	Bromus carinatus	1		
10/856	Bromus carinatus	3	Carex pensylvanica	2		
11/868	Stipa occidentalis	5	Bromus carinatus	3	Poa prate	3
12/854	Bromus carinatus	3	Carex pensylvanica	3		
13/853	Carex pensylvanica	5	Stipa occidentalis	5		
15/857	Carex pensylvanica	5				
16/858						
17/859	Carex pensylvanica	1				
18/860	Carex pensylvanica	3	Agrostis tenuis	3	Bromus c	2
19/861	Carex pensylvanica	2	Stipa occidentalis	1		
2/849	Carex pensylvanica	5	Stipa occidentalis	3		
20/866	Bromus carinatus	5	Carex pensylvanica	3		
21/867	Carex pensylvanica	1	Bromus carinatus	2		
22/869	Carex pensylvanica	10	Poa pratensis	4	Bromus c	1
23/870	Carex pensylvanica	5	Bromus carinatus	2		
24/871	Stipa occidentalis	5	Bromus carinatus	3	Poa prate	3
25/873	Stipa occidentalis	3	Bromus carinatus	2		
26/872	Carex pensylvanica	5	Stipa occidentalis	3		
27/876	Bromus carinatus	5	Carex pensylvanica	5	Poa prate	3
28/874	Bromus carinatus	5	Carex species	5		
29/875	Carex pensylvanica	10	Poa pratensis	2		
3/851	Bromus carinatus	5	Carex pensylvanica	5		
30/878	Poa pratensis	5	Bromus carinatus	5		
31/	Carex pensylvanica	5	Bromus carinatus	3		
32/879	Bromus carinatus	2				
4/852	Poa pratensis	3	Bromus carinatus	3	Carex per	3
5/848	Carex pensylvanica	10	Bromus carinatus	5		
6/864	Bromus carinatus	5	Carex pensylvanica	3		
7/865	Bromus carinatus	3	Carex pensylvanica	2		
8/862	Carex pensylvanica	5	Elymus glaucus	3		
9/863	Stipa occidentalis	5	Carex pensylvanica	3		
14/855	Bromus carinatus	5	Festuca idahoensis	5	Carex per	5

Grapefern, Washington						
OVPsite.	Oviposition plant	% Cover	Gram1	%cover	Gram2	%cover
26/26			Carex halliana	15	Bromus carinatus	3
5/5			Carex hoodii	15	Danthonia intermedia	5
25/25			Carex hoodii	10	Bromus carinatus	10
1/1			Carex pensylvanica	20	Carex hoodii	10
2/2			Carex pensylvanica	20	Carex hoodii	10
8/8			Carex pensylvanica	30	Danthonia intermedia	10
12/12			Carex pensylvanica	35	Carex hoodii	35
14/14			Carex pensylvanica	20	Carex hoodii	5
15/15			Carex pensylvanica	40	Bromus carinatus	10
17/17			Carex pensylvanica	35	Bromus carinatus	10
20/20			Carex pensylvanica	20	Carex hoodii	5
4/4	BROMUS CARINATUS	10	BROMUS CARINATUS	10	Carex hoodii	10
23/23	BROMUS CARINATUS	10	BROMUS CARINATUS	10	Carex hoodii	10
24/24	BROMUS CARINATUS	5	Carex halliana	10	BROMUS CARINATUS	5
16/16	CAREX HOODII	15	CAREX HOODII	15	Carex halliana	10
3/3	CAREX MULTICOSTATA	10	CAREX MULTICOSTATA	10	Carex halliana	10
6/6	CAREX PENSYLVANICA	25	CAREX PENSYLVANICA	25	Carex hoodii	15
7/7	CAREX PENSYLVANICA	25	CAREX PENSYLVANICA	25	Bromus carinatus	10
9/9	CAREX PENSYLVANICA	30	CAREX PENSYLVANICA	30	Bromus carinatus	10
10/10	ACHILLEA MILLEFOLIUM	15	Carex pensylvanica	20	ACHILLEA MILLEFOLIUM	15
11/11	FRAGARIA VIRGINIANA	20	Carex pensylvanica	35	FRAGARIA VIRGINIANA	20
18/18	CAREX PENSYLVANICA	15	CAREX PENSYLVANICA	15	Danthonia intermedia	15
19/19	AGOSERIS AURANTIACA	10	Carex pensylvanica	20	AGOSERIS AURANTIACA	10
13/13	FRAGARIA VIRGINIANA	35	FRAGARIA VIRGINIANA	35	Carex pensylvanica	10
22/22	FRAGARIA VIRGINIANA	25	FRAGARIA VIRGINIANA	25	Carex halliana	15
21/21	VIOLA NUTTALLII	10	VIOLA NUTTALLII	10	Danthonia intermedia	15

Grapefern, Washington

OVPsite.	Gram3	%cover	Gram4	%cover	OVPsite.	Gram5	%cover
26/26	Poa pratensis	2	Carex pensylvanica	1	26/26		
5/5	Bromus carinatus	3			5/5		
25/25	Carex halliana	5	Stipa occidentalis	5	25/25		
1/1	Bromus carinatus	5	Phleum alpinum	3	1/1	Danthonia intermedia	3
2/2	Bromus carinatus	5	Carex halliana	5	2/2	Poa pratensis	5
8/8	Bromus carinatus	5	Elymus glaucus	5	8/8	Poa pratensis	1
12/12	Bromus carinatus	5	Poa pratensis	5	12/12	Carex halliana	1
14/14	Bromus carinatus	5	Carex halliana	5	14/14	Poa pratensis	3
15/15	Carex halliana	5	Poa pratensis	5	15/15	Luzula campestris	3
17/17	Elymus glaucus	10	Bromus carinatus	5	17/17		
20/20	Carex halliana	5	Bromus carinatus	5	20/20		
4/4	Poa pratensis	5	Phleum alpinum	2	4/4		
23/23	Danthonia intermedia	5	Carex pensylvanica	5	23/23	Carex halliana	5
24/24	Elymus glaucus	5	Carex #2	5	24/24	Carex hoodii	5
16/16	Bromus carinatus	5			16/16		
3/3	Carex hoodii	10	Stipa occidentalis	5	3/3	Bromus carinatus	5
6/6	Bromus carinatus	10			6/6		
7/7	Carex halliana	3	Carex hoodii	2	7/7		
9/9	Carex halliana	5	Poa pratensis	3	9/9	Danthonia intermedia	1
10/10	Elymus glaucus	5	Bromus carinatus	5	10/10	Carex halliana	5
11/11	Carex halliana	10	Carex hoodii	5	11/11	Bromus carinatus	5
18/18	Phleum alpinum	5	Poa pratensis	5	18/18	Carex halliana	5
19/19	Bromus carinatus	10	Carex halliana	3	19/19	Poa pratensis	3
13/13	Bromus carinatus	5	Carex halliana	5	13/13	Elymus glaucus	5
22/22	Bromus carinatus	10	Carex hoodii	3	22/22	Stipa occidentalis	3
21/21	Carex hoodii	11	Bromus carinatus	5	21/21	Phleum alpinum	2

Grapefern, Washington					
Gram6	%cover	Gram7	%cover	Gram8	%cover
Elymus glaucus	3	Poa pratensis	3	Trisetum spicatum	2
Stipa occidentalis var.	5				
Elymus glaucus	3	Stipa occidentalis var. minor	3		
Stipa occidentalis var.	3				
Stipa occidentalis var.	5	Poa pratensis	3		
Danthonia intermedia	5				
Poa pratensis	1				
Luzula campestris	1				
Stipa occidentalis var.	3				
Carex hoodii	5				
Agrostis tenuis	2	Carex halliana	2		

Pumpchance 125

OVPsite.	Oviposition plant	% Cover	Gram1	%cover	Gram2	%cover
12/825			Danthonia californica	25	Poa pratensis	20
16/824			Danthonia californica	20	Phleum pratense	10
5/806			Danthonia californica	40	Poa pratensis	20
23/847			Festuca roemeri	15	Danthonia californica	10
14/826			Poa pratensis	25	Danthonia californica	15
7/813			Poa pratensis	10	Danthonia californica	3
8/814			Poa pratensis	30	Danthonia californica	15
9/815			Poa pratensis	15	Danthonia californica	5
2/804			vegetative slender rush	20	Phleum pratense	10
4/805			vegetative slender rush	20	Phleum pratense	10
1/816	DANTHONIA CALIFORNICA	40	DANTHONIA CALIFORNICA	40	Poa pratensis	5
17/823	DANTHONIA CALIFORNICA	50	DANTHONIA CALIFORNICA	50	Deschampsia caespitosa	10
20/844	DANTHONIA CALIFORNICA	20	DANTHONIA CALIFORNICA	20	Carex microptera	15
3/803	DANTHONIA CALIFORNICA	35	DANTHONIA CALIFORNICA	35	Phleum pratense	10
6/812	DANTHONIA CALIFORNICA	20	DANTHONIA CALIFORNICA	20	Poa secunda	10
6/812	DANTHONIA CALIFORNICA	20	DANTHONIA CALIFORNICA	20	Poa secunda	10
15/827	DESCHAMPSIA CAESPITOSA	25	DESCHAMPSIA CAESPITOSA	25	Danthonia californica	20
18/829	DESCHAMPSIA CAESPITOSA	20	DESCHAMPSIA CAESPITOSA	20	Carex microptera	15
21/845	DESCHAMPSIA CAESPITOSA	20	DESCHAMPSIA CAESPITOSA	20	Danthonia californica	10
11/818	FESTUCA ROEMERI	10	FESTUCA ROEMERI	10	Poa bulbosa	10
10/817	DANTHONIA CALIFORNICA	5	Poa pratensis	25	Deschampsia caespitosa	15
13/828	DANTHONIA CALIFORNICA	20	Poa pratensis	30	DANTHONIA CALIFORNICA	20
22/846	POA PRATENSIS	20	POA PRATENSIS	20	Poa secunda	10
19/830	POTENTILLA GRACILLIS	15	POTENTILLA GRACILLIS	15	Danthonia californica	5

Pumpchance 125			Pumpchance 125				
OVPsite.	Gram3	%cover	Gram4	%cover	OVPsite.	Gram5	%cover
12/825	Luzula comosa	10	Phleum pratense	10	12/825	vegetative slender rush	5
16/824	Carex microptera	10	Luzula comosa	5	16/824	Poa pratensis	5
5/806	Phleum pratense	10	vegetative slender rush	10	5/806	Deschampsia caespitosa	5
23/847	Phleum pratense	5	Poa pratensis	5	23/847	Immature Carex	3
14/826	Phleum pratense	10	small Juncus	2	14/826	Luzula comosa	2
7/813					7/813		
8/814	Carex	2	Luzula comosa	2	8/814		
9/815					9/815		
2/804	Danthonia californica	10	Immature Carex	5	2/804	Poa pratensis	5
4/805	Poa pratensis	10	Danthonia californica	5	4/805		
1/816	Phleum pratense	5	Immature Carex	5	1/816		
17/823	Poa pratensis	10	Phleum pratense	5	17/823		
20/844	Poa pratensis	10	Festuca rubra	10	20/844	Deschampsia caespitosa	10
3/803	Poa secunda	5	Poa pratensis	5	3/803	vegetative slender rush	5
6/812	Phleum pratense	10	Juncus species	5	6/812	Deschampsia danthonioides	5
6/812	Phleum pratense	10	Juncus species	5	6/812	Deschampsia danthonioides	5
15/827	Poa pratensis	10	Phleum pratense	10	15/827	small Juncus	5
18/829	Poa pratensis	15	Danthonia californica	15	18/829	Luzula comosa	10
21/845	Poa secunda	10			21/845		
11/818	Poa pratensis	5	Immature Carex	1	11/818		
10/817	DANTHONIA CALIFORNICA	5	Poa secunda	3	10/817	Carex microptera	2
13/828	Deschampsia caespitosa	10			13/828		
22/846	Phleum pratense	10	Danthonia californica	5	22/846	vegetative slender rush	2
19/830	Poa pratensis	5	Immature Carex	5	19/830	Stipa nelsonii	5

Pumpchance 125

Gram6	%cover	Gram7	%cover	Gram8	%cover
Immature Carex	5	small Juncus	5	Juncus ensifolius	2
small Juncus	5	Deschampsia caespitosa	5	Hordeum brachyantherum	5
Hordeum brachyanthe	5				
Poa bulbosa	3	small Juncus	1		
Poa secunda	2				
Festuca rubra	2	Deschampsia caespitosa	1		
Luzula comosa	10	Phleum pratense	5		
Immature Carex	5				
Bromus mollis	1				
Bromus mollis	1				
Luzula species	2				
Festuca roemeri	1				
Juncus ensifolius	1				

South Little Hyatt						
OVPsite.	Oviposition plant	% Cover	Gram1	%cover	Gram2	%cover
2/802			Carex like scopulorum	30	Poa pratensis	20
3/807			Danthonia californica	30	Festuca pratensis	5
10/820			Festuca rubra	30	Danthonia californica	5
11/820			Festuca rubra	30	Danthonia californica	5
6/809			Festuca rubra	25	Poa pratensis	10
9/819			Festuca rubra	25	Danthonia californica	10
12/821			Immature Carex	15	terete-pointed juncus	10
4/808	DANTHONIA CALIFORNICA	10	DANTHONIA CALIFORNICA	10	Poa pratensis	5
7/811	DANTHONIA CALIFORNICA	40	DANTHONIA CALIFORNICA	40	Poa pratensis	5
1/801	FESTUCA RUBRA	25	FESTUCA RUBRA	25	terete-pointed juncus	10
13/822	CAREX -VEGETATIVE	5	Festuca rubra	20	CAREX -VEGETATIVE	5
5/810	FESTUCA RUBRA	15	Festuca rubra	20	FESTUCA RUBRA	15
8/819	CAREX -VEGETATIVE	5	Festuca rubra	20	Danthonia californica	10
Pacific Crest Trail						
9/842			Carex sp "ovales"	25	Immature Carex	10
1/836			Danthonia californica	25	Carex sp "ovales"	10
10/843			Danthonia californica	10	Poa pratensis	10
11/834			Danthonia californica	25	Poa pratensis	10
2/837			Danthonia californica	20	Poa pratensis	5
4/839			Danthonia californica	15	Poa pratensis	5
5/840			Danthonia californica	15	Poa pratensis	10
6/841			Danthonia californica	25	Poa pratensis	10
8/833			Immature Carex	10	Carex -vegetative	10
13/835	DANTHONIA CALIFORNICA	30	DANTHONIA CALIFORNICA	30	grass vegetative	10
7/832	DANTHONIA CALIFORNICA	25	DANTHONIA CALIFORNICA	25	Poa pratensis	15
12/831	POTENTILLA GRACILLIS	15	POTENTILLA GRACILLIS	15	Carex sp "ovales"	15
3/838	POTENTILLA GRACILLIS	20	POTENTILLA GRACILLIS	20	Danthonia californica	20

South Little Hyatt							
OVPsite.	Gram3	%cover	Gram4	%cover	OVPsite.	Gram5	%cover
2/802	Danthonia californica	10			2/802		
3/807	Poa pratensis	5	terete-pointed juncus	5	3/807	Alopecurus pratensis	2
10/820	Phleum pratense	5	terete-pointed juncus	5	10/820	Carex sp "ovales"	5
11/820	Phleum pratense	5	terete-pointed juncus	5	11/820	Carex sp "ovales"	5
6/809	terete-pointed juncus	10	Immature Carex	10	6/809	Danthonia californica	5
9/819	Poa pratensis	5	terete-pointed juncus	5	9/819	Phleum pratense	5
12/821	Poa pratensis	5	Danthonia californica	5	12/821	Festuca rubra	5
4/808	terete-pointed juncus	5	Stipa lemmonii	5	4/808	Immature Carex	2
7/811	Bromus mollis	5	terete-pointed juncus	5	7/811	slender tufted juncus	2
1/801	Festuca pratensis	5	Immature Carex	5	1/801	Carex sp "ovales"	5
13/822	Immature Carex	5	Poa pratensis	5	13/822	Danthonia californica	5
5/810	Agropyron caninum	5	Carex sp "ovales"	5	5/810	Poa pratensis	5
8/819	Carex sp "ovales"	10	CAREX -VEGETATIVE	5	8/819	Festuca pratensis	5
Pacific Crest Trail							
9/842	Danthonia californica	10	Carex sp2	5	9/842		
1/836	Poa pratensis	5			1/836		
10/843	Immature Carex	5	Poa secunda	3	10/843		
11/834	Carex sp "ovales"	5			11/834		
2/837	Poa secunda	5	Phleum pratense	3	2/837		
4/839	Poa secunda	5	Immature Carex	5	4/839	Luzula comosa	1
5/840	Immature Carex	2			5/840		
6/841	Phleum pratense	5			6/841		
8/833	Danthonia californica	10	Festuca pratensis	5	8/833	Carex sp "ovales"	5
13/835	Poa pratensis	5			13/835		
7/832	Phleum pratense	10	Poa bulbosa	5	7/832	Poa secunda	2
12/831	Danthonia californica	10	Poa bulbosa	5	12/831	Poa pratensis	5
3/838	Phleum pratense	5	Poa pratensis	5	3/838	Immature Carex	5

South Little Hyatt					
Gram6	%cover	Gram7	%cover	Gram8	%cover
Poa pratensis	5	Festuca pratensis	1		
Poa pratensis	5	Festuca pratensis	1		
Luzula comosa	1				
Carex sp "ovales"	5	Carex -vegetative	5		
Festuca pratensis	2	Luzula comosa	1		
Melica bulbosa	1				
Stipa lemmonii	2	Phleum pratense	2	Poa bulbosa	1
Danthonia californica	3	Poa pratensis	3	Carex -vegetative	3
terete-pointed juncus	5	Carex sp "ovales"	5		
Carex hoodii	5				
terete-pointed juncus	5	Phleum pratense	5	Poa pratensis	2
Pacific Crest Trail					
Juncus species	3	Poa compressa	2	Phleum pratense	2
Poa secunda	5				

Appendix 5:

Protocol Site Utilization by Adults and Larvae of Mardon Skipper Butterfly (*Polites mardon*) at four sites in Washington and Oregon.

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Background

The Mardon skipper (*Polites mardon*) is a small, tawny-orange butterfly currently found at only four geographically disjunct areas in Washington, Oregon and California. In order to learn how to properly manage extant populations of this little-studied species we need to learn important life history information. One of the most important, and unknown, aspects of this butterfly's life history are the habitat features it utilizes for egg laying and larval development/growth.

Using the research protocol we detailed here we provide critical information regarding the relationships between Mardon skipper and the meadow plants and micro-habitats at extant sites. Specifically, we determined where in the habitat, and on what plants, adult females lay their eggs. To accomplish this task we coordinated with Forest Service botanists who characterize the vegetation in oviposition areas.

After the end of the adult flight period we returned to all sites at least once to search for larvae. We conducted repeated larval surveys at Bunny Hill where we documented life stage and behavior information.

This work was completed at four sites: two on the Gifford Pinchot National Forest in Washington, and two on the Bureau of Land Management Lands on the Medford District in Southern Oregon.

Population Counts

Population counts at all four sites were made using modified (5 meter radius) Pollard transect surveys. Pollard transects were developed by the British Butterfly Monitoring Scheme (Pollard and Yates 1993) and are a common method of estimating butterfly populations. This transect method provides an index of the total number of butterflies per unit area, not an absolute count or density estimate. Pollard transects have low impact on both butterflies and habitat.

Sampling Area for population estimates

The entire core Mardon habitat area (Note: core areas have already been designated for populations in southern Oregon) were considered the sample area for purposes of population estimates. In all sites a grid system was developed with evenly spaced transects so that the entire core area was surveyed (see description in next paragraph).

Transect methods

Transect counts were conducted between 10AM and 5PM on sunny days with low wind speeds (<5 on Beauford wind scale) and temperatures above 60 degrees F. On the day of the transect counts, one count was made along each transect at each site. Transects were determined by a grid laid out with pin flags that create distinct 10 by 10 meter square cells. The surveyor walked down the center of these cells so that s/he can see 5 meters to both edges of the cell. Total number of butterflies were recorded for each 10 m square cell as the surveyor walked slowly along each transect line. Each 10 meter cell was given an identifiable name (i.e. C5). Butterflies that enter from behind the surveyor were ignored. An effort was made to determine the sex of each individual counted when this was not possible the individual was recorded as having an unknown sex. Mardon skipper identification was made without capture, when necessary with the aid of 10x binoculars.

Polities Sonora (Sonora skipper) is a morphologically similar species to the Mardon skipper. In the Oregon sites the adults co-occur late in the Mardon skipper flight period. Before each census a Mardon skipper and a Sonora skipper were captured at the opposite end of the grid that the census would start on. The individuals were viewed to calibrate the surveyor's eye to species differentiation, and then promptly released. Data were only recorded when we were 100% certain on the species identification.

Site counts

The number of butterflies at each site was simply recorded as a daily count. There were not enough daily counts to come up with an index of population for the sites.

Determining Site Utilization by Ovipositing Females

Sampling Area for Oviposition Utilization

Sample areas were chosen based on where Mardon skipper females were most abundant and frequently encountered. The habitat for Mardon skipper is potentially a much larger area at each study site than we included within sample areas.

Sampling Protocol

We visited each sample area to collect data on Mardon skipper oviposition behavior. Oviposition observations were made primarily during the peak of Mardon skipper's adult flight period in each region (i.e. southern Washington Cascades and southern Oregon Cascades). Sampling was conducted on calm (<5 on Beauford wind scale), sunny days with temperatures above 15° C. Oviposition observations began when any individual female butterflies were observed flying.

During each survey session, the observer randomly selected a point at which to begin, within the previously established site grid transects. From this point, the observer walked the transect in search of female Mardon skippers. Observations were made with the aid of 8x 42 binoculars. From this point, observers walked the transect in search of female Mardon skippers. When a female butterfly was located it was watched until it was visually lost, or for a maximum of 10 minutes if it was not ovipositing. Females engaged in ovipositing were watched for up to five individual egg laying behaviors. The total ovipositing behavior sample per site consisted of as many females as possible. Observations were made with the aid of 10x binoculars. All sites where oviposition occurs – which we call “oviposition locations” -- were temporarily marked with a pin flag immediately after egg-laying was complete and the butterfly moved on. At the end of the sampling period, the field observer returned to the pin flags and marked each location with a permanent spike with flagging with tape and an identifying numbered metal tag attached, inserted until almost flush with the ground below the plant where oviposition occurred. Notes and sketches were taken concerning the precise location of the egg relative to the spike. No location was marked unless either the egg is visually seen dropped from the female skipper or relocated after a female displayed typical oviposit behavior. We recorded a precise GPS coordinate for each micro-site. To relocate each site, we will use a GPS and, if needed, a metal detector.

We coordinated with Forest Service botanists in the field so they could easily find and describe vegetation at these oviposition locations. For more information on describing vegetation please see: *Protocol for Describing Vegetation at Mardon Skipper Oviposition Micro-sites in Summer 2006*; Draft Version by Wayne Rolle, March 7, 2006.

Nectar observations were recorded by a tally method while conducting oviposition surveys.

Determining Site Utilization by Larvae

Sampling Area for Larval Utilization

We searched for larvae around at least 50% of oviposition locations per site, at least once. We conducted continuous larval surveys at Bunny Hill at all oviposition.

Timing

We visited the selected sampling area three times at two week intervals following the adult flight period.

Sampling Protocol

To find larvae, we carefully searched through the grass at each larval survey area. We worked from the center (spike) outwards for 15-45 minutes at each location. As no larvae have ever been seen in the wild, our search image was based on photos from Lepidopterist Dave Nunnallee and the Oregon Zoo's 2004/2005 captive rearing project.

We recorded detailed information about larval habits, such as where they built nests, how far they moved, what host plants they utilized, and what life stage they were in.

Reporting

A full report was generated which includes all information on both adult and larval study site utilization. We incorporated information on oviposition site characteristics from vegetation descriptions generated by U.S. Forest Service botanists. For more information on describing vegetation please see: *Protocol for Describing Vegetation at Mardon Skipper Oviposition Micro-sites in Summer 2006*; Draft Version by Wayne Rolle, March 7, 2006.

Timeframe

The entire program (site visits and reporting) took place in calendar year 2006. All sites were surveyed during the flight and active larval period.

Appendix 6:

PROTOCOL FOR DESCRIBING VEGETATION AT MARDON SKIPPER OVIPOSITION MICRO-SITES IN SUMMER 2006

Amended Version by Wayne Rolle June 27, 2006

BACKGROUND

Mardon skippers are rare butterflies known so far from only a few meadows/prairies in western Washington, southern Oregon Cascades, and Del Norte County, California. They cycle through one generation each year. No long distance migration. Adults emerge in early summer, visit nectar plants and water sources, mate, and females lay eggs on larval host plants. Best evidence is that larval food sources are graminoids (grasses, rushes, sedges). There is conjecture that overwintering pupae are constructed in the crowns of perennial bunchgrasses.

In addition to this protocol for describing vegetation, one or more protocols will be developed to guide how oviposition sites are detected and selected for study, and for larval detection and study.

MANAGEMENT OBJECTIVE

It is the hope of the team conducting this study that accurately describing the vegetation and environmental variables at oviposition (egg-laying) sites will help clarify key landscape features that can be managed in a manner favorable to the Mardon skipper.

Management Objective = maintain healthy populations of Mardon skippers where they currently exist.

VEGETATION DESCRIPTION OBJECTIVE

Accurately identify the primary host plant (individual plant on which eggs are actually deposited, also called the oviposition plant) to genus and species.

Measure, estimate, and describe vegetation attributes within a close distance to

the primary host plant (the area most likely to be used by larvae before they pupate) that are judged to be important to Mardon skippers.

PROTOCOL

- Set compass to 20 degrees east declination.
- Xerces Society members and/or biologists detect and mark oviposition plants according to a separate protocol, and guide botanists to the precise oviposition micro-sites.
- Collect vegetation data at each oviposition site within 7 days of egg-laying.
- Conduct the protocol described below with as little disturbance to primary host plants and their immediate vicinity as possible. Remember that other oviposition sites being studied may be immediately adjacent or even underfoot.
- At each location, a 1-meter square quadrat will be centered directly over the primary host plant, with each edge of the quadrat facing a cardinal direction.
- Record Genus and species of primary host plant*. If voucher collections or plants for later laboratory ID are needed, get them from outside the quadrat.
- Measure the distance in centimeters from the center of oviposition plant at ground level to center of nearest neighbor of the same species, at ground level*.
- **Within the quadrat, estimate the percent cover of the following** (in increments of 5%, except use smaller increments if cover is clearly less than 5%) (The sum of these individual cover estimates will usually total more than 100%. That's fine):
 1. % cover of oviposition species*
 2. % cover of each graminoid (each species in genera belonging to the families Poaceae, Juncaceae and Cyperaceae) that occurs in the quadrat
 3. % cover of all (lumped) ferns

4. % cover of all (lumped) shrubs less than 3 m high (record main species)
 5. % cover of all (lumped) hardwood trees greater than 3 m high (record main species)
 6. % cover of all (lumped) conifer trees of any height (record main species)
 7. % cover of all (lumped) forbs
- Estimate the total vascular plant % cover (all species lumped) (100% maximum) (think of raindrops falling vertically. What percentage would hit a vascular plant vs. the ground).
 - Estimate the ground cover of (each) bare soil, rock, litter (including down wood), and all (lumped) cryptogams (bryophytes, lichens, fungi).
 - If litter cover is estimated to be more than 50%, estimate average litter depth (across entire quadrat)
 - Within the quadrat, measure the maximum height of:
 1. primary host plant (culm height)*
 2. Primary host plant basal leaves*
 3. the tallest herbaceous plant (forb or graminoid, and record which species it is.
 - Measure a length and width of primary host plant at ground level (two perpendicular measurements)*.
 - Estimate the % of basal foliage of the primary host plant that is green (alive) vs. brown (dead leaves still present)*.
 - On the north edge of the quadrat, place a meter stick parallel to the ground at three different heights, 1 ft., 2 ft., and 3 ft. From the south edge of the quadrat, at each height interval, estimate the % of the meter stick that is NOT visible when viewed through a plane at that height, from the south side to the north side of the quadrat (1 meter horizontal distance). We will arbitrarily call this measure “horizontal vegetation thickness”.

- Measure, or estimate, total canopy density as reflected in a Robert E. Lemmon Model-A convex spherical Densiometer.
- Use a field form, developed specifically for this protocol, to record all the data to be collected under this protocol.

* = When oviposition is observed and marked as an oviposition site by the lepidopterist, yet a single primary host plant cannot be identified (no clearly defined single dominant graminoid plant clearly marked by a stake), cross out the section of the field form titled “Primary Host Plant Attributes”. Instead, in the blank area at the bottom of the field form’s back side, estimate and record the following attributes within a 1/10 meter square centered directly over the oviposition stake:

 % cover of each graminoid species present

 % maximum height of each graminoid species present

 % forb cover, and if a particular forb dominates the 1/10 meter square, record its name.

Then, when filling out the “Quadrat Vegetation Features” section, write N.A. (not applicable) in the blank asking for “Estimated cover of oviposition plant species (all individuals) within the quadrat”. The graminoid species recorded on the back of the form should also be listed on the front of the form, with their full-meter quadrat cover estimates, along with other graminoids that were not detected in the 1/10 meter square.

Appendix 7: *Polites mardon* Site Utilization Raw Data

Key

This key will help decipher any abbreviations, symbols, or headings that are not self explanatory in the data.

Sites

UC = Pump Chance 125 in Oregon

PT= Pacific Crest Trail in Oregon

LH= Little Hyatt Reservoir in Oregon

BH= Bunny Hill in Washington

GF= Grape Fern in Washington

- Observation Data

<u>Code</u>	<u>Behavior</u>
1	Flying
2	Land/Perch
3	Oviposit
4	Nectar
6	Chase
7	Courtship
8	Copulation
9	Other-usually explained in notes

Cell = meadow divided into a 10 meter X 10 meter grid and given a letter-number coordinate (i.e.) M12

Observ. Start/Stop Time- time began and ended observing an individual

Sex- M=male, F=female, U=unknown sex

OVP# - individual number assigned to each oviposition location flagged, specific to each site

- Weather data

Survey start/End time- time I arrived in the field for observation

Beg Time-when I took the first weather observation

Beg Time -when I took the first weather observations (temp, wind, cloud cover)

Temp-Temperature taken in degrees Celsius

Cloud %- estimated percent cloud cover

Wind speed- used Beaufort Wind Speed Scale. Maximum wind gust speed is represented in parentheses, for example 1(2) = wind is a 1 and gusts are a 2

Wind direction-cardinal direction that the wind is originating from.

? = unable to determine

"squirrelly" = from more than one direction

Mardon activity- a qualitative observation of how active the Mardon are at a given time of day (Low, Med, High)

Other Temp(s)/Time(s)-if other temperatures were taken it was noted in degrees Celsius per time of day. For example 28/10:00

OVP Loc. Stake # = a unique number for each Oviposit location that is marked in the field with a number tag and nail. Note: beware that there are a couple of Stake numbers that correspond to more than one Oviposition location.

OVP# - individual number assigned to each ovposition location flagged, specific to each site

OVP Obs date- date oviposition was observed

Cell 1/4 & 1/16- location information referencing the breakdown of the 10 meter cells into quarter parts and sixteenth parts

Dist. Forest Edge (~m)- an estimate in meters to the nearest forest edge from the oviposition location

Dist. Visible moisture (~m)- an estimate in meters to the nearest body of water or substantial moisture

S-->O dist/bearing (deg) - the distance from the stake to the oviposition location (or egg) as well as the compass degree bearing or cardinal direction.

- *General notes*

~ = approximately

1" = 1 inch

1' = 1 foot

</> = less than/greater than

Oviposition Survey Weather Data

Site	Date	Survey Start Time	Survey Stop Time	Beg Time	Beg Temp (C)	Beg Cloud%	Beg Wind Speed (gusts)	Beg Wind Direction	Beg Mardon Activity	Mid Time	Mid Temp (C)	Mid Cloud%	Mid Wind Speed	Mid Wind Direction	Mid Mardon Activity	End Time	End Temp	End Cloud%	End Wind Speed	End Wind Direction	End Mardon Activity	Other Temp(s) taken/time(s)	
LH	12-Jun	0730	1630	730	10	60	0			1100	24	80	1										
LH	15-Jun	1100	1615	1100	20	85	1(4)	SSW		1300	29	10				1615	21	>5	1(5)				
LH	20-Jun	0900	1730	900	17	0	1	S	Med	1200	27	0	1	NE	Med	1730	30	0	1(2)	W	High		
LH	22-Jun	1230	1730	1230	35.5	0	0(1)	N	High	NA	NA	NA	NA	NA	NA	1730	33	0	1(2)	W	Low		
LH	24-Jun	0900	1215	915	29.5	0	1(4)	SE	Low	1215	40.5	0	0(3)		Low								
PT	11-Jun	0830	1630	830	19	85	0		None							1600	25		3(4)		None		
PT	14-Jun	1030	1600	1030	30	20	1		Low							1600	36	3(5)		S	None		
PT	20-Jun	1400	1715																				
PT	22-Jun	1010	1210	1020	30.5	0	0(1)	E	Low	1210	32	0	0(1)		Med	NA	NA	NA	NA	NA	NA		
PT	24-Jun	1230	1700	NA	NA	NA	NA	NA	NA	1230	38	0	0(3)	SE	High	1720	30	0	0(1)	W	Low		
UC	13-Jun	0800	2000	800	15	95	4(5)		None	1100	15	100			None								
UC	17-Jun	0830	1600	830	18.5	0	1(2)	N	Low	1500	25	0	4(5)	?		1600	25						
UC	21-Jun	0845	1700	900	23	0	0(1)	NE	Med	1345	30	0	3(4)	N	Very High	1800	27	0	3(5)	N	High	28/1000	
UC	23-Jun	0830	1800	830	22	0	0(1)	?	Med	1200	31.5	0	0(2)	S	High	1800	27	0	1(3)	Squirrely	Med	31/1015 & 34/1700	
UC	25-Jun	1030	1550	1030	33	0	1(3)	S	High	1250	37					1550	39	0	1(2)	?	High		
BH	29-Jun	1045	1800	1045	21	85	1(0)		High	1238	25.5	90	1(2)		High	1800	21	50	1(2)	SE	Low		
BH	1-Jul	0945	1630	945	24.5	0	1(2)	W	Med	1300	34	0	0(2)	S	Med	1645	36.5	0	2(3)	S	High	33/1500	
BH	4-Jul	1330	1640	NA	NA	NA	NA	NA	NA	1330	42.5	50	2(3)	S	Med	1640	34	20	1(3)	Squirrely	Med		
BH	5-Jul	0800	1645	800	16	80	0(1)		None	1400	28	15	2(3)	S	Med	1645	27	15	1(4)	S	Med	23.5/0900	
BH	8-Jul	0930	1615	930	23.5	1	0(1)	Squirrely	Low	1200	34	1	2(3)	S	Med	1615	34	1	0(2)	Squirrely	Med	33/1400	
GF	6-Jul	1300	1500	NA	NA	NA	NA	NA	NA	1300	27	50	1(4)	W&N	None	1500	17	70	4(5)	Squirrely	None		
GF	11-Jul	1500	1630	NA	NA	NA	NA	NA	NA	1500	24	90	1(3)	SE	Med	1630	25	90	3(5)	W	Med		
GF	14-Jul	1000	1730	1000	22.5	5	1(2)	?	High	1300	25	3	2(4)	W	High	1730	26	3	3(4)	W	Med	24/1415 Windy	
GF	15-Jul	1015	1600	1025	21.5	1	2(3)	W	Med	1340	27.5	1	0(4)	W	High	1615	29	1	2(4)	W	Med		
GF	16-Jul	1100	1700	1100	28	0	0(2)	N	High	1300	40	0	0(1)	W	High	1700	29.5	0	1(3)	W	High		
GF	17-Jul	0900	1030	912	20.5	0	1(2)	W	High	NA	NA	NA	NA	NA	NA	1030	25	0	0(1)	W	High		

Oviposition Survey Natural History Observations

Site	Date	Observer(s)	Start Time	End Time	Notes
LH	12-Jun	LB	0730	1630	Se up Grid & Searched for Butterflies. @ 1100 cumulus clouds, @ 1300 cumulus to SW thundering. @ 1200 Searched for butterflies. ID: Phyciodes pulchellus, a dark checkerspot also present. Saw 5-6 P.mardon. No end temp taken . @ 1400-1500 a low fog rolled through.
LH	15-Jun	LB	1100	1615	Some bug activity in AM and lots in PM. First Ovp observations today. Working on grid in early AM and after 1600.
LH	20-Jun	B, S	0900	1730	At ~1730 a lot of nectaring and courting behavior in cell F6 centered around a Wyetha angustifolia Patch. BF: Checkered, Artic, Sonora Skippers. Birds: WAVI, ORJU, PIWO, AMRO, YEWA. Scott Black Joined at ~1300.
LH	22-Jun	LB	1230	1730	Seems to be a lot less P.mardon at this site today, # of P.sonora has increased.
LH	24-Jun	LB	0900	1215	Crude count 7 male and 1 female P.mardon. Population has decreased greatly. P. sonora are prevalent. Perigrin Falcon dove on a AMRO, a good show, but the falcon went hungry. I left @ 1215 to survey PCT.
PT	11-Jun	LB	0830	1630	Setting up grid today. Overcast in the AM w/ high ceiling. Moths, butterflies, & bees just starting to fly @ 0830. Moths flew all day. Blues, Fritillaries, & checkerspots (E. chalcidona wallianensis?) I saw no P.mardon. Also saw swallow tailed butterflies. Cumulus clouds approach in evening. Birds: ORJU, RBNU, TUVU, NOFL, AMRO, WETA, PIWO, Great Gray Owl Juveniles.
PT	14-Jun	LB	1030	1600	I was at LHR setting up grid in early AM. @ PCT 1030 bugs flying-it's warm! Dana Ross Joined me @ 1400-1600 and we observed 3 male P. mardon together in cells E12/14-J12/14 generally. P.mardon activity decreased after 1400 (winds picked up).
PT	20-Jun	SB	00/1600	00/17	Scott Black visited PCT twice today, 1400-1500 & 1645-1715, while Loni Beyer conducted surveys at LH.
PT	22-Jun	LB	1010	1210	AT 1020 only saw some nectaring activity near the north edge of the meadow, by 1210 I had seen approximately 6 females and 12 males. This is the most P.mardon activity seen thus far suggesting a later hatch than at LH or UC meadows. I left at 1215 for LH surveying. F16
PT	24-Jun	LB	1230	1700	At "ovaposite O'clock (AKA 1400) Temperature = 35 degrees celcius. More female P.mardon active here that previously observed, again supporting the notion that this site is a "late bloomer". I ID a Common Branded Skipper.
UC	13-Jun	LB	0800	2000	Fog rolled in at 10:00 & drizzled. At 10:20 it began to hail, hail stopped at 11:00. Birds: AMRO,MOCH, GCKI,TRSW,UNK sparrow,ORJU,LAZB,SHCR,CAVI,Fox sparrow?,RBNU,NOFL,BHCB,PIWO,Unk duck,
UC	8-Sep	LB	0830	1600	No activity in the eastern-most 30 meters of the grid. Birds:CAVI,RBNU,WETA,OCWA,NAWA,DUFL,ORJU,unkn woodpecker, CHSP,AMRO
UC	21-Jun	LB	0845	1700	reset ovp2 & ovp1 as something came & ate and pulled out (ELK?) the skewers. I didn't start Ovp searching until 10:00 (Temp 28 deg C). A Rodent chewed on the flag for ovp4. Yarrow beginning to bloom, AMRO foraging in site. Stopped due to eye strain & need to stake new ovp sites before dark.
UC	23-Jun	LB	0830	1800	At 10:15 Temp was 31 deg C, at 1700 Temp was 34 deg C. Elk in camping meadow this AM with some Mule deer. AMRO,ORJU, & GTTO foraging in site. GTTO also nesting in shrubs in site. Other birds MOCH,NOFL,RBNU,Unk sparrow,CAVI,SOSP,BHCB,NAWA.Yarrow and W.angustifolia coming into full bloom. In patches of blooming W.angustifolia-Delphinium-Bistort-Yarrow Mardon are staying consistent to W.angustifolia. In patches of blooming P.diversifolia-Bistort-Delphinium Mardon are staying consistent to P.diversifolia. In blooming patches of Bistort-P.diversifolia-Penstemon Mardon seem to favor the later 2. There is a lot of nectaring and courtship in this strange and beautiful 8X15 m "island" boarded by rocks and a boggy area (~cell E6). The patch is blooming with P.diversifolia, Penstemon procerus, Bistort, & other unknown forb in Borage family. Note: Brodiaea sp starting to bloom, very pretty.
UC	25-Jun	LB	1030	1550	Today was a census day, I just happened to make 4 ovp observations #20-23. Wane Rolle was here all day doing veg. Plots. I assisted him at the end of the census until ~1930.
BH	29-Jun	LB	1045	1800	Mardon so fresh I have to squint when I look at them. Or may look different because it is a different subspecies. Very active. Males seem to be favoring bare ground patches for perching. Some vicia going to fruit. Blooming plants: Vicia, Calochortus sp., Achillea millefolium, unknown in Asteracea family, Agoseris aurantiaca, Erysimum asperum, Fragaria virginiana, Antennaria microphylla (pusseytoes), Ipomopsis or Gilia aggregata, Liliun columbianum, Fescue, Bromus, & other grasses & sedges. Butterflies:Pale & Western Swallowtails, fritillaries, Sulfurs, & Angle wings? At the end of the day I spooked a mardon out of the grass . It made a big circle (~25 m radius) and flew high which caught my attention. It perched up in a PIPO ~4.5 meters the tree on the pine needles. Strange behavior. Scott Black did a census today, the grid isn't set up yet so he estimated 5meter transects.
BH	1-Jul	LB	0945	1630	Frequency of oviposition encounters increased @ 1200. 1st P.mardon activity noticed @~0900. A Large fritillary was observed carrying another, courtship? Birds:BHGB,AMRO,NAWA. Simon Friedman here today to help set up the grid. Worked together before and after survey. Assigned cells after survey from detailed notes.
BH	4-Jul	LB	1330	1640	Today I did a census, & oviposition observations were taken if they occurred on my transects. I did not follow every female seen for 10 minutes. Nectaring observations were only taken as I noticed in the count.
BH	5-Jul	LB	0800	1645	Sprinkled for a few minutes today @ 0600. @0900 1st mardon activity seen basking Temp=23.5. Scott Black & Cheryl Shultz were present 1100-1400, observations did not occur during this time. John Scott also present to start vegetation plots. Some Penstemon now in bloom.
BH	8-Jul	LB	0930	1615	@1400 temp 33 deg.C, Clouds 1%, wind 0(2). In morning only a few individuals found basking, I had to look hard to find them. @ midday numbers were less by population was active. At end of day oviposition activity increased but overall activity remained the same. Some Vicia fruiting (rough approximation is 30%), Vegetation height increased since last visit. OVP#22, stake 869, location is mostly buried from a gopher burrowing in within 6"of host fescue. Other new burrowing in general area (within 2m) Took 1/2 hour break 1130-1200. Butterflies:checkerspot, anglewing, & pale tiger swallowtail.
GF	6-Jul	LB	1300	1500	Saw 1 unknown sex P.mardon in lower PCT meadow on hike in. Mosquitoes present, but in slightly less #s than previous visits. Vegetation has grown a few inches since last here (7-2-06). No Mardon activity-saw checkard skipper, several blues, & a few great Artic (Oeneis nevadensis)? Anchors set, meadow sketched, ready for action. Cold & windy when I left @1500. Lupine & Wild Strawberry in bloom. Saw a fresh Male mardon in lower PCT meadow on hike out (~1515) Temp 23 C.
GF	11-Jul	LB	1500	1630	Mosquitos haven't left yet, more female mardon than on census day (7-9). @ end wind picked up strong enough to make tree branches sway.
GF	14-Jul	LB	1000	1730	Cell G8 could see a lot of "hunting" by P. mardon, presumably males for females. A lot of flies busy low to the ground creating a constant hum. Northern Harrier flew through the site. Birds: HETH, WETA, AMRO. @1120 gusts picked up strong enough to move tree branches. By 1300 wind gusts picked up strong enough to move tree tops, negatively affecting mardon detectability and my ability to follow females. @ 1127 Ann Potter, Tom Kogut, Vince w/ USFW, Carol Chandler, & others arrived. We did a FS type census & had lunch. I did not conduct observations during this time. They let @ 1250 & I resumed observations. Blue-eyed-Mary in bloom. Some strawberry and Vicia in fruit.
GF	15-Jul	LB	1015	1600	Golden Mantled Ground Squirrels &/or Elk pulled up ovp flags & ate skewers. Spent some time resetting & GPSing at beginning of survey. Elk evidence prominent, scat & areas where they have lain are dispersed throughout the meadow. I decided to stop using the skewer method and use only nails -noting measurements and direction for ovp locations. I took a 20 min break between noon and 1300 to set up bug domes to see if females would lay eggs in them. Females did not take to the domes, they hung out at the tops trying to get out the whole time.
GF	16-Jul	LB	1300	1700	1100-1300 I was conducting a census. Winds picked up between 1400 & 1700 making it difficult to track females for the entire 10 minutes.
GF	16-Jul	LB	0900	1030	John Scott & Darci Rivers-Pankratz are here to do Vegetation plots. Fog was thick in early morning, burnt off by 0830.

Nectar Observation Data Medford District Oregon																	
			Aster sp. "White sticky"	Bistort	Brodiaea sp	Fragaria virginiana	Penstamon procerus	Plectritus congesta	Potentilla diversifolia	Potentilla flabifolia	Ukn wht composit	Vicia sp.	Wyetha angustifolia	Yarrow	Yellow Aster "cow weed"	Zygadenus venenosus	"Short Lyiac"
Sex	Site	Date															
Male	LH	20-Jun											1				
Female	LH	20-Jun	1				2	4	3		1		2				
Sex Unkn	LH	20-Jun							1			2					
Male	LH	19-Jun											1				
Female	LH	19-Jun						2									
Sex Unkn	LH	19-Jun										1					
Male	LH	22-Jun						3									
Female	LH	22-Jun					3		2								
Sex Unkn	LH	22-Jun															
Male	LH	24-Jun					3		2								
Female	LH	24-Jun					1										
Sex Unkn	LH	24-Jun					2										
Male	LH	26-Jun															
Female	LH	26-Jun															
Sex Unkn	LH	26-Jun															
Male	PT	19-Jun															
Female	PT	19-Jun			1												
Sex Unkn	PT	19-Jun															
Male	PT	20-Jun						3									
Female	PT	20-Jun															
Sex Unkn	PT	20-Jun															
Male	PT	22-Jun					1								1		
Female	PT	22-Jun											3		1		
Sex Unkn	PT	22-Jun											1				
Male	PT	24-Jun						5									
Female	PT	24-Jun						3						1	2		
Sex Unkn	PT	24-Jun					1								1		
Male	PT	26-Jun															
Female	PT	26-Jun					1										
Sex Unkn	PT	26-Jun															
Male	UC	17-Jun					6	1	10				6				
Female	UC	17-Jun								1						1	1
Sex Unkn	UC	17-Jun														1	
Male	UC	18-Jun							1				2				
Female	UC	18-Jun							1				1			2	
Sex Unkn	UC	18-Jun							2				2				
Male	UC	21-Jun					2		9				3				
Female	UC	21-Jun					1						7				
Sex Unkn	UC	21-Jun					1		2			5	2				
Male	UC	23-Jun		1			3		14			1	4				
Female	UC	23-Jun		1			5		2				6				
Sex Unkn	UC	23-Jun					6		4	1		1	7				
Male	UC	25-Jun					3		10								
Female	UC	25-Jun					1		3				1				
Sex Unkn	UC	25-Jun							2				1				
Totals			1	1	1	1	47	24	74	2	1	10	50	1	5	4	1

Nectar Observation Data Mt Adams National Forest												
	Site	Date	Achillea millefolium	Agoseris arantifolia	Calachortus sp.	Antennaria microphylla	Erigeron perigrinus	Erysimum asperum	Fragaria virginiana	Longipes	Potentilla drummondii	Vicia
Male	BH	29-Jun										9
Female	BH	29-Jun										9
Sex Unknown	BH	29-Jun										4
Male	BH	1-Jul						1				7
Female	BH	1-Jul			1			1				9
Sex Unknown	BH	1-Jul			1							3
Male	BH	4-Jul										1
Female	BH	4-Jul										4
Sex Unknown	BH	4-Jul										1
Male	BH	5-Jul										4
Female	BH	5-Jul	1									6
Sex Unknown	BH	5-Jul										
Male	BH	8-Jul	1									1
Female	BH	8-Jul										
Sex Unknown	BH	8-Jul	1									1
Male	GF	9-Jul							13			4
Female	GF	9-Jul							1			1
Sex Unknown	GF	9-Jul							1			2
Male	GF	11-Jul							2	5		
Female	GF	11-Jul					1					5
Sex Unknown	GF	11-Jul							1			3
Male	GF	14-Jul							2	2		13
Female	GF	14-Jul							1			17
Sex Unknown	GF	14-Jul								2		10
Male	GF	15-Jul				1						9
Female	GF	15-Jul					3					14
Sex Unknown	GF	15-Jul							1			5
Male	GF	16-Jul		1			3		2	3	1	5
Female	GF	16-Jul							2	1		15
Sex Unknown	GF	16-Jul								2		12
Male	GF	23-Jul	2									2
Female	GF	23-Jul	1									3
Sex Unknown	GF	23-Jul	1				1		1	1		5
Male	GF	4-Aug										
Female	GF	4-Aug	1									
Sex Unknown	GF	4-Aug										
Totals			8	1	2	1	8	2	27	16	1	184

Oviposition-Behavior Survey Data

Site	Date	Observation#	Obsv. Start Time	Obsv. Stop Time	Behavior	Cell	Sex	OVP #	Notes
LH	15-Jun	1	1300	1300	3	O3	F	1	Saw egg drop, 2 more possible ovp locations within 1.5 m squared. Perched on a forb within 3" of ground. 100% positive ID!
LH	15-Jun	2	1400	1400	3	G2	F	2	100%ID! F was being chased by M, the M lost interest after they perched >1min & chased another butterfly. F remained perched ~1min . She moved to another grass perch ~2" off the ground. After 30 sec. She dropped an egg and flew.
LH	20-Jun	1	924	924	7	M8	B		F vibrating wings to dissuade M, he flew off, F basked on Aster.
LH	20-Jun	1	924	930	2	M8	F		
LH	20-Jun	1	930	931	7	M8	B		M left after F vibrated wings for a bit
LH	20-Jun	1	931	933	2	M8	F		
LH	20-Jun	1	933	934	2	M7	F		Moved to new perch by road. Another F flew by.
LH	20-Jun	2	934	934	2	M8	F		Was watching observation #1
LH	20-Jun	3	949	949	1	N8	M		Hunting for F?
LH	20-Jun	4	952	952	4	O8	U		Plectritus congesta
LH	20-Jun	5	1015	1015	1	P3	M		
LH	20-Jun	6	1026	1036	2	M3	F		On P.diversifolia leaf
LH	20-Jun	7	1048	1049	2	J5	F		Lost F. In last 5 min I have seen >6 M "hunting" for F.s.
LH	20-Jun	8	1057	1107	4	I3	F		Plectritus congesta
LH	20-Jun	9	1111	1112	4	D3	F		Penstemon procerus
LH	20-Jun	10	1221	1231	2	N3	F		Caught after observation for calibration as I think P.sonora are flying.
LH	20-Jun	11	1245	1245	7	N8	B		F seemed receptive
LH	20-Jun	12	1326	1332	7	O3	B		Male flew off no copulation, F flew to "check for ovp locations"? I lost her in flight.
LH	20-Jun	13	1346	1350	2	P7	F		
LH	20-Jun	14	1350	1350	3	R4	F	3	<100% sure because did not see egg drop, however abdomen was curled and she was in OVP posture
LH	20-Jun	15	1408	1408	4	Q9	F		P.diversifolia
LH	20-Jun	16	1411	1411	7	P9	F		F vibrated wings, M left
LH	20-Jun	16	1411	1414	2	P9	F		
LH	20-Jun	16	1414	1415	4	P9	F		
LH	20-Jun	16	1415	1416	2	P9	F		
LH	20-Jun	16	1415	1416	4	P9	F		P. diversifolia
LH	20-Jun	17	1417	1419	4	Q9	F		Plectritus congesta
LH	20-Jun	17	1419	1420	2	S9	F		Lost her.
LH	20-Jun	18	1426	1429	3	R5	F	4	Perched after 3 min flew ~1.5 m NNW and worked to base of grass and OVP. Egg visible yellowish with a red speck. Egg sits on a blade of grass near base. Skewer in exact location.
LH	20-Jun	19	1507	1507	4	J7	F		Plectritus congesta
LH	20-Jun	19	1507	1508	2	J7	F		
LH	20-Jun	19	1508	1510	4	J7	F		Plectritus congesta
LH	20-Jun	20	1517	1518	3	M3	F	5	NE 1/16 of NW1/4
LH	20-Jun	21	1523	1523	3	O3	F	6	Within 2"radius of skewer
LH	20-Jun	22	1530	1530	4	O3	F		Penstemon procerus
LH	20-Jun	23	1545	1546	2	M3	F		
LH	20-Jun	24	1544	1545	7	M3	B		
LH	20-Jun	25	1553	1558	3	I5	F	7	She weaseled her way down to the bottom and took her time dropping the egg.
LH	20-Jun	26	1601	1602	4	H5	F		Potentilla diversifolia
LH	20-Jun	26	1602	1603	4	H5	F		white composite
LH	20-Jun	27	1600	1610	4	R6	F		Stayed consistent to plectritus.
LH	20-Jun	28	1627	1627	4	H6	F		Wyetha angustifolia
LH	20-Jun	29	1627	1627	7	H6	B		
LH	20-Jun	30	1641	1641	4	D4	F		Penstemon procerus
LH	20-Jun	31	1648	1648	2	B2	F		Fresh & Less dirty looking
LH	20-Jun	32	1703	1709	7	E7	B		courting on W.angustifolia F has torn right front wing
LH	20-Jun	32	1709	1713	4	E7	F		W.angustifolia
LH	20-Jun	33	1713	1720	4	E7	F		W.angustifolia torn left front wing, looks older and sunbleached
LH	20-Jun	34	1725	1728	7	G7	B		M interrupted F nectaring to court.
LH	20-Jun	34	1728	1731	2	G7	F		
LH	22-Jun	1	1319	1321	2	P4	F		Wind picked up to a 3-lost her
LH	22-Jun	2	1353	1356	4	D3	F		Penstemon ---> flew
LH	22-Jun	2	1356	1359	4	E4	F		Potentilla/Penstemon, lost her, Males in area too
LH	22-Jun	3	1412	1413	3	K2	F	8	<2' apart, same individual as OVP 9
LH	22-Jun	3	1413	1413	3	K2	F	9	<2' apart, same individual as OVP 8
LH	22-Jun	4	1423	1423	3	K2	F	10	~1' apart, same individual as OVP 11
LH	22-Jun	4	1423	1423	3	K2	F	11	~1' apart, same individual as OVP 10
LH	22-Jun	5	1435	1435	3	K2	F		Lost the spot! Did not flag. With in 0.5m of OVPs 8-11
LH	22-Jun	6	1523	1523	7	K6	B		Lost in chaos
LH	22-Jun	7	1532	1532	3	O3	F	12	Same individual as OVP 13
LH	22-Jun	7	1532	1532	3	O3	F	13	Same individual as OVP 12
LH	24-Jun	1	1000	1010	2	D6	F		Basking on a Wyetha leaf
LH	24-Jun	2	1020	1021	2	D3	F		In a Penstemon patch, 3+ male P. sonora in patch as well
LH	24-Jun	3	1121	1131	2	F4	F		Perched on a Potentilla leaf, female seems "old".

LH	24-Jun	3	1131	1131	4	F4	F	Nectaring on <i>Potentilla diversifolia</i>
LH	24-Jun	4	1133	1133	4	D4	F	Nectaring on <i>Penstemon procerus</i>
LH	24-Jun	5	1201	1202	2	O3	F	Lost
PT	14-Jun	1	1100	?		L/M9	U	~ 5 <i>P.mardon</i> in Cells L9 & M9
PT	14-Jun	2	1200	1200	8	K10	B	Copulation on <i>P.diversifolia</i> leaf
PT	14-Jun	3	1200	1200	6	K9	B	male chasing female
PT	14-Jun	4	1244	1246	4	E10	U	Nectaring on <i>Plectritus congesta</i> . <3m west of the intermediate stream.
PT	14-Jun	5	1350	1350	2	Other	M	In meadow nest to private property fence, out of set grid
PT	14-Jun	6	1350	1350	2	Other	U	In meadow nest to private property fence, out of set grid
PT	14-Jun	7	1350	1350	2	Other	U	In meadow nest to private property fence, out of set grid
PT	20-Jun	1	1400	?			M	
PT	20-Jun	2	?	?			M	
PT	20-Jun	3	?	?	3		F	displaying ovipositing behavior-lost her
PT	20-Jun	4	?	?			M	
PT	20-Jun	5	?	?	4		M	nectaring on <i>plectritus</i>
PT	20-Jun	6	?	?			M	
PT	20-Jun	7	?	1500	4		M	nectaring on <i>plectritus</i>
PT	20-Jun	8	1645	?	4		M	nectaring on <i>plectritus</i>
PT	20-Jun	9	?	?	7		F	perching-being chased-lost
PT	20-Jun	10	?	1715	7		F	perching-being chased-lost
PT	22-Jun	1	1027	1031	4	C14	F	<i>W.angustifolia</i>
PT	22-Jun	1	1031	1038	2	C14	F	
PT	22-Jun	2	1040	1042	2	C12	F	In <i>W.angustifolia</i> patch
PT	22-Jun	2	1042	1044	4	C12	F	Nectaring on <i>W.angustifolia</i>
PT	22-Jun	2	1044	1046	2	C12	F	
PT	22-Jun	2	1046	1048	4	C12	F	<i>W.angustifolia</i>
PT	22-Jun	3	1046	1048	2	C12	F	In <i>W.angustifolia</i> patch
PT	22-Jun	3	1048	1048	4	C12	F	<i>W.angustifolia</i>
PT	22-Jun	3	1048	1048	1	C12	F	Flew South to D12 cell
PT	22-Jun	3	1048	1056	2	D12	F	
PT	22-Jun	4	1125	1127	7	L11	B	2 males courting 1 female, female vibrating wings, soon both flew off.
PT	22-Jun	4	1127	1136	2	L10	F	Female moved perch from courtship place to L10
PT	22-Jun	5	1137	1143	4	K12	F	Nectaring on Yellow Aster sp. "cow weed" with clustered flower at end of stem. Lost when she flew to J13.
PT	22-Jun	6	1153	1203	2	C12	F	In <i>P.congesta</i> and <i>W.angustifolia</i> patch
PT	24-Jun	1	1253	1254	4	J11	F	<i>P.congesta</i>
PT	24-Jun	1	1254	1259	2	J11	F	
PT	24-Jun	1	1259	1259	3	J11	F	1 In grass under <i>P.diversifolia</i> leaf
PT	24-Jun	1	1259	1303	2	J11	F	
PT	24-Jun	1	1303	1304	3	J11	F	2 same individual as OVP 1-5
PT	24-Jun	1	1304	1304	3	J11	F	3 same individual as OVP 1-5 Oviposite on a <i>P.diversifolia</i> leaf!!! Egg rolled off into grass below.
PT	24-Jun	1	1305	1305	3	J11	F	4 same individual as OVP 1-5 Oviposite in grass
PT	24-Jun	1	1306	1320	2	J11	F	perched on <i>P.diversifolia</i> leaf
PT	24-Jun	1	1320	1321	3	J11	F	5 very accurate though egg not relocated, same individual as OVP 1-5
PT	24-Jun	2	1320	1321	3	J11	F	6 Different individual than observation #1, very close to OVPs 1-5
PT	24-Jun	3	1334	1335	2	J11	F	
PT	24-Jun	3	1335	1337	4	J11	F	Nectared on cow cluster, may have oviposite between perch and nectaring observation.
PT	24-Jun	4	1340	1342	3	M9	F	7 same individual as OVP 8
PT	24-Jun	4	1342	1342	1	L10	F	
PT	24-Jun	4	1342	1344	3	L10	F	8 same individual as OVP 7
PT	24-Jun	5	1346	1346	7	K11	B	
PT	24-Jun	6	1413	1414	4	H11	F	Nectared on Unkn Yellow Aster sp. "cow weed" with cluster of flowers , also nectared on Yarrow.
PT	24-Jun	6	1414	1414	3	H11	F	Darn, missed the spot, she makes shorter stops and perches higher on grass than my other observations.
PT	24-Jun	6	1415	1416	3	G10	F	9 Very accurate though egg not relocated, stake # 842
PT	24-Jun	7	1431	1431	3	C17	F	Lost the spot! Did not flag. Dropped egg in similar forb patch as OVP#10 and with in 1.5 meters
PT	24-Jun	7	1432	4632	3	C17	F	10 Next to orange corner marker
PT	24-Jun	8	1454	1454	3	L8	F	Darn, missed the spot, she too quick! <1m to OVP #11
PT	24-Jun	8	1455	1455	3	L8	F	11 High Accuracy, did not relocate the egg.
PT	24-Jun	9	1527	1527	3	N9	F	12
PT	24-Jun	10	1529	1530	4	N9	F	Nectared on Unkn Yellow Aster sp. "cow weed" with cluster of flowers at end of stem.
PT	24-Jun	10	1530	1531	3	N9	F	Lost the spot!
PT	24-Jun	11	1533	1535	4	M11	F	Nectared on <i>P.congesta</i>
PT	24-Jun	11	1535	1535	3	M11	F	Lost the spot!
PT	24-Jun	11	1536	136	3	M11	F	13 Accurate to <0.5"
PT	24-Jun	12	1543	1544	4	L9	F	Lost in shadow, nectared on <i>Plectritus congesta</i>
UC	17-Jun	1	0900	0900	4	F11	M	Nectaring and flying, mostly males seen, high activity
UC	17-Jun	2	0912	0922	2	F10	F	
UC	17-Jun	3	0930	0930	4	H10	U	Nectaring on Death Camas
UC	17-Jun	4	0940	0945	2	M13	F	
UC	17-Jun	5	0945	0950	2	M12	F	
UC	17-Jun	6	0955	0955	4	N20	M	Nectaring on <i>Wyetha angustifolia</i>
UC	17-Jun	7	1003	1011	2	Q21	F	Male interfering with female causing her to change activity from either perching or nectaring.
UC	17-Jun	7	1011	1014	4	Q21	F	
UC	17-Jun	8	1109	1109	4	J23	U	Nectaring on Death Camas
UC	17-Jun	9	1207	1210	7	Q13	B	Female Vibrates wings and flies to M15
UC	17-Jun	10	1225	1237	2	O14	F	Female moved perch a couple of times
UC	17-Jun	11	1253	1255	4		F	Nectaring on Death Camas
UC	17-Jun	12	1346	1346	3	E18	F	1 In grass at east end of pond on south rise of bank

UC	17-Jun	13	1350	1350	3	E18	F	2	Female with torn wing, same general location as OVP#1, same individual as OVP#3
UC	17-Jun	14	1410	1410	3	E18	F	3	Female with torn wing, same general location as OVP#1, same individual as OVP#2
UC	17-Jun	15	1415	1415	3	E18	F	4	
UC	17-Jun	16	1436	1443	3	F18	F	5	Perched ~5 min then moved within 2 meters & perched ~3 min, then flew ~2.5 meters & OVP.
UC	21-Jun	1	1026	1036	2	H5	F		2"from ground on yarrow leaf, P.diversifolia, Delphinium menzies, & W.angustifolia evenly dispersed.
UC	21-Jun	2	1054	1055	2	I7	F		
UC	21-Jun	3	1100	1112	2	J9	F		
UC	21-Jun	4	1105	1112	2	J9	F		
UC	21-Jun	5	1110	1114	4	J9	F		W.angustifolia, I netted as P.sonora are out here and I got paranoid
UC	21-Jun	6	1116	1117	4	J9	F		W.angustifolia, spooked off by male
UC	21-Jun	6	1117	1118	2	J9	F		
UC	21-Jun	6	1119	1119	3	J9	F	6	Possibly dropped 2 eggs in bunch grass
UC	21-Jun	7	1132	1137	4	H2	F		W.angustifolia
UC	21-Jun	8	1203	1207	4	J10	F		W.angustifolia
UC	21-Jun	9	1217	1217	4	K14	F		W.angustifolia
UC	21-Jun	10	1235	1242	1	C6	F		Flying and perching new grass clumps
UC	21-Jun	10	1242	1245	2	A8	F		Lost her after a "close call"
UC	21-Jun	11	1256	1258	1	B8	B		Flying and perching, displaying ovp behavior but there is a lot of interruption by courting males. Lost her
UC	21-Jun	12	1300	1302	2	B9	F		Female perched after being chased/harassed by males
UC	21-Jun	12	1302	1303	3	B8	F	7	after perching for a couple of minutes she found a spot by making a "figure 8" over the ground, then
UC	21-Jun	13	1315	1320	3	B9	F	8	Laid >1 egg. Skewer is within 1" of one egg, the other egg is within 1'. Same vegetation type as OVP #7.
UC	21-Jun	14	1330	1332	3	B8	F	9	Egg is within 4" of skewer. Dropped near the ground from regular grass and vegetation.
UC	21-Jun	15	1410	1412	7	B13	B		Male flew off no copulation
UC	21-Jun	15	1412	1415	2	Z12	F		Female flew South & I lost her in cell P12
UC	21-Jun	16	1458	1458	4	C10	F		Penstemon,lost her due to winds
UC	21-Jun	17	1515	1515	3	K27	F	10	Skewer within 3" of ovp location
UC	21-Jun	18	1556	1556	3	R21	F	11	
UC	21-Jun	19	1636	1642	2		F		Cell ?17 north side of pond (grid not finished here)
UC	21-Jun	20	1648	1653	7	L18	B		Lost her when she flew...eye strain
UC	23-Jun	1	0845	0845	2	O16	F		
UC	23-Jun	2	0908	0913	2	O22	F		Moved locations 3 times
UC	23-Jun	2	0913	0918	2	P21	F		5 males visible hunting in the area
UC	23-Jun	3	0927	0937	2	P18	F		In large W.angustifolia patch
UC	23-Jun	4	0938	0939	7	P18	B		Male left after female vibrated its wings
UC	23-Jun	4	0939	0948	2	P18	F		Perched on W.angustifolia leaf, 5+males in area
UC	23-Jun	5	0942	0944	4	P18	F		W.angustifolia
UC	23-Jun	5	0944	0945	2	P18	F		
UC	23-Jun	5	0945	0945	7	P18	F		male left
UC	23-Jun	5	0945	0948	2	P18	F		
UC	23-Jun	6	0949	0949	7	N18	B		male left
UC	23-Jun	6	0949	0950	2	N18	F		basking on shrub
UC	23-Jun	7	1016	1026	2	N14	F		perched on Blooming Prairie Smoke
UC	23-Jun	8	1021	1023	2	N14	F		
UC	23-Jun	8	1023	1025	4	N14	F		W.angustifolia
UC	23-Jun	9	1039	1039	4	J9	F		male tried to court briefly, female continued nectaring after he left
UC	23-Jun	10	1041	1041	7	J10	B		
UC	23-Jun	11	1100	1102	4	E6	F		Penstemon procerus
UC	23-Jun	12	1115	1123	2	C2	F		
UC	23-Jun	13	1143	1147	7	C8	B		male left
UC	23-Jun	13	1147	1153	2	C8	F		female stayed low in grass below Penstemon
UC	23-Jun	14	1200	1202	2	B7	F		Flew to C7
UC	23-Jun	14	1202	1204	4	C7	F		P.diversifolia
UC	23-Jun	14	1204	1210	2	C7	F		Spooked and perched in shrub
UC	23-Jun	15	1215	1217	2	B11	F		Lost her when she flew north
UC	23-Jun	16	1255	1259	2	N19	F		2 females perched near each other-lost both when flew
UC	23-Jun	17	1303	1307	3	M19	F	12	
UC	23-Jun	18	1314	1324	2	N19	F		
UC	23-Jun	19	1331	1331	7	M21	B		
UC	23-Jun	20	1338	1338	6	L24	B		
UC	23-Jun	21	1346	1347	7	L20	B		Male left
UC	23-Jun	21	1347	1348	2	L20	F		
UC	23-Jun	21	1348	1348	1	L20	F		
UC	23-Jun	21	1348	1349	7	L20	B		Male left
UC	23-Jun	21	1349	1349	1	N22	F		
UC	23-Jun	21	1349	1352	2	N22	F		
UC	23-Jun	21	1353	1353	3	N22	F	13	
UC	23-Jun	22	1410	1410	3	M21	F	14	Egg visible at base of grass
UC	23-Jun	23	1420	1420	3	M21	F	15	
UC	23-Jun	24	1440	1440	3	L18	F	16	
UC	23-Jun	25	1452	1452	3	M18	F	17	
UC	23-Jun	26	1525	1528	7	T24	B		In W.angustifolia patch
UC	23-Jun	27	1528	1552	4	T24	F		W.angustifolia
UC	23-Jun	28	1530	1530	7	T25	B		Netted to calibrate my eye as P.sonora are also in this area.
UC	23-Jun	29	1558	1559	3	C20	F	18	
UC	23-Jun	30	1617	1622	3	C9	F		Missed egg drop, male interfered shortly afterwards and I lost her
UC	23-Jun	31	1626	1626	3	A9	F	19	Egg visible on a drying - Yellow P. diversifolia leaf! Between flag and skewer.
UC	23-Jun	32	1641	1642	7	C5	B		
UC	23-Jun	33	1644	1652	2	C7	F		

UC	23-Jun	34	1653	1703	2	D9	F		
UC	25-Jun	1	1144	1144	3	D20	F	20	~2.5m NNE of ovp8
UC	25-Jun	2	1410	1410	3	L28	F	21	egg visible in grass bunch. Stake 845 shrubby area
UC	25-Jun	3	1518	1518	3	P23	F	22	Stake 846
UC	25-Jun	4	1610	1610	3	R21	F	23	Stake 847, egg visible in Ca Oatgrass, ~2.5m south of ovp11
BH	29-Jun	1	1059	1109	2	E5	F		On steep slope on west edge & North portion of meadow
BH	29-Jun	2	1117	1117	3	I7	F	1	In fescue bunch grass, dropped egg from tops of grass-did not work down to base.
BH	29-Jun	3	1136	1137	2		F		Lost when she flew
BH	29-Jun	4	1138	1141	4	N6	F		Vicia
BH	29-Jun	5	1149	1159	8	C6	B		On yarrow bloom
BH	29-Jun	6	1212	1213	4	D10	F		Vicia
BH	29-Jun	6	1213	1223	2	D10	F		
BH	29-Jun	7	1224	1231	2	D10	F		Basking on bare ground (dirt patch) she moves from dirt patch to dirt patch.
BH	29-Jun	7	1231	1231	4	D9	F		Vicia
BH	29-Jun	7	1231	1234	2	D9	F		
BH	29-Jun	8	1234	1244	2	L10	F		East Side of meadow next to class 5 downed log
BH	29-Jun	9	1244	1254	2	L10	F		Perched on Fragaria leaf & moved to dirt patch on ground after 3 minutes
BH	29-Jun	10	1316	1320	2	N10	F		
BH	29-Jun	10	1320	1321	4	N10	F		Perched on Fragaria nectared on Vicia
BH	29-Jun	10	1321	1326	2	N10	F		
BH	29-Jun	11	1422	1424	2	B3	F		Lost
BH	29-Jun	12	1424	1426	7	B3	B		broke due to my disturbance
BH	29-Jun	12	1426	1434	2	B3	F		
BH	29-Jun	13	1441	1444	2	C4	F		
BH	29-Jun	13	1444	1444	3	C4	F	2	Female on ground, flew around briefly, landed on fescue, dropped egg & flew immediately. Egg visible sitting
BH	29-Jun	14	1459	1459	3	J6	F	3	Dropped egg from tops of fescue bunch grass. Did not relocate.
BH	29-Jun	15	1522	1524	4	J5	F		Nectared on Vicia
BH	29-Jun	15	1524	1526	1		F		Perched on bare ground
BH	29-Jun	15	1526	1529	4		F		Vicia-flew to cell L8 & lost
BH	29-Jun	16	1529	1536	2	L8	F		Perched on Trifolia leaf, then moved to yarrow leaf, then to bare ground.
BH	29-Jun	16	1537	1537	3	L8	F	4	Flew to base of fescue, worked into base & oviposited! Egg visible nested in litter (dead dry grass) at base of
BH	29-Jun	17	1533	1536	4	L8	F		Vicia
BH	29-Jun	17	1536	1537	2	L8	F		Perched on cow pie, lost when I noticed observation # 16 ovaposition (ovp 4).
BH	29-Jun	18	1555	1605	8	J5	B		On Yarrow leaf, still copulating when 10 minute observation was complete.
BH	29-Jun	19	1611	1621	2	J9	F		on dead grass
BH	29-Jun	20	1626	1627	7	J9	B		2 males courting 1 female, competed by "leap foraging" each other then both males left. Lost female shortly
BH	29-Jun	21	1630	1630	4		F		Vicia, male chased female off of nectar flower
BH	29-Jun	22	1632	1640	3	B4	F		Perched on yarrow leaf, another female perched and a nectaring male within 2 ft
BH	29-Jun	22	1640	1640	3	B6	F	5	Flew to fescue bunch, perched at top & oviposited, skewer @ egg visible in litter at base of fescue.
BH	29-Jun	23	1633	1640	2	B6	F		This individual was basking within 2ft of observation 22. Lost when ovaposition occurred.
BH	29-Jun	24	1636	1640	2	B6	F		This individual was basking within 2ft of observation 22. Lost when ovaposition occurred.
BH	1-Jul	1	0954	1004	2	C3	F		
BH	1-Jul	2	1004	1005	2	C4	F		lost when flew
BH	1-Jul	3	1006	1011	2	D6	F		perched next to another mardon individual unknown sex
BH	1-Jul	3	1011	1011	7	D6	B		Declined more than 2 attempts (perching next to female and trying to attach while she vibrates her wings)
BH	1-Jul	3	1011	1016	2	D6			
BH	1-Jul	4	1022	1026	4	E5	F		Staying specific to vicia, visited multiple flowers in 4 minutes
BH	1-Jul	4	1026	1132	2	E5	F		
BH	1-Jul	5	1034	1037	4	I6	F		Vicia
BH	1-Jul	5	1037	1040	2	I6	F		
BH	1-Jul	5	1040	1041	4	I6	F		Vicia
BH	1-Jul	5	1041	1044	2	I6	F		
BH	1-Jul	6	1102	1104	2	N3	F		Yarrow leaf
BH	1-Jul	6	1104	1104	7	N3	B		Female declined = vibrated wings until male left
BH	1-Jul	6	1104	1112	2	N3	F		
BH	1-Jul	7	1118	1119	2	N4	F		
BH	1-Jul	7	1119	1120	4	N4	F		Vicia, but a different sp.? White-yellow verses purple. She flew & I lost her.
BH	1-Jul	8	1127	1133	2	O3	F		Stopped observation to switch to another female displaying ovp behavior.
BH	1-Jul	9	1133	1134	2	O3	F		Lost her after a minute
BH	1-Jul	10	1135	1145	2		F		
BH	1-Jul	11	1139	1149	2		F		
BH	1-Jul	12	1156	1159	2	J7	F		
BH	1-Jul	12	1159	1201	4	J7	F		Vicia
BH	1-Jul	12	1201	1205	2	J7	F		
BH	1-Jul	12	1205	1205	3	J7	F	6	
BH	1-Jul	12	1205	1206	4	J7	F		
BH	1-Jul	12	1206	1208	2	J7	F		
BH	1-Jul	12	1208	1208	3	J7	F	7	
BH	1-Jul	13	1218	1218	2		F		
BH	1-Jul	14	1220	1220	3	H7	F	8	
BH	1-Jul	15	1224	1224	3	H7	F	9	
BH	1-Jul	16	1232	1240	2	E8	F		
BH	1-Jul	16	1240	1240	3	E8	F	10	
BH	1-Jul	17	1254	1255	2	D9	F		
BH	1-Jul	17	1256	1256	3	D9	F	11	
BH	1-Jul	18	1306	1306	3	C7	F	12	
BH	1-Jul	19	1309	1309	3	C7	F	13	
BH	1-Jul	20	1352	1354	2	B4	F		

BH	8-Jul	8	1217	1232	2	D7	F		Worn so that cells are less prominent. Abdomen still swollen
BH	8-Jul	9	1222	1222	7	D7	F		Male "lost interest" after female perched and vibrated wings.
BH	8-Jul	9	1222	1232	2	D7	F		Perched within 1m from observation #8. Fresher than #8 & abdomen much more swollen.
BH	8-Jul	10	1228	1228	6	D7	M		A fair amount of male chasing occurring at this location
BH	8-Jul	11	1232	1232	2	D7	F		Within 3ft of observation 9 & 10
BH	8-Jul	12	1235	1235	6	D7	B		At least one male and one female, a group of 4 chasing each other in this cell, other than those already obs
BH	8-Jul	13	1236	1236	7	D6	B		
BH	8-Jul	13	1236	1237	9	D6	F		Seems to be "looking" for a place to oviposit but male courting and chasing keeps interfering with her effort
BH	8-Jul	13	1237	1237	7	D6	B		
BH	8-Jul	13	1237	1240	2	D6	F		
BH	8-Jul	13	1240	1240	6	D6	B		Lost in a chase
BH	8-Jul	14	1250	1251	4	G7	F		Vicia
BH	8-Jul	14	1251	1300	2	G7	F		Perched on non-fescue...Broma?
BH	8-Jul	15	1305	1308	2	H8	F		Lost her, was perched on strawberry leaf
BH	8-Jul	16	1318	1318	2	K7	F		Spooked
BH	8-Jul	17	1339	1345	2	I6	F		Stopped to observe, ovp female, obs #18
BH	8-Jul	18	1345	1345	3	I7	F	30	Into fescue used as perch-egg relocated, NW 1/4 SW1/16
BH	8-Jul	19	1349	1349	3	I5	F		missed egg drop, but certain she was ovp. Into fescue, didn't flag because didn't relocate egg.
BH	8-Jul	19	1349	1355	2	I5	F		Not a fresh female but still in fair condition, abdomen full-lost her
BH	8-Jul	20	1358	1400	2	H7	F		Lost
BH	8-Jul	21	1403	1413	2	H6	F		on strawberry leaf, moved to a yarrow leaf
BH	8-Jul	22	1414	1417	9	F7	F		Female in vertical perch position (often ovp occurs in this position) on fescue but egg never dropped. She f
BH	8-Jul	23	1421	1421	33	E10	F	31	Perched on fescue bunch, egg landed in dirt@base & SW of fescue bunch by 1cm.
BH	8-Jul	24	1428	1432	2	E10	F		next to ovp#31 - lost
BH	8-Jul	25	1433	1435	2	E10	F		Lost when flew
BH	8-Jul	26	1540	1542	7	H7	B		at 1542 male flies off , female remains perched on Vicia. Female has tattered wings.
BH	8-Jul	26	1548	1548	1	H7	F		
BH	8-Jul	26	1548	1548	2	G7	F		
BH	8-Jul	26	1549	1549	1	G7	F		
BH	8-Jul	26	1549	1549	3	F7	F	32	in fescue "nest" at base of bunch. Egg visible.
GF	11-Jul	1	1507	1510	2	G6	F		
GF	11-Jul	1	1510	1513	4	G6	F		Vicia
GF	11-Jul	1	1514	1514	2	G6	F		
GF	11-Jul	1	1514	1517	7	G6	F		
GF	11-Jul	2	1517	1517	2	G8	F		
GF	11-Jul	2	1517	1517	4	G8	F		Erigeron perigrinus
GF	11-Jul	2	1517	1517	7	G8	F		
GF	11-Jul	3	1519	1522	2	F5	F		
GF	11-Jul	3	1522	1522	4	F5	F		Vicia - Lost
GF	11-Jul	4	1523	1523	6	F5	B		
GF	11-Jul	5	1524	1525	4	F5	F		Vicia
GF	11-Jul	5	1525	1526	2	F5	F		lost when flew
GF	11-Jul	6	1527	1531	2	F4	F		
GF	11-Jul	6	1531	1531	3	F4	F	1	Perched on grass, egg visible on ground/litter @ base SE1/4 NE 1/16
GF	11-Jul	6	1531	1531	4	F4	F		Vicia
GF	11-Jul	7	1544	1545	7	E6	F		
GF	11-Jul	7	1545	1546	2	E6	F		Wind picked up, lost
GF	11-Jul	8	1547	1547	1	E6	F		
GF	11-Jul	8	1547	1548	2	F6	F		
GF	11-Jul	8	1548	1548	1	F6	F		
GF	11-Jul	8	1548	1548	2	F5	F		Moving from one grass perch to another
GF	11-Jul	8	1550	1550	3	F5	F	2	Perched on thing waxy grass & dropped egg-did not relocate SE 1/4 NE 1/16
GF	11-Jul	9	1558	1602	2	F6	F		
GF	11-Jul	9	1602	1602	1	F6	F		spooked
GF	11-Jul	9	1602	1602	2	F5	F		
GF	11-Jul	9	1602	1602	1	F5	F		
GF	11-Jul	9	1602	1602	2	G5	F		on yarrow lf
GF	11-Jul	9	1604	1606	4	G5	F		vivia
GF	11-Jul	9	1606	1608	2	G5	F		on vicia lf
GF	11-Jul	10	1604	1604	6	G5	B		
GF	11-Jul	11	1607	1607	6	G5	B		
GF	11-Jul	12	1621	1621	7	F4	B		
GF	14-Jul	1	1008	1008	4	G7	F		Vicia
GF	14-Jul	1	1008	1011	2	G7	F		clearly basking
GF	14-Jul	1	1011	1013	4	G7	F		Vicia
GF	14-Jul	1	1013	1013	2	G7	F		
GF	14-Jul	2	1014	1014	4	G7	F		Vicia-lost her
GF	14-Jul	3	1018	1018	4	G5	F		Vicia
GF	14-Jul	3	1018	1018	1	G6	F		
GF	14-Jul	3	1018	1019	4	G7	F		Vicia
GF	14-Jul	3	1019	1019	1	G7	F		
GF	14-Jul	3	1019	1020	4	G6	F		Vicia
GF	14-Jul	3	1020	1020	1	F6	F		
GF	14-Jul	3	1020	1021	2	F6	F		On bare ground
GF	14-Jul	3	1021	1021	4	F6	F		Vicia
GF	14-Jul	3	1021	1021	1	F6	F		
GF	14-Jul	3	1021	1021	2	F6	F		Forb leaf
GF	14-Jul	3	1023	1023	7	F6	B		Brief encounter by male,male continued on

GF	14-Jul	3	1023	1027	2	F6	F		
GF	14-Jul	3	1027	1027	4	F6	F	Vicia	
GF	14-Jul	3	1027	1028	2	F6	F		
GF	14-Jul	4	1029	1033	2	D6	F		
GF	14-Jul	4	1033	1034	4	D6	F	Vicia	
GF	14-Jul	4	1034	1035	2	D6	F	has lesion back side of abdomen	
GF	14-Jul	4	1035	1036	4	D6	F	Vicia	
GF	14-Jul	4	1036	1036	2	D6	F		
GF	14-Jul	4	1036	1039	1	D6	F		
GF	14-Jul	5	1039	1040	2	E6	F	Crooked right forewing	
GF	14-Jul	5	1040	1040	1	E6	F	Disturbed by a fly	
GF	14-Jul	5	1040	1040	2	E5	F		
GF	14-Jul	5	1040	1040	1	E5	F		
GF	14-Jul	5	1040	1045	2	G8	F		
GF	14-Jul	5	1045	1045	7	G8	B	Brief encounter by male, he flew off	
GF	14-Jul	5	1045	1049	2	G8	F		
GF	14-Jul	6	1049	1049	7	G8	B	Flew & lost	
GF	14-Jul	7	1050	1051	7	F8	B	Strawberry	
GF	14-Jul	7	1051	1054	4	F8	F	Distacted & lost her	
GF	14-Jul	8	1055	1057	2	F8	F		
GF	14-Jul	8	1057	1057	7	F8	B	male went to court another female in same cell then continued on	
GF	14-Jul	8	1057	1058	2	F8	F	other female also went to nectar on Vicia	
GF	14-Jul	8	1058	1058	4	F8	F	Vicia-lost her	
GF	14-Jul	9	1100	1100	4	F9	F	Vicia	
GF	14-Jul	9	1100	1101	7	F9	B		
GF	14-Jul	9	1101	1102	2	F9	F		
GF	14-Jul	9	1102	1103	4	F9	F	Vicia	
GF	14-Jul	9	1103	1104	2	F9	F	on nectar Vicia	
GF	14-Jul	9	1104	1104	4	F9	F		
GF	14-Jul	9	1104	1104	1	F9	F		
GF	14-Jul	9	1104	1104	4	F8	F	courtship occurring with a different pair	
GF	14-Jul	9	1106	1110	2	F8	F		
GF	14-Jul	10	1110	1110	6	F8	B	3 mardon, 2 males chasing presumable female	
GF	14-Jul	11	1107	1110	8	F8	B	near obs 9	
GF	14-Jul	12	1111	1117	2	E8	F		
GF	14-Jul	13	1117	1117	6	E8	B	while watching obs 12	
GF	14-Jul	14	1256	1256	2	F10	F		
GF	14-Jul	15	1302	1302	4	F10	F	Vicia, visited 2 plants, flew & I lost her	
GF	14-Jul	16	1308	1311	2	G11	F		
GF	14-Jul	16	1311	1312	4	G10	F	Vicia	
GF	14-Jul	16	1312	1312	2	G10	F	Lost after flew from perch	
GF	14-Jul	17	1314	1324	2	F10	F		
GF	14-Jul	18	1324	1324	2	F10	F		
GF	14-Jul	18	1326	1326	1	F11	F		
GF	14-Jul	18	1326	1328	2	F11	F		
GF	14-Jul	18	1328	1329	3	F11	F	Didn't see egg drop or relocate one, but behavior indicated an ovaposition	
GF	14-Jul	18	1329	1331	2	H10	F		
GF	14-Jul	18	1331	1331	3	H10	F	again!!!demonstrated ovaposition behavior but didn't see egg drop or relocate one!	
GF	14-Jul	18	1331	1332	2	H10	F		
GF	14-Jul	18	1332	1332	3	G9	F	3 Dropped egg & I relocated it. Egg visible on litter below "waxy grass leaves" maybe a rush?	
GF	14-Jul	18	1332	1332	4	G9	F	Vicia	
GF	14-Jul	19	1339	1342	2	G9	F		
GF	14-Jul	19	1342	1342	1	G8	F		
GF	14-Jul	19	1342	1343	2	G8	F		
GF	14-Jul	19	1343	1343	3	G8	F	Climbed under strawberry leaf on ground. But didn't see egg drop or relocate one. No flag.	
GF	14-Jul	20	1351	1351	7	G8	B		
GF	14-Jul	20	1351	1351	2	G8	F		
GF	14-Jul	20	1351	1351	4	G8	F	Vicia	
GF	14-Jul	20	1351	1359	2	G8	F		
GF	14-Jul	20	1359	1359	4	G8	F	Vicia	
GF	14-Jul	21	1402	1402	7	H8	B		
GF	14-Jul	21	1402	1402	2	H8	F		
GF	14-Jul	21	1402	1402	1	H8	F		
GF	14-Jul	21	1402	1402	3	H8	F	4 saw egg drop with naked eye, egg visible in whorl of a different grass-wider leaves, not waxy. But the "waxy	
GF	14-Jul	22	1408	1408	3	D8	F	I lost the spot. Female had worked herself up under a strawberry leaf.	
GF	14-Jul	22	1408	1408	2	D8	F		
GF	14-Jul	22	1415	1415	1	D8	F		
GF	14-Jul	22	1415	1415	2	D8	F	I became distracted and watched another female --> observation 23	
GF	14-Jul	23	1414	1415	2	D8	F	Had been walking on ground under forbs	
GF	14-Jul	23	1415	1415	3	D8	F	5 Perched on "waxy thin leafed rush" egg visible on bare ground between a bunch of forb leaves & mixed gra	
GF	14-Jul	24	1429	1439	2	D7	F		
GF	14-Jul	24	1439	1439	4	D7	F	Vicia	
GF	14-Jul	24	1439	1439	6	D7	B	male chased off female	
GF	14-Jul	25	1445	1449	9	F6	F	Perching on strawberry if waving distal segments of abdomen over leaf, she flew & climbed under some str	
GF	14-Jul	26	1452	1452	6	H7	B	3 males chasing 1 female or another male?	
GF	14-Jul	27	1456	1456	9	H6	F	Perched on a strawberry leaf waving distal segments of abdomen over the top of the leaf.	
GF	14-Jul	28	1458	1458	6	H6	B	male chasing a presumable female	
GF	14-Jul	29	1458	1458	4	H6	F	Vicia	

GF	14-Jul	30	1459	1459	7	H6	B		
GF	14-Jul	30	1459	1503	2	H6	F		Stopped observing this female because I saw another female oviposit during observation. See Observation
GF	14-Jul	31	1503	1503	3	H6	F	6	Egg dropped in rush-like grass, not relocated
GF	14-Jul	32	1506	1506	2	H7	B		2 separate pairs in courtship perched next to each other. I will watch the female that breaks courtship first.
GF	14-Jul	32	1506	1516	2	H7	F		
GF	14-Jul	33	1518	1520	7	H7	B		
GF	14-Jul	33	1520	1522	2	H7	F		
GF	14-Jul	33	1522	1522	1	H7	F		
GF	14-Jul	33	1522	1526	2	H7	F		
GF	14-Jul	33	1526	1526	7	H7	B		
GF	14-Jul	33	1526	1526	6	H7	B		lost in the frenzy-male chasing female
GF	14-Jul	34	1530	1534	2	E5	F		
GF	14-Jul	34	1534	1534	1	E5	F		
GF	14-Jul	34	1534	1536	2	E5	F		Went to observe another female ovipositing, see observation 35
GF	14-Jul	35	1536	1536	3	E5	F		Egg dropped into "thin-waxy-rush-like" grass tuft. Egg not relocated.
GF	14-Jul	36	1539	1539	6	D5	B		Male chasing a presumable female
GF	14-Jul	37	1540	1540	1	D4	F		
GF	14-Jul	37	1540	1540	2	D4	F		
GF	14-Jul	38	1553	1553	7	F5	B		Male left & female remained on perch
GF	14-Jul	38	1553	1554	2	F5	F		she flew & I lost her
GF	14-Jul	39	1555	1556	4	F5	F		Vicia
GF	14-Jul	39	1556	1556	1	F5	F		spooked, male chased to ground & courted female vibrates wings
GF	14-Jul	39	1556	1558	7	F5	B		
GF	14-Jul	39	1558	1558	1	F5	F		Female flew, male chased to ground & a 2nd male joined in courtship.
GF	14-Jul	39	1558	1559	7	F5	B		Males chased each other off, female remained perched in same location.
GF	14-Jul	39	1559	1602	2	F5	F		
GF	14-Jul	40	1603	1604	7	H5	B		
GF	14-Jul	40	1604	1604	1	H5	F		
GF	14-Jul	40	1604	1605	7	H5	B		moved & a new male chased to ground to court
GF	14-Jul	40	1605	1606	2	H5	F		
GF	14-Jul	41	1609	1609	2	H5	F		This female's wings are so deformed she can not fly, looks like she hatched recently (very fresh in color). W
GF	14-Jul	42	1612	1612	7	H5	B		
GF	14-Jul	42	1612	1612	2	H5	F		
GF	14-Jul	42	1612	1612	7	H5	B		
GF	14-Jul	43	1613	1615	2	H5	F		
GF	14-Jul	43	1615	1615	1	H5	F		circled grass tuft and researched-"looking for a spot"?
GF	14-Jul	43	1615	1616	2	H5	F		
GF	14-Jul	43	1616	1616	1	H5	F		
GF	14-Jul	43	1616	1616	9	H5	F		crawled under strawberry leaf and remain under for a while, no oviposition occurred
GF	14-Jul	43	1616	1616	1	H5	F		
GF	14-Jul	43	1616	1620	2	H5	F		reperched in sun
GF	14-Jul	43	1620	1620	1	H5	F		
GF	14-Jul	43	1620	1622	2	H5	F		
GF	14-Jul	43	1622	1622	1	H5	F		
GF	14-Jul	43	1622	1623	2	H5	F		Continued flying and circling grass tufts "looking for a spot", then perching again. I lost her in one of these f
GF	14-Jul	44	1622	1622	1	H5	F		
GF	14-Jul	44	1622	1623	2	H5	F		
GF	14-Jul	44	1623	1625	1	H6	F		
GF	14-Jul	44	1625	1625	3	H6	F	9	Egg visible on moss on ground at base of 2 different types of grass. She used thinner leafed grass as perch
GF	15-Jul	1	1039	1039	2	F8	F		Observing 2 females at the same time, 1 old & 1 new, The first one to display a behavior other than perching
GF	15-Jul	1	1039	1040	1	F8	F		
GF	15-Jul	1	1040	1040	2	F8	F		a fly disturbed her and I lost her
GF	15-Jul	2	1041	1042	7	E8	B		
GF	15-Jul	2	1042	1042	2	E8	F		lost
GF	15-Jul	3	1045	1045	4	D8	F		Erigeron perigrinus-visited 3 plants consecutively
GF	15-Jul	3	1045	1045	7	D8	B		
GF	15-Jul	3	1045	1048	2	D8	F		
GF	15-Jul	3	1048	1049	7	D8	B		male found female at her perch
GF	15-Jul	3	1049	1055	2	D8	F		male left and female remained at her perch
GF	15-Jul	4	1116	1116	7	G6	B		
GF	15-Jul	4	1116	1118	2	G6	F		
GF	15-Jul	4	1118	1119	4	G6	F		Vicia
GF	15-Jul	4	1119	1120	2	G6	F		
GF	15-Jul	4	1120	1120	6	G6	B		male chased - she dropped to a perch and lost him
GF	15-Jul	4	1120	1126	2	G6	F		
GF	15-Jul	5	1126	1126	4	F8	F		Vicia
GF	15-Jul	5	1126	1133	2	F8	F		3 other females perched in the same vicinity, after 6 minutes there was some movement & I lost track of wh
GF	15-Jul	6	1134	1134	4	E8	F		Vicia
GF	15-Jul	6	1134	1141	2	E8	F		
GF	15-Jul	6	1141	1141	1	E8	F		
GF	15-Jul	6	1141	1144	2	E8	F		
GF	15-Jul	7	1153	1154	7	E10	B		
GF	15-Jul	8	1304	1304	3	F4	F	10	female perched on yarrow & laid egg - visible on yarrow leaf-stake 1" S of egg
GF	15-Jul	9	1307	1307	3	E5	F	11	female perched on yarrow lf & dropped egg, egg is visible on the strawberry lf. Stake is directly below ovp l
GF	15-Jul	10	1318	1318	7	E4	B		
GF	15-Jul	11	1323	1324	2	E4	F		2 more females in the area, I lost when watching the others
GF	15-Jul	12	1328	1328	3	F4	F	12	dropped egg in grass bunch, stake N edge of grass bunch
GF	15-Jul	13	1335	1336	2	E4	F		

GF	15-Jul	13	1336	1336	1	E4	F		
GF	15-Jul	13	1336	1336	2	E4	F		landed nxt to ovp 11, then flew & I lost
GF	15-Jul	14	1340	1341	2	E5	F		
GF	15-Jul	14	1341	1341	7	E5	B		male came and went
GF	15-Jul	14	1341	1342	2	E5	F		
GF	15-Jul	14	1342	1343	7	E5	B		male came & found female on perch then left
GF	15-Jul	14	1343	1344	2	E5	F		
GF	15-Jul	14	1344	1344	3	E5	F	13	Female used a strawberry leaf as a perch, egg visible on ground in litter, stake placed within 1/2" to NE
GF	15-Jul	15	1351	1352	7	E6	B		male left female remained perched
GF	15-Jul	15	1352	1357	2	E6	F		I stopped this observation to mark a different individual's ovaposition- see obs 16
GF	15-Jul	16	1357	1357	3	E6	F	14	Egg visible in litter between yarrow lf and strawberry lf and grass. Female displayed different ovp behavior.
GF	15-Jul	17	1405	1405	2	E6	F		
GF	15-Jul	17	1405	1407	4	E6	F		Vicia
GF	15-Jul	17	1407	1408	2	E6	F		
GF	15-Jul	17	1408	1410	4	E6	F		Vicia
GF	15-Jul	17	1410	1412	2	E6	F		
GF	15-Jul	17	1412	1412	4	E6	F		Vicia
GF	15-Jul	17	1412	1412	1	E6	F		
GF	15-Jul	17	1412	1413	3	E6	F	15	Perched in top of grass & dropped egg-not relocate stake -ovp location
GF	15-Jul	18	1418	1418	3	E7	F	16	perched in grass & dropped egg from ~2" above ground. Egg not relocated. Stake- ovp location.
GF	15-Jul	19	1427	1428	2	D5	F		left to mark another female ovaposition, see observation 20
GF	15-Jul	20	1428	1428	3	D5	F	17	Egg in litter below yarrow lf. Female used grass perch. Stake ~2cm W of egg
GF	15-Jul	21	1435	1436	2	D8	F		
GF	15-Jul	21	1436	1436	4	D8	F		nectar flower =Erigeron perigrinus, male staking
GF	15-Jul	21	1436	1436	2	D8	F		
GF	15-Jul	22	1437	1437	7	D8	F		
GF	15-Jul	22	1437	1439	4	D8	F		Erigeron perigrinus- stopped observation to follow another female with suspect behaviors
GF	15-Jul	23	1441	1442	2	D8	F		
GF	15-Jul	23	1442	1442	1	D8	F		
GF	15-Jul	23	1442	1443	9	D8	F		Moving distal segments of abdomen over strawberry leaf, no egg dropped
GF	15-Jul	23	1443	1443	1	D8	F		
GF	15-Jul	23	1443	1444	9	D8	F		Moving distal segments of abdomen over ground as she crawls on ground under grasses and forb leaves.
GF	15-Jul	23	1444	1444	1	D8	F		
GF	15-Jul	23	1444	1444	3	D7	F	18	Within 1' of previous location, Egg visible in litter by grass perch.
GF	15-Jul	24	1454	1455	2	E9	F		On bare ground
GF	15-Jul	24	1455	1456	4	E9	F		Vicia
GF	15-Jul	24	1456	1457	2	E9	F		on nectar Vicia
GF	15-Jul	24	1457	1457	1	D10	F		spooked by another butterfly
GF	15-Jul	24	1457	1458	2	D10	F		
GF	15-Jul	24	1458	1458	6	D10	B		lost due to male interference
GF	15-Jul	25	1458	1459	7	D10	B		
GF	15-Jul	25	1459	1504	2	D10	F		Stopped observation to pursue suspicious behavior by another female.
GF	15-Jul	26	1507	1507	9	E8	F		Dragging distal segments of abdomen on ground under potentilla leaves, no egg drop or relocation
GF	15-Jul	27	1510	1510	6	G8	B		3 independent events of a presumable female being chase by 3 to 5 males at once.
GF	15-Jul	28	1510	1510	7	G8	B		2 males courting-really "fighting" eachother
GF	15-Jul	28	1510	1510	8	G8	B		In chaos 1 male succeeding in attaching onto female, 2nd male continued to try and latch onto female for 1
GF	15-Jul	29	1515	1517	2	G8	F		moved perch due to fly disturbance
GF	15-Jul	29	1517	1517	1	G8	F		
GF	15-Jul	29	1517	1517	2	G8	F		
GF	15-Jul	30	1519	1519	2	G8	F		
GF	15-Jul	30	1519	1520	7	G8	B		
GF	15-Jul	30	1520	1520	1	E8	F		
GF	15-Jul	30	1520	1520	2	E8	F		
GF	15-Jul	31	1520	1521	7	E8	B		
GF	15-Jul	31	1521	1521	1	E8	F		
GF	15-Jul	31	1521	1521	2	E8	F		lost
GF	15-Jul	32	1527	1527	2	E8	F		
GF	15-Jul	32	1527	1528	1	E8	F		
GF	15-Jul	32	1528	1528	4	E8	F		Vicia
GF	15-Jul	32	1528	1528	7	E8	B		male left, female never stopped nectaring while he had attempted to court her. I bee spooked her and I lost
GF	15-Jul	33	1531	1532	2	F7	F		
GF	15-Jul	33	1532	1532	1	F7	F		
GF	15-Jul	33	1532	1532	3	F7	F	19	In tuft of forb lvs- egg visible @ base of Agoseris arantiaca forb lvs (on lvs). Grasses mixed in with forb lvs.
GF	15-Jul	34	1542	1543	4	F7	F		Vicia
GF	15-Jul	34	1543	1543	1	F7	F		
GF	15-Jul	34	1543	1545	2	F7	F		within 4" of nectar flower on strawberry lf.
GF	15-Jul	34	1545	1546	4	F7	F		Vicia
GF	15-Jul	34	1546	1546	1	F7	F		
GF	15-Jul	34	1546	1546	2	F7	F		perched on white composite-lost her
GF	15-Jul	35	1547	1548	2	F7	F		
GF	15-Jul	35	1548	1548	1	F7	F		
GF	15-Jul	35	1548	1550	2	F7	F		nest to ovp 19
GF	15-Jul	35	1550	1550	1	F7	F		
GF	15-Jul	35	1550	1551	4	F7	F		Vicia
GF	15-Jul	35	1551	1552	2	F7	F		
GF	15-Jul	35	1552	1554	7	F7	B		male found her on her perch, she moved perches and he left
GF	15-Jul	35	1554	1557	2	F7	F		@1555 another female landed next to her- continued observing this female after 10 minute obs ended. Se
GF	15-Jul	36	1556	1556	4	F7	F		Vicia

GF	15-Jul	37	1600	1600	3	F7	F	20	Perched on blooming Yarrow stem & dropped egg. Egg visible in litter @ base, 1/2" to east of stake.
GF	16-Jul	1	1328	1331	4	D8	F		Vicia, stopped observation to mark another female ovapositioning (observation 2, OVP 21)
GF	16-Jul	2	1331	1331	3	D8	F	21	Female crawled into foliage, laid egg in clump of mixed forbs & grasses. Egg sits on small forb leaf-not Fra
GF	16-Jul	3	1339	1340	7	C9	B		
GF	16-Jul	3	1340	1341	2	C9	F		male left, female remained perched. Lost when she flew.
GF	16-Jul	4	1342	1343	4	C9	F		Vicia
GF	16-Jul	5	1343	1345	2	C10	F		On shrub
GF	16-Jul	6	1346	1348	4	D10	F		Vicia & Antennaria but mostly consistent to Vicia
GF	16-Jul	6	1348	1350	2	D10	F		
GF	16-Jul	6	1350	1351	4	D10	F		Vicia
GF	16-Jul	7	1352	1352	2	D10	F		
GF	16-Jul	8	1354	1354	3	E9	F	22	Female drug the distal segments of her abdomen on the ground then flew & perched on grass, egg is on lo
GF	16-Jul	9			9	E8	F		I found another female with a deformed wing & unable to fly. Left front wing is curled over and stunted.
GF	16-Jul	10	1408	1409	2	F6	F		
GF	16-Jul	10	1409	1409	6	F6	B		Lost female in courtship chase
GF	16-Jul	11	1411	1411	2	G6	F		
GF	16-Jul	11	1411	1411	7	G6	B		
GF	16-Jul	12	1411	1414	2	G6	F		
GF	16-Jul	12	1414	1414	1	G6	F		
GF	16-Jul	12	1414	1414	3	G6	F	23	Laid egg in tuft of grass, egg visible in "nest" of dense grass leaves. Stake is 1" S of egg.
GF	16-Jul	13	1423	1425	2	G7	F		
GF	16-Jul	13	1425	1429	3	G7	F		lost the spot
GF	16-Jul	13	1429	1430	4	G7	F		Vicia
GF	16-Jul	13	1430	1430	3	G7	F		displayed ovp behavior, male disrupted trying to court, egg not relocated or seen drop
GF	16-Jul	13	1430	1430	7	G7	F		
GF	16-Jul	14	1430	1438	2	G10	F		
GF	16-Jul	15	1443	1443	7	E9	B		male left within seconds
GF	16-Jul	15	1443	1447	2	E9	F		
GF	16-Jul	16	1447	1451	2	E9	F		other females active in area, due to the distraction I lost her
GF	16-Jul	17	1455	1455	3	F9	F	24	Egg not relocated, dropped in grass tuft. Stake ~location
GF	16-Jul	18	1457	1457	3	F8	F		Egg relocated in litter below yarrow leaves, stake 1/2" N egg
GF	16-Jul	19	1513	1514	4	D9	F		Vicia
GF	16-Jul	19	1514	1514	6	D9	B		male chased female off of nectar flower
GF	16-Jul	20	1518	1519	2	G9	F		
GF	16-Jul	20	1519	1519	4	G9	F		Vicia
GF	16-Jul	20	1519	1519	2	G9	F		
GF	16-Jul	20	1520	1520	1	G9	F		
GF	16-Jul	20	1520	1520	7	G9	F		female was displaying oviposition behavior when male interrupted, lost them
GF	16-Jul	21	1523	1524	2		F		
GF	16-Jul	21	1524	1524	1		F		
GF	16-Jul	21	1524	1524	7		B		
GF	16-Jul	21	1524	1524	2		F		
GF	16-Jul	21	1525	1525	4		F		Vicia
GF	16-Jul	22	1529	1529	3	F6	F	26	crawled under strawberry leaf, also used as a perch, & dropped egg, egg visible in litter. Stake ~ egg locati
GF	16-Jul	23	1530	1530	3	G6	F	27	Perched on yarrow, dropped egg in litter stake ~egg location
GF	16-Jul	24	1539	1539	6	G6	B		2 male courting and chasing 1 female, lost in the chaos
GF	16-Jul	25	1540	1543	2	G5	F		Flew & lost
GF	16-Jul	26			6	F5	B		> 3 independent accounts of courting and chasing
GF	16-Jul	27	1547	1552	2	G4	F		
GF	16-Jul	27	1552	1552	1	G4	F		
GF	16-Jul	27	1552	1552	2	G4	F		
GF	16-Jul	28	1555	1557	2	F3	F		
GF	16-Jul	28	1557	1557	7	F3	B		lost
GF	16-Jul	29	1600	1602	2	E3	F		
GF	16-Jul	29	1602	1602	1	E3	F		
GF	16-Jul	29	1602	1602	2	E3	F		
GF	16-Jul	29	1602	1602	1	E3	F		
GF	16-Jul	29	1602	1602	2	E3	F		lost

Oviposition Location Data										
OVP Site	OVP Obs date	OVP Stake#	OVP Loc #	OVP Cell	Cell 1/16	Cell 1/4	Dist Forest edge (-m)	Dist visible moisture(-m)	S-->O dist/bearing(deg)	Notes
LH	15-Jun	801	1	O3	NE	NE	>40	>5	6"/S	
LH	15-Jun	802	2	G2	SW	SW	>40	10	6"/S	On the western edge of a large patch of blooming <i>Plectritus congesta</i> .
LH	20-Jun	807	3	R4	NE	NW	>40	>4	6"/S	95% confident ovp occurred, skewer w/in 2" of Ovp location.
LH	20-Jun	808	4	R5	SW	NW	>40	>4	6"/S	OVP is ~ 7m to the W.
LH	20-Jun	810	5	M3	NE	NW	>40	8	6"/S	
LH	20-Jun	809	6	O3	NW	SE	>40	>8	6"/S	Near blooming <i>Penstamon</i> patch
LH	20-Jun	811	7	I5	NW	NW	>40	<10	6"/S	In a large <i>Plectritus congesta</i> patch.. ~18m west of center power pole of 3 in site.
LH	22-Jun	819	8	K2	SW	NE	>40	<5	10.5"/88	Cell K2 is boarder on west by a running creek and on East by a wet boggy depression in landscape.
LH	22-Jun	819	9	K2	SE	NW	>40	<5	10"/268	Cell K2 is boarder on west by a running creek and on East by a wet boggy depression in landscape.
LH	22-Jun	820	10	K2	SE	NW	>40	<5	4.75"/253	Cell K2 is boarder on west by a running creek and on East by a wet boggy depression in landscape.
LH	22-Jun	820	11	K2	SE	NW	>40	<5	4"/89	Cell K2 is bordered on west by a running creek and on East by a wet boggy depression in landscape.
LH	22-Jun	821	12	O3	NE	SE	>40	<5	2.75"/S	Cell O3 is bordered on 2.5 sides by wet bog depression in landscape. OVP 12 & 13 are ~1m apart.
LH	22-Jun	822	13	O3	NW	SE	>40	<5	2"/S	Cell O3 is bordered on 2.5 sides by wet bog depression in landscape. OVP 12 & 13 are ~1m apart.
PT	24-Jun	836	1	J11	SE	NE	25	<5	2"/S	In grass under <i>Potentilla diversifolia</i> leaf, same individual as OVPs 1-5, NE aspect, Intermittent stream is dry
PT	24-Jun	837	2	J11	SE	NE	25	<5	2"/S	Ovaposited in the grass, same individual as OVPs 1-5, NE aspect, Intermittent stream is dry
PT	24-Jun	838	3	J11	NW	SE	25	<5	2"/S	Ovaposited on <i>P.diversifolia</i> leaf! Egg rolled off, same individual as OVPs 1-5, NE aspect, Intermittent stream is dry
PT	24-Jun	839	4	J11	NW	SE	25	<5	1.25"/S	Ovaposited in the grass, same individual as OVPs 1-5, NE aspect, Intermittent stream is dry
PT	24-Jun	840	5	J11	NW	SE	25	<5	2.5"/S	Ovaposited in the grass, same individual as OVPs 1-5, NE aspect, Intermittent stream is dry
PT	24-Jun	841	6	J11	SW	SE	25	<5	2.25"/S	Ovaposited in the grass, same individual as OVPs 1-5, NE aspect, Intermittent stream is dry
PT	24-Jun	832	7	M9	SW	NW	20	<5	1.5"/S	Same individual as OVP 8, Intermittent stream is dry
PT	24-Jun	833	8	L10	SW	NW	25	<5	1.5"/S	Same individual as OVP 7, Intermittent stream is dry
PT	24-Jun	842	9	G10	NE	SW	45	15	1.75"/S	~15m west of Large intermittent stream that is now dry. On East aspect.
PT	24-Jun	843	10	C17	SW	SW	15	10	1.75"/S	~25 meters West of dirt road, oviposite in a forb patch
PT	24-Jun	834	11	L8	SE	NW	5	10	1.5"/S	~10 meters NW of Large intermittent stream that is now dry.
PT	24-Jun	831	12	N9	SW	NE	7	3	1"/S	~3m from small intermittent stream that is now dry
PT	24-Jun	835	13	M11	SW	NW	7	15	1.5"/S	
UC	17-Jun	816	1	E18	NW	NE	>100	<5	6"/S	3/4" @ 155degrees from stake 803 (SE) shooting ovp-->803.
UC	17-Jun	804	2	E18	SE	NW	>100	<5	1"/S	OVP#3 is 5'1" @219 degrees from OVP#2 shooting 3-->2
UC	17-Jun	803	3	E18	SW	NE	>100	<5	1"/S	
UC	17-Jun	805	4	E18	SE	NW	>100	<5	5"/S	
UC	17-Jun	806	5	F18	SE	SW	>100	2	1"/S	
UC	21-Jun	812	6	J9	SW	NW	10	10	5"/S	10 meters from moist bog-depression in landscape, ~40 meters from pond
UC	21-Jun	813	7	B8	SE	NE	25	15	3"/S	~1.5m south of small dirt mound. Female laid egg on different fern-like ground-cover vegetation.
UC	21-Jun	814	8	B9	SW	NW	15	20	3"/S	Another egg was dropped within 1 foot of OVP8, not flagged as lost exact spot.
UC	21-Jun	815	9	B8	SW	NE	25	15	6"/S	
UC	21-Jun	817	10	K27	SW	NW	15	20	3"/S	
UC	21-Jun	818	11	R21			15	75	3"/S	Egg visible in fescue bunch grass. Grid not complete here. Ovp 11 is ~2.5m north of Ovp 23. Both are at east end of site a north finger of meadow.
UC	23-Jun	825	12	M19	SE	NE	35	25	2"/S	On dividing line between M19 and M20
UC	23-Jun	828	13	N22	SE	SE	30	35	2.75"/S	Near dividing line between M/N and 22/23
UC	23-Jun	826	14	M21	NE	NW	45	20	2"/S	Egg visible at base of grass
UC	23-Jun	827	15	M21	SE	SW	45	20	1.75"/S	Near L/M dividing line
UC	23-Jun	824	16	L18	SE	SE	45	<10	2"/S	Pond ~25 m away, low moist bog depression <10m away.
UC	23-Jun	823	17	M18	SW	NE	35	25	2"/S	Pond ~35 m away, low moist depression ~25 m away.
UC	23-Jun	829	18	C20	NE	NW	>50	2	2.5"/S	
UC	23-Jun	830	19	A9	SW	NW	8	25	0.5"/S	Egg lain on <i>Potentilla diversifolia</i> leaf (already drying).
UC	25-Jun	844	20	D20	NW	SE	>50	15	0.75"/S	~2.5m NE of Ovp 18
UC	25-Jun	845	21	L28	SE	NW	20	25	2"/S	Egg visible in bunch of grass. This location has a lot of spiria shrubs <2 ft tall.
UC	25-Jun	846	22	P23	SW	NW	30	55	1"/S	~15m west of large decayed log next to a grassy knoll
UC	25-Jun	847	23	R21			15	75	0.75"/S	Grid not complete here. Ovp23 is ~2.5m south of Ovp11
BH	29-Jun	850	1	I7	SW	NW	15	NA	1.5"/S	~20m west of largest PIPO in middle of Meadow. In middle of steep hillside. Egg laid in bunch of fescue.
BH	29-Jun	849	2	C4	SW	SE	8	NA	0.75"/S	Egg visible in litter at base of fescue.
BH	29-Jun	851	3	J6	NE	SW	20	NA	1.25"/N	Female used fescue as perch to drop egg. Egg not relocated.

BH	29-Jun	852	4	L8	NE	NW	35	NA	0.75"/E	Fescue used as perch, egg visible in litter at base of fescue bunch.
BH	29-Jun	848	5	B6	NE	NW	25	NA	1"/S	Fescue used as perch, egg visible in litter at base of fescue bunch.
BH	1-Jul	864	6	J7	NW	NW	25	NA	2cm/S	Same individual as OVP7 stake 865
BH	1-Jul	865	7	J6	NW	SE	30	NA	1"/S	Same individual as OVP6 stake 864
BH	1-Jul	862	8	H7	SE	NW	12	NA	1"/S	
BH	1-Jul	863	9	H7	NE	SW	12	NA	2cm/S	
BH	1-Jul	856	10	F8	NW	NE	35	NA	1"/S	
BH	1-Jul	868	11	E9	NE	NE	17	NA	2cm/S	
BH	1-Jul	854	12	D7	SE	SE	10	NA	2.5"/S	
BH	1-Jul	853	13	D7	NE	SE	10	NA	1.75"/S	
BH	1-Jul	855	14	E7	SW	NW	15	NA	1"/S	Egg visible in on bare ground at base of a NON-fescue grass that was also used as a perch by the female during ovaposition.
BH	1-Jul	857	15	H8	NW	NW	25	NA	3"/S	Egg visible in a "nest" of dense fescue grass leaves that female used as a perch during oviposition.
BH	1-Jul	858	16	H8	NE	NW	25	NA	1"/S	Egg visible in litter at base of fescue, female used another type of grass as a perch, this grass perch is growing out of the middle of the fescue bunch.
BH	1-Jul	859	17	H7	SW	NE	12	NA	1.25"/S	
BH	1-Jul	860	18	H6	SE	NE	6	NA	2"/S	Egg is visible on bare ground below fescue bunch grass used as perch by female during ovaposition.
BH	1-Jul	861	19	H7	SW	NW	8	NA	2cm/S	Egg is visible in a "nest" of dense fescue grass leaves that female used as a perch during ovaposition.
BH	1-Jul	866	20	M3	NW	NE	15	NA	2cm/S	Used Agoseris for a perch & dropped egg on ground @ base of fescue.
BH	1-Jul	867	21	N4	NE	NE	8	NA	2cm/N	Female used fescue as perch to drop egg. Egg not relocated.
BH	4-Jul	869	22	L11	NW	SW	10	NA	0.5"/SSW	Egg visible at base of fescue that female used as a perch.
BH	4-Jul	870	23	E9	NE	NE	25	NA	1cm/W	Egg dropped in fescue bunch grass
BH	4-Jul	871	24	E9	NE	NE	25	NA	2cm/S	Egg dropped in fescue bunch grass ~ 1 ft east of OVP 11
BH	4-Jul	873	25	C4	NE	NW	15	NA	2"/S	Female weaseled halfway down into fescue bunch grass to drop egg.
BH	4-Jul	872	26	C5	SE	NE	20	NA	2.5"/W	Egg visible at base of fescue bunch
BH	5-Jul	876	27	L4	SW	NW	15	NA	1.5"/E	Egg dropped into fescue, not relocated. ~6m North of ovp 20
BH	5-Jul	874	28	E7	SE	NE	50	NA	0.5"/W	Egg dropped into fescue, not relocated.
BH	5-Jul	875	29	F10	SE	NE	5	NA	1.5"/S	Egg visible on eastern edge of fescue bunch
BH	8-Jul	878	30	I6	SW	NW	25	NA	2cm/S	Fescue bunch used as perch, egg not relocated
BH	8-Jul	877	31	E10	SW	NE	10	NA	3cm/S	Female used fescue bunch as perch. Egg sits on bare ground @base just 1 cm to SW of "edge" of the fescue bunch.
BH	8-Jul	879	32	F7	SW	SE	35	NA	1"/S	Egg visible in fescue bunch, in "nest" or cluster of lvs.
GF	11-Jul	1	1	F4	NE	SE	35	NA	1cm/N	
GF	11-Jul	2	2	F5	NE	SE	40	NA	0.75"/W	
GF	14-Jul	3	3	G9	SE	SE	8	NA	==	Stake is butted up to skewer, so they are basically marking the ovp site
GF	14-Jul	4	4	H8	NE	NE	10	NA	2.5CM/E	
GF	14-Jul	5	5	D8	SE	NW	15	NA	1.5CM/E	
GF	14-Jul	6	6	H6	NW	NE	20	NA	1CM/E	
GF	14-Jul	7	7	E5	NW	SW	30	NA	==	Stake is butted up to south side of skewer, so they are basically marking the ovp site
GF	14-Jul	8	8	E4	NE	NE	25	NA	==	Stake is butted up to NE side of skewer, so they are basically marking the ovp site
GF	14-Jul	9	9	H6	SE	NE	20	NA	==	Stake is butted up to E side of skewer, so they are basically marking the ovp site
GF	15-Jul	10	10	F4	NW	NW	40	NA	1"/N	Female used yarrow leaf as perch, dropped egg on yarrow leaf!
GF	15-Jul	11	11	E5	SE	NE	30	NA	=	Stake place directly below egg which was lain on a strawberry leaf, yarrow leaf used as a perch.
GF	15-Jul	12	12	F4	SE	SW	30	NA	1"/S	Egg dropped & visible in grass bunch, stake is on N edge of host grass bunch.
GF	15-Jul	13	13	E5	SW	SW	30	NA	0.5"/SW	Female perched on strawberry leaf & dropped egg, egg visible in litter below.
GF	15-Jul	14	14	E6	NW	NW	20	NA	1cm/SW	Egg is visible in litter, female did not use a perch, but "walked" on ground below yarrow, strawberry, and grass.
GF	15-Jul	15	15	E6	SE	NW	25	NA	=	Female perched in top of grass leaves & dropped egg, not relocated
GF	15-Jul	16	16	E7	SW	NW	25	NA	==	Egg not relocated. Female used grass as perch to drop egg.
GF	15-Jul	17	17	D5	NW	SE	30	NA	2cm/E	Female used grass perch, egg visible in litter below yarrow leaf.
GF	15-Jul	18	18	D7	NE	NE	10	NA	0.5"/N	Female used grass perch, egg visible in litter
GF	15-Jul	19	19	F7	NE	NE	35	NA	0.5"/SW	Egg, on perimeter of tuft of forb leaves. Egg visible in whorl of forb leaves at the base.
GF	15-Jul	20	20	F7	NE	NE	35	NA	0.5"/W	Visible in litter at base of Yarrow stem, other grasses also around area.
GF	16-Jul	21	21	D8	SE	NW	15	NA	=	stake was placed below forb leaf (not a strawberry or yarrow) where egg was lain. Female crawled into a clump of mixed forbs & grasses.
GF	16-Jul	22	22	E9	SW	NW	25	NA	0.5"/S	Egg sitting on low strawberry leaf
GF	16-Jul	23	23	G6	SE	NE	40	NA	1"/N	Female laid egg in tuft of grass, egg visible in "nest" of grass leaves.
GF	16-Jul	24	24	F9	SW	NW	25	NA	==	Egg dropped into grass tuft & not relocated
GF	16-Jul	25	25	F8	SE	NE	25	NA	0.5"/S	Egg relocated in litter below yarrow leaves.
GF	16-Jul	26	26	F6	SE	SW	40	NA	==	Crawled under strawberry leaf and dropped egg in litter, visible
GF	16-Jul	27	27	G6	NE	NW	40	NA	==	Perched on yarrow & dropped egg into litter, visible
GF	23-Jul	28	28	D9	NE	SW	10	NA	==	Saw egg drop near unknown forb lvs, not relocated. Note: no veg. Plots done for this location.
GF	23-Jul	29	29	D6	NE	SW	25	NA	==	Female perched on yarrow, I saw egg drop but did not relocate it. Note: no veg. Plots done for this location.
GF	23-Jul	30	30	G7	NW	SW	25	NA	==	Saw egg drop from Vicia leaf perch, not relocated. Note: no veg. Plots done for this location.

2006 Mardon Skipper Census

Date _____ Observer: _____

Begin	End	Tran	Sex	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total
		A	M																												
		A	F																												
		A	U																												
		B	M																												
		B	F																												
		B	U																												
		C	M																												
		C	F																												
		C	U																												
		D	M																												
		D	F																												
		D	U																												
		E	M																												
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		F	F																												
		F	U																												
		G	M																												
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		G	U																												
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Ovaporation Location Sketch Card

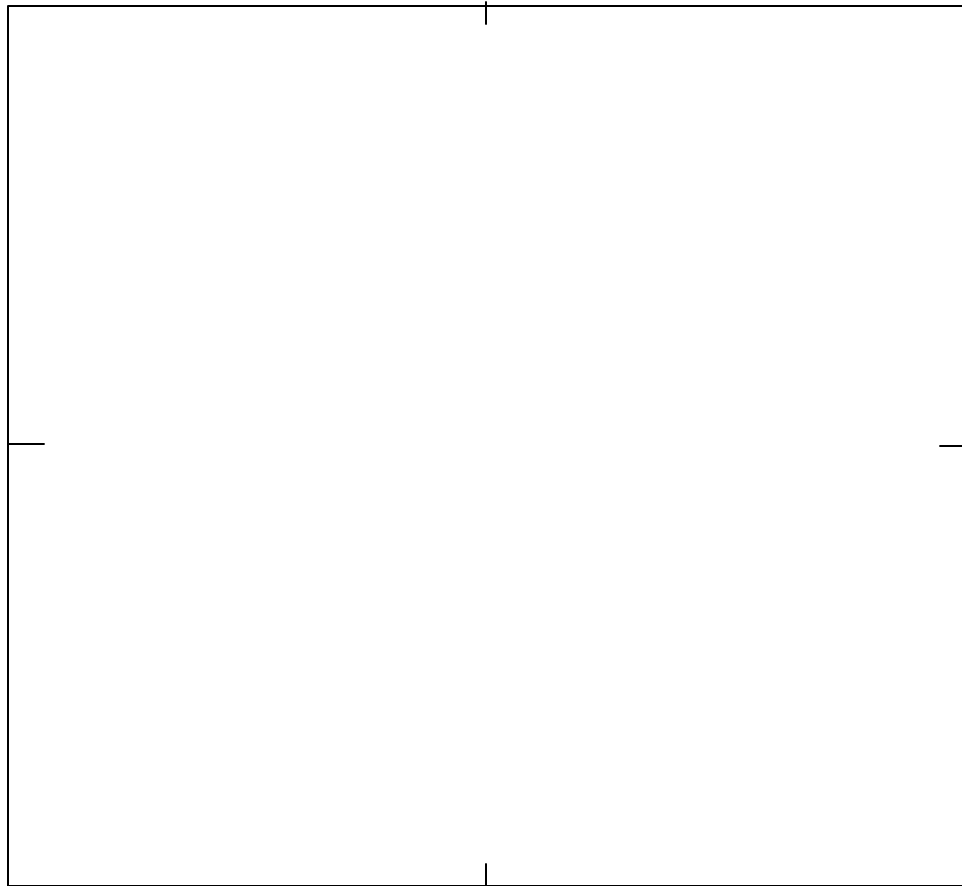
Mardon Skipper Survey 2006

Site: _____ Recorder(s)/Observer(s): _____

Date of observation: _____

OVP# (s): _____

Please note each Stake # and it's corresponding OVP location# with distances and approximate bearings between them.



Please sketch the stake(s) and OVP(s) in respect to each other. Include cell numbers, distances, bearings, and any identifying landmarks. Please note which OVP#(s) are from a single Mardon individual. Any notable or interesting behaviors can be written in margins or on the back.

FIELD FORM
FOR MARDON SKIPPER OVIPOSITION MICROSITE VEGETATION

Meadow _____ Oviposition site # or name within meadow _____

Date of Vegetation Observations _____ Date Oviposition was detected _____

Vegetation Examiners _____

PRIMARY HOST PLANT ATTRIBUTES (see Protocol if the primary host plant is not clearly distinguishable) *checkbox if host plant not distinguishable. (see info at bottom of next page)*

Scientific Name _____ Common Name _____

Distance to nearest neighbor of same species (see protocol) _____ cm.

Maximum Height (not length) of highest culm _____ cm.

Maximum Height (not length) of basal leaves _____ cm.

Length & width at ground level (two perpendicular measurements): _____ X _____ cm.

Percent of basal foliage that is green (alive) _____% versus brown (dead leaves present) _____%.

QUADRAT VEGETATION FEATURES

Estimated cover of oviposition plant species (all individuals) within the quadrat _____%.

Total estimated cover of all (lumped) live or standing vascular plants _____%.

Total estimated cover of all (lumped) graminoids (Poaceae, Juncaceae, Cyperaceae) _____%.

Total estimated cover of all (lumped) forbs _____%.

Scientific Name and estimated percent cover (%) of each graminoid that occurs in Quadrat (not including the primary host plant species, if it is a graminoid):

(over)

FIELD FORM - FOR MARDON SKIPPER OVIPOSITION MICROSITE VEGETATION - Page 2

Total estimated cover of all (lumped) ferns _____%.

Total estimated cover of all (lumped) shrubs less than 3 meters tall _____%.

Total estimated cover of all (lumped) hardwood trees greater than 3 meters tall _____%.

Total estimated cover of all (lumped) conifer trees of any height _____%.

Estimated **Ground** cover of: Rock _____% Bare Soil _____% Litter (including down wood) _____%

Cryptogams (lumped) _____% (the sum of these 4 percentages can equal no more than 100%).

If litter is estimated to be more than 50%, what is the average **depth** of ground litter? _____cm.

Maximum Height (not length) of tallest herbaceous plant in quadrat _____cm.

Scientific name, or common name, of tallest herbaceous plant in quadrat _____

Estimated "Horizontal Vegetation Thickness" (see protocol) at 1 ft. above ground _____%.

Estimated "Horizontal Vegetation Thickness" at 2 ft. above ground _____%.

Estimated "Horizontal Vegetation Thickness" at 3 ft. above ground _____%.

Total canopy density as seen reflected on a Robert E. Lemmon Model-A convex spherical

Densitometer:

As measured according to instructions in the lid: _____% or...

If less than 10%, check here: _____. or...

If estimated by quick judgement over the entire convex mirror rather than dot counting,
record your density estimate here: _____%

Host plant not distinguishable: species w/in 1/10m² plot centered on oviposition center (skewer):

Species	%cover	height (cm)	Species	%cover	height (cm)

Forb % cover = _____