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Butterflies of the South Puget Sound Prairie Landscape
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Abstract

Butterflies are an important scientific and aesthetic component of South Puget Sound prairies. At least 48 species of butterflies have been found on the prairies, about one-third of these are found on most prairies. Several prairie dependent butterflies are of conservation concern. Four species, the Mardon skipper, Puget blue, Whulge checkerspot and Zerene fritillary, are candidates for listing as threatened or endangered by the State of Washington. Each of these species has a unique pattern of distribution and ecology and is at significant conservation risk.

The current distribution of butterflies within South Puget Sound prairies is patchy and localized. Some prairies are extremely important for both rare and common species, while others are seemingly butterfly vacuums. Managers of these prairies must consider the effects of their management actions on butterflies, and use the full range of suitable management tools. These tools should include controlling Scotch Broom through manual cutting, prescribed fire and chemical control with herbicides. While we know more about butterflies than any other group of invertebrates, there is still much that we do not understand. Research priorities for butterflies of the South Puget Sound prairies includes status and distribution surveys, definition of critical habitat characteristics, effects of fire and recolonization patterns.

Introduction

Some of the most beautiful organisms living on the prairies of South Puget Sound are its butterflies. A treat, unique in western Washington, is to stand on the prairies and watch dozens or even hundreds of butterflies, fly, cavort, feed and mate. These butterflies might include the subtle beauty of a Sara's Orangetip, the masses of a good Whulge checkerspot population, or the awesome size and power of Great Spangled Fritillary. And if you really are entranced by butterflies, you will probably drive your companions crazy on every prairie walk by calling off butterflies constantly -

Checkerspot! Ochre! Brownie! Skipper!
Another Ochre! Another!?!?

At least 47 species of butterflies have been found on our prairies (Appendix 1). Most of these utilize, in addition to prairies, other plant communities, including forest and disturbed habitats that border our prairies. This is not a terribly high number of butterfly species; due to our cool, wet climate, western Washington is not the best habitat for butterflies. But about a quarter of these butterfly species use the prairies exclusively and are important components of the prairie ecosystem.

Prairie dependent butterflies have been significantly reduced in numbers, and are now of conservation concern. The loss of 97% of prairie habitat to human development and encroachment of Douglas-fir forest is a significant factor, as is the degradation of remaining habitat by pest plants such as Scotch broom (Crawford & Hall, this volume; Parker, this volume). This has prompted the Washington Department of Fish and Wildlife to consider for sensitive status four butterfly species which rely on prairie habitat (Table 1). These butterflies are thought to be at low population sizes and significant conservation risks. They are currently being considered for listing as endangered, threatened or sensitive by the State of Washington (WA DFW, 1993). One of these species, the Mardon skipper, is also a species of concern, under consideration for endangered or threatened listing. The conservation and ecology of the state candidate species are discussed in the next section of this paper.

The current distribution of butterflies within South Puget Sound prairies is patchy and localized. Some prairies are extremely important for butterflies, maintaining robust populations of both rare and common

species. Similarly there are prairies that are seemingly butterfly vacuums, with only low numbers of few species present. The factors that control this distribution are not easily discernible. Prairies that have few butterflies can have substantial amounts of high-quality grassland and oak woodlands. These prairies might or might not be associated with prescribed fire. Other prairies that have considerable portions burned yearly still maintain populations of some of the rarest butterflies. The second section of this paper describes the current distribution at several protected prairie locations and discusses the unique patterns from those distributions.

Finally, continued conservation of the butterflies of South Puget Sound prairies depends on active management of butterflies and their habitat. Sometimes these management practices may conflict with the conservation of butterflies. The small fragmented nature of even our largest natural areas, exaggerates the effects of management. Basic recommendations for active management are discussed, as are future research and management priorities.

Table 1. Candidate butterfly species of South Puget Sound prairies and the number of recently, confirmed populations. State candidate species are under review by the Washington State Dept. of Fish and Wildlife for listing as endangered, threatened or sensitive. * - also a federal ‘species of concern’.

Common Name	Scientific Name	# of Confirmed Recent Pops	
		Puget Prairie	Other
Mardon skipper *	<i>Polites mardon</i>	2	1
Puget blue	<i>Plebejus icariodes erymus</i>	5	?
Whulge checkerspot	<i>Euphydryas editha taylori</i>	2 major	3 minor 1?
Zerene fritillary	<i>Speyeria zerene bremnerii</i>	?	

Status and Ecology of Candidate Prairie Butterflies

Mardon Skipper

The Mardon skipper was formerly considered to be Washington's only endemic butterfly, until populations were found in California and Oregon. It has an extremely patchy distribution with populations found on serpentine deposits in northwestern California and a record for a single location in southwestern Oregon. In Washington, 12 separate locales have been recorded as having mardon skippers, 5 of these are South Puget Sound prairie sites. The remaining locales are in the southern Cascades at higher elevations in Klickitat and Yakima counties.

The most reliable known population within South Puget Sound prairies occurs at Scatter Creek Wildlife Area. This population has been sighted and enjoyed every year for at least the last decade. Until recently this was thought to be the only viable population in the prairies, especially after site visits by The Nature Conservancy and State of Washington personnel to two previously important sites failed to locate any Mardon skippers. Fortunately, surveys in 1997, by State of Washington Natural Heritage Program located a robust population along the southern edge of the Artillery Impact Area at Ft. Lewis. This population occurs over a considerable amount of prairie. Interestingly, this population also occurs in a prairie that is subject to frequent, almost yearly, fires soon after the flight period ends.

Like other skippers, the larvae of Mardon skippers feed on grasses and in the South Puget Sound are thought to rely heavily on Idaho fescue (*Festuca idahoensis*). At

Scatter Creek Wildlife Area adult mardons rely heavily on prairie violets (*Viola adunca*) for nectar, though they also use other nectar sources including lomatiums ????

Mardon skippers are univoltine, producing only a single cohort of individuals each year. Their flight period is one of the earliest for skippers in our prairies and occurs from 11 May through 9 June (Fig. 1). The flight period of the high elevation populations is later.

Puget Blue

The Puget blue is another Northwest endemic and one of three blue butterflies that occur on South Puget Sound prairies. Blue butterflies include several taxa that are listed as endangered or threatened at the federal level. This includes another subspecies of *Icaricia icariodes*, the mission blue (ssp. *missionensis*) which has already been federally listed as endangered and four other subspecies which are 'species of concern'. The Fender's blue (*I.i. fenderi*) which uses remnant prairie habitat in Oregon is one of these 'species of concern' (USFWS, 1992).

The Puget blue occurs from Vancouver Island, south in the meadows of the Olympic mountains to the Puget prairies. Less than 12 sites are known in Washington. Currently known Puget prairie sites include the Artillery Impact Area, 13th Division Prairie Research Natural Area and Johnson Prairie at Ft. Lewis, Scatter Creek Wildlife Area, Mima Mounds NAP and the Glacial Heritage park. Rocky Prairie NAP has been a strong spot for Puget blues since 198? (Pyle, 198?), and still is (B. Bidwell, pers. com., 1997).

Puget blues are strongly associated with their host plant - lupine. In our prairies adult Puget blues have been seen ovipositing on the sicklekeel lupine (*Lupinus albicaulis*), though other perennial lupines may also host Puget blue larvae. Adults fly in mid-May through June. Again it is interesting to note that robust populations of lupines are often associated with recently burned prairies.

Whulge Checkerspot

The Whulge checkerspot is a Pacific Northwest subspecies of the Edith's checkerspot. It is historically known from Vancouver Island through the San Juan Islands to the Dungeness Spit area, in both the Pierce and Thurston county sections of South Puget Sound prairies and in Lewis county. This historic range included 20 separate sites, with more than half (13) centered in the South Puget Sound prairies. Current distribution in the South Puget Sound prairies includes two substantial and three minor populations. The largest populations occur within and adjacent to the 13th Division Prairie Research Natural Area at Ft. Lewis and at the Mima Mound-Black River-Glacial Heritage Park of Thurston County. Other sites containing Whulge checkerspots include the Bald Hills NAP, Mima Mounds NAP and Scatter Creek Wildlife Area.

Edith's checkerspots are some of the most thoroughly studied organisms on earth. The basic biology, and ecology of California subspecies are summarized by Ehrlich (1981). The Whulge checkerspot flies early in the season from 16 April through 11 June. Early nectar sources include the Lomatiums and Camus with members of the composite family becoming more important as the flight period progresses. Checkerspots primarily use plantains (*Plantago*) and

members of the figwort family (Scrophulariaceae) for host food plants. These plants share a group of chemicals, the iridoid glycosides, that stimulates oviposition (Ehrlich and Murphy, 1981). Whulge checkerspots primarily use plantains, both native and non-native species (*Plantago major*, *P. lanceolata* and *P. macrocarpa*) though Indian paintbrush (*Castilleja hispida*) is also a known host (Char & Boersma, 1995).

The number of individuals within a population vary widely between sites and years. In California there appears to be no density dependent factors - e.g. predators or parasites - controlling population numbers. These populations decline when young larvae die from starvation when food plants wither from drought. Larger populations are correlated with the quantity of nectar sources. The problems associated with drought seem minimal in the Puget prairies, but weather can be extremely harsh in early spring. Continuing cold weather and rains in early spring may limit the population, though in 1996 marked, adult individuals of Whulge checkerspot survived for at least ten days during an extremely rainy and cold period at Ft. Lewis. Analysis of available nectar sources in our populations has not been conducted.

Zerene Fritillary

The zerene fritillary is also known as the valley silverspot. Historically it occurred from Vancouver Island south through Oregon. It was first collected in the San Juan Islands, though the population at this original type locale is now thought to extirpated. The zerene fritillary also went extinct in Oregon, though a population has been subsequently reintroduced from Washington stock. In the South Puget Sound, zerenes can be found at several

prairie locations. The largest populations occur at Mima Mounds NAP, Scatter Creek Wildlife Area and at Glacial Heritage Park. Additional populations occur on Ft. Lewis at Johnson and 13th Division Prairies and the Central Impact Area, Rocky Prairie NAP and McChord Airbase???? The related Oregon silverspot (*Speyeria zerene*

hippolyta) is listed as a federal threatened species.

Fig. 1 Average flight times for WA candidate South Sound prairie butterfly species

Mardon skipper								
Puget blue								
Whulge checkerspot								
Zerene fritillary								
Months	Apr	May	June	July	Aug	Sep	Oct.	

Violets, primarily the early blue violet (*Viola adunca*), are the primary larval host plant. Dense patches of violets are attractants since this is where the species mates and females lay their eggs. Zerene's flight period is late in the year from late June through mid-September. During the

second half of this period few nectar sources are available. White-topped aster (*Aster curtus*), northwest endemic plant with its distribution centered in South Puget Sound prairies, is a major nectar source during this period

Distribution of Butterflies in Five Protected Prairie Sites

Butterflies do not occur evenly across the South Puget Sound Prairie Landscape. Certain prairies are habitat for large numbers of species and individuals, while

other prairies contain only small numbers. This pattern holds for even those prairies that have a protected status and are managed, at least partially, for their prairie resources. Five major South Puget Sound prairie sites (Table 2) have been recently surveyed and monitored through a cooperative project of The Nature

Conservancy and Washington Departments of Natural Resources and Fish and Wildlife. Although this project produces quantitative data, techniques have evolved each year and data have been collected by a variety of volunteers and professionals. We, therefore, report only presence/absence and discuss qualitative abundance for the sites.

Table 2. Number of butterfly species, WA candidate species and WA monitor species found at five protected South Puget Sound prairie sites from 1994 - 1996.

	Ft. Lewis 13th Div. RNA	Ft. Lewis Weir Prairie	Mima Mounds NAP	Black River-Mima Prairie-Glacial Heritage Park	Scatter Creek Wildlife Area
Total Species	19	9	26	21	25
Candidates	2	0	4	3	4
Monitor	3	0	5	2	4

Most of these protected prairies contain robust populations of butterflies, with the highest species richness found at Mima Mounds NAP and Scatter Creek Wildlife Area. Over one-half of the 48 species ever reported on South Puget Sound prairies were reported from these areas during the last three years. This also includes all four of the candidate species at each location. This last fact illustrates the weakness of presence/absence data since robust populations of neither mardon skippers or Whulge checkerspots occur at Mima Mounds NAP.

The low diversity and abundance of butterflies at Weir prairie is especially surprising since it contains some of the highest quality prairie vegetation in the South Puget Sound (WA Natural Heritage Program, 1995). Larval food and nectar supplies appear adequate for a variety of butterflies on this site. And although Weir prairie is part of Ft. Lewis prescribed burn program, they have been careful to burn

only sections of this prairie in a year. The largest single burn involved about 50% of Upper Weir prairie, or less than 25% of the entire prairie complex. Monitoring on the adjacent prairie at Ft. Lewis, Johnson prairie, shows results similar to the more diverse areas with 19 total species and 3 candidate and 2 monitor species.

The high diversity at the 13th Division Prairie RNA at Ft. Lewis illustrates the importance of particular sections of prairie, since this small section of a larger prairie is one of the main locations for sensitive butterflies on Ft. Lewis. Robust populations of Whulge checkerspot and Puget blues occur within and immediately adjacent to this small (75 acres of prairie) site. Much of the remainder of 13th Division prairie does not contain the diversity or abundance that the RNA does.

The impact of fire, including controlled fire as used in prairie management, continues to be controversial. In theory, fire should

extirpate most butterfly and other invertebrate species resident on a burned site. In practice, extirpation has never been documented, and sites with long histories of fire management still have many prairie obligate species. Factors such as site condition and management history have confused the issue on every case. For example, the southern section of Mima Mounds NAP has lower butterfly diversity than the northern part, Fire has been used as a management tool on the southern section, but the vegetation in this part of the prairie is also in poorer condition, due to its history of land use, than that on the northern part of the site. The history of South Puget Sound Prairies is complex, and the impacts of various factors are not easily separated.

The patchy distribution of the monitor species is interesting since they were selected by Washington Dept. of Fish and Wildlife to be indicators of overall habitat or prairie quality. Their distribution and seemingly lack of correlation with overall and candidate species richness is intriguing. They appear to be responding to habitat factors which we do not yet understand.

Butterfly Management

Active management is needed to maintain the habitat required by prairie butterflies. Scotch broom Douglas-fir and other invasive plants are significant on-going threats to the prairies. Different control strategies have different effects on butterfly populations and until recently little concern to these effects were considered.

Most managers of significant butterfly populations now consider the effects of their actions on butterflies. This is best exemplified in planning prescribed fires. Managers now explicitly plan for butterfly

refugia by limiting the amount of prairie burned in a season and also develop fire return cycles based on butterfly recolonization patterns.

Many managers do not extend their pest control efforts to include all tools available. When managing for pest plants such as Scotch Broom, managers should consider utilizing Integrated Pest Management and utilize a full suite of control tools.

Prairie managers in the South Puget Sound region are just beginning to use several valuable pest control tools. Manual control of Scotch Broom and several other pest plants by volunteers has been used only on small projects. But recent work at the Glacial Heritage Park and Mima Mounds NAP illustrates that they can be effectively use on larger scales. Volunteers are especially effective as a follow-up to large-scale or initial control efforts. Their efforts can increase the control rate dramatically and can extend the period before additional major control actions are needed.

Another tool that managers have not used is chemical control of pest plants. Herbicides are safe and effective when used correctly. Small scale trials of herbicides on Scotch Broom at Ft. Lewis have been successful with little damage to native grassland plants (The Nature Conservancy, 1996). Proposed trials by the WA Dept. of Fish and Wildlife at Scatter Creek using wipe-on application of herbicides with booms looks promising and safe for desirable prairie plants and animals. This type of application is used by commercial grass-seed growers and is effective for pest plants that grow just six inches above the native grassland understory (William et. al., 1997). Scotch Broom one to two years after a burn or mechanical treatment would be susceptible to this

treatment as would some pest grasses, such as Velvetgrass (*Holcus lanatus*).

Research Priorities

Our knowledge of prairie butterflies is incomplete and contains several areas of weakness. These areas include basic biology and current status of sensitive butterfly species, interactions of the plant community with butterflies, habitat restoration/enhancement methods and goals for butterflies and the effects of specific management actions on the butterfly community, including sensitive species. Several specific priorities are briefly discussed below.

- Determine current status and distribution of sensitive butterfly species. Recent monitoring and survey efforts need to be continued and expanded. These efforts have discovered critical butterfly populations and critical patterns of distribution. Further survey efforts focusing on Puget blue and zerene fritillary locations are especially needed.
- Definition of the critical characteristics of prime butterfly habitat is needed to develop successful restoration programs. This is critical for sensitive species such as the Mardon skipper. Restoration could then help expand current populations or create conditions suitable for successful translocations.
- The effects of prescribed and wild fires on butterflies is difficult to quantify. Further studies to assist managers in designing effective, but invertebrate safe prescribed fires are needed.
- Critical habitat size needed to support butterfly populations, especially in relationship to small fragmented prairies. Will populations on fragmented prairies survive? Can these small prairies be managed as refugia within a framework of populations on larger prairies facing detrimental human impact?
- Determine the critical habitat size needed to support butterfly populations, especially in relation to small fragmented prairies. Will populations on fragmented prairies survive? Can these small prairies be managed as refugia within a framework of populations on larger prairies facing detrimental human impact?
- Flight patterns and behavior suggest that prairie obligate butterflies have diverse abilities to recolonize sites. Species such as the Zerene fritillary are relatively strong fliers and may be able to recolonize sites which are newly suitable to them. Other species, such as the Mardon skipper, do not appear to be good colonizers. Additional research on this ability is critical to management planning.

Conclusions

After only a short time on a prairie during a hot summer day, a visitor is aware of the beauty, and in many places, the abundance of butterflies. The range of appearance and behavior is impressive. The range of questions concerning butterflies is also large. While we know more about butterflies than any other group of invertebrates, there is still much that we don't understand. We know little about what regulates their distribution and abundance among and within prairies. While we know something

of their habitat requirements, some surprising questions remain. In many situations, we do not know how to manage for butterflies. We need to start answering these questions as the amount and quality of South Puget Sound prairies decreases. If not, it will be difficult to maintain butterflies as an important scientific and aesthetic component of South Puget Sound prairies.

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Appendix 1: Scientific and common names highlighted in grey are normally found on
Species with asterisks have been found on

Butterflies

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Scientific Name
<i>Erynnis icelus</i>
<i>Erynnis propertius</i>