Impact of Fire on the

Taylor Checker Spot Butterfly Habitat:

Is it enough to purify the land, heal her wounds through honoring traditional ecological knowledge of prescribed burning, and lead the lost butterfly back to their home at Mima Mounds.

Figure 1: Rod Gilbert. Mima Mounds, Natural Areas Perserve: Butterfly Guide.

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Abstract

The focus of this paper is to determine if Mima Mounds is ready to reintroduce the Taylor checker spot butterfly, which is an endangered species. The butterfly's population has been on the decline as their key habitats are being destroyed by invasive non-native plants species. There has been research done over the past 10 years analyzing what needs to be done, or doesn't, to help improve the habitat for the butterfly. This paper will discuss the results of the data analyzed in 2014, pre-burn, in 2015, post burn, and 2016 post burn 1 year.

Statement of Purpose:

Did the prescribed burn improve key habitat characteristics for the Taylor checker spot butterfly? Which characteristic was improved most and which wasn't? Is the site suitable to re-introduce the Taylor checker spot butterfly?

Introduction

The Taylor's checker spot butterfly was identified as an endangered species in Washington State in 2006. Today there are 8 populations of the butterfly detected in Washington, one of which is located at Mima Mounds, in Olympia. Since then there has been a great effort to determine what was causing the decline in these populations. In 2011 Paul Sevens and Dan Grosboll researched what was behind this phenomena. One of their findings were, degradation to key habitat characteristics were what was contributing to the decreasing population. (*Patterns of reproduction in four Washington State populations of Taylor's checkerspot during the spring of 2010).*

The study was used to evaluate populations of the checker spot in areas throughout Washington and Oregon. At Mima Mounds it was determine the cause of their decreasing checker spot population was invasive plant species: *Cytisus scoparius* (Scotch broom), and *Arrhenatherum elatius* (tall oat-grass). These obnoxious species were crowding out larval host plants, and restricting the native nectar plant sources from being abundant enough to make a suitable habitat the checker spots need. As well as

consuming open space the butterfly needs to travel across. The worst of the two is the tall oak grass because it has a rhizomatous root system making it very difficult to remove. There have been a number of efforts to manipulate and maintain the prairie land such as: mowing, herbicide, manual weed control, and controlled burns. *(Site Visit with Dave Wilderman.2016.) and (Appendix A. Habitat Requirements of Taylor's Checkerspot)*

The focus of the paper will be on the manipulated maintenance method, controlled burning. Native Americans have been using this method for thousands of years. The value of controlled burning historically has had positive impacts on the vegetation. Journal entries of early European settlers, describing the open prairies; along with study's botanist conducted within these areas, prove this to be true. (Boyd and Leopold. 1999) Although burning seemed to be a great land management tool in the past, many were skeptical and hesitant to utilize this as a land management tool in the early twenty first century. In article, Diversity loss with persistent human disturbance increases vulnerability to ecosystem collapse, written by Macdougall, A., Mccann, K., Gellner, G, Turkington, R., in 2013, it challenges traditional ecological knowledge. The challenges discovered in this study showed results that the re-introduction of fire, caused the system to collapse within one growing season, with immediate dominance by invasive species, especially woody plants. However, the study also suggests that fire is not all bad, but that it needs to be introduced strategically to a site based on high or low-diversity. Doing so could determine whether the ecosystem collapse or replenishes. (Macdougall, A., Mccann, K., Gellner, G, Turkington, R. 2013.)

The value of controlled burning historically has had positive impacts on the vegetation. However, it was thought this was due to decline of grassland fires and heavy grazing by large herds of domesticated animals. A study was conducted on a dormant-season fire and a growing-season fire. The results showed that conducting a burn in a dormant growing season was more successful than that in a growing season fire. (Brockway, D.; Gatewood, R.; Paris, R. 2002.) However, there are those that would disagree and say that a growing-season fire will be more successful than that of a dormant-season fire.

Time is also a factor in the success rate of the controlled burn, which is based on the survival rate of the eggs on the vegetation. You don't want to burn at times of year when flame lengths are greatest. You want cool burns. (Knapp, Estes, and Skinner. 2009)

The controlled burn at Mima Mounds was conducted at the end of September of 2015 and considered to be a growing-season fire. (Boone. 2015) According, to Brockway and Gatewood's study mentioned previously, burning at this time should yield a lower success rate than that of a dormant-season fire. After analyzing the data collected pre-burn and post- burn, the results should show us if this is true and whether Mima Mounds burn was successful enough to reintroduce the Taylors checker spot butterfly.

Methods

The Taylor checker spot butterfly is a delicate species. It requires key habitat characteristics that make it a suitable place for the butterfly to live, especially during oviposition. The key habitat characteristic the group measured were: high-density of the host plant Plantago lanceolate, high open ground cover, and short vegetation, as well slope position and aspect.

The site is located within the north eastern 5 acres of the 40-acre parcel that DNR acquired recently. Data has been collect over the last 3 years. To promote biological diversity and remove invasive species like scotch broom and tall oat grass, a prescribed burn was introduced a little over 1 year ago in 2014 where the first data collection was gathered. The second collection of data was gathered shortly after the burn in 2015. The most recent collection of data was gathered in October of 2016.

The most recent 2016 data was collected from 10 transect lines. The team measured, a 2m*2m plot frame and placed it approximately every 6 meters along the west side of the transect line. (figure 1) There were approximately 6-8 plots located along the entire transect. The plots were subdivided into four 1m*1m quadrants. From here we began collecting data.

To determine the slope position of the plot frame, the team had three positions to choose from: MT – top of mound, MS – side of mound, and IM – flat/intermound. If the

plot frame had a slope we were to also determine the aspect using a compass to record in degrees which way the slope is facing.

Next we estimate the amount of open ground covering there is within the plot frames. We did this by creating separate estimates for the 1m*1m quadrants. We then took from this category: <1, 1-5, 6-15, 16-25, 26-35, 36-45, 46-55, 56-65, 66-75, 76-85, 86-95, 96-100> to record the midpoints of the cover classes as follows: 0.5, 3, 10, 20, 30, 40, 50, 60, 70, 80, 90, and 98.0%.

Now on to the vegetation height. We took a 1m stick and held it up 30cm off the ground, horizontally, about 1m off the ground. Looking carefully at the vegetation height, we determined a percent of living are dead species are alive and well.

Lastly when we counted the number of Plantago lanceloata plants within the plot frame.

There was a total of 10 transect lines within the 5 acres, which had 54 plot frames along the transects.

Figure 1: Mima Mounds,2015 burn sit

Results (Data)

A t-test was done to compare 2014 average open space, average vegetation height, and abundance of Plantago; to 2016 average open space, average vegetation height, and abundance of Plantago. However, 2014 data collected started at transect 80, therefore, I only included transects 80-140 from 2016 as well. The results indicate some change, but not much. In 2016 there was less open ground post burn 1 year, less Plantago lanceloata, and a slightly shorter vegetation height.

2014 (pre-burn) compared to 2016 (1year post-burn)

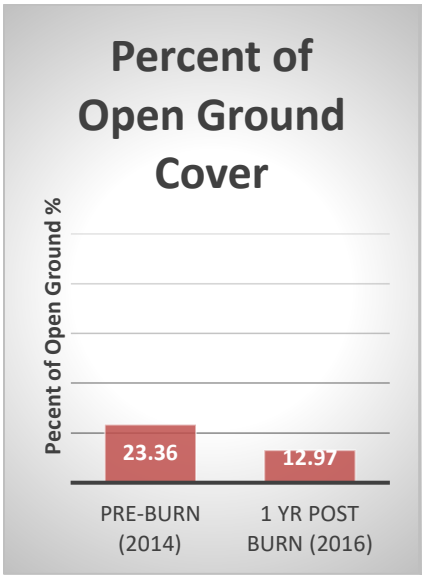

Figure 2

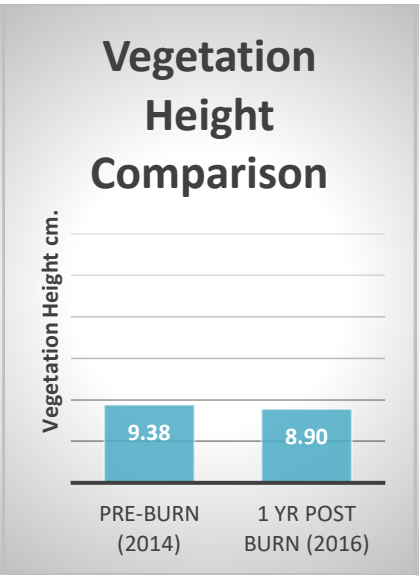

Figure 3

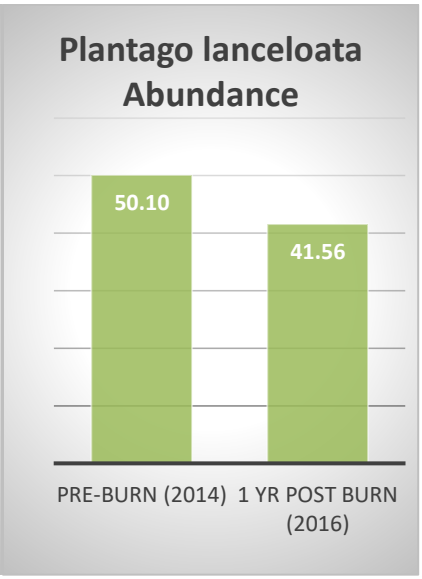

Figure 4

Results (Data)

An additional t-test was done to compare 2015 post burn to 2016 1 year post burn. The reason for this was because both years included transects 5-140. These results indicated that there was more open ground cover after the burn, 2015, compared to 1 year after in 2016. The vegetation height was much taller post burn, in 2015 compared to 1 year after, in 2016. However, the Plantago lanceloata did increase by much in 2016 compared to 2015.

2015 (post-burn) compared to 2016 (1year post-burn)

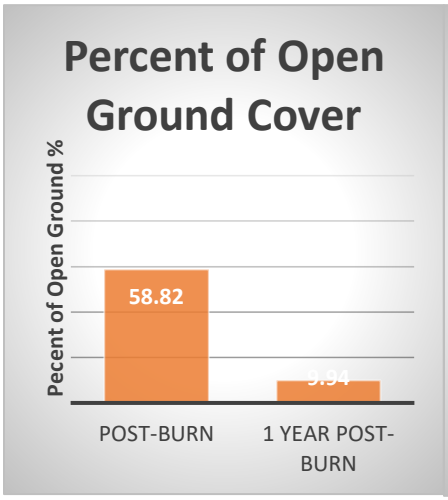

Figure 5

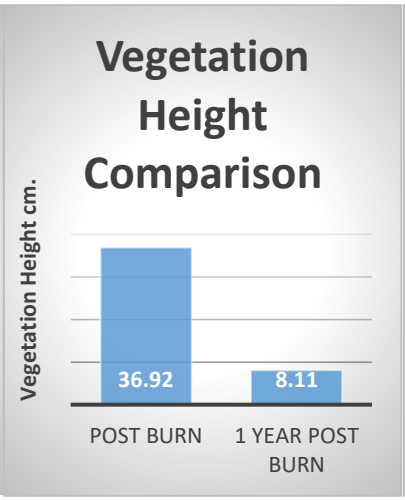

Figure 6

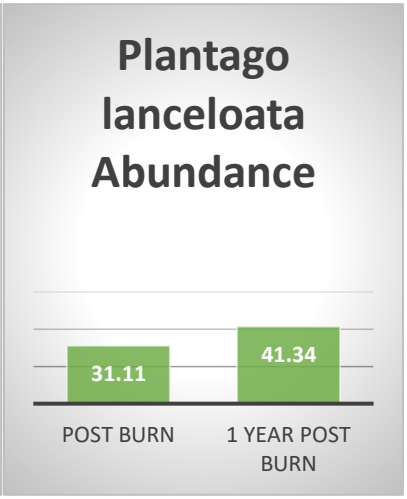

Figure 7

Discussion

After analyzing the data collected from 2014 and 2016, the findings are that there was a decrease in the Plantago lanceloata 1 year post burn. This could be because the fire promoted other native plants that hadn't been there because of the invasive species crowding them out. Or it could be the fire wasn't as successful because the burn was a growing-season fire and not a dormant-season fire, as argued by Brockway and Gatewood in 2002.

While on site David Wilderman, natural areas ecologist for DNR, informed the students collecting data that although it preferred native plants be the host plant, the Taylor checker spot butterfly seems to like the Plantago lanceloata. An article written by Schults and Dlugosh, point out that it isn't the total abundance of flowers and nectar from all sources that predict butterfly numbers, but the numbers were significantly associated with the abundance of nectar from native species (Schultz and Dlugosch 1999). It would be interesting for the class next year, to also collect data to include types of plant, native or non-native, to determine if the ground cover includes native species the butterfly needs.

The distribution of nectar plants is known to affect the movements of adult checker spots and the distribution of egg clusters (Boggs and Nieminen 2004) Both larval host plant and adult nectar resources diminish rapidly with exotic grass abundance. However, active propagation of an exotic larval host plant, *Plantago lanceolate*, may be. (Severns. 2008) This could explain why the results for vegetation height did not show much of a change, because the space was consumed by Plantago. However, the Plantago decreased 1 year post burn, therefore it isn't likely that the Plantago is taking up the vegetation height. Again, it would be helpful to make note of what plants species are forming the vegetation height.

Conclusion

After analyzing the data collected from 2016 and comparing it to 2014 and 2015, I don't think there is a significant enough change to the key habitat characteristics for the reintroduction of the Taylor checker spot butterfly to thrive. The data indicates that there has been some improvement to those key characteristics that the butterfly could survive, however, the butterfly is too delicate to put into an environment where it may struggle to stay alive. It needs to be reintroduced to a healthy home where it can get the nutrients it needs from native plants, be free to move throughout the area without obstructions, and have a safe place to lay their babies.

Although the burn did not remove all imperfections on the landscape for the butterfly, progress was made towards improving the butterfly's key habitat characteristics. The long-term lack of beneficial disturbances since the late 1800's, when Native Americans were restricted from burning the land as they had traditionally done for thousands of years, has severely harmed these key habitats, and it is going to take time for the land to heal. Each burn acts as a symbol of purification from the relentless wrath of the bitter past. Science and humans complicate it by trying to determine the right time and place, the when and the why. What they need to do is keep it simple, embrace the interconnectedness of the eco-systems around them, from the mountain to the Salish Sea and go back to time immemorial and listen to what is being said, fire…. The land and the butterfly communicate, and humans can too if they got quite and still enough. The butterfly will again flutter is delicate wings through the prairie air.

Figure 8: Wildflower blooms at Thurston's County Glacial Heritage Preserve. Credit: Carola Tejeda

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