Mardon Skipper Surveying

Internship with
USDA Forest Service

Submitted by
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**Introduction**

The summer of 2013, I spent in Gold Beach, Oregon working with the USDA Forest Service as part of the wildlife department’s crew. As a temporary summer employee, many tasks and projects were asked of me to have completed before the end of the summer season. The summer months are when most of the field work at this station can be completed due to weather conditions the remainder of the year. Through all the tasks and participation in projects, better understanding of nature and the outdoor world has been gained, while also working to understand the significance of human-environment relations.

The broad spectrum of knowledge that the subject of geography covers, applies to the multidisciplinary nature of the experiences I had with the Forest Service. The multifaceted nature of the subject field allowed for each task to be approached with a goal to connect what I was experiencing and observing while working to what I had learned from my courses at Western Oregon University. For example, I used the skills I learned in Map Reading and Analysis to organize historical aerial photos, circa 1940’s. While cleaning and organizing, curiosity took over and I started comparing the historic photos to more recent ones and discovered how much the landscape has changed. Then I started thinking about why? What are some of the possible explanations of why it has changed? What could have the past environment been like when compared to the current one? To answer these questions I took information from courses like Physical Geography, Biogeography, even Earth Science.

The acknowledgement and management of conservation is important to the different departments of the USDA Forest Service. Most relevant to me is the wildlife department. Some of the tasks and projects that I took part in were meadow restoration and enhancement, bald eagle surveys, and Mardon skipper surveys. A more complete list of tasks and projects can be found in the Appendix. The Mardon skipper is a rare and sensitive butterfly. Researchers use population surveys as the main sources of species and habitat health indication. Because of this population surveys and other projects relating to this species were my main focus for the summer. This butterfly has a small window of opportunity when people are able to survey and monitor them. Due to this and the fact that as a summer employee, many other tasks were asked of me and I was not able to use my
entire time with the Forest Service, to devote to Mardon skipper surveying efforts. In the end, though, I was able to draw on all my experiences through work and schooling, to develop a well-rounded project that considered the multiple aspects of an ecosystem or environment that affects the survival of the Mardon skipper.

**Abstract**
There are several aspects that make the Mardon skipper unique and possibly an indicator species. It is a rare butterfly that is affected by fragmentation and is greatly isolated. It is endemic to the Pacific Northwest of North America and is limited to four populations that are in Washington, Oregon, and northern California (Miller & Hammond; pp. 39-40, & 68). It is considered to be a relict (Miller and Hammond; pp. 39-40) and the remaining habitats could possibly be “islands,” microclimates, and/or refugia that are just as unique as the butterfly itself. By surveying and monitoring the current populations of the Mardon skipper, we are able to learn of relationships between habitat change and species response.

**Statement of Research Question**
Originally my research plan was focused on identifying aspects of Mardon skipper habitat in currently populated sites and from there, identifying new potential habitat. However, through my experiences and further education, the focus of the project has become more about expanding Mardon skipper survey efforts and exploring aspects that were not previously recognized. From the results of my work, I gained a better understanding of whether or not, the Mardon skipper species is an indicator organism, an organism that points to the health of an ecosystem or environment. It is similar to how a bald eagle population will indicate the health of the waterway in which it depends on and the health of the fish, its food source.
Conservation and specific species – the Mardon skipper

A Literature Review

The world has always been changing and reorganizing but recently it has been more rapid with greater impacts. According to Cox and Moore “[T]he loss of global biodiversity that we are currently experiencing may well be affecting the functioning of the entire biosphere” (Cox & Moore; p. 100). Any loss has an effect on the ecosystems, and concepts of conservation and its management are becoming more and more relevant. Changes such as global warming and human disturbance all cause changes, which are stressful for the creatures that live in affected habitats, or ecosystems. Making up “95% of all animal life in terrestrial environments” arthropods and insects “are highly sensitive to environmental change, both climate and habitat modification” (Miller & Hammond; p. 15). Because of this researchers can learn through observations of arthropods and insects about the habitat that is associated with that organism (Beyer & Schultz, 2010) by “serv[ing] as an indicator organism for ... health, diversity, and sustainability of the environment” (Miller & Hammond; p. 15).

The Mardon skipper is a rare butterfly species that is found in the Pacific Northwest region of the United States, noted by Hatfield, Hoffman Black, and Jepsen (2013b), the authors of Range-wide strategy and monitoring protocol for the Mardon skipper (Polites mardon, W.H. Edwards, 1881). According to NatureServe (2013) the conservation status of the Mardon skipper is imperiled, which means it is at risk of becoming endangered. The species is already listed as endangered in the state of Washington, and imperiled in Oregon. Is it possible that the Mardon skipper is an indicator species? If so what is it indicating? Through a review of the literature, it is revealed that conservation is relevant and is going to be increasingly important for the world’s biosphere. Acknowledging the fact that conservation efforts are need for several habitats and species, Mardon skipper included.

Threatened and Endangered Species and Conservation

Goble, Wiens, Scott, Male, and Hall (2012) stated “The accumulated effects of individual and societal actions, taken locally over centuries, have transformed the composition, structure, and function of the global environment.” Things have changed so
much that ecosystems and species are becoming threatened, imperiled, endangered, and even extinct. When a species becomes so threatened it has potential to become extinct, it is considered an endangered species (Raven, Berg, & Hassenzahl, 2010, pp. 375-376). To respond to the “endangerment and loss of species” the Endangered Species Act (ESA) is to “bring species at risk of extinction ‘to the point at which the measures provided pursuant to this Act are no longer necessary’” (Goble et al., 2012).

Species are being threatened and endangered all over the world. Fattorini (2009) assess species threats at different spatial scales using a “three-step analysis:”

In the first step, species are assigned to categories of threats at larger (e.g. continental) scale. Then in the second step, the species are assigned to categories of threats at a smaller (e.g. country) scale. Thus the conservation status of a given species is evaluated at two spatial scales ... In the third step, areas which host species that are imperiled at the 'larger' scale, but not at the 'smaller' scale, can be considered as priority areas where conservation efforts are expected to be more effective. (Fattorini, 2009)

This analysis allows conservation efforts to be better designed. The authors, Thomas, Franklin, Gordon, and Johnson (2006) concluded their research review by providing “suggestions for better achieving the goals of the NWFP,” Northwest Forest Plan, a conservation plan that is specific to the United States of America’s Northwest region, for old growth forests and associated species. One of the suggestions that I would like to draw attention to is, to “manage the NWFP forests as dynamic ecosystems.” When looking at “species-specific protection on endangered, threatened, and at-risk species” the authors, Thomas et al., turned to coarse- and fine- filtered approaches. The coarse-filtered approach is “the occurrence of species is predicted by the occurrence of habitat,” and will maintain species diversity through ecosystem diversity over large areas (Thomas et al., 2006). The fine-filtered approach is “based on actual site specific data,” and is more appropriate for “federally threatened and endangered species” (Thomas et al., 2006). The fine-filtered approach also recognizes the importance of the habitats of the species that are in question (Thomas et al., 2006).

Summers, Bryan, Crossman, and Meyer (2012) suggest that “there is a need to reduce the vulnerability of native ... species through a range of conservation measures” that
will aid in adaptations needed due to climate changes for the “most sensitive-species.” Miller and Hammond (2007; p. 3) state that “[i]f climatic conditions change to such a degree that the habitat suitable for a species also changes, then the species will likely be at a higher risk of extinction.” Conservation considers both the organisms and their habitats, in order to assist in the success of the species and ecosystems. Conservation is defined by “The American Heritage Science Dictionary” (2013) as “[t]he protection, preservation, management, or restoration of natural environments and the ecological communities that inhabit them.” The conservation of habitats or species, plant or animal, is important because it preserves biodiversity. Biodiversity is the “variation among organisms” and accounts for species richness, genetic diversity, and ecosystem diversity (Raven et al., 2010, p. 371). A healthy ecosystem requires biodiversity of the species within it, and when a species or whole habitat is lost, biodiversity is lessened.

**Unique Characteristics and Landscape**

Ecosystems all over the world have their own characteristics that add to the landscape. An ecosystem is “a system formed by the interaction of a community of organisms with their environment” (ecosystem. Dictionary.com). Endemism is a characteristic that is used to describe an organism that is found in a particular region, or “confined in their distribution” (Cox & Moore, p. 39; Raven et al, 2010, p. 377; Strahler & Strahler, 2005, p. 693). Endemism is “based on the distribution of a species being limited to relatively well-defined population within a restricted geographical area... [or] localized habitat of just a few square kilometer” (Miller & Hammond; p. 3). Another unique characteristic that deals with spatial confinement is relict. A relict is “an organism that now has a more limited distribution than it once had,” usually due to climate change (Cox & Moore; p. 481). In other words a relict is an endemic organism that is even more restricted in distribution and is often considered to be species remnant of time period or climate that no longer exists to its previous extent. What is now left as a population and habitat could be considered an example of microclimate and refugium.

Microclimates and refugium, can occur naturally but are pushed by both natural and human influences. Microclimates are the most local level of habitat type, which can often be
restricting, taking into considerations “the spatial environment within which an animal feeds, moves around, shelters, lives, and breeds” (Cox & Moore; pp. 40, 127-128). There are animals that only live within a microclimate, restricting their movement. A refugium is similar to a microclimate, in a sense that they are both a localized habitat. Refugium, (plural, refugia) is defined as “location[s] in which some organisms have been able to survive a period of unfavorable conditions” (Cox & Moore; p. 481). These usually are areas that are stable, meaning they do not have a lot of tectonic activity, glaciation, and don’t have extreme weather conditions. Refugia are areas, or “islands” (Cox & Moore; p. 53), of favorable conditions for survival. These are places were relicts usually show up because the condition are similar to what their previous habitat would have been (Cox & Moore, p. 53).

These “islands” can occur when the world’s biosphere naturally changes but in today’s world human factors have accelerated the process and have changed the landscape. With all the changes that happen in the world, some species become indicator species. This “refers to species that have such narrow ecological tolerance that their presence or absence is ... [an] indication of environmental conditions” (Hunter, p. 241). They “warn of a problem” that could be happening in their environment (Hunter, p. 241). A species may be indicating with subtle changes in their behavior or drastically with major population changes. A characteristic that plagues landscapes today is fragmentation.

The fragmentation of habitat threatens so many aspects of ecosystems, especially the organisms associated with them. Fragmentation can be caused by human influences such as “agricultural and residential development, fire suppression, livestock grazing, and introduction of exotic species” (Hoffman and Vaughan, 2013). This is because land is being delegated for other reasons, instead of natural habitat. In a way fragmentation is a ecosystems way of adapting to changing conditions. According to the authors of “Environment,” habitat fragmentation is “the breakup of large areas of habitat into small, isolated patches” (Raven et al., 2010 p. 377). These “isolated patches” could then be considered refugia, because the way the world is changing favorable conditions in the patches are what organisms are using to survive. Some creatures have had their habitat changed so much that they then become relicts.
The concept of the “island” describes the isolation of a particular habitat, which is similar to how an island in an ocean provides a terrestrial habitat in a marine environment. “Islands” that occur in continental conditions are favorable habitat that species, both plant and animal, use to survive in a changing environment. Isolation can occur by altitude. There are several climate changes as altitude increases, and with that ecosystems change too. “Species that are found only with a narrow altitudinal belt are particularly sensitive to isolation, fragmentation, and reduction of their habitat” (Olson, Noss, Orains, Striholt, Williams, & Sawyer; n.d.). Looking at a profile of a landscape by elevation, a person will notice that there are environmental changes. Increases in elevation, will change the temperature and moisture levels, which in turn changes the type of habitat and climate that are present. According to Briles, Whitlock, Bartlein, and Higuera (2008), “[s]teep elevation gradients created by mountains transform large-regional scale climate patterns into site-specific microclimates in which different aspects and elevations strongly influence vegetation.” Sometimes “islands” and refugia occur at different altitudes because they are dependent on the conditions that are present at those certain elevation. A certain elevation may promote the survival for a particular habitat and therefore the survival of the species within it. Ecosystem adaptation and accelerated process from human influence can be a cause of fragmentation but there are also other situations that lead to fragmentation.

The Pacific Northwest is an area that is, sometimes, still regarded as wild and untamed, where wildfires are a natural occurrence. The major difference is in the past they were not as severe. When natural occurrence of fire is suppressed, several things happen as a result. Miller and Hammond explain the situation and consequences of fire suppression and encroachment.

Under controlled conditions, the disturbance caused by fire is beneficial to the biota. Conversely, catastrophic fires are detrimental to the biota. Prolonged periods of time without fire will result in tree encroachment into meadows and other types of clearings and promote a more dense growth of the understory vegetation. In turn, the understory shrubs and trees outcompete species of sun-loving grasses and herbs. (Miller & Hammond, p. 3)

Encroachment is major threat to habitats because it causes fragmentation and isolates environments. Beyer and Schultz (2010) tell that “Forest encroachment not only reduces
the amount of open habitat but [also] closes off corridors between meadows.” The closing of corridors makes it impossible for animals and plants to expand without immediate threat (Raven et al., 2010, p. 386). As the climate changes, plants and animals need to be able to adapt and follow their habitat movement, otherwise they may be threatened with extinction.

One way to offset isolation and fragmentation is to have corridors. A corridor is defined by Cox and Moore (2010) as “a pathway [that] may include a wide variety of interconnecting habitats, so that the majority of organisms found at either end of the corridor would find little difficulty in traversing it” (p. 42). According to Strahler and Strahler (2005, pp. 692-693) corridors, or landscape fluidity (Summers et al., 2012), “facilitate” movement of species. “In order to survive ... species will need to migrate ... [making] landscape fluidity necessary” (Summer et al., 2012). Summer et al. (2012) also states, “Species that are unable to overcome these barriers and migrate to new areas will become increasing isolated ... [making them vulnerable] to climate change.” Corridors connect the landscape in a way that can assist in the survival plant and animal species, but it depends on range, or area need for an individual to complete life cycle, of the species (Hunter, pp. 129-130).

**Mardon Skipper (Polites mardon)**

“First described by W.H. Edwards” in 1881 from H. K. Morrison collected in 1880 (Hatfield et al., 2013b) the Mardon skipper is part of the taxonomy order, Lepidoptera, or butterflies and moths, which is “one of the largest, most diverse, and most endangered taxonomic groups” (Beyer & Schultz, 2010). “Mardon skippers were likely more widespread and abundant” prior to the European settlers being in the area, revealed by Hoffman Black, Vaughan, and The Xerces Society for Invertebrate Conservation. Now an endemic species, the Mardon skipper is found in 21 sites in southern Oregon Cascade-Siskiyou Mountains and even fewer in coastal regions of northern California and southern Oregon (NatureServe, 2013). “Rare butterflies are ... useful for monitoring unique ecosystems and are often associated with other threatened fauna” (Beyer and Schultz,
As an indicator species, the Mardon skipper is so connected to its environment that any changes will be forewarned by the butterfly (Hunter, p. 241).

Miller and Hammond (2007) identified six possible reasons why butterflies and moths are rare.

1) the food plant for the caterpillars is also rare; 2) the species exhibits a narrow range in its optimal climatic conditions, such as temperature and moisture conditions, that limit the availability of suitable habitat; 3) natural enemies; 4) some other species is superior interspecific competitor and utilizes a similar and limited critical resource, such as the same food plant; and 5) the population is at the edge of the species range and therefore is inconsistent in sustaining a colony through time...

The sixth factor is founded on insufficient sampling protocols for population assessment... [contributing to the] perception that a species is rare. (Miller & Hammond, 2007, p. 1)

With little information or population assessments on a species there isn’t a definite answer regarding its status as rare or not. With a small amount of information it can be assumed that a species is rare, because there is no evidence stating otherwise. With more information, a species’ status has better background and support, so a question of rarity can be answered definitively. This is why surveys and other efforts are done. They provide additional knowledge to a limited, but growing, general knowledge of the Mardon skipper.

Specifically the Mardon skipper’s rarity is further expressed by its population groups. A population group is an assemblage of individuals of the same species that interact and exchange genetic material within a defined spatial area. The Mardon skipper species only has four known population groups known only in Washington, Oregon, and Northern California (Miller & Hammond; p. 39). The “four localized but widely disjunct [sic] populations” appear to be relicts “from what was once a much more widely distributed species in Western North America” (Miller & Hammond; p. 39). The four populations occur in “Tenino Prairies of western Washington near Olympia,” summits of the Cascades around Washington state’s, Mt. Adams, “along the summit of the Cascades in southern Oregon and northern California,“, and “the Siskiyou and coastal mountains of Del Norte County ... [and] immediately to the north in Oregon within the Siskiyou National Forest, Curry County” (Miller & Hammond, pp. 40 & 68). In the southern Oregon Cascade-Siskiyou Mountains, and
adjacent coastal regions of northern California and southern Oregon there are only 21 sites
where the Mardon skipper is found (NaturServe, 2013). In the coastal regions of southwest
Oregon and northwest California, the research showed that that fragmentation is high and
“most [sites are] separated by a distance of over two miles” (Hatfield et al., 2013a), which is
too far for the Mardon skipper to travel. The fragmentation of the habitat is a major threat,
separating required Mardon skipper habitat. What once was a connected habitat
supporting life is now fragmented and has created “islands.”

The small number of sites where the Mardon skippers are found may be due to the
type of habitat that is preferred. The habitat itself may be a relict, making the species a
relict as well. The preferred habitat consists of moist, grassland areas, in serpentine based
soils (Hatfield et al., 2013a). “Serpentine is a relatively rare rock type, created when oceanic
mantle is emplaced on land typically at fault zones near continental margins” (Cooper).
This type of soil is also considered “toxic and nutrient poor” (Sleeter & Calzia). A species of
oatgrass, *Danthonia californica*, common name California oatgrass, is found in the
serpentine soil sites in Oregon. California oatgrass is most often used by the Mardon
skipper for oviposition, or the laying of eggs (*Dictionary.com Unabridged*), as explained by
Beyer and Hoffman Black (2006). This is a species of oatgrass, along with fescue, native
bunchgrasses, and other grasses, that the Mardon skipper larvae and caterpillars feed on
(Hoffman & Vaughan, 2013; Miller & Hammond, p. 68). The grasslands that the Mardon
skipper depend on “have declined dramatically in the past 150 years due to agricultural
and residential development, fire suppression, livestock grazing, and introduction of exotic
species” (Hoffman & Vaughan, 2013).

The Mardon skipper has a body that is less than one inch, or 2.0 to 2.4 centimeters,
with tawny-orange hair (Hoffman Black & Vaughan), and a 2.8 centimeter wingspan (Miller
& Hammond; p. 68). In “Conservation assessment for the Mardon skipper (*Polites
mardon*)” by Kerwin (2011), other distinguishable characteristics are explained:

1) In the resting position, or “basking posture[,] ... the forewings are held at a 45-
degree angle and the hind wings are fully spread”

2) A “series of 5 or 6 ... adjacent spots” adorn the wings, with the middle being
“strongly rectangular”
3) The “[b]orders between the orange and brown areas are generally more diffuse[d]...,” meaning more drawn-out or spread

4) Being part of the Hesperiinae taxonomy family and subfamily (p. 3), Mardon skippers “have a fast, skipping flight ... [similar to] a stone skipping across water”

These characteristics are important to keep in mind because the flight periods of the Mardon skipper overlap with other similar skipper species, which can be referred to as look-a-like species. To aid in population counts, proper identification is indeed important, because of the look-a-like species. Population counts, which are conducted during flight periods, help researchers understand the health the Mardon skipper and associated habitats.

The lives of the adult Mardon skipper are usually “between five days to two weeks” (Hatfield et al. 2013b). “[F]emales deposit their eggs into native bunchgrass where they hatch after 6 to 7 days. Larvae feed on fescue, oatgrass, and a variety of other grasses for about 3 months, overwinter as larvae, then pupate in the early spring” (Hoffman Black, Vaughan, & Xerces Society). Female butterflies, in general, are very selective when choosing on “oviposition location,” according to Beyer and Schultz. “Habitat factors ... include host plant species, host plant nutritional and chemical content, host plant size and structure, and oviposition location microclimate” (Beyer & Schultz, 2010). The effects of environmental changes on the butterfly are seen more easily when in the larval stage “due to their limited mobility and restricted habitat requirements” (Beyer & Schultz, 2010). The most common flight period is between May and July (Hatfield, Hoffman Black, Jepsen, 2013a; Hatfield et al. 2013b).

The flight period is created by factoring together the incoherent nature of when the adults emerge from the pupa stage, or “[m]etamorphosis, the process of changing for a caterpillar into an adult” (Miller & Hammond, pp. 13-14). The flight period is influenced by factors that have to do with location such as present population, weather conditions, and elevation. “Sites with large populations may have a flight period that extends for more than a month, whereas sites with small populations may have adults present for only ten or fewer days” (Hatfield et al., 2013a; Hatfield et al., 2013b). Flight periods are further influence by weather conditions. “Wet or cold conditions delay emergence and conversely, warm, dry conditions promote earlier emergence” (Hatfield et al., 2013a; Hatfield et al.,
Site locations that are in coastal regions are found “within the coastal fog belt” (Kerwin). Due to the changing climate we live in weather conditions are less predictable and more extreme. Making it more threatening for sensitive species and associated habitats, consequently makes conservation of species and habitat more significant.

**Conclusion**

“Population growth, human health, and urbanization are increasingly seen to affect forests, with reciprocal effects on human populations in both social and biological dimensions” (Thomas et al., 2006). Many people see the different species that are in this world as something that should be cherished. Many species have already gone extinct, and many others are threatened and/or endangered. Protecting the biodiversity of different ecosystems of the Earth and in conserving habitat and ecosystems, a person is helping species like the Mardon skipper to survive. Studying species like the Mardon skipper, I have come to realize that its sensitivity to associated habitats make it an indicator organism.

The Mardon skipper is so fine tuned to its habitat and surroundings any change will affect it and there will be noticeable differences exhibited by the species. The Mardon skipper already exhibits signs of a changing biosphere. It has shown that it is endemic to the Pacific Northwest of the United States of America. It has also considered to be a relict (Miller & Hammond, pp. 39-40), that depends on microclimates, refugia, and “islands.” The species is also affected by human influences, fragmentation and encroachment.

The knowledge base for the Mardon skipper is slowly expanding and gaining more and more. This species of butterfly holds its own kind of importance in the natural and academic world. Conservation not only helps many different animals and habitats but it also helps people understand what those species need and how the world is changing. Understanding a species such as the Mardon skipper, can allow us to better understand our world.
**Methods**

**Required Equipment**

This is equipment that all the employees usually have when they work in the field. They use what they need when it applies to the conditions they are working in.

- Appropriate Clothing: long-sleeved shirt, jeans or work pants, a hat when appropriate
- Compass
- Ranger District Map
- Eye Protection
- Field 1st Aid Kit
- Hard Hat
- Keys to buildings and gates
- Leather Work Gloves
- Orange Work Vest
- Sunblock
- Work Boots
- Walkie-Talkie / Radio
- Water
- Work Site Maps

**Aerial Photos**

Aerial photos are taken to enable a better understanding of the landscape. Each image shows unique characteristics of the landscapes from the year the picture was taken. When comparing photos from different years the trends in landscape change become noticeable.

A task that was asked of me was to gather, clean, and organize historical aerial photos from the 1940s. Materials that will be needed are: aerials photos, flight line map, previous knowledge of aerial photo coding (used to organized by flight line)

**Historical Aerial Photo Cleaning and Organization**

Materials: Aerial photos from around the 1940's, Box, Eraser, Flight line map, Notebook paper, pen or pencil, Previous knowledge of aerial photo coding (used to organized by flight line)

The goals for this project were to organize as much of a complete set of 1940's aerial photos, as possible. The general process includes: finding photos from around the 1940's, use eraser to remove and markings, then organize into a shipping box by flight line. Once that process was completed the photos were then shipped off to be digitized.
Mardon Skipper Surveying Efforts

Materials: District map, Identification book, Notebook and pencil, Work site maps and coordinates

1) Sites are determined from a reported sighting of the butterfly. Another way sites are found is by doing exploratory surveys. This is done by choosing a site via satellite images, going to the designated site and doing a general survey to see if any individuals are present. The sites that I looked at were Snow Camp Meadow and Windy Valley Meadow.

Latitude & Longitude

Snow Camp Meadow: 42°21'11.38"N; 124°10'19.48"W
Windy Valley Meadow: 42°19'53.56"N; 124°8'59.19"W

2) On a district map identify work site, usually meadows. Having extra copies of maps of specific work sites comes in handy when in the field. It allows the observer to make notes spatially if needed.

3) Decide which surveying method (described below) will be used and gather materials.

4) Drive to location. Many of the sites require a walk/hike in, so go prepared.

5) Once in the meadow proceed with surveying method.

Surveying Methods

Catch and Release Surveying - Getting a positive identification

Materials: Butterfly net, Camera, Identification book, Glass observation jar with lid, Work site maps, notebook and pencil

1) Start day’s record in notebook with pencil. Day’s date, weather conditions, temperature, wind conditions, and any other noticeable observations.

2) Objective is to catch a butterfly to identify and then release.

3) With the butterfly net attempt to catch a butterfly.

4) Once a butterfly is in the net, without causing harm or injury, get it into the glass observation jar. Put the lid on but not all the way, so there is still oxygen available.

5) Using the identification book, identify the butterfly. Take picture if needed with camera.

6) Record in notebook for identified count.

7) Release butterfly.

8) Once back at the station type up identified count and report findings.
Example: Windy Valley; Date: 6/20/2013; Mardon skipper: 12; Checkerspot: 5; Silvery Blue: 2; Admiral: 1; Fritillary: 6

Permanent Transect Surveying – Distance Surveying

This type of surveying method allows for consistent data to be collected. The original transects were put in using “Range-wide strategy and monitoring protocol for the Mardon skipper (Polites mardon, W.H. Edwards, 1881).” By Rich Hatfield, Scott Hoffman Black, and Sarina Jepsen.

Materials: GPS unit, Flagging, Notebook, Pencil, Permanent Marker, Rebar, and Mallet

Permanent Transect Installation


Transect Coordinates

1) Using the suggested coordinates in the “Range-wide strategy and monitoring protocol for the Mardon skipper (Polites mardon, W.H. Edwards, 1881)” plot rebar at the units.

The current transects at Windy Valley were installed by Rich Hatfield, Candace Fallon, Jessie Dubuque, and myself. The transect UTM coordinates follow.

<table>
<thead>
<tr>
<th>Transect</th>
<th>Length</th>
<th>Easting</th>
<th>Northing</th>
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<td>405333.958506</td>
<td>4687264.065095</td>
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</tbody>
</table>

2) Use mallet to secure rebar in the ground.

3) If any adjustments need to be made record them in your notebook, make sure to also record the new coordinates.
4) On the flagging write what transect it is, at each end. For example:
   Flagging on the rebar designating transect 1: TRANSECT 1
   Flagging on the rebar designating transect 2: TRANSECT 2
   Flagging on the rebar designating transect 3: TRANSECT 3

**Distance Surveying**

This survey technique is based on what is stated in "Mardon Skipper (Polites mardon, W.H. Edwards, 1881) Rangewide Monitoring Protocol" by Rich Hatfield.

Materials: Insect net, Glass or plastic observation jars, 2 people or a digital voice recorder, Distance measuring pole, Data sheets, Pencil, Thermometer, Wind gauge (Kestrel), "The Butterflies of Cascadia: A Field Guide to All the Species of Washington, Oregon and Surrounding Territories" by Robert Michael Pyle,

1) Before conducting any surveys, record the information at the top of the datasheet (example on page 44). Should include site name, date, cloud cover %, observer, temperature, wind speed, and start and end time.

2) Randomly choose transect. This can be done by throwing a pencil over your shoulder and survey the transect the pointed end is bearing towards. Then designate the order of with survey transects with continue. For example you start on transect 2, then move to transect 1, and finish with transect 3.

3) Before walking each transect state aloud the designated number (i.e. Transect 1), so it can either be recorded by the other person or a digital voice recorder. Then proceed to walk transect.

4) Walk transect at a consistent pace, saying number of observed skippers aloud and distance perpendicular from transect.

5) As the observer walks transect, they should be saying their detection aloud for the digital voice recorder or have another person follows them recording observations on data sheet.

6) Once at the end of transect observer should state ending of transect. For example “End of Transect 1”
Repeat steps 3-6 for rest of transects.

Once observations are done on transects, 10 or 10% of observed butterflies need to be caught. This is done to determine ratio of Mardon skippers to look-alikes, and, if possible, male and female ratio of Mardon skipper. An example of this would be if you observe 100 skippers while walk transects, 10 skippers need to be caught.

**Bald Eagle Surveying**

The bald eagle is another indicator organism but is also on the federally protected list. By observing them, a better understanding of their health and the ecosystem's health.

Materials: Tri-pod, Telescope, Description of site (where to find the nest), Notebook, Pen/Pencil, Map, Timer, Photo of nest site if available

1) When a nest is located and an observation site is determined, then observations can proceed. Nests are usually located when tracking and observing a bald eagle.
2) Drive to site. Some require you to walk to the observation site.
3) Set up telescope in described spot and direction. Having a photo from a previous observation helps with locating the nest(s).
4) Find nest in scope. A bald eagle’s nest can usually be found near the top of a tree, with some tree foliage still above the nest for shelter.
5) Once the nest is found, record in notebook with pencil, the observations. Observations should include time, date, duration of observation, behavior, number of animals observed, weather, etc.
6) Start observation time and continue for 15 to 45 minutes.
7) If there are two observable nests at the observation location then repeat steps 3-5.
8) Pack up supplies and return to vehicle.
9) Type up observations, once in office, for each site and report findings.

**Habitat Restoration and Enhancement**

In order for species that depend on meadow habitats to survive sometimes restoration and enhancement is needed. Species such as the Douglas-fir will easily over take a meadow if the chance is present. Keeping the meadow open will benefit the species that depend on it, such as the Mardon skipper.
Native Grass Seed Collection

Native grasses are not always found in meadows and species, such as the Mardon skipper depend on native grasses for oviposition. Collecting native grass seed allows for the seeding of areas where native grasses are absent.

Materials: District map, Knowledge of the grass species collecting, Knowledge of location of collection, Paper grocery bag, Work site map,

1) Collection sites are determined by a positive identification of the grass species
2) On a district map identify work site, usually meadows or fields.
3) Locate work site on map, most likely a meadow or meadow complex, and drive to location.
4) Identify which grass species that is being collected. In this case Danthonia californica or California oatgrass.
5) While picking the seed, collect them in the paper grocery bag. The paper bag allows for drier storage and easier transfer.
6) Once back at station deposit the day's collection into appropriate location. There were several locations where the Danthonia was found, with different soil types. To make sure the seeds reproduced successfully based on soil type, the seeds that were collected at a specific site are stored together. For example, collections from serpentine soils were stored separately.

Meadow Restoration

Many meadows are having their natural habitat taken over by trees and other encroaching species. Meadow restoration can include the reopening up of a meadow, such as taking out encroachment. The easiest way to control encroachment is to catch it when the trees are still small. Use pruners, preferably with the long handle, and also use a bow saw to cut down the encroachment trees. If there are bigger trees that require a chain saw, make sure someone who is trained and has the correct credentials, takes care of those trees. Make sure trees are cut as close to the ground as possible.

Invasive Plant Extraction

Invasive plants are also taking over certain habitats where the species was not present before. Before going to the site, be familiar with the correct ways to dispose of the plant. The most useful tools for this are to use a weed wrench and/or a Pulaski. Each plant species has different physical and growing characteristics. Some have really deep roots, while others
have shallow root systems. Knowing which type you are dealing with is essential to successful eradication. Be sure to remove as much as the root system and seeds (i.e. thistles) as possible, to ensure there will be no future growth at the site.

**Web Soil Survey Query**

All plant life comes from the soils and all animal and insect life depends on plant life in one way or another. A query on the soil information for Windy Valley meadow and Snow Camp meadow was done in order to explore the possible differences in the two sites regarding the soil. There were several things that were looked at and the results are stated and discussed on pages 24 to 29.
Results
A full account of results is on pages 35-37 in the appendix.

Aerial Photos
There are significant differences of meadows when comparing different years. When looking at the older photos it can be noticed that the meadows are larger and more open. Meadows and roads are similar in the fact that they are open areas that can be over grown with vegetation and encroached on. For example designated roads are more visible, but when comparing to later photos the road become over grown with vegetation. These characteristics are similar to how meadows become overgrown with encroachment.

Mardon Skipper Surveying Efforts
Survey report on page 36

Windy Valley Meadow
This meadow was successfully surveyed in 2013. It was surveyed four times spanning June and July. The first survey population count produced 226 individuals. A permanent transect was installed on June 20, 2013, in accordance with the information provided in “Range-wide strategy and monitoring protocol for the mardon skipper (Polites mardon, W.H. Edward, 1881) by Richard Hatfield, Scott Hoffman Black, and Sarina Jepsen. There were several adjustments that needed to be made based on the knowledge of the site, and preferred habitat. Adjustments were made, by me, to include as much of the preferred habitat as possible, and to exclude the forested area around the site.

Recently, May 2, 2014, Rich Hatfield and Candace Fallon, accompanied myself and my supervisor, out to the meadow. Hatfield relocated the previous installed transects and the flagging for each was redone. We were also taught by Hatfield and Fallon how to successfully complete a distance sampling survey, described in “Mardon Skipper (Polites mardon, W. H. Edwards, 1881) Rangewide Monitoring Protocol” by Rich Hatfield. Distance sampling survey and monitoring method will continue to be used.

Snow Camp Meadow
This was surveyed twice and no skippers were detected. There was, however, California oatgrass present. This site is similar yet different from Windy Valley. The vegetation is similar but there is more surface water present. Also more than half the area that would be
considered possible meadow on the map, is actually peat bog, with surface water running just under the peat and organic matter. This area was also affected by the Biscuit Fire of 2002. From the characteristics of the meadow it looks as if there is a dozer line going through meadow part of the area. In general this area seems much more disturbed than Windy Valley meadow.

**Bald Eagle Monitoring**

This was successful year for most of the known sites. According to the bald eagle monitoring summary that looks at all observation data collected, from 1982 to 2013, an increase in the number young that fledged is displayed (USDA Forest Service, 2013, Bald Eagle Monitoring Report...).

**Habitat Restoration and Enhancement**

There was work done in Windy Valley meadow and at Ludlum House Recreation Site. That area has an orchard nearby that was part of a pioneer family’s settlement. Over the years it has become overgrown with encroachment and invasive plant species. Figure 1 shows the progress of restoration
from about the same vantage point.

Restoration of this particular meadow was important for several reasons. The first was historical. This is part of a settlement of a pioneer family. This meadow/orchard is also used by elk, deer, and bear. Further importance of the restoration here will be discussed later.

The other meadow that I was able to work on was the Windy Valley meadow. This meadow is secluded enough that invasive plants have a hard time getting there. There is some encroachment but that can easily be taken care of when visiting the site.

**Web Soil Survey Query**

Soils information can be daunting and little overwhelming. One reason is that the terminology is unusual for someone who is not used to it. But the information that the terminology provides is important to understand, even if just the surface. The information that is used I believe will shed light on a possibility why the two sites, Windy Valley meadow and Snow Camp meadow, are different. To start with, soil comes from the breaking down of rock and the minerals in them. The main ones that are a part of the soils that I will cover are igneous, sedimentary, and metamorphic. Igneous rock forms from the “cooling and solidification of magma” (Soil Science Society of America). Metamorphic rock is the reorganization of preexisting rocks due to pressure and heat (Soil Science Society of America). Sedimentary rock forms when minerals and materials deposit and are “more or less consolidated” (Soil Science Society of America).

Windy Valley Meadow had the following results:

- (7D) Aquic Haplohumults-Cryaquepts complex, 0 to 15 percent slope
- (29F) Bobsgarden-Rilea-Rock outcrop complex, conglomerate substratum, 30 to 60 percent south slopes
- (34E) Bobsgarden-Rilea complex, conglomerate substratum, 0 to 30 percent slopes
- (54F) Cedarcamp-Snowcamp-Flycatcher complex, 30 to 60 percent south slopes
- (262F) Threetrees-Saddlepeak-Scaloreck complex, 30 to 60 percent south slopes

Snow Camp Meadow had the following results:

- (7D) Aquic Haplohumults-Cryaquepts complex, 0 to 15 percent slope
- (56F) Cedarcamp-Snowcamp-Rock outcrop complex, 30 to 60 percent south slopes
- (241E) Snowcamp-Cedarcamp-Rock outcrop complex, 0 to 30 percent slopes
- (242G) Snowcamp-Flycatcher-rock outcrop complex, 60 to 90 percent south slopes

Figure 2, on the next page, shows the layout of the soils present.
They all have different characteristics that make them unique from each other. With each site having different soil types can cause the sites to be different as will be discussed later.

**Figure 2** (Images from USDA Web Soil Survey site)

Snow Camp Meadow off of the Web Soil Survey site.

Windy Valley Meadow off of Web Soil Survey site.
**Discussion**

The natural development of the world and its biosphere, are always changing and in today's world things are changing faster. The world and its ecosystems, adapt to the different characteristics that are now present. The species, both plant and animal, within the ecosystems now have to adjust too.

Changes in the climate alter ecosystems either in a good way or a bad way. For example when looking at the aerial photos, meadows were more open in the past and over the years it can be seen that encroachment has slowly taken over. It has also been noted several places that climate has been on a warming trend for years now. The warming trend and encroachment could be correlated. Encroachment is when the trees invade on a meadow or open space. When this happens they are taking essential habitat of other plant and animal species. When participating in habitat restoration and enhancement projects, preservation of habitat and species was observed. For example when I participated in the Ludlum Orchard restoration project, we were creating more suitable habitat for deer, elk, and bear, while also preserving the apple trees from the pioneer family. By taking care of meadow encroachment, such as at Windy Valley meadow, plant and animal species are able to sustain their life cycles and be successful.

The successfulness of an species is often determined by the health of its habitat, and indicator species generally tells of the health of their habitat and ecosystem. A great example of this is the bald eagle. This species of bird relies on the river or waterway ecosystems. And when there is something wrong with that ecosystem the bald eagle is affected. In the past, rivers of the Pacific Northwest were over fished or deadly chemicals (insecticides and pesticides) were leached in to waterways, making the aquatic species suffer. In both of these situations the bald eagle suffered. But according to the general trend that can be seen when looking at the number of young fledged a year since 1982, things are moving in a positive direction (USDA Forest Service, 2013, Bald Eagle Monitoring Report...). The number of successful young fledglings has increased since the start of the recordings of monitoring activities. In the end it can be said that an individual bald eagle is an indicator organism for the ecosystems, and the health of the fish, that it relies on.
The presence of the Mardon skipper at one site and not another is interesting. What is it indicating? Snow Camp and Windy Valley meadows really aren’t that far apart; as can be seen in Figure 3. The Mardon skipper only shows up in Windy Valley meadow. One reason of this, I believe, is the disturbance level. Windy Valley meadow is very secluded. It is about an hour hike in from the trailhead that is used. And, although, it is along a designated trail system, there isn’t a great deal of human disturbance evidence. It is fairly protected by steep mountains on two sides and when the Biscuit Fire (2002) swept through it seemed to go around Windy Valley meadow. The evidence of this seen in the trees that surround the meadow doesn’t have any extremely notable fire damage. This could possibly be from a low intensity burn. The ones that do are in the area where the ground is saturated with water and doesn’t promote tree growth.

Snow Camp meadow on the other hand appears to have had a high level of disturbances in the past. The meadow itself is not as protected as Windy Valley meadow. Instead of being tucked between two mountains, Snow Camp meadow is on the side of a mountain, as if a
bench in the landscape. It is easily accessible from a road and is visible from Snow Camp Lookout. Where the soils that aren’t saturated with water, they appear to be quite dry as well as the vegetation. California oatgrass, *Danthoian Californica*, is present in this meadow. This native grass species is used by the Mardon skipper to deposit their eggs and feed the larvae and caterpillars. But the level of disturbance in this area could possibly be too much for the butterfly to have survived. There appears to be an old dozer line going through Snow Camp meadow. The dozer line is a fire fighting technique and was possibly used during the Biscuit Fire. This tells an observer that there was a high level of human disturbances in past. Today there isn’t a great deal of disturbances but past ones have contributed to the current state of the meadow and the possible reason why the butterfly has not been detected in this meadow.

A major telling point in the mystery of these two sites is their soil. There are aerial images of the meadows from the Web Soils Survey site on page 25. The area of the meadows at both sites is Frigid Aquic Haplohumults (7D). The describing words frigid and aquic mean that there is water present and it is cold. According to the Soil Science Society of America, aquic conditions have characteristics such as soil saturation that create an aerobic situation. This type of soil, aquic haplohumults, mostly found in Oregon, is “developed in sediments derived largely from basic rocks” (Soil Survey Staff, pp. 740-741). According to the Soil Survey Staff that wrote “Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys,” this soil has been “cleared for hayland, pasture, or cropland” (pp. 740-741). When looking at this fact it is hard not to connect it to the threats of Mardon skippers, agriculture and livestock grazing. If the soil that the Mardon skipper lives on is ideal for agriculture industry purposes then it makes sense that their habitat is so rare now. An agricultural boom has potentially made this species a rare and sensitive one.

The reason why Windy Valley meadow has a Mardon skipper population and Snow Camp meadow doesn’t, also lies in the soil. Both of the meadows are surrounded by mountainous landscapes so the soils from those slopes influence the meadow. Materials and minerals are colluvium influenced or acted on “by gravitational action” (Soil Science Society of America), are then deposited in an area that is down slope, in this case within the meadow. The
materials and minerals eventually get integrated in the soil and influence the composition of the site. The soils that surround Snow Camp meadow happen to have a common parent material, or rock composition that the soil derives from, peridotite and serpentineite. Peridotite is a green in color igneous rock formation (King). Serpentinite or serpentine is a toxic soil that is “relatively rare rock type” (Cooper). “Soils developed on serpentine are toxic and nutrient poor, and are characterized by high levels of magnesium, nickel, and chromium as well as low levels of calcium” (Sleeter & Calzia). It is created when oceanic mantle is emplaced on land, typically at fault zones near continental margins” (Cooper).

Windy Valley meadow and Snow Camp meadow both have serpentine influences but the Mardon skipper is only present in one. Windy Valley meadow has a single serpentine parent material influence according to the Web Soil Survey site. Snow Camp meadow has three soil types with serpentine and peridotite parent materials that influence the meadow. With this said it could be possible that Snow Camp meadow is influenced too much by the toxic serpentine soils that surround it. With one serpentine influence on Windy Valley meadow, a conclusion could be made that this is just enough for the Mardon skipper and its preferred habitat to survive. Some sources stated that the Mardon skipper prefers habitat with some serpentine influence, but I believe that Snow Camp meadow has too much serpentine influence. There are other factors that could be influencing the meadows and the Mardon skipper’s presence, or absence, in them. Other influences, as I stated earlier, could be the level of disturbances, location of the meadow.
Conclusion

I believe that Mardon skipper is an indicator species, but the situations that it would indicate may have passed. There has already been an agricultural boom and the remaining sites are mostly unknown to the majority of the public population. If a Mardon skipper butterfly were to indicate anything now, it would be that climate change is taking a hold of the landscapes and habitats that it is already restricted to. The monitoring and surveying that I did for the Mardon skipper with the U.S. Forest Service, is only a small part and there is a huge need for continued efforts. The efforts should include habitat restoration and enhancement, continued monitoring of all known populations, and if possible the identification of other sites of occurrence. I feel that these efforts will help people better understand what is going on with the Mardon skipper. So much is still unknown about this butterfly.

Another possible action that can be taken is to keep looking at Snow Camp meadow. This site may give more information that can contribute to the knowledge base of the Mardon skipper. Continuing native grass seed collection is also an important avenue for action. California oatgrass is used by the Mardon skipper, so putting it in other areas may help with developing habitat for the butterfly. In regards to other species, native grass habitats are becoming uncommon and continuing the development of habitats for other species is just as important.

The world will always be changing and it will never be static. The natural habitats all over the world will adapt to the new conditions. The health of species and the habitats and ecosystems they rely on have become more and more important to conservation. Understanding indicator species allows researcher and scientist to look for signals and to better know how to focus their efforts. The Mardon skipper is just one indicator species; there are so many others in the world.
References


U.S. Department of Agriculture Forest Service Region 6 and U.S. Department of the Interior Bureau of Land Management Interagency Special Status and Sensitive Species Program, Assistance agreement L13AC00102

Hatfield, R., Hoffman Black, S., & Jepsen, S. (2013a). *Management plans for all southern Oregon cascade Mardon skipper (Polites mardon) sites on the bureau of land management’s hunter creek area of critical environmental concern (ACEC)* (Tech.). The Xerces Society for
Invertebrate Conservation.
U.S.D.A. Forest Service Region 6 and U.S.D.I. Bureau of Land Management Interagency Special Status and Sensitive Species Program


U.S. Department of Agriculture Forest Service Region 6 and U.S. Department of the Interior Bureau of Land Management Interagency Special Status and Sensitive Species Program, Assistance agreement L08AC13768, Modification 7


Report to Forest Service and BLM from the Xerces Society


Appendix

Contact and Agency Information

USDA Forest Service
Gold Beach Ranger Station, Rogue River-Siskiyou National Forest
Front Desk Phone Number: (541) 247-3600
Address: 29279 Ellensburg Ave., Gold Beach, Oregon, 97444

Supervisor: Jessie Dubuque
Wildlife Biologist
Desk Phone Number: (541) 247-3651
E-mail: jdubuque@fs.fed.us

Coordinates

Snow Camp Meadow (Lat. /Long.): 42°21'11.38"N; 124°10'19.48"W
Windy Valley Meadow (Lat. /Long.): 42°19'53.56"N; 124°8'59.19"W

Current Transects at Windy Valley Meadow (UTMs)

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Data: Bald Eagle, Mardon Skipper, Web Soil Survey

Bald Eagle Surveying Efforts


### Rogue River Observation Summary 2013

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<td>5 times between April 16 and July 23</td>
<td>2 young fledged</td>
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<td>Quosatana Campground</td>
<td>Quosatana Campground boat ramp; immediately opposite nest tree</td>
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<td>Copper Canyon</td>
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</table>
Mardon Skipper Surveys


2013 Windy Valley Meadow (Mdw # 629; T. 37 S., R. 1 W., Sec. 31, SE ¼, W.M)

<table>
<thead>
<tr>
<th>Date</th>
<th>Observer(s)</th>
<th>Species Count</th>
<th>Weather Conditions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 June 2013</td>
<td>Holly Witt &amp; Jessie Dubuque</td>
<td>226 fresh individuals</td>
<td>Temperature was round 78 degrees, sunny, clear and light intermittent breeze.</td>
<td>Used transect survey method. Occasional cloud cover would cause the Mardon to settle, but once cleared they would become active again. Nectar on camas lilies and a variety of small buttercups. Most numerous count thus far.</td>
</tr>
<tr>
<td>18 June 2013</td>
<td>Cameron Adams &amp; Lily Miller</td>
<td>0</td>
<td>Rainy Showers; around 40 degrees F</td>
<td>Attempted to put in permanent transects using information provided by monitoring protocol set in document mentioned below. Was unsuccessful due to GPS projections on units were off. Did meadow restoration.</td>
</tr>
<tr>
<td>20 June 2013</td>
<td>Cameron Adams &amp; Lily Miller</td>
<td>Observed while setting transects; 25 skippers, 7 Checkerspots, 2 Fritillary</td>
<td>Partly sunny; Temperature around 50 degrees F; Meadow was cold with sunny spots</td>
<td>Successful installation of permanent transects. Adjustments were made to include majority of suitable habitat and to move transects out of the trees. Map of transects can be seen in appendix along with transect UTM units.</td>
</tr>
<tr>
<td>3 July 2013</td>
<td>Cameron Adams &amp; Lily Miller</td>
<td>Total: skippers 41; Fritillary 13; Checkerspot 4; Silvery Blue 1; Admiral 1</td>
<td>Sunny; about 75-80 degrees F</td>
<td>Distance surveying on transects was the surveying method used. Species count was taken for each transect and used to get total. The meadow was cooler in temperature than at the vehicle parked at trailhead.</td>
</tr>
</tbody>
</table>

2013 Snow Camp Meadow (Mdw # 626; T. 37 S., R. 1 W., Sec. 24 & 25, E ½, W.M)

<table>
<thead>
<tr>
<th>Date</th>
<th>Observer(s)</th>
<th>Species Count</th>
<th>Weather Conditions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 July 2013</td>
<td>Cameron Adams</td>
<td>0</td>
<td>Temperature around 10 degrees; Sunny, clear, and no wind</td>
<td>Attempted to locate the Mardon skipper species in the area of the meadow. No skippers were detected</td>
</tr>
<tr>
<td>17 July 2013</td>
<td>Cameron Adams &amp; Lily Miller</td>
<td>0</td>
<td>Temperature around 80 degrees, Sunny, clear, and no wind</td>
<td>No skippers were detected.</td>
</tr>
</tbody>
</table>
Web Soil Survey Query
All information comes from http://websoilsurvey.nrcs.usda.gov

<table>
<thead>
<tr>
<th>Windy Valley Meadow Soils</th>
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<tbody>
<tr>
<td>Symbol</td>
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<tr>
<td>7D</td>
<td>Frigid Aquic Haplohumults</td>
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<td>Aquic Haplohumults-Cryaquepts Complex, 0-15% Slope</td>
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<tr>
<td>29F</td>
<td>Loamy-skeletal, mixed, frigid Umbric Dystrochrepts</td>
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<tr>
<td>Bobsgarden-Rilee-Rock outcrop complex, conglomerate substratum, 30-60% South Slope</td>
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<tr>
<td>34E</td>
<td>Loamy-skeletal, serpentinitic, frigid Umbric Dystrochrepts</td>
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<tr>
<td>Bobsgarden-Rilee complex, conglomerate substratum, 0-30% slope</td>
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<tr>
<td>54F</td>
<td>Loamy-skeletal, serpentinitic, frigid Dystic Eutrochrepts</td>
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<tr>
<td>Cedarcamp-Snowcamp-Flycatcher complex, 30-60% South Slope</td>
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<tr>
<td>262F</td>
<td>Loamy-skeletal, mixed, frigid Typic Dystrochrepts</td>
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<tr>
<td>Threetrees-Saddlepeak-Scalerock complex, 30-60% South slope</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Snow Camp Meadow Soils</th>
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<tbody>
<tr>
<td>Symbol</td>
<td>Soil Taxonomy</td>
</tr>
<tr>
<td>7D</td>
<td>Frigid Aquic Haplohumults</td>
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<tr>
<td>Aquic Haplohumults-Cryaquepts Complex, 0-15% Slope</td>
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<tr>
<td>56F</td>
<td>Loamy-skeletal, serpentinitic, frigid Dystic Eutrochrepts</td>
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<tr>
<td>Cedarcamp-Snowcamp-Rock outcrop complex</td>
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<tr>
<td>241E</td>
<td>Loamy-skeletal, serpentinitic, frigid Dystic Eutrochrepts</td>
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<tr>
<td>Snowcamp-Cedarcamp-Rock outcrop complex</td>
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<tr>
<td>242G</td>
<td>Loamy-skeletal, serpentinitic, frigid Dystic Eutrochrepts</td>
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<tr>
<td>Snowcamp-Flycatcher-Rock outcrop complex</td>
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</tr>
</tbody>
</table>
**Journal Entries**

Summer 2013 Work with USFS Gold Beach Ranger District

**Monday June 17, 2013:** 1st day of work; 1st Aid Class

**Tuesday June 18, 2013:** Windy Valley; Mardon Skipper; Attempted to put in permanent transects but was unsuccessful due to GPS units' projections were off; Did meadow enhancement; Rain showers 40ºF

**Wednesday June 19, 2013:**

Timeline of the day:

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0730-1000</td>
<td>Bald eagle survey at Watson Bar; visibility was too low</td>
</tr>
<tr>
<td>1000-1200</td>
<td>Safety meeting</td>
</tr>
<tr>
<td>1200-1300</td>
<td>Lunch</td>
</tr>
<tr>
<td>1300-1400</td>
<td>Safety meeting</td>
</tr>
<tr>
<td>1400-1730</td>
<td>Bald eagle survey at Watson Bar; 1 Adult present for about 1.5 minutes</td>
</tr>
</tbody>
</table>

**Thursday June 20, 2013:** Windy Valley; Mardon Skipper; Permanent transects were put in successfully using suggested UTM points from the paper "Range-wide strategy and monitoring protocol for the mardon skipper (Polites mardon, W.H. Edwards, 1881)." by Rich Hartfield, Scott Hoffman Black, and Sarina Jepsen. NAD 83.

<table>
<thead>
<tr>
<th>Line 4</th>
<th>Start</th>
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<th>Adjustments</th>
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<td>N 4687043</td>
<td>E 405276</td>
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<td>-Adjusted to exclude longer grass (non-habitat)</td>
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<td>Line 3</td>
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<tr>
<td></td>
<td>N 4687122</td>
<td>E 405293</td>
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<td>Line 2</td>
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<tr>
<td></td>
<td>N 4687186</td>
<td>E 405326</td>
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<td>-Adjusted out of trees</td>
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</table>

Determined that other transects not needed due to them not being in habitat where butterfly is usually found.
While walking setting up transects counted ~25 Mardon skippers, 7 Checkerspots, 2 Fritillary Meadow was cold with patchy sun in habitat. When sun hit habitat butterflies moved.

**Friday June 21, 2013:** Introduction to assignment for gathering the 1940’s aerial photos; Assignment was to clean, organize, and find missing photos

**Monday June 24, 2013:** Off

**Tuesday June 25, 2013:** Off

**Wednesday June 26, 2013:** Off

**Thursday June 27, 2013:** Off

**Monday July 1, 2013:** Off

**Tuesday July 2, 2013:** Off

**Wednesday July 3, 2013:** Mardon skipper survey at Windy Valley; temperate was cooler at meadow than at the truck

Survey started at 1050

Transect 3 (Start to End): Fritillary 6; Checkerspot 3; Silvery Blue 1; Mardon Skipper 12

Transect 2 (End to Start): Mardon Skipper 26; Fritillary 2; Checkerspot 1; Silvery Blue 2; Admiral 1

Transect 4 (Start to End): Mardon Skipper 3; Fritillary 5

**Thursday July 4, 2013:** Independence Day; Holiday; Off

**Monday July 8, 2013:** 1940’s aerial photos

**Tuesday July 9, 2013:** Invasive weed pull

**Wednesday July 10, 2013:** Invasive weed pull

**Thursday July 11, 2013:** 1940’s aerial photos

**Monday July 15, 2013:** 1940’s aerial photos
Tuesday July 16, 2013: 1940’s aerial photos

Wednesday July 17, 2013: Mardon skipper survey at Windy Valley & Snow Camp Meadow

Windy Valley Meadow
Transect 3 (Start to End): Fritillary 2; Mardon Skipper 3; Duskywing 1
Transect 2 (End to Start): Mardon Skipper 1; Fritillary 1
Transect 4 (Start to End): 0

Snow Camp Meadow: when to meadow to see if habitat was suitable.
Determined it was not due to reasons that will be discussed at another point in this document.

Thursday July 18, 2013: 1940’s aerial photos

Monday July 22, 2013: 1940’s aerial photos finished and sent off; Soils research on sites (page 34)

Tuesday July 23, 2013:
Grass seed collection and Bald eagle surveys

Watson Bar 1038-1054 Temp: 75-80ºF
1 immature sitting on nest in shade, stretching & flapping wings; possibly 1 adult fly across view finder; high heat waves

Copper Canyon 1505-1517
Nothing observed

Quasantana 1550-1615 in parking lot
1 immature eating fish; starting to get adult color (white chest and upper back, adult coloring yellow); 1 adult brought food to nest, sitting in tree next to nest

Tu Tu Tun 1635-1650
1 immature eating, flapped wings while standing on edge of nest, practicing take off (running/flapping wings across nest); 1 adult
sitting in tree next to nest; Immature moved to where adult was sitting.

**Wednesday July 24, 2013:** Grass seed collection

**Thursday July 25, 2013:** Worked at the Count Fair Forest Service booth from 1430-1900

**Monday July 29, 2013:** Grass seed collection

**Tuesday July 30, 2013:** Grass seed collection

**Wednesday July 31, 2013:** Office

**Thursday August 1, 2013:** Invasive weed pulling with Botany

**Monday August 5, 2013:** Office

**Tuesday August 6, 2013:** Office

**Wednesday August 7, 2013:** Worked night shift starting 2000 doing owl surveys

**Thursday August 8, 2013:** Got off work at 0600 from the night shift

**Friday August 9, 2013:** Office and started aerial photo room. Organizing the photos and cleaning the room where they are located.

**Monday August 12, 2013:** 1940's aerial photos

**Tuesday August 13, 2013:** Grass seed collection

**Wednesday August 14, 2013:** Grass seed collection

**Thursday August 15, 2013:** Grass seed collection

**Monday August 19, 2013:** Annual Leave; Off

**Tuesday August 20, 2013:** Grass seed collection

**Wednesday August 21, 2013:** Grass seed collection

**Thursday August 22, 2013:** Grass seed collection
Monday August 26, 2013: Grass seed collection

Tuesday August 27, 2013: Grass seed collection

Wednesday August 28, 2013: Office day; Worked on aerial photo room

Thursday August 29, 2013: Grass seed collection

Friday August 30, 2013: Worked on aerial photo room for credit hours from 0800-1000

Monday September 2, 2013: Labor Day; Holiday; Day off

Tuesday September 3, 2013: Went with wildlife crew (2 other people) and supervisor to Ludlum House and campground to look at determine where to put bat boxes on the house. Pictures are at the following location. Also looked at the orchard and determined that the meadow enhancement needed to be performed.

Wednesday September 4, 2013: Worked at Ludlum House orchard

Thursday September 5, 2013: Worked at Ludlum House orchard

Friday September 6, 2013: Worked on aerial photo room for credit hours from 0800-1330

Monday September 9, 2013: Office day; Worked on aerial photo room

Tuesday September 10, 2013: Office day; Worked on aerial photo room

Wednesday September 11, 2013: Worked at Ludlum House orchard

Thursday September 12, 2013: Worked at Ludlum House orchard

Friday September 13, 2013: Worked on aerial photo room

Monday September 16, 2013: Assisted in the preparation of the site for the Experience the Elk event taking place that weekend on the Elk River near Port Orford

Tuesday September 17, 2013: Worked on aerial photo room
**Wednesday September 18, 2013:** Worked at Ludlum House orchard

**Thursday September 19, 2013:** Last day of work; Worked from 1000-1200 getting information together that I may need for my capstone

**List of Tasks and Projects**

- **Daily Journal Entries:**
  - A rough record of the day's findings, work done, etc.

- **Mardon Skipper Surveying:**
  - Surveys of known habitat
  - Determine essential aspects of habitat
  - Created a soil profile using USGS Soil Mapping site (results page 37 with aerial photos on page 25)

- **1940’s Aerial Photo Organization**

- **Started Index of All Aerial Photos**

- **Native grass collection**
  - *Danthonia californica* (California oatgrass)

- **Invasive plant species control**
  - French Broom

- **Meadow restoration and enhancement**
  - Ludlum Orchard
  - Windy Valley Meadow
## Mardon Skipper Distance Sampling Datasheet

<table>
<thead>
<tr>
<th>Transect</th>
<th>Number MASK</th>
<th>Distance</th>
<th>Behavior (F/S)</th>
<th>Comments/Notes</th>
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Acknowledgements

There are several people that have helped me get to where I am today.

First off I would like thank my parents. They have helped me realize that I can do so much. My father has also pointed out several times that the Mardon skipper is an interesting and intriguing species that has quite a bit to offer concerning research opportunities.

I would also like to thank Jessie Dubuque and the USDA Forest Service employees at the Gold Beach Ranger Station. The opportunity for my internship would not have existed otherwise. I gained great experience working in 2013 and this year, 2014, doing Mardon skipper surveying and other projects.

Another group on my Thank You list is the Xerces Society, especially Rich Hatfield and Candace Fallon. They helped reset the permanent transects and took time to teach Jessie Dubuque and I the proper way to do distance monitoring. Having a field day to Windy Valley with them was eye opening.

Lastly I would like to thank my professor and academic advisor, Mark Van Steeter. If I had never taken that Intro to Physical Geography class that he taught, who knows where I would be today. His enthusiasm about the world around him is something that I wish more people had, and it has inspired me to look at the world as exiting experience.