

Conservation Matters: Contributions from the Conservation Committee

Butterflies and Fire: Ashes or Phoenix?

Scott Hoffman Black, Executive Director

The Xerces Society for Invertebrate Conservation, 4828 SE Hawthorne Blvd., Portland, OR 972115

sblack@xerces.org

Consternation, frustration, dismay—when discussing the use of fire to manage grasslands these are some of the emotions of that can sweep over a lepidopterist. There are valid reasons to hold these feelings since lepidopterists can point to numerous examples of butterfly loss from meadows following prescribed fires. The other side of the coin is that controlled burning is used to maintain quality habitat. Land managers believe that fire is essential to many natural areas and without it the areas would become degraded and lose overall biological diversity.

Controlled burning is an increasingly common management tool no matter how you feel about it and all sides can agree that fire has played an important role in native ecosystems. Pre-historically, most fires were probably caused by lightning but once humans obtained the necessary skills to start fires they used fire to shape landscapes. Some Native Americans burned grasslands year after year to keep the forests from encroaching and to maintain favorable habitat for game and plants they traditionally hunted and harvested.

Pioneers across the American landscape used fire to clear forests but a different view of fire gradually took hold. Fire became something that needed to be controlled wherever possible. From log cabins built by settlers on the prairie to sprawling mansions that now dot the hills above Los Angeles, the construction of permanent structures throughout the country's landscape changed attitudes to wildfire. The 1944 arrival of Smokey Bear in the American

consciousness settled the debate: forest fires were bad and should not be allowed to burn.

There was only one problem: without fire the American landscape began to change. Forests grew thicker and trees encroached on meadows and prairies. In some areas this succession eventually resulted in the degradation and loss of these grasslands. To compound the issue, people preferred grasslands for agriculture, housing, and other developments.

Historically, the vast expanse of North America's prairies offered sufficient areas in various stages of succession to support habitat for a wide variety of animals. An area could burn—even for miles—and there was still plenty left to support plants and animals. Fast forward to today: the remaining grasslands are found in fragments scattered across an otherwise intensively managed landscape. This change is not limited to any one region but has taken place across the country. Only a fraction of tallgrass prairies in the East and Midwest remain. Prairie and savanna in the West has fared no better. Without fire many of these areas are negatively affected by both native and non-native invasive plants, changing them from open flower-rich prairie to shaded areas. Paralleling the decline in grasslands, the animals that relied on them have been relegated to ever smaller areas. Grasslands and meadows now contain some of the most imperiled plants and animals in North America. Several butterflies listed under the U.S. Endangered Species Act require grasslands for survival, and other rare

species such as the Ottoo skipper (*Hesperia ottoe*) and the regal fritillary (*Speyeria idalia*) have been seriously reduced on numerous reserves by controlled burns.

So what can be done? Small areas that support extremely rare species need to be managed to control the change to shaded conditions or they will no longer provide viable habitat, but the management practices we use could lead to the local extirpation or overall extinction of some of these species. Can prescribed fire and rare prairie butterflies coexist?

The mardon skipper (*Polites mardon*) is one butterfly that has evolved with fire. Found only in Washington, southern Oregon, and northern California, this small, tawny-orange butterfly is dependent upon grasslands dominated by Idaho fescue (*Festuca idahoensis*), or California oatgrass (*Danthonia californica*), the skipper's two preferred caterpillar host plants. These grasslands have declined dramatically in the past one hundred and fifty years throughout the skipper's range due to agricultural and residential development, fire suppression, livestock grazing, and the spread of exotic species. For example, more than 95 percent of native prairies in western Washington have been dramatically altered or destroyed.

In 2007 and 2008, the Xerces Society worked with the U.S. Fish and Wildlife Service and the U.S. Forest Service to survey potential habitat for this species on Forest Service lands in northern California. California was known to be home to only a few very small

populations and these agencies wanted to see if surveys would find more sites. The mardon skipper has a short flight season, so all surveys were squeezed into a brief two- or three-week period when the adults are expected to be on the wing. In 2007 we surveyed dozens of areas, but found no new populations of skippers. Surveys in the second year seemed to be heading in the same direction until the last day of field work.

After days of grueling hikes in the forested mountains of northern California, and no success in finding the skipper, my Xerces colleague Logan Lauvray and I arrived at our last site on Coon Mountain with relative ease, but feeling low. Stepping out of the 4 x 4 vehicle into the morning sunshine, we looked across a complex of interconnected meadows dotted with immense Jeffrey pines (*Pinus jeffreyi*). Within a minute of walking into the meadow I saw the distinctive shape, color, and flight pattern of a mardon skipper. We soon realized that we had hit the mother lode! Over the course of the next several hours we counted over one hundred butterflies. This may not seem like a lot but most mardon population counts find only a dozen individuals, so we knew we had found a very special site.

Excited about the find, we contacted our agency partners to tell them the good news. We had found this population just in time. For over a year, the Forest Service had been planning a controlled burn at the site, a meadow system on serpentine soils of a quality that is rare in the region. These systems are highly fire-adapted and many of the plants and animals associated with them need fire to keep these habitats open. Also, a closer inspection showed that on the Coon Mountain site there was considerable encroachment by woody vegetation that could lead to a hot-burning wildfire. Without management this meadow would become a brush field or a tinderbox.

There was ample reason to be concerned about a prescribed fire harming the mardon population. The use of fire as

a management tool is based on the supposition that prairie and meadow species are adapted to wildfires and thus can cope with regular burns. However, the survival of many invertebrates in these areas is dependent on the presence of nearby unburned areas to offer refuge to populations that can recolonize the burned habitat. Many studies on a variety of invertebrates, including butterflies, bees, and snails, have found that burning a small habitat fragment in its entirety risks extirpating some species because of limited or no recolonization from adjacent areas.

Fire practitioners often do not take invertebrates into account when planning controlled burns and there are almost never baseline surveys of the invertebrates at a site. They understand that many plants at the site are adapted to fires and know how they will respond. They also know that most mammal and bird species can move out of harm's way, as long as the controlled burn is not done during nesting season. What they are less aware of is that most insects (especially larval stages of habitat-specialist insects) are not as mobile as vertebrates. There is also little consideration of the life history of insects. Many butterflies overwinter as larvae or pupae on site. For instance the island marble (*Euchloe ausonides insulanus*), an extremely rare butterfly found only on the San Juan Islands of Washington state, overwinters as a pupa attached to a blade of grass. If island marble habitat were to be burned in the winter, when most prescribed fires take place, pupae within the fire area would likely be killed. Winter fires present a similar threat to the mardon skipper. Work by Loni Beyer of Washington State University at Vancouver has shown that these butterflies likely overwinter as larvae at the base of Idaho fescue. Burning the entire Coon Mountain site would risk killing all of the larvae.

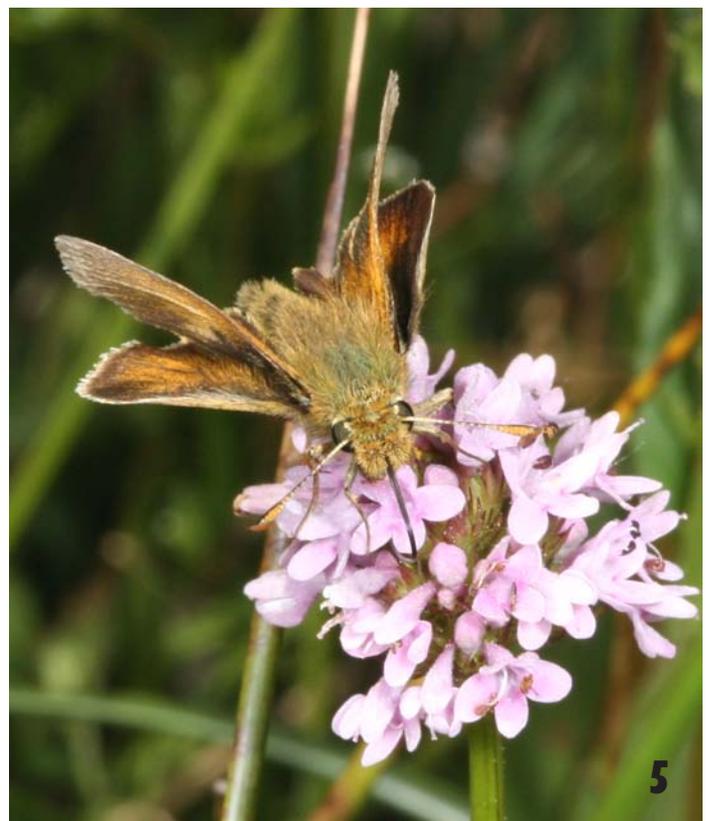
With these considerations in mind we met with biologists and fire staff of the Six Rivers National Forest and U.S. Fish and Wildlife Service to discuss how

to modify the burn to ensure long-term sustainability of mardon skipper at this site, and also how we might study the impact of this fire on the skipper.

The agency staffers were very open to working with us. Indeed, because they had identified the site as a possible mardon location, they were delighted that we had found it and wanted to do everything in their power to manage for it. But they did have somewhat competing interests; fire was needed to control shrub encroachment and to remove thatch that had built up and was choking out rare wildflowers. Together, we plotted out which areas to burn and which to leave untouched. We also designed a study to test the response of the butterfly to the burn. In the early winter of 2008, around one-third of the area occupied by the mardon was burned.

This past summer, the first after the winter burn, Logan and I returned to Coon Mountain to set up transects to study the mardon skipper in both burned and unburned areas. Initial data from this first year showed us what we expected: the number of skippers in the unburned areas was an order of magnitude greater than in the burned areas. On the other hand, the fescue host plant has responded beautifully to the fire and we did see ovipositing (egg laying) butterflies in the burned areas. For the time being, the shrubs have been pushed back and burned areas are more open and have more light.

Will this management plan ultimately benefit the mardon skipper by providing better quality habitat? Only time will tell, and we intend to continue this study over the next several years to more fully document the butterflies' response to fire. In the big picture, grasslands need to be managed to maintain the open conditions that support the many plant and insect species that live in them. In the quest to manage these prairie and meadow habitats, fire can either be an important tool that benefits these butterflies or a threat to their future survival. Burn size, intensity, and frequency are all



1) Mardon skipper (*Polites mardon klamathensis*), June 11, 2007, Little Hyatt Reservoir, Jackson Co., OR. Photo by Donald H. Gudehus. 2) Following surveys by Xerces Society staff, a fire management plan was developed for the Coon Mountain site. Part of the site was burned and part left untouched. Monitoring the next summer demonstrated the difference in response by the skippers to the two treatments. 3) Post burn, the only obvious sign of a fire is charring of trunks. The mardon skipper has returned to the improved habitat. 4) Open grassy areas dotted with Jeffrey pines on Coon Mountain in northern California support one of the largest remaining populations of mardon skippers. 5) *P. mardon klamathensis*, same data as fig. 1. Photo by Donald H. Gudehus. Photos 2, 3 and 4: Scott Hoffman

important elements when managing for invertebrate species. We hope that fire managers will reach out to butterfly and other invertebrate researchers to gather information allowing them to prepare management plans that meet the needs of all of the wildlife that rely on these small remnant ecosystems. In turn we also hope that entomologists will respond to controlled fires with an open mind. If we all work together, biological diversity will benefit.