

Report to the U.S. Fish and Wildlife Service and the U. S. Forest Service

**Mardon Skipper Survey of Coon Mountain Burn Site
Late May and Early June 2009**



Transect through burned habitat at the Coon Mountain Mardon site.
Photograph by Scott Hoffman Black

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ABSTRACT

Xerces Society staff monitored the Coon Mountain mardon skipper (*Polites mardon*) population in 2009 to determine its response to a controlled burn conducted by the U.S. Forest Service in 2008. A substantial mardon skipper population was discovered in 2008 at the site of a planned burn. Following discussions with the Xerces Society and the U.S. Fish and Wildlife Service, the U.S. Forest Service modified the burn plan to reduce the affected area, so that less than half of the mardon habitat was impacted. To study the effects of the burn, the site was divided into four monitoring zones. Each zone was further subdivided into burned and unburned areas, and a 150x30 foot transect was set up in each, resulting in a total of eight transects across the habitat area, four each in burned and unburned areas. Xerces staff counted mardon skippers in each transect on two independent monitoring dates (05/27/09 & 06/07/09). Counts were also completed over the entire zone on each date using a modified Pollard Walk. Substantially fewer mardon skipper were found in burned areas compared to unburned areas in each transect and zone. Continuing surveys are needed to evaluate the timing and levels of re-colonization of burned areas. No further controlled burns should be conducted in this area until previous areas are re-colonized to levels comparable to those seen currently in unburned transects. Planning and implementation of controlled burns in the future must include protecting at least 50% of as unburned habitat within the core population areas of this butterfly and monitoring re-colonization levels.

INTRODUCTION

The mardon skipper (*Polites mardon*) is a rare and declining butterfly in the Pacific Northwest of the United States of America. It is a Washington State endangered species and a candidate species for federal listing under the U.S. Endangered Species Act. Mardon are grassland and open meadow obligates endemic to Washington, Oregon and California. Historic mardon ranges are not known as documentation of this butterfly is scarce, and systematic population studies have only been done in recent decades (Black & Vaughan 2005). Mardon skippers were likely more widespread and abundant prior to the past 150 years of human development, which has negatively impacted their habitat via livestock grazing, fire suppression, and invasion of grassland habitat by native and non-native vegetation.

Mardon skipper is known from four geographic areas: (1) southern Puget Sound, (2) the Mt. Adams area (eastside of the Cascade Mountains) in southern Washington, (3) the Cascade mountains in southern Oregon, and (4) Del Norte County in north-coastal California and Curry County on the southern coast of Oregon.

Two accepted subspecies of mardon skipper have been described. Mattoon *et al.* (1998) proposed that the Oregon Cascades population be given subspecies status *Polites mardon klamathensis* while the Washington and Northern California populations comprise the subspecies *Polites mardon mardon*.

History of Mardon Skipper in California

Mardon skippers were first described by W. H. Edwards (1881) from specimens taken near Tenino, Thurston County, Washington by H. K. Morrison (Dornfeld, 1980). No additional populations were known outside of Washington State until June 1979, when Sterling and Eileen Mattoon discovered a population on High Divide Ridge in Del Norte County, California.

Surveys in 2003 at the High Divide Ridge site identified four principal grasslands (totaling approximately 4.5 acres) in which mardon skipper were consistently observed (Haggard 2003). Three sites are in close proximity to each other (0.1 km), with the fourth being the most distant from these three (~0.3 km). Dozens of individual mardon have been detected during peak years in the 1-2 acre core area at this coastal California site (Haggard 2003). In 2004, lepidopterists found a new population in northwestern California, approximately 10 km from the closest known population (Gary Falxa, Biologist, USFWS, personal communication). At the Little Bald Hills portion of Redwood National Park, Arnold (2005) observed mardon skipper in nine meadows throughout an approximately 2,200 m length of trails on the flank and top of the hills on May 26th, 2005. Arnold (2005) surveyed dozens of other sites in the region with suitable habitat but did not find any additional populations. Surveys conducted by the Xerces Society in 2007 on 21 sites in the Six River National Forest did not find additional populations. In 2008 Xerces Society staff re-surveyed several potential mardon sites on Rattlesnake Ridge and conducted new surveys of meadows at Coon Mountain (on the Six River NF). Mardon were discovered in the Coon mountain meadow complex on June 10, 2008. This is believed to be the largest population in California based on a one day count of 204 individuals on June 10, 2008 (Black et al 2008).

COON MOUNTAIN BURN STUDY 2009

In September 2008, Scott Hoffman Black met with Brenda Devlin (USFS Biologist) and Gary Falxa (USFWS Biologist) to discuss modifications to the Coon Mountain burn plan that would ensure long term sustainability of mardon skipper at this site. Areas that should be left untouched were identified resulting in a burn in early winter 2008 that impacted approximately 30-40% of the core area occupied by the mardon. A basic study to determine the response of the butterfly to the burn was also designed.

Scott Hoffman Black and Logan Lauvray (Xerces) met with Brenda Devlin, Gary Falxa, and staff from the USFS fire crew on May 26, 2009. Burn staff helped delineate burned and unburned areas, which were also observable by the presence of burned shrubs. Xerces staff placed flagging at the sites to clearly demarcate burn boundaries for surveys. .

SURVEY PROTOCOL

The burn site was divided into four zones. Each zone was then subdivided into burned and unburned areas.

Transect Counts

Two transects were set up in each zone, with one in burned and one in unburned habitat, for a total of eight transects across the habitat area. Flagging was placed down the center of a 150 ft transect, and 15 feet was measured out to each side from the center to give a transect width of 30 feet. All transects were placed in the best available habitat within the zone that accommodated the desired transect size. Xerces staff (Scott Hoffman Black) walked each transect slowly and counted all butterflies within the transect areas. Each transect required ~15 minutes to survey. Butterflies were not counted if they flew in from behind the observer to avoid the possibility of counting the same individual twice. Xerces staff completed counts twice during the mardon flight season, on May 27th and June 7th of 2009. A scheduled third count could not be done due to inclement weather.

Zone Counts

In addition to transect monitoring, counts were completed over each entire zone using a modified Pollard Walk (Pollard, 1977). The surveyed area of the unburned area and the burned area in each zone were roughly the same size. Xerces staff walked through each zone slowly, taking about 5 minutes to walk 100 meters, looking back and forth on either side for approximately 20 to 30 feet out. Surveyors walked a path such that all area within the zone with apparently suitable habitat was covered by this visual field.

If the surveyor left the path to look more closely at a particular butterfly, he returned to the original point where he left the path to resume monitoring. When a suspected mardon skipper butterfly was encountered it was identified on the wing, or netted and examined to ensure identity when needed. No voucher specimens were taken at these sites. All data was recorded and particular activities such as nectaring or ovipositing were noted.

Environmental Conditions

All sites were surveyed during the following environmental conditions, which are considered optimum for mardon skipper flight activity:

Minimum temperature: Above 60°F.

Cloud cover: Partly sunny or better. On cooler days, sunshine is very important in warming the butterflies' flight muscles and allowing them to take flight. On warmer days (above 60°F) less direct sunlight is required for skipper activity, but cloud cover should be such that a significant amount of sun comes through to help elevate the body temperature of basking butterflies.

Wind: Less than 10 MPH. On windy days, butterflies drop out of the air if they cannot maintain their direction and/or speed of flight.

Time of year: Sites were visited on May 27 and June 7 2009, in accordance with this species' late spring flight period.

Surveys of New Potential Habitat

An additional goal of this project was to identify new meadows north and east of the known Coon Mountain site and survey them to determine whether mardon are present. Sites were surveyed using the zone count protocol described above.

RESULTS

Mardon skipper surveys revealed a clear pattern of response to burning across all zones and transects. Although each of the four zones differed slightly in the quality of mardon habitat, higher mardon numbers were observed at each unburned transect compared to the burned transect within each zone. Counts for all four zones across both survey dates showed mardon numbers that were 3-27 times higher in unburned areas compared to burned areas on the same dates (mean = 12 times greater). With the exception of a single transect in zone 2, on a single date mardon counts for all transects were 6-19 times higher in the unburned compared to the

burned transect in the same zone (mean = 9.2 times higher). Individual zone and transect counts are presented below.

Zone 1

Zone 1 is located just to the east of road 17N07 (Appendix 1 Maps 1 and 2). In 2008 this site had a relatively high density of mardon skippers. Surveys conducted in 2009 in the unburned portion of this site (zone 1A) found 23 mardon skippers on May 27 and 44 on June 7. Surveys in the burned portion found 3 on May 27 and 8 on June 7. The transect survey in the unburned area (Transect 1A) found 6 mardon on May 27 and 19 on June 7, while the transect in the burn area (Transect 1B) had only one individual on May 27 and two on June 7 (see figures 1 and 2).

Figure 1: Counts of mardon skippers in burned and unburned areas of Zone 1. A sites are in unburned habitat and B sites are burned habitat.

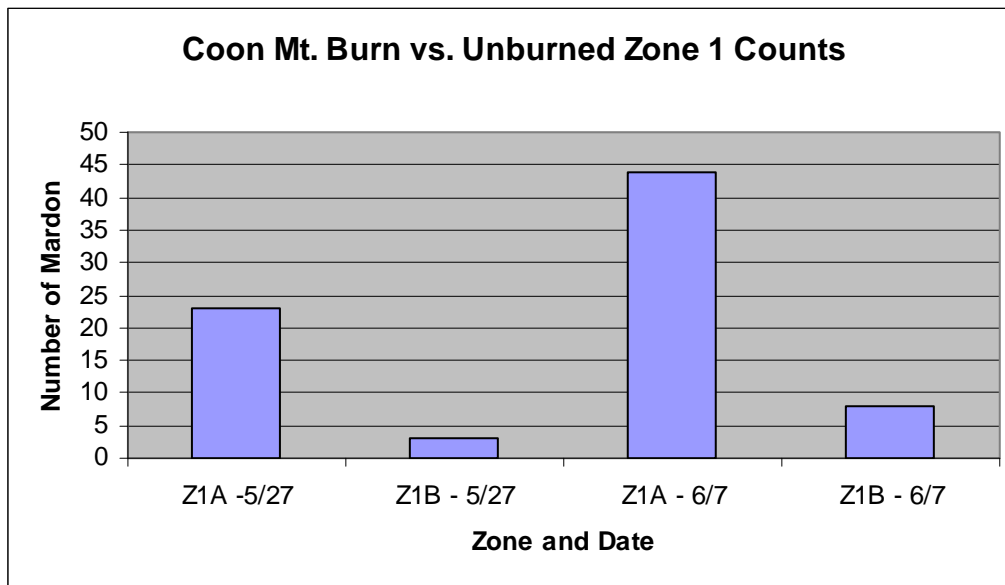
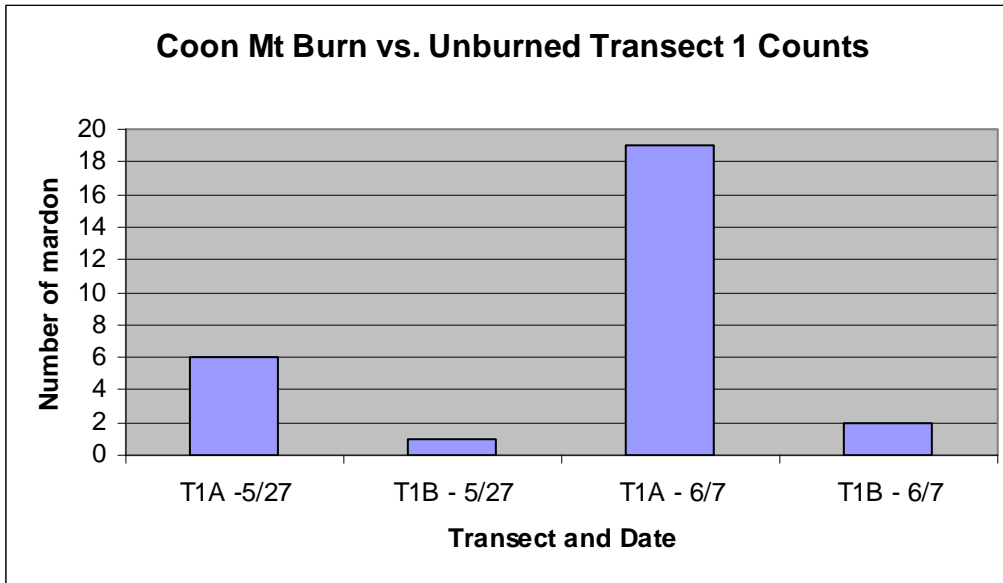


Figure 2: Counts of mardon skippers in burned and unburned transects of zone 1. A transects are in unburned habitat and B transects are burned habitat.



Zone 2

Zone 2 is directly east of zone 1. (Appendix 1. Maps 1 and 2). There are areas within the meadow that are too wet for mardon skipper but the majority of the area has high quality mardon habitat and had a relatively high density of mardon skipper in the 2008 count. Surveys in the unburned portion of this site (zone 2A) found 40 mardon skippers on May 27 and 38 on June 7, while surveys in the burned (zone 2B) portion on the same dates found 14 and 8 skippers, respectively. The transect survey in the unburned area (Transect 2A) found 3 mardon on May 27th and 14 on June 7th while the burn area transect (Transect 2B) had 5 individuals on May 27th and two on June 7th. (see figure 3 and 4).

Figure 3: Counts of mardon skippers in burned and unburned areas of zone 2. A sites are in unburned habitat and B sites are burned habitat.

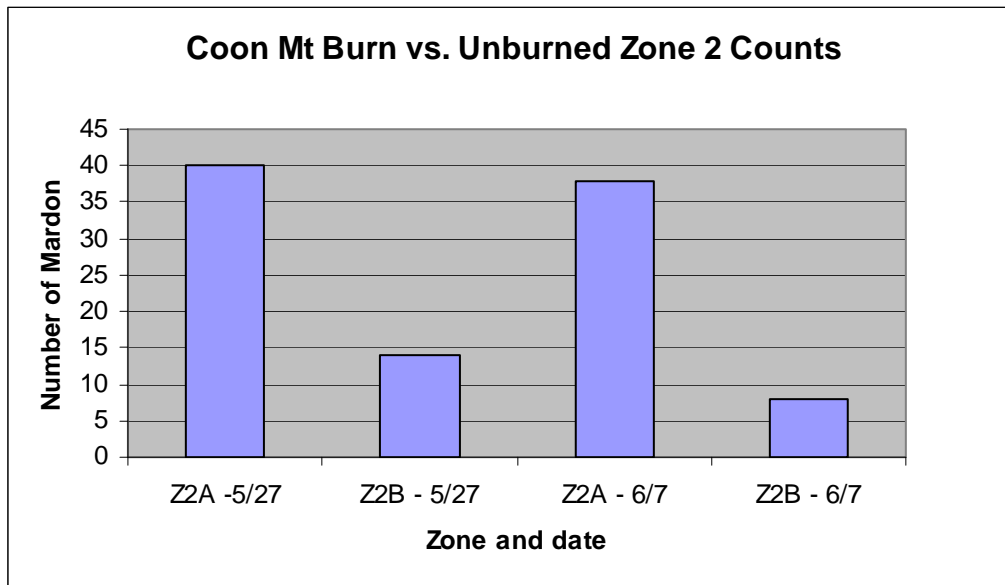
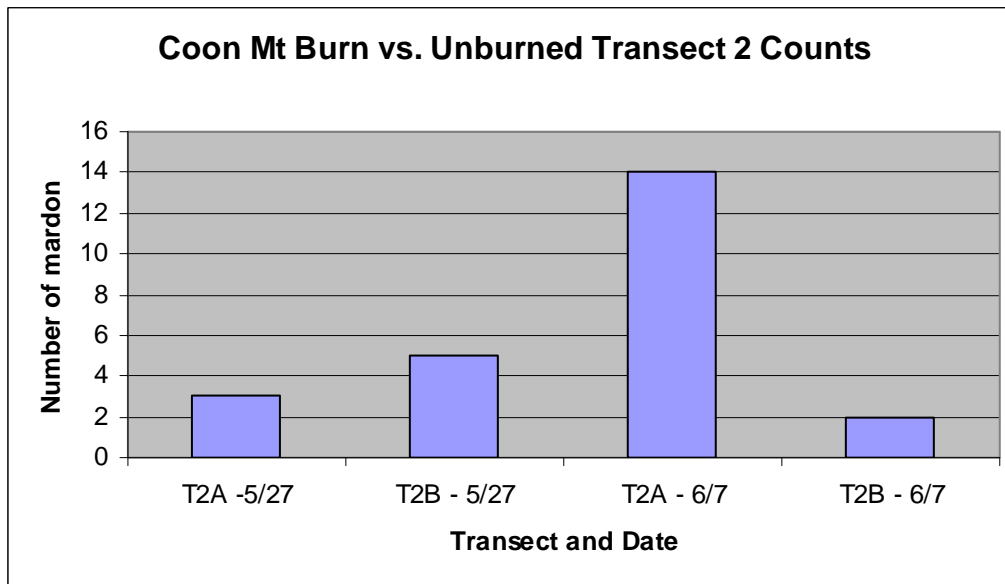


Figure 4: Counts of mardon skippers in burned and unburned transects of zone 2. A transects are in unburned habitat and B transects are burned habitat.



Zone 3

Zone 3 is located just to the south of zone 1 (Appendix 1. Maps 1 and 3). It is a linear habitat area that is much smaller than zones 1 or 2. The habitat in the non-burn area had more fescue and nectar sources than the habitat in the burned portion of the site, although mardon were found in moderate numbers throughout this area in our 2008 surveys. 2009 surveys in the unburned portion of this site (zone 3A) found 14 mardon skippers on May 27th and 27 on June 7th. Surveys Report to the U.S. Fish and Wildlife Service and the U. S. Forest Service, Mardon Skipper Survey of Coon Mountain Burn Site, Xerces Society, October 2009.

in the burned portion (zone 3B) found one mardon skipper on May 27th and no mardon skipper on June 7th. Transect 3A had 6 mardon on May 27th and 10 on June 7th while transect 2 B (in the burn area) had one mardon on May 27th and none on June 7th (see figure 5 and 6).

Figure 5: Counts of mardon skippers in burned and unburned areas of zone 3. A sites are in unburned habitat and B sites are burned habitat.

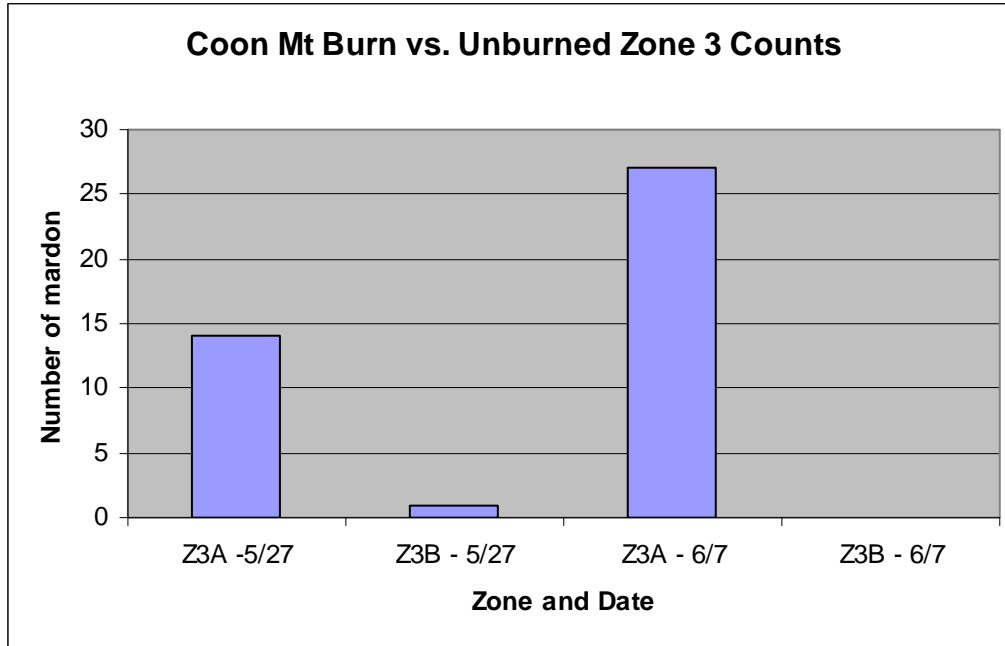
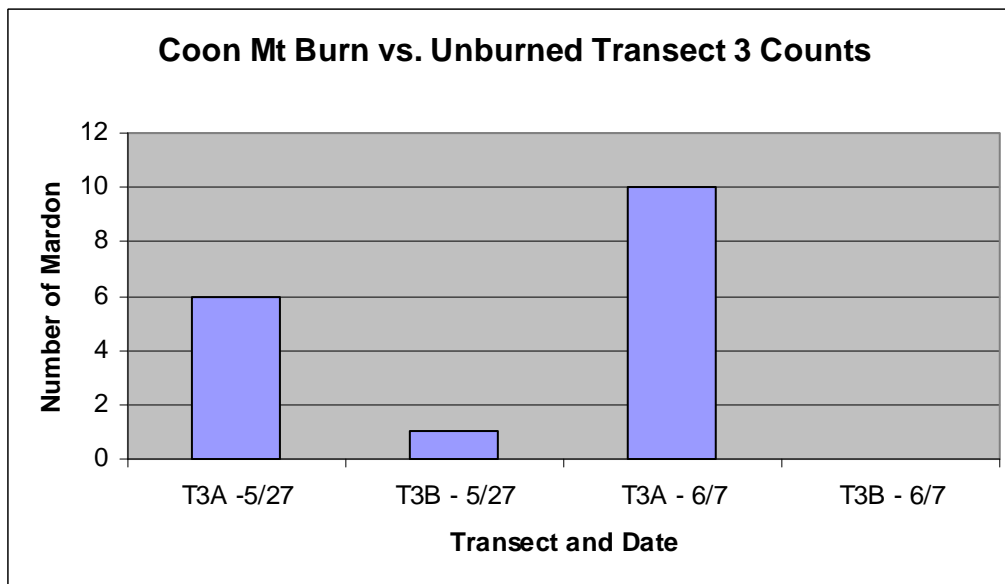


Figure 6: Counts of mardon skippers in burned and unburned transects of zone 3. A transects are in unburned habitat and B transects are burned habitat.



Zone 4

Zone 4 includes the southern-most meadow in this complex and is located just south of zone 3. (Appendix 1. Maps 1 and 4). The habitat in the non-burn area has more fescue and nectar sources than the habitat in the burned portion of the site although mardon were found in moderate numbers throughout this area in our 2008 surveys. 2009 surveys in the unburned portion of this site (zone 4A) found 8 mardon skippers on May 27th and 26 on June 7th. Surveys in the burned (zone 4B) portion found no mardon on May 27th or June 7th. Transect 4A had 7 mardon on May 27th and 19 on June 7th while transect 4B (in the burn area) had no mardon on either date. (see figure 7 and 8).

Figure 7: Counts of mardon skippers in burned and unburned areas of zone 4. A sites are in unburned habitat and B sites are burned habitat.

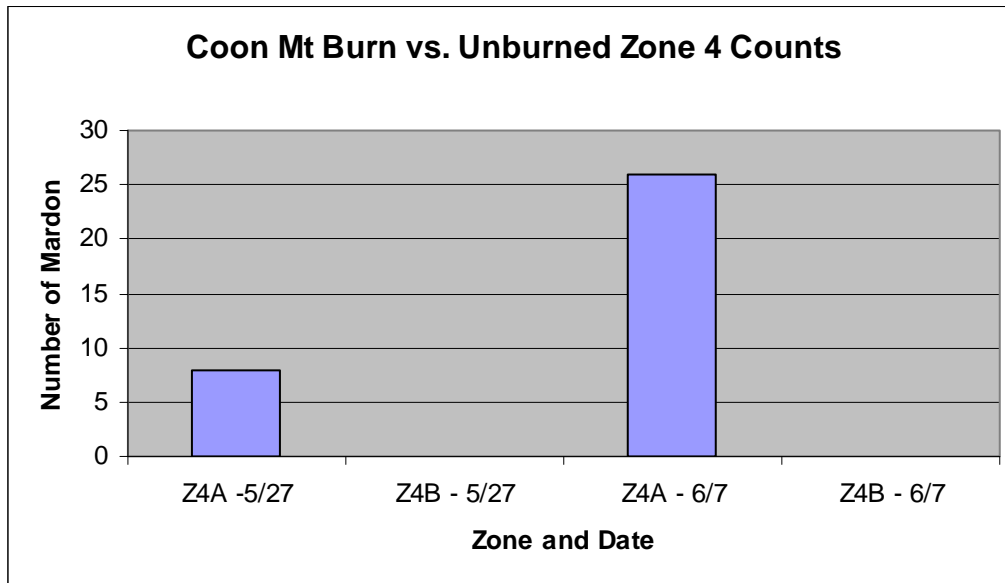
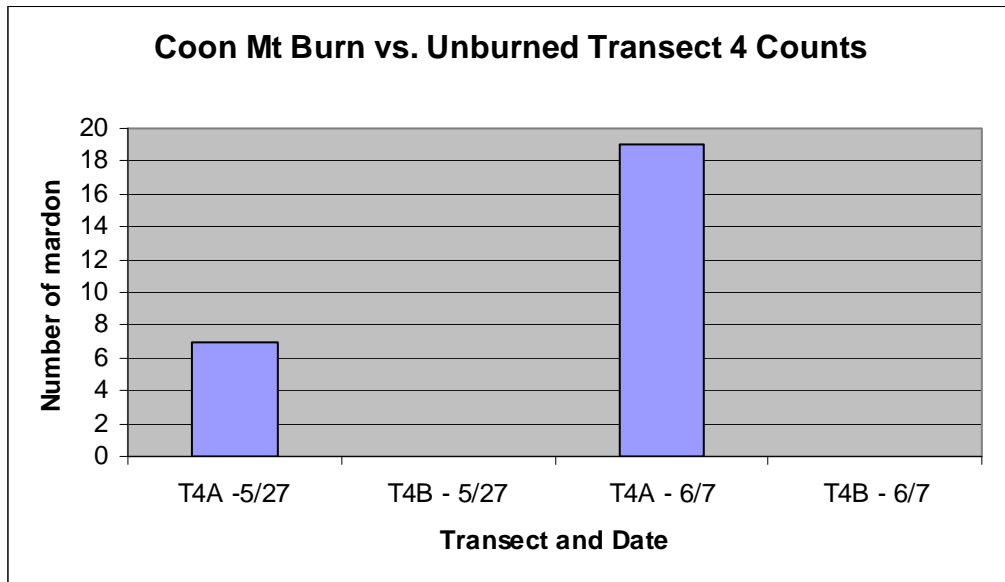


Figure 8: Counts of mardon skippers in burned and unburned transects of zone 4. A transects are in unburned habitat and B transects are burned habitat.



Searches of Additional Meadows

Several meadows adjacent to the main Coon Mountain meadows were searched on 5/27/09 (Appendix 2, Table 2). Also meadows to the east of the Coon Mountain site were searched on 6/7/06. We found a limited number of mardon skippers at two locations -- one to the east and one to the north of the main meadow. Both were within a ¼ mile of the main site. These two sites and one additional complex that should be resurveyed are described below.

The COON F1 site (N 41° 46.555' / W 123° 57.938) appears to have more moisture earlier in the season as well as pockets of shorter and patchier grass nearer bottom of the meadow that looked more promising as mardon habitat. This meadow is visible from the road leaving the main Coon Meadow complex. When this site was visited on May 27 2009 no mardon were found, but a re-survey by Scott Hoffman Black on June 7 2009 found three mardon toward the bottom of the meadow.

This site should be resurveyed to determine the extent of the mardon habitat.

The COON B11 site (N 41° 46.506' / W 123° 58.277' is across (on the west side) of road 17N07. This area is dryer than the main meadow. On 5/27/09 three mardon observed nectaring on *Zygadenus*.

This site should be resurveyed to determine the extent of the mardon habitat.

The COON G site (N 41° 46.370' / W 123° 57.325') is a meadow approximately ¼ to ½ mile long, and can be seen from the road ~ 100 yards below the road. Scott Hoffman Black surveyed various stringer meadows throughout this area on June 7, 2009. No mardon were observed. Most of the area looks as though it has recently burned, which may explain their absence. Mardon may eventually re-colonize this site from the core habitat on Coon Mountain.

This site should be resurveyed to determine if re-colonization has occurred.

The COON E site (N 41° 46.514' / W 123° 57.788') was surveyed by Scott Black and Logan Lauvray on 05/27/09. This site forms a finger visible on map past where the road turns sharply downhill after the main Coon Meadow complex, although on the map it appears that the road ends;. This site did retain some water, but appeared as a whole to be too dry and on too steep a slope to be good mardon habitat. In addition, there was only a small amount of fescue and limited floral resources. There is heavy encroachment of trees and shrubs into this area, further reducing its potential as mardon habitat. A portion near the road appeared to be an old logging skid area. A few additional fingers of meadow led off from this site, but Xerces staff determined that none appeared to be suitable Mardon habitat.

No Mardon were observed and we do not recommend revisiting this area.

DISCUSSION

Although there were not enough replicates in this study to allow statistical analysis, the results consistently show substantially fewer butterflies in the burned areas of Coon Mountain meadows compared to unburned regions. All zone and transect counts except for one transect (Transect 2A & 2B, May 27th) showed fewer mardon skippers in the burned areas, with mardon numbers up to 27 times higher in un-burned areas. It is also important to note that some areas where skippers were found in Xerces' 2008 surveys lacked mardon completely or nearly so in the burned areas in 2009. Zones 3 and 4 both contained mardon in 2008, but only one skipper was found in the burned area of zone 3 in 2009, and the burned area of zone 4 lacked mardon entirely.

This clear pattern of difference in mardon numbers between burned and unburned areas strongly suggests that further study of the effects of controlled burning on existing mardon skipper habitat, size of protected core habitat needed in areas subject to controlled burns, and the rate and level of re-colonization from protected core habitat areas after burning must be investigated actively before continued burning is done.

The effects of fire on vegetation and vertebrate communities are more widely understood than the effects of fire on invertebrates. Burning in habitat areas may benefit, harm, or have no significant impact on invertebrates, depending on the life history of specific taxa (Gibson *et al* 1992). Swengel (1996) and Swengel and Swengel (2001) found that fire had consistent negative effects on prairie specialist butterfly species, and that these effects persisted for 3-5 years post-burning. Using a modeling approach, Schultz and Crone (1998) found that burning no more than one-third of the habitat every year would maximize the average annual population growth rate of Fender's Blue (*Icaricia icarioides fenderi*). Burning meadows that contain populations of mardon skipper may kill all butterflies within the fire area, as this species is thought to overwinter as a caterpillar at the base of its host plant, and is thus highly susceptible to ground fires.

Burned areas must be re-colonized by butterflies flying in from unburned parts of the meadow, but the rate and extent of this re-colonization for mardon skippers has not been investigated and

is currently unknown. During adult flight, mardon skippers avoid heavily forested habitats and are assumed to have limited dispersal abilities (Beyer & Schultz *in prep*; Beyer & Black 2007; Runquist 2004). More vagile butterflies, such as the Fender's blue mentioned above, will likely re-colonize more rapidly than species such as mardon skipper. Also, areas with smaller core populations may take longer to colonize than other areas with larger population size. For instance, zones 1 and 2 had the highest mardon numbers in Xerces' 2008 count, and some butterflies were present in the burned areas of these zones in 2009. In contrast, zones 3 and 4 had only moderate numbers of mardon in 2008, and very few to no mardon were found in the burned areas in these zones in 2009. The long linear nature of zones 3 and 4 compared to the shorter, more polygonal shape zones 1 and 2 may also be a factor in dispersal distance.

RECOMMENDATIONS

A careful and well-researched prescribed burning regimen should provide the correct combination of timing, intensity, and size that is appropriate for the management area and will result in long-term stability of Mardon skipper populations. Knowledge of how butterflies respond to fire is integral to designing an effective fire management strategy. The Xerces Society makes the following recommendations:

- Continue mardon skipper monitoring program at Coon Mountain to understand the rate and timing of full re-colonization of burned areas by skippers.
- No additional burns in mardon meadows should be implemented until surveys indicate that mardon have completely recolonized the previous burn areas.
- Future fires should not burn more than 1/3 of the core habitat in any given year, and less if possible.
- As a fire moves through an area it may leave small patches unburned. These skips should be left intact as potential micro-refuges.
- A comprehensive monitoring program should be put in place to accompany any plans for continuing burns to determine the immediate and long-term impacts on mardon populations.
- Measures must be taken to avoid actions that could degrade existing habitat and kill individual skippers in the course of implementing a burn plan, as a result of heavy equipment use and additional or excessive foot traffic by burn staff in mardon meadows.

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APPENDIX 1: MAPS

Map 1: Study burn site overview. A transects are in the non-burn areas and B transects are in the burn areas.



Map 2: Transect locations in zone 1 and zone 2. A transects are in the non-burn areas and B transects are in the burn areas.



Map 3: Transect locations in zone 3. A transects are in the non-burn areas and B transects are in the burn areas.



Map 4: Transect locations in zone 4. A transects are in the non-burn areas and B transects are in the burn areas.



APPENDIX 2: TABLES

Table 1: Zone and transect counts with transect coordinates.

Area	Burn / Non-Burn	# Mardon	Start Coordinates	End Coordinates	Four Corners
Zone 1A	Upper Non Burn Area	(23 – 5/27/09) (44 – 6/7/09)			
Zone 1B	Upper Burn Area	(3 -5/27/09) (8 – 6/7/09)			
Transect 1A	Upper Non Burn Area	(6 – 5/27/09) (19 – 6/7/09)	N 41 46.459 W 123 58.205 @ Small Tree	067	060, 061, 063, 064
Transect 1B	Upper Burn Area	(1 – 5/27/09) (2 – 6/7/09)	N 41 46.485 W 123 58.186 @ Tree	062	060, 061, 063, 064
Zone 2A	Lower Non Burn Area	(40 – 5/27/09) (38 – 6/7/09)			
Zone 2B	Lower Burn Area	(14 – 5/27/09) (8- 6/7/09)			
Transect 2A	Lower Non Burn Area	(3 – 5/27/09) (14 – 6/7/09)	N 41 46.457 W 123 58.198 @ Small Pine	072	070, 071, 073, 074
Transect 2B	Lower Burn Area	(5 – 5/27/09) (2 – 6/7/09)	N 41 46.510 W 123 58.130 @ Burnt Shrub	#055 @ Burnt Shrub	056, 057, 058, 059
Zone 3A	Non Burn Area	(14 – 5/27/09) (27 – 6/7/09)			
Zone 3B	Burn Area	(1 – 5/27/09) (0 -6/7/09)			
Transect 3A	Non Burn Area	(6- 5/27/09) (10 – 6/7/09)	N 41 46.369 W 123 58.229 @ Small Pines	045	046, 047, 048, 049
Transect 3B	Burn Area	(1 – 5/27/09) (0 -6/7/09)	N 41 46.370 W 123 58.184 Burnt Canyon Oak	050	051, 052, 053, 054
Zone 4A	Non Burn Area	(8 – 5/27/09) (26- 6/7/09)			
Zone 4B	Burn Area	(0 -5/27/09) (0 – 6/7/09)			
Transect 4A	Non Burn Area	(7 – 5/27/09) (19 – 6/7/09)	N 41 46.188 W 123 58.002 @ Tree	C22	022, 023, 038, 039
Transect 4B	Burn Area	(0 -5/27/09) (0 – 6/7/09)	N 41 46.243 W 123 58.032 @ Small Pines	050	051, 052, 053, 054

Table 2: Search areas with GPS coordinates.

Site Number	N	W	Burn / Non-Burn	Species Present	Other Notes
COON B1	41 46.428	123 58.129		3 Mardon	
COON B2	41 46.414	123 58.070		No Mardon	End of finger with water; heavy tree/shrub encroachment
COON B3	41 46.418	123 58.034		No Mardon	End of finger, dried water area
COON B4	41 46.436	123 58.014		No Mardon	Edge of woods
COON B5	41 46.503	123 58.016		No Mardon	Edge of woods
COON B6	41 46.504	123 58.078	Burn Area	1 Juba Skipper and 1 Male Mardon	
COON B7	41 46.539	123 58.077			Edge of woods
COON B8	41 46.569	123 58.109		No Mardon	Near road, edge of meadow
COON B9	41 46.581	123 58.205		No Mardon	Other side of road, edge of meadow
COON B10	41 46.579	123 58.256		No Mardon	Seems too dry for Mardon; other side of road; multiple fingers back – all looked too shrubby for Mardon
COON B11	41 46.506	123 58.277		3 Mardon observed (same area observed on previous day – nectaring on <i>Zygadenus</i>)	Other side of road