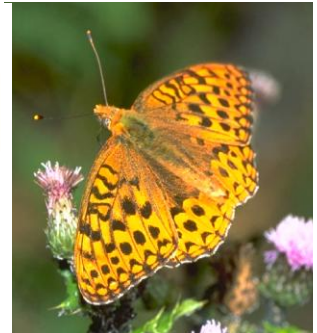




Butterfly Populations on Fort Lewis: A Historic Perspective

The Nature Conservancy

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EXECUTIVE SUMMARY

Fort Lewis Military Installation contains the majority of the highest quality prairie and oak woodlands remaining in Washington State's South Puget Sound region. Four species of prairie-dependent butterfly found on Fort Lewis prairies are candidates for rare species listing at the state and federal levels, including State Endangered Species and Federal Candidate the Mardon Skipper (*Polites mardon*), the State and Federal Candidate Taylor's Checkerspot (*Euphydryas editha taylori*), and State Candidates the Puget Blue (*Icaricia icarioides blackmorei*) and Zerene Fritillary (*Speyeria zerene*) (WDFW 2003). As development, invasive species, and forest succession continue to efface the South Puget Sound region's prairie lands, restoration and management are critical in providing enough quality prairie habitat for these and other prairie-dependent species to maintain viable populations.

Stewardship of rare species and natural habitats is a priority at Fort Lewis, and the proper stewardship of rare species is also mandated under Army regulations and federal law, and the listing of any prairie butterfly as federally threatened or endangered could have negative implications for the installation's training regimes.

This report uses survey and informational reports on South Puget Sound's prairie-dependent butterflies, as well as oral history interviews of lepidopterists with extensive experience in the South Puget Sound region, to develop a picture of rare butterfly distributions on Fort Lewis over time.

The State Endangered and Federal Candidate species Mardon Skipper has only been found in Fort's Lewis's Artillery Impact Area (AIA). Within the past year, its known range has been expanded from the southwest corner of that prairie to include the prairie's north and southeastern corners. This butterfly requires high-quality prairie habitat characterized by high cover of its host plant, Idaho fescue (*Festuca idahoensis*), in order to sustain its population. State Candidate Species the Puget Blue and Zerene Fritillary can sustain populations on prairies of slightly lower quality than the Mardon Skipper. The Puget Blue is currently known to inhabit Johnson and Weir Prairies, the AIA, and TA15. For unknown reasons, it is not currently found in its historic habitat on TA7S, though its host plant, sickle-keeled lupine (*Lupinus albicaulus*) is found there in abundance. The Zerene Fritillary is found on Johnson, Lower Weir, and South Weir prairies, as well as on TA13. A population observed on Marion Prairie in 1994 was not found during 2003 surveys.

The State and Federal Candidate Species Taylor's Checkerspot can currently be found only in the southwest corner of the AIA. Populations on Johnson Prairie, TA7S, TA14, and TA15 have not been observed since the species' numbers crashed in the late 1990s. The disappearance of this species from other prairies in the South Puget Sound region indicates that habitat quality is not the only factor to be considered when managing this species.

Aspects of high-quality prairie such as high Idaho fescue cover, abundant and diverse nectar sources, and low Scotch broom (*Cytisus scoparius*) cover can be correlated with butterfly species diversity and abundance (Char & Boersma 1995 and Hays et al. 2000). The highest quality prairie on Fort Lewis is found on training areas that are protected from disturbance by Research Natural Area status (Johnson and Weir Prairies and TA15's Triangle), or in the case of

the AIA, by live munitions on the ground. Not coincidentally, Fort Lewis's rare butterfly species are found almost exclusively on these prairies.

Active management is necessary to maintain populations of the rare prairie-dependent butterflies that inhabit Fort Lewis. Successful management will entail use of available knowledge on butterfly distributions, habitat preferences, and life history characteristics; research on site- and butterfly-specific habitat considerations; prairie restoration work; and surveying of butterfly populations to monitor their response. A great deal of knowledge and experience is accruing on this topic, and TNC is in the process of developing a butterfly habitat management plan for Fort Lewis.

Priority in managing Fort Lewis's prairies for butterfly habitat should be based on an area's demonstrated ability to support rare butterfly populations at present or in the past, and the extent to which a prairie already provides butterfly host plants and nectar sources. Thus, the AIA, Johnson Prairie, the Weir Prairies, and 13th Division Prairie (particularly TA15) should be top priorities for restoration efforts. TA7S is a site with excellent butterfly habitat and a perplexing dearth of butterflies, and should be given special consideration as a prairie on which minimal restoration efforts may result in maximum potential benefit. TA6 and Marion Prairie should be considered secondary priorities for restoration due to their proximity to the AIA and the possibility that they can be used to assist in the recovery of rare species found there. Finally, TA8 and Chambers Prairie should be considered the lowest priority for habitat restoration as they will require by far the most rehabilitation in order to support robust butterfly populations.

ACKNOWLEDGEMENTS

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INTRODUCTION

Fort Lewis Military Installation contains the majority of the highest quality prairie and oak woodlands remaining in Washington State's South Puget Sound region. Throughout the region, less than 3% of an estimated 150,000 pre-settlement acres remain (Crawford & Hall 1997). Large species losses are predicted to accompany this loss of habitat (Char & Boersma 1995). Four species of prairie-dependent butterfly found on Fort Lewis are candidates for rare species listing at the state and federal levels, including State Endangered Species and Federal Candidate the Mardon Skipper (*Polites mardon*), the State and Federal Candidate Taylor's Checkerspot (*Euphydryas editha taylori*), and State Candidates the Puget Blue (*Icaricia icarioides blackmorei*) and Zerene Fritillary (*Speyeria zerene*) (WDFW 2003). As development, invasive species, and forest succession continue to efface prairie lands in the South Puget Sound region, restoration and management are critical in providing enough quality prairie habitat for these and other prairie-dependent species to maintain viable populations.

Stewardship of rare species and natural habitats is a priority at Fort Lewis, and in April of 2003 the installation published an Annual Sustainability Report detailing 25-year sustainability goals that include recovering all Federal Candidate, Threatened, and Endangered species in the South Puget Sound region. The proper stewardship of rare species is also mandated under Army regulations and federal law, and the listing of any prairie butterfly as federally threatened or endangered could have negative implications for the installation's training regimes.

Information on rare prairie-dependent butterflies and their habitat is crucial in managing for their preservation successfully. The results of butterfly surveys and life history investigations are critical components of this information. This report uses survey and informational reports on South Puget Sound's prairie-dependent butterflies, as well as oral history interviews of lepidopterists with extensive experience in the South Puget Sound region, to develop a picture of rare butterfly distributions on Fort Lewis over time. It also discusses the qualities of different Fort Lewis prairie habitats that may or may not allow them to support populations of these butterflies.

METHODS

A variety of sources were used to develop this summary paper. The Washington Department of Fish and Wildlife (WDFW) provided The Nature Conservancy (TNC) with butterfly observation records for Taylor's Checkerspots in Pierce County and for all butterflies on South Puget Sound prairies from its Hinchcliff Records database. TNC's Fort Lewis Butterfly Survey 2003 database was also used. Survey reports by TNC and the Land Rehabilitation and Maintenance (LRAM) and Land Condition Trend Analysis (LCTA) components of Fort Lewis's Integrated Training Area Management program, as well as reports on South Puget Sound butterflies by TNC, WDFW, and the University of Washington's Zoology Department provided a great deal of information, including observation records and quantitative and qualitative assessments of both butterfly populations and their prairie habitats. Finally, Robert E. Hardwick and Barry Bidwell, two lepidopterists with a great deal of experience surveying South Puget Sound butterflies, graciously submitted to oral history interviews. Hardwick also provided the collection dates of Puget Blue specimens he took from Ft. Lewis's Training Area 7 South (TA7S) in the 1980s.

Databases

The first of two databases provided by the WDFW details eight historic locations of Taylor's Checkerspot populations in Pierce County, including the years in which the locations were surveyed or observations were otherwise made there, and the numbers of butterflies observed (including a lack of observations). Butterfly observations in the Artillery Impact Area (AIA) and on 13th Division Prairie and TA7S are included in this database. The WDFW also provided TNC with the Hinchcliff Records database. This database is a compilation of lepidopterists' butterfly observation records of various species on South Puget Sound prairies from 1937 to 1994. The observations are very generally located with the majority listed as "Fort Lewis," though some specifically refer to 13th Division Prairie.

TNC's 2003 Fort Lewis Butterfly Survey database contains butterfly records of all species observed by TNC employees and volunteers on 13 Fort Lewis prairies between 29 April and 26 August of 2003. For each observation, the species and number of butterflies, as well as the date, prairie site, and environmental parameters the survey was conducted under are recorded. The database is linked to an ArcView shapefile that locates each observation on orthophotos of Fort Lewis within approximately twenty meters of its actual location.

Reports

Survey Reports. Butterfly surveys have been conducted annually on Fort Lewis since 1995 by the combined efforts of TNC, LRAM, LCTA, and the WDFW. The results of these surveys are available in three TNC survey reports from 1995, 1997, and 2003, and two LCTA survey reports from 1999 and 2002.

TNC's first butterfly survey on Fort Lewis during the spring and summer of 1995 covered areas of Johnson, Lower Weir, and Upper Weir Prairies, as well as four areas of 13th Division Prairie: the Depressions and Pacemaker areas on TA14 and the South Creek and Triangle Research Natural Area (RNA) on TA15. The survey's goal was "to determine the abundance and diversity of butterfly species on the prairies of Fort Lewis" (TNC 1995), as well as to compliment data being gathered as part of a regional effort. Methods for the survey involved teams of two surveying each site for 50 minutes every 10 days between 24 April and 28 August. The author of this report felt confident in using unspecified statistical testing to compare butterfly abundance and species diversity between prairies and survey sites, and found that abundance and diversity of butterflies on Johnson and Weir Prairies was not significantly lower than what was found on 13th Division Prairie, while Johnson Prairie by itself ranked first in terms of species diversity and relative abundance. The report for this survey includes a spreadsheet detailing for each survey the date; the species and numbers of each butterfly observation; the total number of butterflies and number of species observed, as well as the total number of butterflies and number of species observed per site and during the entire survey; and whether or not each site had been burned (TNC 1995).

In January of 1997 LRAM employee Oliver Crew reported on the 1996 Fort Lewis butterfly survey that LRAM conducted for TNC. The goal and survey methods were substantially the same as in the previous year, but the total number of surveys conducted and sites surveyed were significantly reduced, the interval between surveys at each site ranged from

10 to 18 days, survey times ranged from 20 to 52 minutes, and the survey period was shortened by several weeks. The author of this report goes to lengths to disclaim the value of direct comparisons between the 1995 and 1996 surveys due to these differences. Surveys were conducted between 16 May and 22 August 1996 on Johnson and Upper Weir Prairies, as well as in the Triangle and South Creek areas of TA15. Notable results from this survey focused on Johnson Prairie both for its top-ranked species diversity and the large abundance of Common Wood Nymphs (*Cercyonis pegala*) on this prairie in comparison to other sites surveyed. The report for this survey includes one spreadsheet detailing for each survey the date and the species and numbers of each butterfly observation, and another spreadsheet detailing the total number of each species seen per survey date (Crew 1996).

The LCTA began surveying butterflies on Fort Lewis in 1997 in order to “aid in assessing overall population fluctuations, species diversity, potential nectaring host plants, and habitat requirements” (Ressa 2002). It uses permanent survey routes that TNC and the WDFW developed to target the four prairie-dependent butterflies listed as State Endangered or State Candidate species. The route on TA15 targets Taylor’s Checkerspot, the route on Johnson Prairie targets the Zerene Fritillary, and the route developed in 1998 for the AIA targets both the Mardon Skipper and the Puget Blue. Survey transects are walked every 10 days between 1 April and 29 September, as weather permits. All butterflies sighted within 5 m of either side of the transect are recorded. Additionally, a list of all plants in flower during each survey is developed in order to correlate butterfly flight times and nectaring plant flowering periods (Gilbert 1999 and Ressa 2002).

The LCTA collected survey data from TA15 and Johnson Prairie in 1997, 1998 and 1999, and assisted the Washington Department of Natural Resources’ (WDNR’s) Washington Natural Heritage Program in surveying the AIA in 1998 and 1999. Data from the AIA surveys is not available in the LCTA reports. The LCTA’s 1999 report discusses the drastic decline observed in TA15’s Taylor’s Checkerspot population, with 1997 being the year that the WDFW estimated the population to be over 7,000 and 1999 being the first year the butterfly was not observed during an LCTA survey. It also recommends that additional surveys be conducted in the AIA for this butterfly, and that the southwestern corner of the AIA, where both the Federal Candidate Species Taylor’s Checkerspot and Mardon Skipper are currently found, be considered a high priority for restoration efforts involving direct seeding of Idaho fescue. The report for the 1999 survey includes one spreadsheet detailing by species the numbers of butterflies observed during each survey on each prairie and the total number of butterflies observed per survey for 1999, and one spreadsheet summarizing the total number of each species observed on Fort Lewis by the LCTA in 1997, 1998, and 1999, as well as each species’ flight period (Gilbert 1999).

In 2000, 2001, and 2002 the LCTA collected survey data from all three permanent survey transects. The 2002 survey report notes that this was the first year the LCTA observed Puget Blue butterflies in TA15 and a Mardon Skipper in the AIA, though both populations had previously been observed by others. The continued absence of Taylor’s Checkerspot from TA15 is discussed, as is the relatively high quality of the three prairies surveyed. Finally, the author recommends that Upper Weir Prairie and TA7S be surveyed in the future. The report includes

one spreadsheet each for Johnson Prairie, TA15, and the AIA detailing the numbers of butterflies observed during each survey by species and the total number of each butterfly species observed by year from 1997 through 2002 (Ressa 2002).

The goal of TNC's recently completed 2003 Fort Lewis Butterfly Survey was to determine the distributions of all butterflies on Fort Lewis prairies, while targeting rare, prairie-dependent species. Various-sized groups comprised of TNC employees and volunteers surveyed thirteen prairies between 29 April and 26 August, including: the AIA; TA6; TA7S; TA8; TA13, TA14, and TA15 on 13th Division Prairie; Chambers Prairie; Marion Prairie; Johnson Prairie; and Lower, South, and Upper Weir Prairies. Due to the large number of prairies surveyed, an average of 20 days passed between surveys at a given area of each site. Survey times ranged from 30 minutes to six hours, as survey teams attempted to cover entire sections of prairie that could potentially provide butterfly habitat. This survey established the currently known range of the four State Endangered and State Candidate rare butterfly species found on Fort Lewis, as well as provided observations of four of nine State Monitor species. Like previous surveys, it found that Johnson Prairie, the AIA, TA15 in 13th Division Prairie, and the Weir Prairies provide the best butterfly habitat on Fort Lewis. It also found that TA7S is abnormally lacking in butterflies, given its current abundance of host and nectar plants and historic butterfly abundance. In addition to several tables produced from the database discussed above detailing the total number of butterflies observed by species, the number of butterfly species observed on each prairie, and the number of butterflies observed per hour on each prairie, the report for this survey includes a spreadsheet that details the species and number of individual butterflies observed on each prairie, as well as the total number of butterflies observed and the total number of person hours spent on each prairie (Morgenweck & Dunn 2003).

Other Reports. Several reports on South Puget Sound butterfly populations cannot be strictly classified as survey reports, though two discussed below do provide survey data. All three provide critical information on the life history, habitat preferences, and management of the rare butterflies that inhabit South Puget Sound's prairies.

In 1995 Char and Boersma submitted their final report on "The Effects of Prairie Fragmentation on Butterfly Species in Western Washington" to TNC and Fort Lewis. This report was the result of a two-year study during which the authors surveyed prairie sites on Fort Lewis, the WDNR's Mima Mounds Natural Area Preserve (NAP), and the WDFW's Scatter Creek Wildlife Area, in order to: "1). census butterflies on these different prairies 2). compare differences in species richness and butterfly abundance at the different sites 3). examine potential effects of habitat fragmentation on butterfly species by studying butterfly movement 4). evaluate butterflies as indicators of overall prairie quality 5). assess the effects of burning and other management practices on butterflies and 6). evaluate butterfly monitoring protocols for long-term monitoring in the Puget Trough prairies" (Char & Boersma 1995). Johnson, Upper Weir, and Lower Weir Prairies were surveyed in 1993; Johnson Prairie, Upper and Lower Weir Prairies, Marion Prairie, the AIA, TA7S, TA14, and TA15 were surveyed in 1994; and TA14 and TA15 were surveyed in 1995. Because they were being tested for efficacy, methods for these surveys varied greatly in terms of survey group size, the amount of data collected, and walking patterns. Several important results are discussed in this study, including that Scotch broom was found to constrain butterfly movement, that butterflies are informative indicators of prairie

quality, and that active management may be necessary to preserve butterflies on Fort Lewis prairies. A great deal of data is available in this report, including a spreadsheet detailing historic butterfly sightings on Mima Mounds NAP, Scatter Creek Wildlife Area, and Fort Lewis from the Northwest Lepidoptera Database; and spreadsheets detailing survey results from 1993 and 1994 by prairie and species, including the person hours expended at each prairie and the percent of total butterflies observed at each prairie for prairie-dependent species and the extremely common Ochre Ringlet (*Coenonympha tulia*) (Char & Boersma 1995).

Dunn & Fleckenstein's 1997 report on "Butterflies of the South Puget Sound Prairie Landscape" addresses the presence and characteristics of rare butterflies in the South Puget Sound region, the quality of prairies they inhabit, options for butterfly management, and the results of surveys conducted by TNC, the WDFW and the WDNR from 1994 to 1996 on Fort Lewis's 13th Division Prairie and Weir Prairies, the Mima Mounds NAP, Scatter Creek Wildlife Area, and Thurston County's Black River-Mima Prairie-Glacial Heritage Preserve. The report includes survey data on the total number of species, number of State Candidate Species, and number of State Monitor Species observed on each prairie. The report discusses what the authors believe to be abnormally low species diversity and butterfly abundance on the Weir Prairies given that they are of relatively high quality and are in close proximity to species-rich Johnson Prairie. It also discusses high species diversity in the protected RNA in TA15 in comparison to the rest of 13th Division Prairie, and the controversial impacts of fire as a prairie management tool for butterfly habitat (Dunn & Fleckenstein 1997).

Potter et al.'s 1999 "Draft Washington State Status Report for the Mardon Skipper" addresses historic, current, and future population trends; current and historic habitat trends; historic and present management activities; and the life history of the species; as well as threats to the butterfly's continued existence and the relationship between population demographics and long-term sustainability. The report makes habitat management recommendations for the Mardon Skipper as well as the three State Candidate Species prairie butterflies (Potter et al. 1999).

Oral History Interviews

TNC employee Maija Morgenweck interviewed Washington Butterfly Association (WBA) Research Coordinator and past President Robert E. Hardwick on 26 August 2003 on South Weir Prairie, and lepidopterist and long-time TNC and WDNR volunteer Barry Bidwell on 27 August 2003 at TNC's Olympia office. Both men had recently completed participation in TNC's 2003 Fort Lewis Butterfly Survey. The interviews covered their past observations of butterflies populations and prairie habitat in the South Puget Sound region, and the changes they've observed in both up to the present. The content of the interviews is discussed later in this report and transcripts of the interviews are available in Appendices B and C.

SOUTH PUGET SOUND PRAIRIE BUTTERFLIES

Approximately 48 species of butterflies have been observed on South Puget Sound prairies (Dunn & Fleckenstein 1997). Forty-one of these species have been observed on Fort Lewis prairies (see Appendix A for a complete list). Seven of these species are believed to exclusively use prairie habitat through all stages of their lives, including: Taylor's Checkerspot, the Mardon Skipper, the Puget Blue, the Zerene Fritillary, the Great Spangled Fritillary (*Speyeria cybele*), the Common Branded Skipper (*Hesperia comma oregonia*), and the Sonora Skipper (*Polites Sonora*) (Dunn & Fleckenstein 1997).

Butterflies are considered viable indicators of prairie quality because their abundance can be correlated with high Idaho fescue (*Festuca idahoensis*) cover, high flower availability, and low Scotch broom (*Cytisus scoparius*) cover; and because their extremely short adult generation time is measured in weeks, allowing changes in butterfly populations to be detected much more rapidly than those in prairie-dependent plants, birds and mammals. Butterflies are highly susceptible to environmental factors and human-induced disturbance such as the use of herbicides and pesticides and the manifestation of physical changes in the prairie landscape. Therefore, they can serve as an early warning signal of deleterious alterations in prairie habitat that will negatively affect other species on smaller and slower scales, as well as provide rapid feedback on the effects of prairie management actions (Char & Boersma 1995, Gilbert 1999, and Hays et al. 2000).

Many factors are involved in the decline of prairie-dependent butterfly species in the South Puget Sound. The most obvious culprit is habitat loss due to human activities, including development, logging, impoundment, grazing, plowing, mowing, herbicide application, and recreational activities. Other factors include habitat loss due to the encroachment of Douglas fir (*Pseudotsuga menziesii*) and invasion by Scotch broom and other non-native species; and butterfly mortality due to exposure to insecticides (Dunn & Fleckenstein 1997, Gilbert 1999, Hays et al. 2000, Potter et al. 1999, Pyle 2002, and Ressa 2002).

Due to extensive loss of prairie habitat throughout the South Puget Sound region, several species of prairie-dependent butterflies found on Fort Lewis are considered "Species of Concern" because they are rare enough to warrant monitoring or rare species listing at the state and federal levels, as detailed below in Table 1. "State Monitor" species are those butterflies that may be rare globally or locally, though not enough information is available on their current distributions to make them candidates for listing. "State Candidate" is defined by WAC 232-12-297 as a species for which "sufficient evidence suggests that its status may meet the listing criteria defined for State Endangered, Threatened, or Sensitive." "State Endangered" species are defined as "any wildlife species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state," while a "State Threatened" species is "likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats," and a "State Sensitive" species "is vulnerable or declining and is likely to become endangered or threatened."

Table 1. Rare species status of butterflies observed on Fort Lewis¹.

Common Name	Latin Name	State Status	Federal Status
Mardon Skipper	<i>Polites mardon</i>	Endangered	Candidate
Taylor's Checkerspot	<i>Euphydryas editha taylori</i>	Candidate	Candidate
Puget Blue	<i>Icaria icarioides blackmorei</i>	Candidate	
Zerene Fritillary	<i>Speyeria zerene</i>	Candidate	
Arctic Skipper	<i>Carterocephalus palaemon</i>	Monitor	
Common Branded Skipper	<i>Hesperia comma oregonia</i>	Monitor	
Dun Skipper	<i>Euphyes vestries</i>	Monitor	
Juba Skipper	<i>Hesperia juba</i>	Monitor	
Silver-spotted Skipper	<i>Epargyreus clarus californicus</i>	Monitor	
Sonora Skipper	<i>Polites Sonora</i>	Monitor	
Great Spangled Fritillary	<i>Speyeria cybele</i>	Monitor	
Hoary (Obscure) Elfin	<i>Incisalia polia</i>	Monitor	
Purplish Copper	<i>Lycaena helloides</i>	Monitor	

¹Compiled from WDFW 2003.

Dunn and Fleckenstein (1997) suggest that positive correlations found between the number of State Monitor Species on a prairie and the number of State Candidate Species and total number of butterflies on a prairie indicate that prairies providing habitat for candidate rare species are also providing habitat for a wide range of butterflies. Thus both the presence of State Candidate and State Monitor butterfly species can be indicators of high-quality prairie habitat.

State and Federal Endangered and Candidate Species

Fort Lewis is one of a handful of remaining areas in South Puget Sound with prairie habitat of sufficient size and quality to support butterflies that are listed at the state and federal levels as Endangered and Candidate Species. Table 2 below details observations on Fort Lewis of the four species that comprise the primary conservation concern for the South Sound's prairie-dependent butterflies.

Table 2. Records of state and federal Endangered and Candidate Species observations on Fort Lewis¹.

	Mardon Skipper	Taylor's Checkerspot	Puget Blue	Zerene Fritillary ²
AIA	2002, 2003	1999-2003	1994, 2001, 2003	
Johnson		1994	1993-1997, 2000, 2002, 2003	1994-2003
TA15		1991, 1994-2000	1994, 1995, 2001, 2003	
TA14		1994, 1995	1994	
TA13				2003
TA7S		1980	1980, 1982, 1988, 1994	
Marion				1994
Lower Weir			2003	2003
South Weir			2003	2003
Upper Weir			2003	

¹Compiled from Char & Boersma 1995, Crew 1996, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, TNC 1995, the WDFW's Hinchcliff Records, and the personal records of Robert E. Hardwick.

²The presence of Zerene Fritillaries on 13th Division Prairie and in the Central Impact Area is reported in Dunn & Fleckenstein (1997), but no records are available.

Mardon Skipper. Mardon Skippers are very small (wingspan of < 1”), tawny-orange butterflies with a band of light yellow rectangular spots following the wing margin (Figure 1 below). They bask in the characteristic skipper manner of fully spreading the hindwings while holding the forewing at a 45° angle. Mardon Skippers use Idaho fescue as a larval host plant and nectar heavily on early blue violet (*Viola adunca*) as adults. They fly earlier in the season than any other skipper, from approximately 10 May through 5 June in the South Puget Sound region. Their habitat consists of grasslands: short-grass gravelly outwash prairies in the South Puget Sound trough and openings in Ponderosa pine (*Pinus ponderosa*) savanna/woodlands south of Mount Adams. Mardon Skippers have been observed making use of a variety of habitat types within South Puget Sound prairies; their use of edge habitat where the open prairie meets oak woodlands or Douglas fir forest is particularly noted (Dunn & Fleckenstein 1997, Hays et al 2000, Potter et al. 1999, and Pyle 2002). Hays et al. found that Mardon Skippers select habitat with a greater mean cover of Idaho fescue and therefore of higher quality than that of two other rare butterflies, the Puget Blue and the Zerene Fritillary.



Figure 1. Mating Mardon Skippers (*Polites mardon*).

Before additional populations were found in Oregon and California, the Mardon Skipper was thought to be Washington’s only endemic butterfly. It is currently listed as an Endangered Species at the state level and has been petitioned for emergency listing at the federal level. Until TNC’s 2003 survey, the Mardon Skipper had only been observed on Fort Lewis along the southwestern edge of the AIA (Table 2 above). It is now known to inhabit the north and southeastern corners of the AIA. An additional, robust population of this endangered butterfly is found at Scatter Creek Wildlife Area. Prairie management recommendations for this species include maintaining and promoting stands of Idaho fescue and early blue violet. The invasion of tall exotic turf grasses on Fort Lewis prairies is also of concern, as the structural changes they bring to the prairie limit the butterfly’s access to its favored low-lying vegetation. The proximity of Mardon Skipper habitat discovered in 2003 to TA6 should be considered as an opportunity to extend the butterfly’s habitat to an additional prairie if a sufficient supply of host and nectar plants can be maintained there (Dunn & Fleckenstein 1997, Gilbert 1999, Hays et al. 2000, Morgenweck & Dunn 2003, Potter et al. 1999, and Ressa 2002).

Taylor’s Checkerspot. Taylor’s Checkerspot is a subspecies of Edith’s Checkerspot (*Euphydryas editha*). It is a large butterfly (wingspan < 2.25”) with a checkerspotted pattern of black, orange and white on the dorsal side of its wings, and yellow, orange, and black striping on the ventral side (Figure 2 below). Its larval host plants are believed to be both harsh paintbrush (*Castilleja hispida*) and introduced English pliantain (*Plantago lanceolata*), while the adult nectars primarily on common camas (*Camassia quamash*) and lomatiums (*Lomatium nudicale*, *L. utriculatum*, and *L. triternatum*). The Taylor’s Checkerspot is an early spring butterfly, with a flight period from approximately 23 April through 1 June. Its habitat consists of short-grass gravelly outwash prairies in the South Puget Sound trough and mountain meadows. Like the

Mardon Skipper, Taylor's Checkerspot has been observed making use of a variety of habitat types within South Puget Sound prairies; particularly edge habitat where the open prairie meets oak woodlands or Douglas fir forest (Dunn & Fleckenstein 1997, Gilbert 1999, Hays et al. 2000, Potter et al. 1999, and Pyle 2002).

Taylor's Checkerspot is well known among butterfly and prairie restoration communities for its prolific displays numbering in the thousands at Glacial Heritage Preserve in 1996 and the 13th Division Prairie RNA in TA15 on Fort Lewis in 1997. It is equally well known for the precipitous decline its populations have experienced throughout the South Puget Sound region since 1997. The Taylor's Checkerspot is a State Candidate Species and has been petitioned for emergency rare species listing at the federal level. Currently only one population is known to occur on



Figure 2. Taylor's Checkerspot (*Euphydryas editha taylori*).

Fort Lewis, located along the southwestern edge of the AIA in the same area that the Mardon Skipper is known to inhabit. It is hoped that this species is in diapause and living as larvae and/or eggs at its historic locations on TA14 and TA15 (detailed above in Table 2), which would account for the lack of adult butterfly observations in 2003. However, no adult butterflies have been observed during surveys at these sites since 1998. The butterfly can be considered extirpated from two prairies on which it was previously observed, TA7S and Johnson Prairie. One additional South Puget Sound population exists at the WDNR's Bald Hills Natural Area Preserve and other adjacent balds. Management recommendations for the Taylor's Checkerspot on Fort Lewis include augmenting patches of harsh paintbrush in the AIA and considering the relocation of ROTC helicopter training that results in the annual mowing of historic Checkerspot habitat in TA15 (Gilbert 1999, Morgenweck & Dunn 2003, Potter et al. 1999, Pyle 2002, Ressa 2002, and TNC 1995).

Puget Blue. The Puget Blue is a small butterfly (wingspan < 1.5"), and a subspecies of the Boisduval's Blue (*Icaricia icarioides*) (Figure 3 below). A dimorphic butterfly, the dorsal side of the male is bright azure, while the dorsal side of the female is predominately brown highlighted with blue. The ventral side of both sexes is silvery with white-ringed black spots along the forewing margin and all white to mostly white spots on the hindwing margin. Additionally, a set of faint submarginal crescent spots on both the ventral fore and hindwings distinguish the Puget Blue from the common Silvery Blue (*Glaucopsyche lygdamus*). The Puget Blue is highly associated with sickle-keeled lupine (*Lupinus albicaulus*) both as a larval food plant and an adult nectar source. The adults fly between approximately 25 May and 5 July on the South Puget Sound prairies. Its habitat consists of areas where lupines thrive, including short-grass gravelly outwash prairies in the South Puget Sound trough, forest clearings, powerline cuts, and unsprayed railroad rights of way (Dunn & Fleckenstein 1997, Hays et al.

2000, Potter et al. 1999, and Pyle 2002). Hays et al. (2000) found that the Puget Blue is somewhat tolerant of habitat invasion by exotic species, and will nectar in areas with 28 to 60% cover of non-native grasses and forbs.

The Puget Blue is currently a candidate for state rare species listing. Two other subspecies of the Boisduval's Blue have been federally listed as Endangered Species: California's Mission Blue (*Icaricia icarioides missionensis*) and Oregon's Fender's Blue (*Icaricia icarioides fenderi*). On Fort Lewis, Puget Blues are known to inhabit the AIA, TA14, TA15, Johnson Prairie, and all three Weir Prairies as detailed above in Table 2. Populations also occur on several other prairie preserves in the South Puget Sound region and in the Olympic Mountains.

Despite multiple surveys of TA7S during the Puget Blue flight period and an extreme abundance of sickle-keeled lupine, no Puget Blues were observed there in 2003. Butterfly expert Robert Hardwick provided records of the Puget Blue on TA7S in the 1980s, and explained that the majority of these observations were in the middle section of the prairie, which then provided prime habitat, and now has been converted to a gravel pit (personal communication). Lupines are successional plants that are normally replaced by more permanent plant communities after the habitat disturbance that allows them to thrive passes, so management recommendations for the Puget Blue involve maintaining stands of sickle-keeled lupine on prairies by controlling succession through cutting and/or burning (Char & Boersma 1995, Crew 1996, Dunn & Fleckenstein 1997, Gilbert 1999, Hays et al. 2000, Morgenweck & Dunn 2003, Ressa 2002, and TNC 1995). In cooperation with Cheryl Schultz of Washington State University—Vancouver, TNC participated in a 2003 pilot study investigating the characteristics of lupine patches preferred by Puget Blues for ovipositing. Schultz has extensive experience investigating the habitat of the Fender's Blue in Oregon, and TNC will continue assisting her in her Puget Blue work by conducting a full-scale study on Johnson Prairie in 2004.

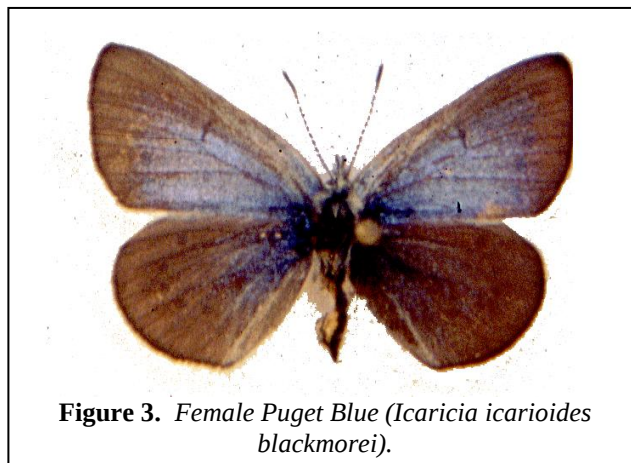


Figure 3. Female Puget Blue (*Icaricia icarioides blackmorei*).

Zerene Fritillary. Zerene Fritillaries are large butterflies (wingspan < 2.5") with black markings and spots on an orange background on the dorsal side, and silver spots on a reddish-brown disc with a tawny background on the ventral side (Figure 4 below). They use early blue violet as a larval host plant, and adults nectar on showy fleabane (*Erigeron speciosus*) and white-topped aster (*Aster curtus*) though they are particularly attracted to Canada and bull thistles (*Cirsium arvense* and *C. vulgare*) as a late summer nectar source. Zerene Fritillaries fly from approximately 14 July through 7 September. Their habitat consists of short-grass gravelly outwash prairies in the South Puget Sound trough, and canyons, meadows, roadsides, and clearings in the mountains (Dunn & Fleckenstein 1997, Hays et al. 2000, Potter et al. 1999, and Pyle 2002). As with the Puget Blue, Hays et al. (2000) found that the Zerene Fritillary will make use of areas with 28 to 60% cover of non-native grasses and forbs when nectaring.

Historically, Zerene Fritillaries have been observed on Fort Lewis in the Central Impact Area, in the 13th Division Prairie RNA, and on Johnson and Marion Prairies, as detailed above in Table 2. TNC's 2003 butterfly survey also observed previously unrecorded populations of Zerene Fritillaries on TA13 and Lower and South Weir Prairies. Robert Hardwick theorized it likely that Zerene Fritillaries are utilizing sunny forest glades between Johnson and Lower Weir Prairie. Zerene Fritillaries are most often observed along prairie edges, and one individual was observed in a sunny clearing in the forest at the edge of South Weir Prairie during TNC's 2003 survey.



Figure 4. *Zerene Fritillary (Speyeria zerene).*

Though no Zerene Fritillaries have been observed at their historic Marion Prairie location since 1994, the observation of a Great Spangled Fritillary nectaring on Canada thistles there in 2003 indicates that this prairie is still capable of supporting this type of butterfly. Populations of Zerene Fritillaries also occur on several other prairie preserves in the South Puget Sound region and in the Olympic Mountains and Willapa Hills. Management recommendations for the Zerene Fritillary are similar to those for the Mardon Skipper in that this species will benefit from actions to maintain and promote stands of early blue violet and to limit the invasion of tall exotic turf grasses that crowd out and reduce access to violets (Char & Boersma 1995, Crew 1996, Dunn & Fleckenstein 1997, Gilbert 1999, Hays et al. 2000, Morgenweck & Dunn 2003, Ressa 2002, and TNC 1995).

State Monitor Species

Nine butterfly species that have been observed on Fort Lewis are currently being monitored at the state level for population fluctuations. These butterflies include six skippers: the Arctic (*Carterocephalus palaemon*), Common Branded, Dun (*Euphyes vestries*), Juba (*Hesperia juba*), Silver-Spotted (*Epargyreus clarus californicus*), and Sonora; and three additional butterflies: the Great Spangled Fritillary, the Hoary Elfin (*Incisalia polia*), and the Purplish Copper (*Lycaena helloides*). Historic observations of these butterflies on Fort Lewis are detailed below in Table 3.

Table 3. *Records of State Monitor Species observations on Fort Lewis¹.*

	Arctic Skipper	Common Branded Skipper	Dun Skipper	Juba Skipper	Silver-spotted Skipper	Sonora Skipper	Great Spangled Fritillary	Hoary Elfin ²	Purplish Copper ²
AIA		1994, 2001, 2002		2001, 2002		2001, 2002	1994		1994, 2000, 2001
TA14	1994						2003		1994
TA15		1994		1983			1994, 2003		1994, 1995
Johnson			1997		2003		1994, 1995, 1997-2003	2003	1993-1995
TA7S							1994 ³	n/a ³	1994, 2003
Marion		1994					2003		
Lower Weir							2003		
South Weir							2003	2003	
Upper Weir								2003	

¹Compiled from Char & Boersma 1995, Crew 1996, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, TNC 1995, and the WDFW's Hinchcliff Records.

²The Hoary Elfin and Purplish Copper were observed on Fort Lewis in 1983, locations indeterminate.

³The Great Spangled Fritillary and Hoary Elfin were observed on TA7S in the 1970s and 1980s, no records available (R. Hardwick, personal communication).

State Monitor Skippers. Five of the skippers with State Monitor status in Washington are small butterflies (wingspan < 1-1.5") that are relatively similar in appearance to the Mardon Skipper, with the bright, heavily yellow-spotted Arctic Skipper and the uniformly brown Dun Skipper at either end of the spectrum. The sixth State Monitor skipper, the Silver-spotted Skipper, is larger (wingspan < 2") and chocolate brown with bright gold patches on its dorsal forewing and jagged silver marks on its ventral hindwing. Due to their size and flight patterns, skippers can be difficult butterflies to see. There are relatively few State Monitor skipper sightings on Fort Lewis Prairies, as detailed above in Table 3. With the exception of a singled Silver-spotted skipper observed on Johnson Prairie in 2003, the most recent observations of these species have been in the AIA in 2001 and 2002. TNC surveyors did not gain access to this site during the height of the flight periods of these species in 2003 to confirm the extent of their current habitat. A more concentrated effort on surveying these butterflies is needed to determine the extent of their presence/absence throughout Fort Lewis (Char & Boersma 1995, Crew 1996, Gilbert 1999, Hays et al. 2000, Morgenweck & Dunn 2003, Ressa 2002, and TNC 1995).

Great Spangled Fritillary. The Great Spangled Fritillary is similar in appearance and life history to the Zerene Fritillary, with a half-inch larger wingspan (Pyle, 2002). Populations of this butterfly are currently found on TA14, TA15, Johnson Prairie, Marion Prairie, and South and Lower Weir Prairies (Table 3 above). The population on Johnson Prairie is by far the most robust, with observations totaling over forty individuals during surveys in 2000, 2002, and 2003, despite differences in survey methods. Although the butterfly is present on TA15, very few were observed there in 2003 despite both organized survey efforts and the watchful eye TNC's Prairie Restoration Team kept on TA14 and TA15 as they performed Scotch broom control work at the end of July and beginning of August. This butterfly was not observed during the 2003 survey on TA7S despite its presence there in the 1980s and 1994 and a current abundance of Canada thistle. Also, access was not gained to the AIA during the butterfly's flight period in order to

confirm whether or not a population still inhabits that prairie. This large butterfly is a very strong flyer, so it is likely that newly documented populations on Lower and South Weir Prairies are related to the robust population on Johnson Prairie, and if a population still exists in the AIA, it may freely fly to Marion Prairie, where the butterfly was also observed for the first time in 2003 (Char & Boersma 1994, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, TNC 1995, and R. Hardwick, personal communication).

Hoary Elfin. The Hoary Elfin is a small (wingspan <1”), brown butterfly that can be as difficult to spot as a skipper. Both larvae and adult butterflies rely on patches of kinnikinnick (*Arctostaphylos uva-ursi*) as a food source, and the butterfly rarely strays from its patch (Pyle 2002 and B. Bidwell and R. Hardwick, personal communications). The Hoary Elfin is currently found on Johnson, South Weir, and Upper Weir Prairies (Table 3 above). Historically, one observation of this butterfly was recorded at an indeterminate location on Fort Lewis. Robert Hardwick also reports observing it on TA7S during the 1970s and 1980s in his oral history interview with TNC. As was the case with several butterfly species on TA7S, TNC’s 2003 Butterfly survey did not observe the Hoary Elfin (Morgenweck & Dunn 2003).

Purplish Copper. The Purplish Copper is a small (wingspan < 1.25”), sexually dimorphic butterfly. Both the female and male are various shades of brown with fine black spots on the ventral side, while on the dorsal side the female is orange with heavy black spotting and the male is purple (Pyle, 2002). The Purplish Copper has historically been recorded on five Fort Lewis Prairies, as detailed in above Table 3. Only one of these populations was confirmed during TNC’s 2003 survey, and that observation consisted of a single individual observed on TA7S. A qualitative examination of available butterfly records seems to indicate that this butterfly has suffered a significant reduction in population on Fort Lewis Prairies.

Other Butterflies

Silvery Blues, Ochre Ringlets, and Common Wood Nymphs are by far the most commonly observed butterflies on Fort Lewis, both in terms of numbers observed and number of prairies on which they are observed. Johnson and the Weir Prairies all contain robust populations of all three species. The AIA is also known to contain all three, but TNC was not able to survey this prairie during the Common Wood Nymph’s flight period in 2003 to confirm that population. Silvery Blues are found on every prairie with stands of sickle-keeled lupine, which excludes Chambers Prairie, Marion Prairie, and TA13. The seemingly ubiquitous Ochre Ringlet has not been recorded on Chambers Prairie, TA6, and TA8, where habitat is especially poor. It is also currently absent from high-quality historic habitat on TA7S. Common Wood Nymphs are highly abundant on Johnson and the Weir Prairies, but are found more uncommonly and in fewer numbers on the prairies to the northeast. The reason for this discrepancy has not become apparent since Crew noted it in 1997 (Char & Boersma 1995, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, and TNC 1995).

The prairie-dependent Western Meadow Fritillary (*Boloria epithore chermocki*) has only been recorded once on Johnson Prairie in 2000. Like the Great Spangled Fritillary, this butterfly is highly mobile and it is curious that it has not been more commonly observed, especially as it is becoming more abundant in surveys of other South Puget Sound Prairies, as discussed by Barry Bidwell in his oral history interview with TNC (Ressa 2002 and TNC 1995).

A complete list of non-Species of Concern butterflies observed on Fort Lewis is available in Appendix A.

FORT LEWIS PRAIRIES

Three prairie sites on Fort Lewis have displayed high butterfly species diversity over the years with 20 or more species: the AIA, Johnson Prairie, and TA15, particularly the RNA within (Char & Boersma 1995, Crew 1996, Dunn & Fleckenstein 1997, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, and TNC 1995). The remaining sites currently display moderate to low species diversity, as detailed below in Tables 4 and 5.

Table 4. Total number of species observed on Fort Lewis Prairies, 1960 to 2003¹.

Site	Years of Observations	Total Species Observed
Fort Lewis	1960, 1973, 1978, 1980, 1982, 1983, 1988, 1991, 1993-2003	41
Johnson	1993-2003	31
13th Division	1983, 1991, 1994-2003	30
TA15 All	1994-2003	27
TA15 Triangle	1994, 1995, 1996, 2003	21
TA15 South Creek	1994-2003	21
AIA	1994-2003	20
Lower Weir	1995, 2003	17
TA14	1994, 1995, 2003	14
TA7S	1980, 1982, 1988, 1994, 2003	13
Upper Weir	1995, 1996, 2003	11
Marion	1994, 2003	5

¹Compiled from Char & Boersma 1995, Crew 1996, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, TNC 1995, and the WDFW's Hinchcliff Records.

Table 5. Number of butterfly species observed at each survey site during The Nature Conservancy's 2003 Fort Lewis Butterfly Survey¹.

Survey Site	Number of Species Observed
Johnson	21
TA15	15
Lower Weir	15
South Weir	11
TA15 Triangle	10
Upper Weir	9
AIA	8
TA15 North of Muck Creek	8
TA15 South Creek	8
TA7S	7
TA13	6
TA8	5
TA14	4
TA6	3
Marion	2
Chambers	1
All	32

¹From Morgenweck & Dunn 2003.

Relatively high butterfly abundance is currently and has historically been found at Johnson Prairie, the Weir Prairies, the AIA and TA15, as shown below in Tables 6 and 7. As observed by Char & Boersma (1995) and Dunn & Fleckenstein (1997), Fort Lewis prairies have patchy and localized butterfly distributions where adjacent prairies (i.e. TA14 and TA15 or the AIA and TA6, which in both cases are separated by a two-lane road) can show very different diversity and abundance characteristics. High abundance of Idaho fescue, low abundance of Scotch broom, and high abundance and diversity of nectar plants on a prairie can all be associated with butterfly abundance (Char & Boersma 1995 and Hays et al. 2000). Tables 4 through 7 generally reflect this pattern of higher butterfly abundance and species diversity on

higher quality prairies, with the curious exception of TA7S. Its butterfly abundance and species diversity are similar to that of TA13 and Marion Prairie, but a cursory visual examination of these prairies reveals a striking difference in the quality of their vegetative communities. This discrepancy on TA7S is discussed below.

Table 6. Number of butterflies observed per hour at each survey site during Char & Boersma's 1993 and 1994 Fort Lewis butterfly surveys¹.

Survey Site	Butterfly Observations Per Hour
Johnson and Weir Prairies 1994	11.7
Johnson and Weir Prairies 1993	9.4
TA15 Triangle	8.1
AIA	7.3
TA14 Pacemaker	7.0
TA15 South Creek	5.4
Marion Prairie	3.8
TA7S	2.7

¹Compiled from Char & Boersma 1995.

Table 7. Number of butterflies observed per hour at each survey site during The Nature Conservancy's 2003 Fort Lewis Butterfly Survey¹.

Survey Site	Butterfly Observations Per Hour
Johnson	26.3
Upper Weir	9.8
Lower Weir	9.4
TA15 Triangle	7.3
South Weir	6.7
AIA	6.0
TA15	5.9
TA15 North of Muck Creek	5.3
TA15 South Creek	4.6
TA13	3.8
TA7S	3.5
Marion	2.2
TA6	0.5
TA8	0.5
TA14	0.3
TA14 Pacemaker	0.2
Chambers	0.2
All	8.8

¹From Morgenweck & Dunn 2003.

Johnson and Weir Prairies. Johnson Prairie and Weir Prairies are within the Rainier Training Area (RTA) and lie in the southwest corner of Fort Lewis, near the town of Rainier. They lie on a contiguous area of glacial outwash soils (Crawford & Hall, 1997), but have been separated by the encroachment of Douglas fir and the development of Rainier Road. These prairie have RNA status, and the use of vehicles is not permitted off of established roads. It is subject more often to both authorized and unauthorized civilian use for activities such as horseback riding, dog training, and 4-wheeling than to military training, which predominately involves paratrooping (Ressa 2002). The prairies are similar in that Idaho fescue cover and nectaring forb diversity and abundance are relatively high and Scotch broom cover is relatively low in comparison to other Fort Lewis Prairies. However, Johnson Prairie is clearly of a higher quality than the three Weir prairies and many other South Sound prairies in these categories, as well as in terms of butterfly abundance and species diversity.

Johnson Prairie currently provides habitat for five Species of Concern, including the Puget Blue, the Zerene Fritillary, the Silver-spotted Skipper, the Great Spangled Fritillary, and the Hoary Elfin (Tables 2 and 3 above and Appendix A, Table A2). Historically, it has also

provided habitat for the Taylor's Checkerspot, the Dun Skipper, and the Purplish Copper. The plant community includes rare species host and nectar plants including common camas, lomatiums, harsh paintbrush, early blue violet, common vetch (*Vicia sativa*), Canada thistle, white-topped aster, kinnikinnick, and large patches of sickle-keeled lupine (Hays et al. 2000, Pyle, 2002, and personal observation). The topography of the prairie features large swales that appear to be highly attractive to butterflies (personal observation and B. Bidwell & R. Hardwick, personal communication).

Surveys have consistently found Johnson Prairie to be one of Fort Lewis's top-ranked prairies in terms of butterfly abundance and species diversity (Tables 4 through 7 above). TNC observed over 300 individuals each of the Puget Blue, the Silvery Blue, the Ochre Ringlet, and the Common Wood Nymph in surveys of Johnson Prairie in 2003 (Appendix A, Table A2). As this prairie is presently providing some of Fort Lewis's best butterfly habitat, the main restoration concern is to continue reducing Scotch broom cover, with attention given both to seedlings within the prairie and mature stands all along the prairie's perimeter.

TNC's 2003 Fort Lewis Butterfly Survey confirmed that the Weir Prairies are home to multiple Species of Concern, including the Puget Blue on all three prairies, the Zerene and Great Spangled Fritillaries on Lower and South Weir, and the Hoary Elfin on South and Upper Weir (Tables 2 and 3 above and Appendix A, Table A2). All three prairies also host significant populations of Silvery Blues, Ochre Ringlets, and Common Wood Nymphs. The Weir Prairies are of relatively good quality and all ranked in the top 5 prairie sites for butterflies observed per hour in 2003, but have historically had lower species diversity than Johnson Prairie, 13th Division Prairie, and the AIA (Tables 4 through 7 above).

The Weir Prairies contain much of the same vegetative community of butterfly host and nectar plants as prairies with higher species diversity, but in lower abundance. The proximity of these prairies to robust fritillary populations on Johnson Prairie increases their potential to contribute to rare species recovery efforts. Specific management recommendation for butterfly habitat on these prairies include continuing to control invasive Scotch broom as discussed above for Johnson Prairie, as well as propagation of native forbs favored by rare species for nectaring and ovipositing.

13th Division Prairie — TA13, TA14, and TA15. Thirteen Division Prairie is located southeast of the cononement area, to the east of the AIA. It is divided into three different training areas and consists of both riparian and prairie habitat of varying quality. The prairie is commonly used for military training and civilian recreation, though vehicles are not permitted in Siebert-staked areas along the riparian zones and in TA15's Triangle RNA. TA14 and TA15 of 13th Division Prairie are often discussed in the prairie restoration community as the location of remarkable Taylor's Checkerspot flights in the mid-nineties that were followed by very few and currently no survey observations since 1998. The cause of the disappearance is unknown, though it has been noted that annual mowing on TA15 for ROTC training has likely been detrimental to this butterfly (Gilbert 1999). However, Taylor's Checkerspot is disappearing throughout the South Puget Sound region.

As shown above in Tables 2 and 3 above and in Appendix A, Table A2, rare species currently known to inhabit 13th Division Prairie include the Puget Blue on TA15 and the Zerene Fritillary on TA13. Historically the Zerene Fritillary has been found elsewhere on 13th Division Prairie, and the Puget Blue has been observed on TA14. Among State Monitor species, the Great Spangled Fritillary is currently found on both TA14 and TA15, while the Arctic Skipper, Common Branded Skipper, Juba Skipper, and Purplish Copper were historically found there. Robust populations of Silvery Blues and Ochre Ringlets are found on TA15, but few are found on TA14, and a single Ochre Ringlet was observed on TA13 in 2003. Very few Common Wood Nymphs were observed on TA13 and TA15, a trend that Crew observed in 1996 and caused him to speculate that “significant distinctions may exist in the favorability for Large [Common] Wood Nymphs in the respective micro-habitats of Johnson-Weir and 13th Division Prairie complexes.” The nature of these possible distinctions has not been investigated.

Thirteenth Division Prairie is largely a contiguous prairie with some division due to riparian areas, stands of Douglas fir, and 8th Avenue South, which runs between TA14 and TA15. In spite of its connectivity, butterfly populations are not distributed throughout the site, and are instead found in microhabitats such as lupine and thistle patches and most significantly throughout the protected TA15 RNA area (Dunn & Fleckenstein 1997 and Morgenweck & Dunn 2003).

TA15 is ranked in the top five Fort Lewis prairies in terms of butterfly abundance and species diversity (Tables 4 through 7 above). However, both of these measurements have declined over time with just over half of the species historically observed on TA15 observed there in 2003. The landscape of this training area is highly varied. In TA15, the area northwest of Muck Creek is routinely mowed short for ROTC training, and was nearly devoid of both nectar sources and butterfly activity in 2003. The area just north of Muck Creek contains far better nectaring opportunities and large patches of sickle-keeled lupine, but also has very little butterfly activity. The Triangle RNA between Muck Creek and South Creek is the most productive part of this training area, with an abundance of nectaring and host plants including common camas, lomatiums, early blue violet, and sickle-keeled lupine. Along with the area south of South Creek, the RNA is historically known for having high butterfly diversity and abundance (TNC 1995). However, the South Creek area now has only a moderate amount of nectar sources and is very sparsely populated with butterflies. TNC has performed a substantial amount of Scotch broom control work on this prairie. Butterfly habitat management recommendations for this site include continuing to reduce Scotch broom cover and establishing and substantially increasing stands of native nectaring forbs and Idaho fescue.

TA14 has experienced sharp declines in butterfly abundance and diversity over time, most notably a decline from observations of seven butterflies per hour (BPH) in 1994 to .2 BPH in 2003 in the Pacemaker area. In 1995 TNC characterized the prairie as being dominated by exotic species and having low butterfly diversity. This description is still generally applicable; however, TNC has performed a substantial amount of Scotch broom control work, and in addition to very dry, unproductive areas dominated by invasive turf grass, TA14 contains small patches of high-quality prairie near Pacemaker, as well as oak woodlands, a large wet meadow area smothered in invasive turf grass and vetch and containing significant amounts of thistle, and

highly disturbed areas dominated by bare ground. The butterfly-specific habitat management requirements of TA14 are identical to those of TA15.

TA13 had not been surveyed for butterflies before 2003. In terms of butterfly abundance and diversity, it falls in between the butterfly-rich prairies discussed above and the depauperate prairies discussed below. The south section of TA13 where Zerene Fritillaries were observed is wet meadow rather than prairie, and therefore is unlikely to be considered a priority for prairie-dependent butterfly habitat management. In addition, it contains more invasive Canada and bull thistle than any other site surveyed. Invasive thistle is an excellent nectar source for fritillaries, so it should not be removed from the site, but neither can it be propagated. No butterflies were observed in the northern section of TA13, a former short-grass prairie that has been invaded by turf grass, Scotch broom, and vehicle tracks. This section of the prairie is too severely degraded to be considered a habitat management priority.

The Artillery Impact Area. The AIA is located south of Fort Lewis's contonement area and is subject to live fire training exercises. Though the interior of this prairie is desolate and cratered, the perimeter is rarely impacted and remains of very high quality. Vehicles are not allowed off the main road and civilians are not permitted on this prairie for recreational purposed due to the possibility of encountering live munitions (Ressa 2002). As of 2003, the AIA contains Fort Lewis's only known populations of the Mardon Skipper and Taylor's Checkerspot. The Puget Blue also inhabits this prairie, and recent records for State Monitor species whose flight periods were not surveyed in the AIA in by TNC 2003 include the Common Branded Skipper, the Juba Skipper, the Sonora Skipper, the Great Spangled Fritillary, and the Purplish Copper (Tables 2 and 3 above and Appendix A, Table A2).

Over time, the AIA ranks just above the Weir prairies in terms of butterfly species diversity and just below them in terms of abundance (Tables 4 through 7 above). It is similar in vegetative community and quality to Johnson Prairie, but unlike any other prairie surveyed for butterflies on Fort Lewis, restoration activities are limited due to the presence of live munitions. However, this area is subject to frequent burns, which contribute both to the control of Scotch Broom and the proliferation of successional nectar sources.

TA6 and Marion Prairie. TA6 and Marion Prairie are directly to east and south of the AIA, respectively. TA6 is separated from the AIA by a two-lane road; Marion Prairie by approximately 600 meters of Douglas fir and firing ranges 91, 92, and 93. The proximity of these prairies to populations of the Mardon Skipper and Taylor's Checkerspot in the AIA encourages consideration of their incorporation into potential recovery plans. However, both of these areas are actively used for military training (TA6 is also used by civilians for dog training), and are heavily affected by vehicle tracks, invasive grasses, and Scotch broom. Substantial recovery effort will be necessary in order to increase ground cover of Idaho fescue and other nectar and host plants capable of supporting new butterfly populations.

TA6 was surveyed by TNC for the first time in 2003. The common Silvery Blue was observed in the midst of sickle-keeled lupine patches near the AIA (Appendix A, Table A2). This butterfly and the two other species observed on TA6, the Clouded Sulphur (*Colias philodice*) and the Painted Lady (*Vanessa cardui*), use a wide variety of habitats, and are not

considered prairie-dependent. As reflected by the low species diversity and low relative abundance shown in Tables 5 and 7, TA6 does not have high ground cover of Idaho fescue and nectaring forbs, but does have high Scotch Broom cover. However, the prairie has small islands of abundant nectar sources, and is not entirely incapable of supporting butterflies. Given the remnants of high-quality habitat and its position adjacent to the AIA, it is likely that TA6 supported more abundant and diverse butterfly populations in the past.

Marion Prairie was surveyed by Char and Boersma in 1994 and is known to have historically contained two Species of Concern: the Zerene Fritillary and the Common Branded Skipper (Tables 2 and 3 above and Appendix A, Table A2). During TNC's 2003 Fort Lewis Butterfly Survey, only the one State Monitor species, the Great Spangled Fritillary, and 10 Ochre Ringlets were observed on this prairie at a rate of 2.2 BPH (Table 7 above). Marion Prairie presents interesting invasive species restoration challenges in that populations of bull thistle there are attractive to fritillaries and tall invasive grasses have invaded significant amounts of the prairie.

TA7S. TA7S is located on the northern edge of Fort Lewis, just north of the Central Impact Area. It is used for military training, and historically was open to civilians for recreational use. The northern section of the prairie is divided by railroad tracks, and tracks also form the eastern edge of the prairie. A gravel pit has been established in the prairie's center, an area formally characterized as "prime" butterfly habitat by lepidopterist Robert Hardwick (personal communication). By Hardwick's account, TA7S formerly contained abundant butterfly populations of diverse species, including five Species of Concern: Taylor's Checkerspot, the Puget Blue, the Great Spangled Fritillary, the Hoary Elfin, and Purplish Copper (Tables 2 and 3 above). Of these species, TNC's 2003 Fort Lewis Butterfly Survey recorded a single Purplish Copper.

In comparison to Char & Boersma's 1994 survey, species diversity had barely decreased on TA7S by 2003, but the composition of species had shifted dramatically from prairie-dependent species to butterflies capable of using many different types of habitats (Tables 4 and 5 above and Appendix A, Table A2). BPH rates in both surveys were low relative to other high-quality prairies (Tables 6 and 7 above). During the 2003 survey, Hardwick and other volunteer butterfly surveyors from the WBA repeatedly remarked not only on a lack of butterflies, but also a dearth of all types of insects at this site. They hypothesized that this site, as well as TA15, may be suffering from the effects of the insecticide *Bacillus thuringiensis kurstaki* (Btk), though Washington State Department of Agriculture spray maps do not indicate treatment in these areas. No Puget Blues were observed in spite of an overwhelming abundance of sickle-keeled lupines and past observations of robust populations. Hardwick's 2-hour search for Anise Swallowtail (*Papilio zelicaon*) larvae on their host plant lomatium, also highly abundant, turned up a single caterpillar in 2003 where he had expected to observe approximately 700 larvae as in the 1970s and 1980s. Additionally, the usually ubiquitous Ochre Ringlet was not observed on TA7S in 2003, despite observations of a population there in 1994.

In terms of vegetative community and other habitat features, the areas of TA7S that remain undeveloped and are clear of the prairie's mature and dense stands of Scotch broom are of as high of quality as any found on Fort Lewis. The prairie contains oak woodlands, varied

topography, and an abundance of host plants and nectar sources such as Idaho fescue, camas, harsh paintbrush, and the above-mentioned lomatiums and lupine. TNC's Scotch broom control at the north end of the prairie is predicted to have a very positive effect on butterfly accessibility and the propagation of nectar plants (R. Hardwick, personal communication). Amongst the Fort Lewis prairies, TA7S stands out as the prairie where the most potential benefit in recovering rare species is available for the least investment in restoration activities. Such activities include continuing to control Scotch broom, working to control invasive turf grasses and encroaching Douglas fir, and transplanting rare species that inhabited TA7S less than a decade ago.

TA8 and Chambers Prairie. Chambers Prairie is located a short distance to the east of TA6, separated by a road and less than 700 meters of woods. TA8 is triangulated northeast of Chamber Prairie and southeast of TA7S, directly north of 13th Division Prairie, relatively isolated from other Fort Lewis prairies. Like TA6 and Marion Prairie, TA8 and Chambers Prairie are actively used for military training and are heavily affected by vehicle tracks, invasive grasses, and Scotch broom. Chambers Prairie also contains a recreational area by Chambers Lake along its southeastern half. No survey data is available on these prairies before TNC's 2003 Fort Lewis Butterfly Survey, which found low butterfly abundance and species diversity on both prairies (Tables 5 and 7 above). While TA8 contains five different non-prairie dependent butterfly species that include the widespread Silvery Blue and Common Wood Nymph, observations on Chambers Prairie amounted to one Common Wood Nymph and one unknown species observation that was likely a Painted Lady (Appendix A, Table A2). In spite of their current depauperate state, both prairies contain promising habitat areas.

TA8 is largely dominated by Scotch broom in its southern section and bare ground in its northern section. However, its southeast corner contains an area of oak woodlands and an area of high nectar plant abundance and diversity that could potentially support butterflies. Chambers Prairie is best characterized as Ponderosa pine savannah. Heavy Scotch Broom cover infests the entire site, but amid the Scotch broom common camas, lomatiums, and bluebells (*Campanula rotundifolia*) circle the pines. The site is also topographically varied with several hill providing shelter from the wind. Both prairies currently have little value as butterfly habitat, but potential exists to restore them.

ORAL HISTORY INTERVIEWS

TNC conducted oral history interviews with two South Puget Sound lepidopterists in late August of 2003 in order to take advantage of their experience and expertise for the purpose of writing this report. Full transcripts of the interviews are available in Appendices B and C. Lepidopterist Robert E. Hardwick is the Research Coordinator and past President of the WBA. Hardwick lived in Spanaway near TA7S from the 1973 to 1989, and visited the prairie on many occasions to observe butterflies. Lepidopterist Barry Bidwell is a long-time volunteer for both TNC and the WDNR, and has well over 15 years experience participating in butterfly surveys and restoration work in the South Puget Sound region, particularly on Glacial Heritage Preserve and Rocky Prairie Natural Area Preserve (NAP). Both men volunteered to assist TNC with its 2003 Fort Lewis Butterfly Survey.

Interview questions focused on butterfly observations, including questions about when and where different species of butterflies had been observed, the distribution and abundance of observed butterflies, “hotspots” for butterfly observations, and butterfly use of host and nectar plants, varied topography, and edge habitat. The vegetative composition of prairies they'd performed surveys on was discussed in terms of butterfly nectar sources and abundance of invasive species that have the potential to degrade butterfly habitat. Additionally, questions were posed regarding the role of fire on South Puget Sound prairies, observations of prairie fauna other than butterflies, and changes through time for all of these elements. Finally, Scotch broom control emerged as a topic of importance in both interviews.

Robert Hardwick

By his own account, Bob Hardwick stumbled upon TA7S while searching for local areas where he could observe butterflies. At that time the training area was open to the public, so walking on sunny Sunday afternoons he ran into many other people making recreational use of the prairie with their horses and dogs. He also ran into abundant butterfly populations that kept him returning to the prairie over the course of 16 years. Hardwick recalls observations of several rare and prairie-dependent butterfly species on TA7S. Most significantly, he recalls populations of State Candidate and Monitor species that were not found on this prairie in 2003: Taylor's Checkerspot, the Puget Blue, the Great Spangled Fritillary, and the Hoary Elfin.

The Puget Blue was relying on abundant patches of sickle-keeled lupine Hardwick observed on TA7S that also supported populations of two other blue butterflies: Silvery Blues and Spring Azures (*Celastrina argiolus*). Hardwick feels that lupine on this prairie has grown even more abundant over time, and is at a loss to explain why thorough and well-timed efforts to observe the Puget Blue in 2003 came up empty while the Silvery Blue continues to thrive.

Hardwick also observed that lomatium appears to have grown more abundant on TA7S, but populations of the formerly common Anise Swallowtail, which uses lomatium as a host plant, have declined. His 2-hour search for Anise Swallowtail larvae on TA7S in 2003 produced a single larvae where he had expected to find around 700 as he had observed in the past.

When asked about his observations on the effects of fire on butterfly populations and habitat, Hardwick recalled a 1979 burn on TA7S, which he assumes was executed by Fort Lewis to clear Scotch broom for training purposes. When he first encountered the burnt prairie, he was very disturbed and thought the area had been destroyed in terms of butterfly habitat. However, returning the next year on a whim, he was surprised to observe the greatest abundance of butterflies he has ever seen on TA7S. The fire had killed large amounts of Scotch broom and encouraged propagation of the successional prairie plant community. Hardwick had not considered fire to be appropriate management tool, but after seeing its positive effect on the butterfly population of TA7S, he says it has been “proven to me to be the right way to do things.”

Hardwick moved from Spanaway in 1989 and did not return to TA7S until a few years ago at the request of TNC. He was discouraged to find that the area he spent the majority of his time in and considered prime butterfly habitat had been replaced with a gravel pit. However, he feels that the periphery of the prairie has been improved significantly by Scotch broom control

work performed by TNC, and that in general, the Fort Lewis prairies look healthier than he's ever seen them due to restoration efforts. While stressing that Scotch broom removal is critical for butterfly habitat in the prairies, Hardwick also stated the need for restoration efforts on this prairie to include the propagation of native nectar and host plant species.

However, while stressing the need for restoration efforts and protection of the remaining prairie on TA7S, Hardwick offered a cautionary example of how these efforts can fail to achieve their ecological goals. Preservation efforts by TNC on behalf of the State Candidate Silver-Bordered Fritillary (*Boloria selene*) at Moxie Bog on the Yakima River entailed fencing the property off to prevent cattle grazing. As a result, the growth of exotic grasses was unrestricted and the butterfly's host plant was crowded out of the area, extirpating the butterfly. Hardwick advises restorationists and preservationists to remember that "when an area is protected, it's one thing to protect it, but we have to understand how to protect it, and this takes a lot of research."

Barry Bidwell

As a volunteer for TNC and the WDNR, Barry Bidwell has been very involved in prairie restoration and butterfly surveys in the South Puget Sound region. Throughout the majority of his oral history interview, Bidwell discussed his butterfly observations on Rocky Prairie NAP and Glacial Heritage Preserve. However, some of his observations apply to Fort Lewis prairies as well. Like many others, Bidwell considered the summer of 2003 to be excessively dry and not an especially good season for butterflies. Bidwell noted that while some years produce such large populations of the exceedingly common Ochre Ringlet that the first hatching cannot be distinguished from the second, numbers were down in 2003. He also notes that Western Meadow Fritillary populations he has observed at Rocky Prairie NAP and Glacial Heritage Preserve have appeared to be constantly increasing recently, making it even more curious that the only recorded observations of this butterfly on Fort Lewis were made on Johnson Prairie in 2000. Finally, Bidwell's observation of the disappearance of Taylor's Checkerspot from Glacial Heritage Preserve since 1997 confirms that the quality of Fort Lewis prairie habitat is not the only factor in its disappearance there.

Like Hardwick, Bidwell emphasized the necessity of controlling Scotch broom to promote healthy butterfly habitat, and discussed several methods. Fire is an effective control method, and Bidwell favors burning as a mechanism that not only deters Scotch broom, but also revitalizes prairie lands by encouraging the propagation of the successional native plant community. Bidwell is not especially pleased with mowing and herbicide application as large-scale control methods, but recognizes their necessity in launching an initial assault against the shrub. He pointed out that the biocontrol weevil released on Scotch broom, *Apion fuscirostre*, is very effective in eliminating seed production once it has infested the plant. As the weevil becomes more widely distributed, its effects should become more apparent. A similar weevil released on invasive thistle, *Larinus planus*, is having a demonstrable effect on patches of Canada thistle at Glacial Heritage preserve, although the benefit to butterfly habitat from this is highly questionable.

After large-scale control activities are complete, Bidwell is a strong proponent of controlling Scotch broom through mechanical methods including hand-pulling and using a weed wrench. He offers Glacial Heritage Preserve as a successful example of how a group of

dedicated volunteers can contain the invasive shrub and maintain a large prairie site nearly free of Scotch broom. In Bidwell's experience, once the Scotch broom has been removed from prairie lands, native plants take over nicely. He professes amazement at how well prairies take to restoration with only a little assistance. Bidwell noted the positive changes at Johnson Prairie as an example of this: control efforts have significantly reduced the amount of Scotch broom growing in Puget Blue habitat there, and an area once overgrown with woody shrubs is now excellent habitat that Bidwell feels has definitely enhanced the Puget Blue's population.

Overall, Bidwell is very satisfied that prairie restoration efforts are making striking changes in the South Puget Sound region where areas that may not be considered prairie due to invasive species proliferation and forest encroachment are being transformed into productive habitat. He acknowledges that forest succession does represent the natural course of events on prairie lands, but feels that suppression of this process is desirable in the region as so much prairie land has been developed and so little is left to preserve as part of our natural heritage and to support rare prairie-dependent species.

MANAGEMENT RECOMMENDATIONS

The sources discussed in this paper provide several recommendations for butterfly-oriented prairie management that apply generally to current or potential butterfly habitat on Fort Lewis. As a matter of practicality, management activities should initially be concentrated in areas with abundant nectar and host plant species for a variety of butterflies, especially areas that contain an abundance of these plants along prairie edges (Dunn & Fleckenstein 1997). On Fort Lewis these sites include the AIA, Johnson Prairie, the Weir Prairies, 13th Division Prairie (especially TA15), and TA7S. These prairies also currently and/or historically contain abundant butterfly populations that include multiple Species of Concern. The proximity of TA6 and Marion Prairie to the AIA and their potential to aid in the recovery of Federal Candidate rare species if substantial restoration efforts are undertaken makes them a secondary priority. For TA8 and Chambers Prairie, butterfly habitat restoration efforts will be an extensive project and are best undertaken after work on other prairies increases South Puget Sound prairie restorationists' experience improving prairie lands with the goal of providing viable butterfly habitat.

Scotch broom control is essential to maintaining enough room for butterflies to live on prairies. From an Integrated Pest Management (IPM) point of view, a variety of methods should be evaluated and used in combination in order to achieve a balance of high-efficacy results with minimal environmental damage and logistical difficulty. Methods to be considered in the control of Scotch broom include mowing by tractor and weed whacker, burning, manual removal by hand and with weed wrenches, and chemical control using backpack spray, boom spray, and mechanical wiping methods with Rodeo[®] (glyphosate) or Garlon[®] (triclopyr). Though the broadcast use of herbicide in the habitat of rare species is questionable, it can be a valuable tool if used on a minimal scale and away from prime habitat areas (Char & Boersma 1995, Dunn & Fleckenstein 1997, Potter et al., and B. Bidwell and R. Hardwick, personal communications). Additionally, a study conducted by the University of Minnesota Department of Forest Resources on the federally endangered Karner Blue butterfly (*Lycaeides melissa samuelis*), found that the application of Garlon 4[®] and Accord[®] (glyphosate) separately and in combination to the

butterfly's eggs did not significantly affect the percent of larvae that formed pupae, or the percentage of pupae that produced adults. However, a drenching combination of the two herbicides did significantly lower egg hatching rates (Sucoff et al. 2001).

Tall exotic grasses are invading South Puget Sound prairies and crowding out and impeding access to low-growing nectaring and host plants. Effective control of turf grasses in a bunchgrass prairie is a challenging proposition that continues to lack an adequate solution. Douglas fir must also be restricted from invading prairie and converting them to forest, and can be controlled relatively easily through mechanical methods (Dunn & Fleckenstein 1997 and Potter et al. 1999).

Fire is critical to maintaining the successional plant communities of prairie habitats that serve as nectar and host plants for prairie-dependent butterflies. It is also an effective tool in controlling some invasive species, such as Scotch broom, and preventing encroachment by Douglas fir. Fire can burn up butterfly adults, larvae, and eggs in one fell swoop, so it is generally recommended that burn-free islands or refugia be retained within the habitat, that less than 25% of the prairie be burned, that burns be conducted in the late summer or fall when butterflies have finished flying, and that fire return intervals be greater than two years (Char & Boersma 1995, Dunn & Fleckenstein 1997, Potter et al. 1999, and B. Bidwell and R. Hardwick, personal communications).

In addition to controlling plant community succession by fire, propagation native nectar and host plants through direct seeding and transplanting is highly useful in managing prairie habitat. Transplanting rare butterfly individuals from current populations to areas from which it is possible the species has recently been extirpated should also be considered (Char & Boersma 1995, Potter et al. 1999, and R. Hardwick, personal communication).

Finally, continued monitoring of rare butterfly populations and other butterflies affected by management activities is critical to measuring the effects of intervention and maintaining rare species (Char & Boersma 1995). Even the largest areas of prairie on Fort Lewis are small and fragmented compared to their former expanse, the reduced scale of these prairie remnants and rare butterfly populations magnify the effects of activities that both damage and restore prairie habitat. Management actions need to be undertaken with these considerations in mind (Dunn & Fleckenstein 1997 and Hays et al. 2000).

CONCLUSION

This report is intended to aid Fort Lewis in making management decisions related to their stewardship of rare, prairie-dependent butterflies. Several surveys have observed these butterflies on various Fort Lewis prairies both in the past and currently.

The State Endangered and Federal Candidate species Mardon Skipper has only been found in Fort's Lewis's Artillery Impact Area (AIA). Within the past year, its known range has been expanded from the southwest corner of that prairie to include the prairie's north and southeastern corners. This butterfly requires high-quality prairie habitat characterized by high cover of its host plant, Idaho fescue, in order to sustain its population. State Candidate Species

the Puget Blue and Zerene Fritillary can sustain populations on prairies of slightly lower quality than the Mardon Skipper. The Puget Blue is currently known to inhabit Johnson and Weir Prairies, the AIA, and TA15. For unknown reasons, it is not currently found in its historic and lupine-abundant habitat on TA7S. The Zerene Fritillary is found on Johnson, Lower Weir, and South Weir prairies, as well as on TA13. A population observed on Marion Prairie in 1994 was not found during 2003 surveys.

The State and Federal Candidate Species Taylor's Checkerspot can currently be found only in the southwest corner of the AIA. Populations on Johnson Prairie and TA7S, TA14, and TA15 have not been observed since the species' numbers crashed in the late 1990s. The disappearance of this species from other prairies in the South Puget Sound region indicates that habitat quality is not the only factor to be considered when managing this species.

Aspects of high-quality prairie such as high Idaho fescue cover, abundant and diverse nectar sources, and low Scotch broom cover can be correlated with butterfly species diversity and abundance. The highest quality prairie on Fort Lewis is found on training areas that are protected from disturbance by Research Natural Area status (Johnson and Weir Prairies in the RTA and TA15's Triangle), or in the case of the AIA, by live munitions on the ground. Not coincidentally, Fort Lewis's rare butterfly species are found almost exclusively on these prairies.

Prairie restoration and management are critical to establishing and preserving productive butterfly habitat on Fort Lewis. A great deal of knowledge and experience is accruing on this topic, and TNC is in the process of developing a butterfly habitat management plan for Fort Lewis. Priority in managing Fort Lewis's prairies for butterfly habitat should be based on an area's demonstrated ability to support rare butterfly populations at present or in the past, and the extent to which a prairie already provides butterfly host plants and nectar sources. Thus, the AIA, Johnson Prairie, the Weir Prairies, and 13th Division Prairie (particularly TA15) should be top priorities for restoration efforts. TA7S is a site with excellent butterfly habitat and a perplexing dearth of butterflies, and should be given special consideration as the prairie on which minimal restoration efforts may result in maximum potential benefit. TA6 and Marion Prairie should be considered secondary priorities for restoration due to their proximity to the AIA and the possibility that they can be used to assist in the recovery of rare species found there. Finally, TA8 and Chambers Prairie should be considered the lowest priority for habitat restoration as they will require by far the most rehabilitation in order to support robust butterfly populations.

Active management is necessary to maintain populations of the rare prairie-dependent butterflies that inhabit Fort Lewis. Successful management will entail use of available knowledge on butterfly distributions, habitat preferences, and life history characteristics; research on site- and butterfly-specific habitat considerations; restoration work; and surveying of butterfly populations to monitor their response.

REFERENCES

- Anonymous (April 2003). Fort Lewis Sustainability Annual Report. Department of the Army: Fort Lewis, Washington.
- Char, P. and Boersma, P.D. (1995). The effects of prairie fragmentation on butterfly species in western Washington. Final report submitted to The Nature Conservancy, Washington Field Office, and The U.S. Army, Fort Lewis, Washington. University of Washington: Seattle, WA.
- Crawford, R.C. & Hall, H. (1997). Changes in the South Puget prairie landscape. In: Ecology and Conservation of the South Puget Sound Prairie Landscape (eds P. Dunn and K. Ewing), pp. 11-16. The Nature Conservancy: Seattle, WA.
- Crew, Oliver (November 1996). Summary Report of Nature Conservancy Butterfly Surveys on Fort Lewis Military Reservation, WA., May – Aug, 1996. The Nature Conservancy: Olympia, WA.
- Dunn, P. & Fleckenstein, J. (1997). Butterflies of the South Puget Sound prairie landscape. In: Ecology and Conservation of the South Puget Sound Prairie Landscape (eds P. Dunn and K. Ewing), pp. 11-16. The Nature Conservancy: Seattle, WA.
- Gilbert, R. (1999). Summary Report of LCTA Butterfly Surveys Conducted on Fort Lewis, WA. Land Condition Trend Analysis Program: Fort Lewis, WA.
- Hays, D.W., Potter, A.E., Thompson, C.W., & Dunn, P.V. (November 2000). Critical habitat components for four rare South Puget Sound butterflies. Washington Department of Fish and Wildlife and The Nature Conservancy: Olympia, WA.
- Morgenweck, M. & Dunn, P. (2003). Fort Lewis Butterfly Survey. The Nature Conservancy: Olympia, WA.
- Potter, A., Fleckenstein, J., & Richardson, S. (1999). Draft Washington State Status Report for the Mardon Skipper. Washington State Departments of Fish & Wildlife and Natural Resources: Olympia, WA.
- Pyle, R.M. (2002). The Butterflies of Cascadia. Seattle Audubon Society: Seattle, WA.
- Sucoff, E., Nichols, T. & Lu, E.Y. (2001) Herbicide effects on host plants of Karner Blue butterfly and on butterfly development from egg to adult. Department of Forest Resources Staff Paper Series Number 151. University of Minnesota College of Natural Resources: St. Paul, Minnesota. Available at: <http://www.cnr.umn.edu/FR/publications/staffpapers/Staffpaper151.PDF>
- Ressa, E. (2002). Field Report for the LCTA Butterfly Surveys On Fort Lewis, WA 2002. Land Condition Trend Analysis Program: Fort Lewis, WA.
- TNC (September 1995). Fort Lewis Prairie Restoration Project 6th Quarterly Report. The Nature Conservancy (TNC): Olympia, WA
- WDFW (2003). Species of concern in Washington State. Washington State Department of Fish & Wildlife (WDFW): Olympia, WA. Available at: <http://www.wa.gov/wdfw/wlm/diversty/soc/soc.htm>

PERSONAL COMMUNICATIONS

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Lepidopterist
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Robert E. Hardwick
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Appendix A

Table A1. List of all butterflies observed on Fort Lewis, 1960 to present.....A1

Table A2. All butterflies observed on Fort Lewis by Prairie, 1960 to present.....A2

Table A1. List of all Butterflies observed on Fort Lewis, 1960 to present¹.

Common Name	Latin Name
Anise Swallowtail	<i>Papilio zelicaon</i>
Arctic Skipper	<i>Carterocephalus palaemon</i>
Brown Elfin	<i>Incisalia augustinus</i>
Cabbage White	<i>Pieris rapae</i>
Clodius Parnassian	<i>Parnassius clodius</i>
Common Branded Skipper	<i>Hesperia comma oregonia</i>
Common Wood Nymph	<i>Cercyonis pegala</i>
Clouded Sulphur	<i>Colias philodice</i>
Dun Skipper	<i>Euphyes vestries</i>
Gray Hairstreak	<i>Strymon melinus</i>
Great Spangled Fritillary	<i>Speyeria cybele</i>
Hoary (Obscure) Elfin	<i>Incisalia polia</i>
Juba Skipper	<i>Hesperia juba</i>
Lorquin's Admiral	<i>Limenitis lorquini</i>
Mardon Skipper	<i>Polites mardon</i>
Margined White	<i>Pieris marginalis</i>
Milbert's Tortiseshell	<i>Nymphalis milberti</i>
Mylitta Crescent	<i>Phyciodes mylitta</i>
Ochre Ringlet	<i>Coenonympha tulia</i>
Orange Sulphur	<i>Colias eurytheme</i>
Painted Lady	<i>Vanessa cardui</i>
Pale Tiger Swallowtail	<i>Papilio eurymedon</i>
Pine White	<i>Neophasia menapia</i>
Puget Blue	<i>Icaria icarioides blackmorei</i>
Purplish Copper	<i>Lycaena helloides</i>
Red Admiral (Admirable)	<i>Vanessa atalanta</i>
Sara's Orange Tip	<i>Anthocharis sara</i>
Satyr Angelwing (Comma)	<i>Polygonia satyrus</i>
Silver-spotted Skipper	<i>Epargyreus clarus californicus</i>
Silvery Blue	<i>Glaucopsyche lygdamus</i>
Sonora Skipper	<i>Polites Sonora</i>
Spring Azure	<i>Celastrina argiolus</i>
Taylor's Checkerspot	<i>Euphydryas editha taylori</i>
Two-Banded Checkered Skipper	<i>Pyrgus ruralis</i>
West Coast Lady	<i>Vanessa annabella</i>
Western Meadow Fritillary	<i>Boloria epihore chermocki</i>
Western Tailed Blue	<i>Everes amyntula</i>
Western Tiger Swallowtail	<i>Papilio rutulus</i>
Western White	<i>Pontia occidentalis</i>
Woodland Skipper	<i>Ochlodes sylvanoides</i>
Zerene Fritillary	<i>Speyeria zerene</i>

¹Compiled from Char & Boersma 1995, Crew 1996, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, TNC 1995, and the WDFW's Hinchcliff Records.

[illegible]

Table 2 continued

[illegible]

Table 2 continued

[illegible]

¹Compiled from Char & Boersma 1995, Crew 1996, Gilbert 1999, Morgenweck & Dunn 2003, Ressa 2002, TNC 1995, and the WDFW's Hinchcliff Records.

APPENDIX B

Oral history interview of Robert E. Hardwick

August 26, 2003

Robert E. Hardwick interviewed by intern Maija Morgenweck

Approximately 11 a.m. at South Weir Prairie

Maija: So we wanted to start out with some background as far as what prairies you spent time on in the past and when and why you were hanging out there.

Bob: Yeah, well I've been an avid butterflyer my whole life and when I moved to the Spanaway area in 1973 I started just searching local areas where I could find butterflies. And one of the places I stumbled upon was T7, which is Fort Lewis prairie right adjacent to McChord. Yeah, so that became a little kind of home that often I would visit. I did spend some time down by the powerlines, and at several other spots, but never the consistency that I did T7.

Maija: Where's the powerlines?

Bob: That's the one off of, let's see what is that road going down, the one where the powerlines were, the Triangle.

Maija: Oh, okay, yeah.

Bob: Down by the Triangle, in that area.

Maija: Training area 15?

Bob: Only on the, the actually the south Muck Creek, or is it the, yeah the Muck Creek prairie. I did spend some time in there but I never spent a lot of time to really get to know it. Most of my work as far as observations are concerned were with T7.

Maija: The next question would be what, specifically what butterflies you observed, um, probably can go through these one by one if you like, with what frequency and how they were distributed on the prairie, whether they were hanging out around the edge, or...

Bob: Yeah, first of all, I didn't know what to expect at first because the prairies were unique to me, it's a first, my first experience basically with the Puget prairies was T7. And so I really didn't know what to expect. I had an idea of what might be there, but I wasn't sure, and when I saw balsamroot, and some of these real interesting plants I just got really excited, it was just fun to walk through it and see the plant life, as well as the butterflies, and the birds, and all the other types of wildlife. But I was not initially really seeking anything, I was just trying to see what is there. It was basically, a survey: what does fly here? What lives here? So that was the first thing.

Maija: And what'd you find?

Bob: Well, there were stands of kinnikinnick, and I saw the Hoary Elfin there, and the kinnikinnick was along the sides of the road at that time, that was before the Scotch Broom had grown up on the very edge, that would be the, I guess eastern edge of that prairie, T7, there was some large patches of kinnikinnick, and so the Hoary Elfin was there, it was the first butterfly I saw.

And then of course there were a number in the lupine, which was very abundant, I saw Silvery blues, and Puget Blues, and of course Silvery Blues came out earlier, they were April, and then as May and June rolled around we, I would see more of the Puget Blues.

And then also Taylor's Checkerspots were there, which I found very interesting because that butterfly I was not very familiar with, and I found it was nectaring very heavily on the balsamroot that was also abundant in that prairie.

And then there was also other Blues, particularly the Spring Azure, which I found more towards the edges of the forest because it truly really isn't a prairie butterfly.

And the Anise Swallowtail, which was very common in that prairie, and I saw them on the lomatium, they were nectaring on the lomatium, they were laying eggs on the lomatium, and I ran across many, many in larvae form, larval stages on the lomatium, as late as mid-June.

So it was quite a common, so it was always just a fun experience to, on a nice sunny day, I usually did it like on a Sunday afternoon, just stroll through prairie. Many other people were there with their horses and their dogs, so it was a very common place to be for many people, at that time Fort Lewis was wide open. People could go basically anywhere they wanted anytime. And, so it was kind of just a really fun outing for me, to see butterflies so close, and in such numbers, and the prairies being so beautiful.

Maija: What were the most spectacular displays you observed in terms of numbers of butterflies and numbers of species?

Bob: I think the most abundant butterflies I saw were the, uh and it was sporadic, it depended on the year. When I first came out there, the first few times, there were butterflies, but they weren't in great numbers, but the Scotch Broom was quite abundant, and it was quite scattered throughout.

Then one year, I think it was 1979, I'm not sure, I'm not positive of the year, but I think it's 1979, they had burned the prairie, that area, and I came out and I was very discouraged because I didn't, at that point I didn't understand the power of burning prairies and how beneficial it could be. I thought it was very destructive, I was very disturbed about it, because they'd literally burned the prairie, but, and there were no butterflies whatsoever, so I thought, well this area's lost to me.

I came back the next year just out of a whim, I don't even know why. And that's when I saw the most abundance of all the butterflies, that one year in 1980, and that's when I had even collected specimens, the Puget Blue at that time. But they were extremely abundant because what it had done is killed all the Scotch Broom and all of the herbs had just come up in large numbers, and so the prairie was just, just absolutely beautiful with wildflowers. Especially lupine and balsamroot, and lomatium, and all kinds of other plants. So it was really spectacular. And I could not believe how there could be such a rapid improvement. And the butterfly populations correspondingly were also very high at that time, probably the highest of any other time that I had seen them.

And so it was different, each year was different, some years they were abundant, some years they were not abundant. But they were consistent, you'd see the same butterflies every year.

Maija: Did the entire prairie burn in that burn, was it really thorough? Or was there patches left?

Bob: Basically, the area that was burned was centered around where the, now where the gravel pit is.

Maija: Okay.

Bob: That area was burned. The front part of the prairie was not burned, that is the front part meaning towards the road, before you get to the first parallel of railroad track that crosses the prairie. That area was not burned, so the Scotch Broom was very abundant there, and butterflies were not common. Where the Scotch Broom was, the butterflies, the numbers would diminish very rapidly. But beyond that they had burned that area, I believe because the infantry was doing a lot of training in there. I know at that particular time, they had foxholes dug in there, and I could see that the military had been using that area for training. I mean, it was very visible. And so they probably, because of that, probably wanted to clear the Scotch Broom for their own work there. But it worked beautifully for the butterflies at that particular time.

Maija: What I'm specifically wondering is if there were areas where the host plants were preserved for the butterflies populations to come out of because they generally look at burning a third of the prairie at a time as ideal.

Bob: Yes, and I agree with you, I think that's the way it should be done, and I think they burned probably, I don't know, it's hard for me to estimate acres, but I would say probably they burned maybe, maybe a fourth of that prairie land. The main part they burned was the flat part, down below, where they were doing their training. Now, all of these food plants, also existed up in the tree line around the prairie, and so I'm pretty certain that the breeding stock could reestablish from those areas, in other words, there was enough adults that would survive that could come back down and reestablish themselves in the lower area, so I think that's why it was successful, because it was restricted.

Maija: The next question is did you notice changes or have you noticed changes in the distributions of butterflies that you previously observed on TA7?

Bob: Oh, yes. Dramatically, in fact it's very disturbing. I moved out of Spanaway in 1989, so actually I did not come back to this prairie until Pat Dunn had contacted me about my records and the work I've done in the prairies, and wanted me to get out with him and show me T7, show me the areas that I had looked at. And I was absolutely discouraged. For number one, was the prime area, the very prime area of T7 where I found most of the butterflies consistently year after year, was now one huge gravel pit. So they had actually destroyed the entire part of the prairie that I thought was the most productive of all. The number one part of the prairie. That was very disturbing to me.

And then in the follow-up, of course, this year that we've had with the National Butterfly Association volunteers, here I was expecting to see, see butterflies I had saw of old. And, not true.

We did find a few Anise Swallowtails, but not the numbers that we used to see. Surveying larvae one day in June where they used to be very abundant, I found one larvae looking at lomatium through the entire T7 area. I spent 2 hours going from one lomatium plant to another, studying them all just to see how the reproductive rate is going with the Anise Swallowtail. I found one larvae the entire time. That was disturbing because in that same amount of time in the eighties, in the seventies or eighties I would have seen maybe 700. So that was disturbing.

Secondly we did not see any Taylor's Checkerspots at all. And admittedly, they weren't always abundant every year. They must have a cycle to them that we don't understand, because some years they were very common and some years they were not. But they were not there at all, we didn't see any. So they have totally disappeared, at least in this particular year we did not see any.

Puget Blues, the lupine today is more prolific than it ever has been, than I've ever seen. There's more lupine there now than ever. There's no Puget Blues. Why? I don't know. They are gone from that prairie and we were there during prime time, we know we hit their flight period perfectly, and there was not a single one. However, the Silvery Blue is as abundant now as it was in the seventies and eighties. That has, I see no change there whatsoever.

And other butterflies are ones that kind of pass through. We never did see a lot of fritillaries, in that prairie. The surrounding area in the woodsy parts of it were lots of Great Spangled. Never saw any Zerene fritillaries in there. But Great Spangled were common around the outside of the prairie, sort of the perimeters of the prairie. But other butterflies would fly through, such as Tiger Swallowtails, etc., but they are not really what we call indigenous species to the prairie, so I don't think we're really concerned about that right here. But you would see other butterflies coming through.

Maija: We kind of covered this, but do you have anything more to say on the nectar and host plants that you observed different butterflies using?

Bob: Yes well, the lomatium, the tall lomatium is the food plant for the Anise Swallowtail, I have documented that, I've watched them lay eggs on it and I have reared larvae on it myself personally, and I've collected larvae on it, so that's well-established that the Anise does use that. It probably uses alternate plants as well, out of the prairie area, but at least in that prairie area we know that that is the dominating food plant.

We also know with the Puget Blue and Silvery Blue both feed on the lupine that grows abundantly in there, that is also just a fact, it's been proven by others, not just ourselves. So that is a very important food source.

Now as far as the Taylor's Checkerspot is concerned, I don't have any verification, I've never reared them there, I don't know exactly what they're feeding on. We assume it's on the Castilleja, or it could possibly be other food plants such as the plantain, but that's conjecture right now until we find larvae on it growing, or we develop larvae on them from adults, then we can verify that, but we strongly suspect that's probably what their food plants are there as well.

And so those are the primary butterflies, I think, that we're kind of really concerned about on the prairie. The other butterflies that we would see, well of course the kinnikinnick and the Hoary Elfin, don't forget that as well, that butterfly isn't necessarily a prairie butterfly, you can find that on roadsides in the South Puget Sound area in many places, so that's not a butterfly that is specially just in the prairies.

The other butterflies that come through of course are probably using food plants that are not even in the prairies, so they are just using it as a corridor for travel.

Maija: Have you noticed, over time, any changes in behavior of any specific prairie butterflies, for example incorporating exotic species into their diet (such as the Checkerspot with *Plantago lanceolata*), or any shifts in flight times?

Bob: You know, I haven't seen a single Taylor's Checkerspot in the prairie since 1980. Or since the eighties. Actually, let's see, yeah, it would be about in the mid-eighties I should say. So, I can't answer that question because I haven't seen any in there. I have not see the Taylor's Checkerspot in any of our survey work that we did this year in any of the prairies. So, that question can't be answered. However, last year, if you go up into the Bald Hills, and we did see Taylor's Checkerspots up there in one area, and we found Castilleja was there, not extremely abundant, so I think there's still a big question as to what this butterfly is really picking as a food plant, and a lot more work needs to be done with it. It's a good thesis for somebody to work on, as far as the life cycle of the Taylor's Checkerspot in the Puget Sound area.

Maija: That's be Dan, he's working on that to a certain extent. How would you characterize the habitat provided by the prairies that you observed butterflies on in the past in terms of

nectar sources, host plants, weeds, presence of predators, hydrology, so kind of what kind of habitat was it and why?

Bob: Okay, like comparing the past to today? You want that? Well, obviously The Nature Conservancy's is doing an outstanding job. I, we're all impressed, all the WBA workers that I've talked to that have been with me on these field trips throughout the spring and summer have been dually impressed about the work that's being done. They are doing the right thing. The Scotch Broom has to be removed. And they are doing it, and I think the prairies probably look healthier now than they've ever looked.

Not that the work is completed, I think there's still a lot of work to be done, as far as introducing other prairie plants that were originally there. I think this will enhance the butterfly populations, as well as probably birds and any other type of wildlife. So I think that right now they're working on the right path, I think they're making progress, and we're impressed, and I hope that the work can continue to preserve these prairies.

Maija: When you say plants that were there and aren't anymore, do you have any examples?

Bob: Well, y'know castilleja never was abundant in T7, I think, and it's not abundant there now. But that doesn't mean that it should not be promoted. The balsamroot is probably lesser now than it was in the seventies and eighties that I can recall. The lupine is more abundant now, by far, than it ever was. And so that is a really good sign. Lomatium is also more abundant now than it ever was as well. So, it looks like, as far as the plants go, the prairies are going in the right direction in most cases.

But, the question is, are the butterflies also going to develop accordingly. Are we going to see populations improve as a result of this, and only time will tell that. But I do strongly also believe in reintroduction of species. That should be done. The species that were there, I'm not talking about putting species where they weren't. Species that were originally there that are not there now I think should be reintroduced to the area. And especially T7 and the Puget Blue. I believe the Puget Blue should definitely be reintroduced. With the lupine the way it is now, they should flourish there. They should do very, very well there. And there are not any there now. The Silvery Blues are doing fine, but we need Puget Blues there.

Maija: Have you observed prairie butterflies using topographically diverse areas in the past, like the swales in Johnson Prairie are pretty darn popular, it seems, with the butterflies?

Bob: I think a lot of it has to do, with the topography, it has to do with the amount of moisture. Where the moisture seems to be, let's say stay longer, and also be more abundant in the soil, generally I think your butterfly populations will benefit from that because the plants are going to stay green longer, more flowering plants are going to be there. The problem with the prairies is, one of the problems is, is the soil. The soils are very rocky, they don't hold very well, so they have a tendency to really dry out. And in some years, drought years like this one here, they can be severely, I think, damaged because of the fact there's just not enough water on them. But I think that I have seen that in some cases

where it's more shady or where you have a higher area, the water might be accumulated more, might stay longer, therefore the plants do better, and therefore the butterflies are going to be more common. It seems to be kind of consistent that way.

Maija: Have you observed prairie butterflies using edge habitat, and if so, what was the vegetative composition of the edge, whether it was oak over the prairie or shrubs or Scotch Broom going into Doug Fir, and what do you think the importance of edge habitat is?

Bob: Oh, let's start with the last part first. I think that edge habitat is absolutely essential. Simply because, on our excursion today as we speak, we are looking for fritillaries, and I think fritillaries do enjoy an ecotone system where you have a forest interfacing with a prairie. I think you're more likely to see fritillaries, especially the Zerene, which is the one that we're very concerned about in Puget Sound, I think you're going to find them more in an edge habitat, that is an ecotone system, than you are in the very middle of the prairie. Especially where there are thistles growing, which is by far their favorite, sought-after nectar source. So if you have a combination of their food plant and their nectar source, which you will find in an ecotone area of forest and prairie, this is probably where they will actually flourish the most, and that's where we expect to see them. Now, the other part of the question, related to, let's see what was that that you...

Maija: Have you observed prairie butterflies using edge habitat and if so, what was the composition, or what kind of edge was it?

Bob: Yeah, okay, now I think we've mention that for fritillaries, yeah, the fritillaries, we've already discussed that. Now if you get into the Puget Blue and the Taylor's Checkerspot, I don't think it's that important. They seem to be very abundant right in the very center of the prairie as long as there is green food plant there, and nectar sources, y'know, they're going to be there. They're in the open. And so I don't think that is essential to them. So if you want a good mix of butterflies, then I think the edge habitat is very important, but again it depends what species you're directing your attention towards. As far as the blues are concerned, and the Taylor's Checkerspot, I think they could probably exist very well without an edge. However, once again, the food plant and the nectar sources may actually be maintained longer along an edge than they would be in the very middle of the prairie, so in that sense you might actually enhance their, their being there. But I don't think they're dependent upon the edge for their survival.

Maija: To what extent were trees and shrubs like Douglas fir and snowberry inhabiting the prairie in the past, and have you noticed a shrinking effect?

Bob: T7 is very interesting because parts of it are much better now than they were in the seventies and eighties. Particularly the part The Conservancy has been working on near the road up to the first parallel railroad track. That area now has been cleared of Scotch Broom and it looks like in a few years that's going to be a very nice area, which should be very productive for various species.

But, the disturbing part is the historically sound, I suppose the prime spot of the prairie which is now a huge, huge gravel pit that has grown three times the size in 2 years. And I feel sad because that was the actual best part, the number one part of the prairie, which of course is now destroyed.

However, beyond that, there are some prairie areas that are actually better now than they were then, so there is some compensation. Whether it's a one-to-one trade off, I wouldn't say that, but I would say that there is some areas there that are gained, have been gained, that are better, and then there's a lot of areas that are worse, so it's hard to get kind of a score to say how we can rank that, but I would say there is concern there with that gravel pit, hopefully that it doesn't expand, that it's as far as, as big as it's going to be now.

Maija: So you'd say the shrinking has been occurring from the inside?

Bob: Yeah, the prime area has been lost.

Maija: Have you observed a change in butterfly behavior in terms of habitat use over time, whether there was more use of the open prairie in the past, whether there's more use of edge habitat now, or is that kind of divided by species, and not a...

Bob: Yeah, I, once again I think it's pretty species specific. The blues I don't think are basically any more abundant near the edge than they are in the prairie. As long as their food plant is there, and as long as there's enough moisture, they're going to do fine. Once again we mentioned this, we're kind of repeating ourselves, but the fritillaries do need the edge habitat, and I think they're going to do much better if you have that type of habitat. So, I think that's a very species-related question, and I don't think there has been, I haven't see any change of any butterfly behavior that one preferring one over the other or changing from one over to the other since I've been observing butterflies on the prairies.

Maija: We have 2 more butterfly questions, and the second one, I think, is the best one, or the most important one to me. But, the first one is, throughout the state in the past, from whatever knowledge you may have of that, what were the butterfly hotspots?

Bob: Throughout the whole state?

Maija: Yeah, we're trying to get an idea of what they were say, 20 or 30 years ago, and what they are now. And what they are now also comes with, "How do I get to them?"

Bob: Now by hotspot, you mean endangered area?

Maija: No, I mean popular with butterflies.

Bob: I would say the whole western part of the state is very unpopular for butterflies. Simply we don't have that many species that fly here. Eighty percent of the butterflies that fly regularly in the state of Washington are found in the eastern part of it, on the eastern side

of the Cascades. And that's due to a number of reasons. First of all more sun, more varied habitat, less population, so the habitat has not been disturbed or destroyed like it has in the west part.

So, I would say as far as the western part of the state is concerned, probably your best butterfly habitats are going to be further south towards Skamania, Clark, Cowlitz, Lewis County, where it's still relatively unsettled. There's less population, and also you have some pretty prime habitat. So I think the hotspots for studying butterflies in Washington would be in southwestern Washington.

The worst area would be in the Puget Sound area, where we have our greatest population and density. So this is actually the worst, Seattle is one of the worst place in the entire state to study butterflies.

Maija: And over time though, are the hotspots still the same, or...

Bob: I think it's gotten worse, I think it's directly related, and of course this is just an opinion, I don't have any scientific data to back this up, but I feel that it's directly related to man and his encroachment on the environment. I think the more natural areas we have the more butterflies are common, and once we establish our own roads and shopping centers and schools, which we all of course need, but when we do that of course, the ones that are taking the brunt of this are going to be the wild species including butterflies as well as other wildlife, not just butterflies but all wildlife takes a back seat to that and, and that's happened.

I know growing up in Bellingham, there used to be a lot of butterflies that would fly even be in close to the downtown area because even when it was in the fifties when I grew up, it was basically not very populated, but now you go back to the same areas and a lot of the butterfly areas that I saw in the fifties are now housing developments. And they were really nice spots too, to find many different species. So, this is just one of the sad things about man's population and encroachment on the environment is that as we develop, we push species out, it's just a fact. And I don't know if there's much we can do about it, except that we do need to maintain the wild areas we do have, we need to maintain them and make sure that they stay protected for all of us forever.

Maija: What about that the one place on the eastside near Ellensburg that you were telling me about, the creek where...

Bob: Racer Creek?

Maija: Yeah.

Bob: Oh, now when you talk about eastern Washington, there are many I could give you, I could go for hours telling you places to go there, because eastern Washington has many, not just one hotspot but many hotspots where there are many species of butterflies that fly throughout the spring into the fall. The Racer Creek area has been very popular for

Washington Butterfly Association field trips, we know it well, it has been well surveyed, we know what butterflies to expect there, and we can get as many as, probably during a year, maybe as many as 120 different species in that area. And the nice thing about it is it starts out at basically the Ellensburg area which is farmland and very lowland areas, steppe-sage area, and as you go up the creek valley you go all the way up into the Table Mountain area which is almost montane. So you get different species at different elevations at different times of the year. So it's an excellent area to study.

But, we have so many areas in eastern Washington that at the butterflies are prolific, for example up in Oroville, around Mount Hull area is just a wonderful butterfly area around the entire mountain. And you go over to northeastern Washington to Meddling Falls, Tiger Meadows and some of the areas by Meddling falls up in the hills there are just abundant with butterflies.

So, we can just go on and on, when we get into eastern Washington that's when we really see butterflies, and our association, most of our field trips, I would say probably 9 out of 10 of them are taken in eastern Washington because of that fact.

Maija: Have you noticed changes in the typical colors of the prairie, for example I often hear comments on the redness in areas that have been invaded by *Agrostis*.

Bob: No, I do know, I am aware of the fact that there has been a lot of invasive, exotic grasses, that may or may not do damage to the environment, that's to be seen. But a lot of people claim it does, but that is out of my field of expertise, I don't know, have any knowledge of that. But I would say other than the change in grasses is the Scotch Broom. The Scotch Broom has been to me the most discouraging thing I've seen, not only in South Puget Sound but everywhere in Western Washington. The Scotch Broom is literally taking over every open space, and where it grows, eventually nothing else will. It's as bad as ivy. Ivy and Scotch Broom are two of the plagues of the state of Washington as far as invasive exotic plants.

Maija: Have you noticed a change in the distribution or density of *Festuca* grasses growing out on TA7?

Bob: Y'know, I'm not a specialist in grasses. I'm aware of the difference, I mean I know there are differences and I do observe them, but I'm not a student of grass taxonomy, and so I haven't really observed the changes that have taken place. And once again, as far as the butterfly populations are concerned, I am not really certain, cause I don't have any research on this, to what effect that is having on them. It might have on other plants, and therefore may be in the long run may be a problem, but as far as the grasses are concerned themselves, I'm not sure because we don't know whether or not, especially skippers, skippers are grass feeders and so are the, a group of the nymphalids that we call the satyrids, such as the Wood Nymphs. The Wood Nymphs are grass feeders as well, and the question is are they adapting? Do the skippers and the Wood Nymphs, do they adapt to any type of grass that grows there? That question still has to be worked out. I don't know whether that is common knowledge. We know there are specific grasses they

prefer, and we find them on certain grasses, but in the lab we've been able to rear these on basically any type of grass we've given them, and so we just don't know what the long term effects. They may be adaptive enough that exotic grasses will be fine as far as their food sources are concerned. But you know, only more research and time will tell. There.

Maija: Have you noticed an increase/decrease/changes in the distribution of nectar plants such as lupine, paintbrush, lomatium, camas, showy fleabane, thistle etc.

Bob: You're naming another beautiful species that we'd like to see more abundant. I think the biggest problem is the numbers of all of them. I would like to see more of them. I'd like to see the prairies more in full color of more numbers of each of these species that you have mentioned. And I don't, and we're a little concerned about it. I know a number of us on field trips would say, gee, you know there's not very many different kinds of nectaring food sources that we would find on any of the prairies, the prairies that even have been transformed, the Scotch Broom's is not there, there's lots of grasses there, but there's not the abundance of the nectar sources that we would like to see. I don't think we've arrived yet at where it was, or where we'd like it to be. I think eventually we'd like to see it very rich in wildflowers of many different species, the more species the better. But I don't think we've seen that yet, and whether that will happen, I don't know. It might have something to do with the type of soils. That I'm not an expert on.

Maija: You mean more so than in the past?

Bob: You know, I remember most of the prairies have never been really prolific in a lot of wildflowers. They've been mostly grasses. And, so, but I don't think that that has to be that way. I think that it would be more conducive if the prairies had more of the actual flowering plants in them. I think that would be a positive change. But I don't think that it's basically historically, that, of course I'm only going back into the seventies and eighties, but I don't think that the prairies have ever had an overabundance of wildflowers.

Maija: Some of the plants I previously mentioned are patchy in distribution now throughout other prairies, obviously the lupine on 7 is not patchy, but have you observed a change in distribution?

Bob: Yes, like I mentioned, in T7, the lomatium today is probably more abundant than it ever been, and same with the lupine. But the balsamroot population has decreased. And the Scotch Broom has decreased because of the Conservancy's hard work. And also the Fort in burning the area. So there have been shifts in populations of plants, that's been pretty evident. I'm not familiar enough on a long-term basis with the other prairies, so I can't tell you what's happened there, although I know that a couple prairies that I visited this year that I hadn't seen for many, many years, I thought that they were positive, the changes. But still, not enough wildflowers. The Scotch Broom is gone, there's lots of grasses, but I still believe that, I'd rather see a lot more flowering plants than are existing in there right now, presently.

Maija: Have you noticed any noticeable changes in forbs that aren't considered potential butterfly nectar plants, like yarrow...

Bob: No, I haven't, because mainly once again, they aren't abundant to begin with. And those plants, I think, would be a good nectar source. Yarrow is a good nectar source. And pearly everlasting, and some of these other plants, even hairy cats ear, as we've talked about before, is a good nectar source even though it's a common weed to most people. So, I haven't seen an abundance of anything that I would call disturbing, like gee, there's too much of this wildflower or not, I think basically there's not enough wildflowers period. Of any kind. And certainly not to be a problem.

Maija: What were the common prairie weeds when you were first observing butterflies?

Bob: You know, I don't see much change in the weeds at all. There was hairy cat's ear, it's there now and was there then, I don't see much change in that. There's, let see, what are some of these other plants that I did see, having a hard time giving you the names of all them now, but I would say some plants have shifted, that is, they're more abundant now, and some have decreased in numbers, and I'd have to kind of think longer on that and get a list to tell you which ones those are, but...

Maija: I have a little list.

Bob: You have a little list? Can you give me your list and I'll go over it.

Maija: Scotch Broom.

Bob: The Scotch Broom, because of the Conservancy, has been reduced drastically, which is wonderful.

Maija: Ox-eye.

Bob: Ox-eye daisies, I have never seen a lot of them in the prairie itself, ever, ever, on the sides of the road, yes, but not in the prairies.

Maija: Well, you should see it over on Johnson, I've noticed a lot of it myself in general, but we're working on different prairies.

Bob: It's a good nectar source.

Maija: St. John's Wort.

Bob: St. John's Wort has never been abundant, I've seen it along, generally along the roads or paths on the prairies. But I rarely have seen it, like, in the middle of the prairie, I think there's patches, but I don't think it's ever been an abundant plant, now or in the past.

Maija: Tansy.

Bob: Tansy, usually it's going to be a fringe plant. I notice it most along the where edge of the woods are for tansy, or patches of it within the woods, in clearings. I haven't paid much attention to it out on the prairie itself, although we have seen some Cinnabar Moths out in T7, we saw some, I don't know if you knew that, or...

Maija: Yeah.

Bob: If you were with us. So we know that the tansy of course has to be close by because that's what it feeds on, but I don't think it's really a problem here. I know a lot of farmers are concerned about it in their pastures, but I haven't seen a large amount of it here.

Maija: Blackberry.

Bob: I haven't seen that in the prairies at all, I haven't witnessed any blackberries, well, I'm sorry, I take that back. T7 has one little bank where the blackberries are located that I did see them in there, but that hasn't been a real problem. And you know it should be, because that plant spreads and grows just as fast as Scotch Broom, so it's amazing that it hasn't been more abundant in the prairies. I think maybe because of the dry soils.

Maija: Do you have any fire-related observations about the South Puget Sound prairies?

Bob: Yeah, I've changed my mind totally on fires, when I first saw that fire in T7 in 1979, or the late seventies, I was very discouraged, I thought that was the wrong way to do something. But it has proven to me to be the right way to do things. I believe in burns, as long as the burns are very restricted, that you do not burn an entire prairie at a time. Ideally checkerboarded into like, quarters or thirds, burn the third so that any species that are killed in that particular area can be repopulated by the areas that were not burned. And if you rotate that around in a certain number of years, I think that this is a very, very good way to promote these prairies. Now obviously, that's what the Indians did, when the Indians promoted the camas bulb, which was a very important trading item for them, this is what they would do, they would burn the prairies. Of course they weren't concerned about butterflies, or birds, or anything else, so I imagine they would burn extensive parts of the prairies. And, but I think that if you burn it in the correct way, very controlled, I think it can be extremely valuable to maintaining the prairies.

Maija: Do you recall any bird observations...

Bob: I'm not an ornithologist, but I have noticed, and I know a number of members of our group are part of the Audubon, and they are very good bird watchers, so it's always entertaining to bring a lot of people with us that are ornithologists because they give me that dimension that I don't have, and they're always pointing out birds. And I think that I've seen a large population and a diverse population in the prairies, and some birds I have seen no where else. And they pointed that out that some of them are quite rare, and even some of the birders were quite amazed at some of the things they were seeing in the

prairies that they don't normally see in Western Washington. So I would say that, were not dealing with, most of the topic we're dealing with is butterflies here—I think that it's more reaching than that, I think we're talking about preserving not just the butterfly area, but an entire ecosystem for many species of animals and plants to thrive, so whatever we're doing isn't just for butterflies it's really for many forms of wildlife.

Maija: Do you have any specific memories of different birds on the prairies?

Bob: Well, I saw some of the swifts, we had, there was some boxes on T7, and there were a type of swallow, I can't exactly remember the type, they named it now, but they said that that's a swallow we just don't normally see in Puget Sound. I mean, I've never seen it before, and it was actually nesting in the boxes there. There are a number of songbirds that were mentioned to me, I can't recall their names right now for you and list them out, but I'd notice as we'd walk along somebody would spot one out, and I had never noticed that bird, or to my knowledge had seen that bird before. So yeah, there was a lot of new things.

The raptors, practically every time we'd go out we'd see hawks of various types, especially Red-Tail Hawk, that would be around which are very interesting in the prairies. So I would say that the bird population diversity is great, course I don't have any expertise on the historical implications of how the prairies have changed as far as the bird population goes. That's someone else's area, but I was impressed by the number of species of birds that do use the prairies.

Maija: Do you have any other fauna observations, like toads, snakes, alligator lizards, deer, or coyote?

Bob: We saw scat of many different kinds of predator animals. Probably coyotes, I'm not sure, none of us were really sure, but we were suspecting that they were coyotes. We also saw bear tracks at T7, definitely they were bear tracks, black bear tracks, so we know that the bear have been there. When I lived in Spanaway we used to hear the coyotes scream in the summertime, cause we lived real close to the prairie, and we could listen to them, so we know that there were populations. I did not see any fox or any evidence of them, they may be here, Red Fox could be here, we didn't see any other mammals, rabbits, whatever. We saw some evidence of moles, or some type of ground squirrel by the mounds in the prairies indicating they are there.

I don't remember any reptiles, oh I think we did see one snake, I think it was the first time with you I think we saw a garter snake. But not an abundance of reptiles at all. And, other kinds of insects, of course bees of various kinds and moths, many different species of moths that we didn't really work with but were out here. Also various other kinds of bugs, true bugs, a couple sheep moths, they're quite common here earlier in the year.

Maija: Have you noticed any change over time in any of the fauna distribution?

Bob: No, because I really haven't focused on that part of it. I really don't know. We didn't even see a single deer, or any tracks of deer, but I know, people have told me that they live on the fort and are out here all the time, that of course the deer population is very high. And so I imagine that there are quite a few deer that come through. But we didn't see any evidence of that. But I don't know any changes because I haven't really monitored mammals or birds. My focus has been basically butterflies out here.

Maija: Do you recall any observations made by your neighbors/co-workers/colleagues on South Puget Sound prairies that were particularly interesting, or particularly dealt with changes they've observed through time?

Bob: No, I don't live here anymore, so I don't have many contacts with the people that live on the prairie. So I don't really have a comment to make on that, other than my own observations.

Maija: Finally, how would you compare the prairie that you see now to the prairie that you saw then, the most significant differences and the most striking similarities, given time?

Bob: Well, like I said, it's good and bad. The worse part is the whole prime part of the prairie is now destroyed in that it's a gravel pit of T7, which was the area, that was the area that I would spend most of my time in. So that's gone. However, the periphery of it has been improved drastically. So, that part is very positive. Also the very front part of it has been improved in that the Scotch Broom has been removed, and so only time will tell how that's going to come out, maybe that will be really a nice area that eventually might be really, a good area to study wildlife. So, that question has several answers. It's good and bad.

Maija: Is there anything else that you wanted to put on the record?

Bob: Yeah, what I'd like to say is that, we really, a lot of the group which I'm the person in charge of the research for our group, I think I could speak for all of us saying that, that we're really excited to see what The Nature Conservancy is doing. We're very impressed, we weren't that associated with them before, so we didn't know that much about them, other than some of the places they have preserved in the state, but we're very impressed by how hard they work, and also how dedicated they are to what they are trying to do. So, hats off to them, and we wish them the best in continuing their work. We know sometimes it's an uphill battle, and they're dealing with bureaucracies and you're dealing with politics, and we know sometimes it's very difficult to preserve habitat, because it's much easier to turn that into something that's going to bring in bucks. And so we know the politics involved, and we know the problems we have with different companies and so forth that would like to use that land. The land use. So hats off to them, I think they're doing a great job, and we're really excited about what they're doing.

But they've got a lot to learn too, because the one spot they have preserved for us, they loved too much, and it's actually, the butterfly now is not in existence there anymore, and

that's over at the Moxie Bog. The Nature Conservancy bought a bog area on one of the elbows, or the oxbows of the Yakima River, of which the Silver-Bordered Fritillaries flew. At the time they bought the property, it was grazed with cattle. And so they were going to protect the butterfly by fencing it off and keeping the cattle out. And there's a violet that grows in this bog that the butterfly needs and thrives on. And what has happened is that we've loved the area too much. We blocked it off so the cattle can't graze there, therefore the invasive grasses have come in and taken over the entire bog area, and now the butterfly is not any longer flying in the bog.

And so there's a case where once again, land usage, land protection is very complicated. A lot of research needs to be done to really understand why a species lives where it does and what its longevity is going to be. And in that case, overprotection has actually damaged the butterfly. And so this is kind of word to the wise in the future, when an area is protected, it's one thing to protect it, but we have to understand how to protect it, and this takes a lot of research.

APPENDIX C

Oral history interview of Barry Bidwell

August 27, 2003

Barry Bidwell interviewed by intern Maija Morgenweck

(Wife Darlene Bidwell also present)

Approximately 11 a.m. at TNC's Olympia Office

Maija: So the first question is to get an idea of what prairies you spent time on in the past and when you were there and why you were on the prairie.

Barry: Okay, well the prairies that we spend most of our time on is Rocky Prairie Natural Area Preserve, and Glacial Heritage, we've spent a number of years doing stewardship work plus butterfly surveys, and we've been doing this I think, Rocky Prairie, I've been doing Rocky Prairie for volunteer work for like 15 to 18 years, I can't recall exactly what, but the butterfly activity out at Glacial Heritage has been going on for 8 years right now. We're in our eighth right now.

Maija: 'Til now you hadn't been on the Fort Lewis prairies?

Barry: No, no, not at all, done some limited volunteer work as far as Scotch Broom control and such, but surveys, no.

Maija: What butterflies did you observe on those prairies when you started, and what was their frequency and how were they distributed?

Barry: Well, we go through a whole season, so we start off in let's say late March or early April, depends on what kind of a spring we have, and we see the butterflies that are most prevalent during certain periods of the season. And we start off usually with some of the early skippers like the 2-Lined Spotted Skipper and the, to some degree we'll get into some of the whites like the Mustard White, don't see those too often, never have been too common.

When things start getting interesting as far as numbers are concerned, starts around June, we start seeing Ochre Ringlets, lot of Ochre Ringlets, which do vary from year to year. This year, 2003, they were down from what I've seen in the past. There have been some years when you can't tell one generation from another, they just continue throughout the whole summer.

Tiger Swallowtails, both Pale Tiger and Western Tiger, they've been pretty constant through the years. Both at Rocky Prairie and at Glacial Heritage, I haven't seen any really big fluctuations in that butterfly at all.

Don't see Mardon Skippers at all on those two prairies. I've got to stick with these two prairies because those are the prairies I have my knowledge with. I do spend a little time

out at Scatter Creek, but that's not part of the study area that we're working with, that's for Ann Potter.

Mid-summer, we get into the butterflies we're most interested in on the prairies that I deal with, and that's the fritillaries. The Great Spangled Fritillary has been a constant show regardless of the year, it's always been pretty good. It's been very good out at Glacial Heritage, it's been moderately okay out at Rocky Prairie. Rocky Prairie's never been a real fritillary prairie.

The Zerene Fritillary, is, its populations have dwindled for sure. Six years ago, we had an explosion of Zerene out at Glacial Heritage. There were so many you couldn't count. They were just, they were glittering all over the prairie. But from that point on it's been kind of slow but not precipitous type of a decrease in population. This year it's been okay.

The one huge puzzle is the Whulge Checkerspot. 1996, I believe it was, was a banner year. They were everywhere. It was a fantastic year. The next year I think they counted 3, this was at Glacial Heritage, the years after that I haven't seen a one. It has been completely eliminated from the Glacial Heritage area, and I don't know exactly what's going on there. It never has had an account, and never have really seen any out at Rocky Prairie.

Rocky Prairie's never had much there. Rocky Prairie is a Puget Blue sanctuary, and they've always been very good there. I've never seen a fluctuation in that population that would be of any concern, anyway.

Late summers are always bad, especially 2003, it's dried up and there's nothing out there right now. So it's, a lot of it's, the late populations are dependent on how their prairie conditions are as far as the nectar sources are concerned. When things get dry out there, there's no nectar sources. I don't know where the butterflies go except maybe to the caretaker's house, because he waters the lawn. But it has been, uh, this year has not been the greatest. Because we did start our summer, our dry season early, so the butterfly populations did definitely go the way of the weather.

I'd say overall, except for Whulge Checkerspot and a seeming, somewhat of a decrease in the Zerene, things are very constant on the prairie. Even with all the disturbances that are going on with the restoration work that's been happening out there. So not too surprised with what's going on in the last couple years knowing what has been taking place out there as far as disturbances are concerned.

Maija: What and where were the most spectacular displays you've observed in terms of number of butterflies and numbers of species?

Barry: At Glacial Heritage about 6 or 7 years ago we saw that spectacular explosion of Zerene Fritillaries. And '96 was the year of the Whulge Checkerspot, and those two were really good as far as display is concerned.

Once in a while, a very common butterfly, the Ochre Ringlet, will show up everywhere. It'll be to a point where you can't count them anymore. This year, 2003, has not been one of those years. Last year was a good year, the year before that was a moderate year, and the year before that if I recall, things were really spectacular. They were just everywhere. You couldn't step hardly without kicking one up. That's basically, again on the prairies we spend time with, those are the two most spectacular displays that I can recall, anyway.

Swallowtails, some years, I think last year, 2002, was a good one along the Black River. It wasn't what I'd call spectacular, but they were constant, there was always 3 or 4 flying along the treeline. To me that's what I'd call spectacular, I guess, cause they're big and they're colorful...

Uh, numbers of species, the most I remember counting was, I think 15...it was a lot of diversity just not a lot of numbers, it was a good day for that. 2003 has not been a good year for diversity, and numbers have been down too, except here again for the Meadow Fritillary, the early spring frit that is a non-greater fritillary, it's a small one, they were pretty good this year. In the past years it's only been 2, 3 or 4 at a time, but this time we've been seeing 8 to 10 a day so that would be considered a good number, not spectacular maybe, but something worthwhile to me.

Maija: And we wanted to get the display of Checkerspots on McChord on record for us.

Barry: Oh, yes. The Checkerspots. That was 1956, 57. I talked to Ann about this. I went to an airshow. It was probably around May 17th, 18th when the Armed Forces Day shows used to take place. I was watching a fire fighting demonstration where they take the remnants of an old plane wreck and put it out in the middle of this area between the taxiways, set it on fire, then put the fire out. While I was waiting for this to happen I was noticing the clear areas between the apron I was sitting on and one of the taxiways, there's this stubble of grass they always have, they never let anything grow there because of fire. But there were Checkerspots flying all over the place between these two concrete areas and I couldn't, y'know at the time I thought "Hey! That's very cool", y'know, I thought that was very, very, very interesting, I was there to see the air show but I was getting the butterfly show at the same time. But I've seen that once. Don't recall seeing it after that because I think as I recall they didn't have any more of the air shows during the Arms Forces Day period, they had them later on in the summer.

So, that was an interesting indication of the butterflies—prairie dependent didn't necessarily have to survive on a prairie, was surviving on an area that was highly disturbed. I don't know where the host flower would be there except for some maybe plantains growing in near there, but I haven't seen anything like that since.

Earlier I had seen Checkerspots in the area where the Lakewood Town Center is right now. I used to live out there. And the fields, and some beautiful wetlands, and the butterflies that I see on the prairie today that I had in my backyard, including the Whulge

Checkerspot, not in great numbers but it was there. So, yeah, things have changed since the fifties and sixties.

Maija: What changes, or to what extent do you feel you haven't covered "have you noticed any changes in the distributions of butterflies?"

Barry: Yeah, we've pretty much covered that already.

Maija: What nectaring and host plants do you observe butterflies using?

Barry: Actually, one of the best nectar plants that is currently all around is bull thistle. It's one of the best, that and Canadian thistle, which is also one of the good ones.

As far as host plants, the fritillary host plant is of course the viola, and that's actually increasing in its population because of the restoration activities going on at the prairie sites.

So, fescue, which is a skipper host plant—it has the Mardon Skipper plus the Woodland Skipper and the Oregon Branded Skipper, they all feed on grasses—here again, is on the increase because of man's intervention. I think that the natural population of grasses out at Glacial, once they took the broom away, seem to do okay. And it's always done quite well at Rocky Prairie. Here again, it's a highly monitored site, but there are some obvious places where the grasses have taken off naturally, they're quite good.

Nectar plants in the spring are everywhere, no problems. There's anything from hairy cat's ear to the thistle, tansy ragwort is good nectar plant for certain butterflies in mid-summer. Starting on Early July they start dying off really fast and by the time August comes up on a good year (this is not a good year, 2003) thistle, believe it or not, is probably one of the best nectar plants that we have.

But as far as host plants, for the butterflies we're most concerned with, they don't seem to be a problem. The host plants for Whulge Checkerspot, which should be paintbrush and plantain out at both Rocky and Glacial, the paintbrush is very rare, even though the common paintbrush shouldn't be. And plantain, it's out throughout both preserves, you just have to look for it, but it's there. That's about all I can say there.

Maija: Have you noticed any changes in the behavior of prairie butterflies, for example the incorporation of exotic species into their diet, use of *Plantago lanceolata* for ovipositing by Checkerspots, or a shift in flight times?

Barry: No, not really, actually, I can't tell you about the host plant, I haven't studied the host plant as closely as I have the distribution of butterflies, I honestly couldn't give you a real definitive answer there.

As far as nectar plants, butterflies are fairly easy in regards to the use of nectar plants. They'll use what is available in the summer. Late summer, they'll even go down to a

little lowly plant like *Aster curtus* as a nectar source, but the, if *Aster curtus* and a lot of other good nectar plants are growing together, the *Aster curtus* is going to be down on their list of nectar sources. They'll use the other first, so, the nectar sources, I haven't seen any real change in those.

I really couldn't answer your question as far as host plants are concerned. I do know that the intervention of the restoration activities is increasing certain host plants. The butterfly bar out at Glacial Heritage is a good example of that.

Maija: How would characterize the habitat provided by prairies you observed in that past in terms of nectar source, host plants, weeds, presence of predators, and hydrology?

Barry: Well, on a prairie that has been restored a great deal, especially Glacial Heritage; when we visited it years ago a very small percentage of Glacial Heritage was prairie. It was Scotch Broom city. But once again you get rid of that and, it's amazing how quickly things came back. The situation was similar to Rocky, only that was on its way when I first started getting involved with Rocky Prairie, they were already in the process of eliminating the invasives there so that they could let the native plants really get ahold again. But once the invasives are gone, the natives take over pretty nicely.

With a little help from mankind, you can help it along, but it's amazing how well the prairies do, they restore themselves, especially in the spring, plants such as camas and such, they come back really fast. Predators, hydrology, coarse hydrology here again, dependent on the weather, as far as the prairie's concerned. The riparian area along Glacial of course is being taken out by the Black River, but as far as prairies themselves, the soil conditions typical of prairies are not very good. It's amazing how well the plants adapt to this arid situation, it's amazing how much green you see, well after the soil's gone to dust. They do very well.

Maija: Have you observed prairie butterflies favoring topographically diverse areas, like the swales on Johnson prairie, and what do you think of the importance of varied topography?

Barry: Oh, I think it's important. In a dedicated prairie species such as the Ochre Ringlet, there are times that they need a little shelter. So a low point, on a windy day for instance, a low area, like at Johnson, there's a good example, of a really good swale that can create a great deal of shelter, butterflies tend toward that. They don't like being blown around any more than people do. You were talking about topography here, but there's also wood edges and things like this, I don't know if you were going to address that or not. Topography is important because there's a need for the butterfly to get a rest once in a while. And that's one of the ways to do it, just find a low place, a place that has no wind. You'll find butterflies literally riding out the wind sometimes just by getting behind something. In the case of a topographical feature it would be a low point on the prairie, it would work very well.

Maija: Have you observed prairie butterflies favoring edge habitat, if so what was its composition (Doug fir/Scotch Broom or oak over prairie), and what do you think about the importance of edge habitat?

Barry: Edge habitat is very important regardless of the species. Here again, the butterfly needs a place to get out of the wind, get out of the weather. Also the edges are used as flyways, this is kind of like a butterfly highway and they use it constantly to go from one area to another. Prairie species as well as those indigenous to wooded areas, they use the same edge. I have observed, before they went away, I observed Whulge Checkerspots literally gathering on the lee side of a tree or a group of trees to get out of the wind.

And shade is a good, is also, believe it or not, is an important factor in butterfly habitat. On a really hot day, butterflies retire. That's why late in the afternoon on a hot day you're not going to see any butterflies. They're going to fly someplace to gather a little coolness if they can, they just don't stay out in the sun when it's too hot.

So the edge is good there, that's why prairie edges are pretty important, you can't have 10 miles of prairie without any cover at all. The butterflies here just aren't adapted to that kind of situation because the prairies here are relatively and historically have always been relatively small, they've always had some wooded area somewhere to use, it's not like the mid-West. So those butterflies like the Regal can handle 100 miles of flat land, butterflies here don't do that.

They have to have some kind of shelter, prairie and the edges, regardless of the plant, it can be like you indicated fir and Scotch Broom. Get rid of the Scotch Broom you still have an edge, got to get rid of the Scotch Broom. The oak fens and oak woodland that are out along the riparian area at Glacial are, as I've indicated earlier, the Swallowtails and butterflies that are semi-prairie species (I don't consider a Swallowtail to be a prairie species truly) hang out there in the sort of filtered sun. There's lots of sun there amongst the branches. Butterflies, on a hot day, tend towards that as well. So, yeah, they're very important. They very definitely are important.

Maija: To what extent did trees and shrubs inhabit the prairies observed in the past, and have you noticed a shrinking or encroaching effect?

Barry: Have I noticed? Yeah, Douglas fir. It can be, y'know, even though it's native here and everything, it's very invasive. Give it a chance, it'll just keep marching in. There again, the restoration activity stresses maintaining the edge of existing forest. And in some cases it's because of the fact that all we have left are prairie remnants. We want to expand some of the prairies a little bit, we have to take out some of the trees.

But, as far as snowberry, some of the shrubs, it's hard for me to answer that question because of the restoration work that's been going on. It's actually decreasing in that respect because of the actual activity of restoring pieces of prairie they're taking out some of these plants, obviously the Scotch Broom. Scotch Broom, if you let it go, it'll come right back. But it's moving back. Other woody plants such as snowberry and such,

seems pretty constant to me, I don't notice any great changes in the amount of that kind of plant in the prairie, except for where it's mowed down, and usually when it's mowed it kind of stays mowed. But, basically, most of what I've seen has been as a result of restoration activity, and that's basically the reduction of certain plants in the prairie.

Maija: Have there been changes in butterfly behavior that you've observed like more use of open prairie in the past and more use of edge habitat now?

Barry: They've pretty much maintained, I haven't seen anything that I would want to note, let's put it that way. I mean, you might see a specimen do something sporadically different only because maybe things have changed from one year to the next. An example of that is the area between the old runway out at Glacial Heritage and where the houses are has been worked on a lot, and at first, butterflies seem to have shunned the area after it had been cleared. But after two seasons it was back to normal again. So that was just a temporary disturbance, I don't think there was any actual change in the way they did things out there as far as their lifestyle is concerned. It just that it'd changed enough for the butterflies, and other animals for that matter too, I'm sure, to have to get used to it. They actually had some of their habitat back. Had to get used to that fact. So, no I don't think I've ever seen anything that was different except for on a very temporal basis.

Maija: So going back to since you were first interested in butterflies, throughout the state, what have been the butterfly hotspots?

Barry: By first interested, you mean my lifelong interest? Regardless of where in the state? Well, here again, we already mentioned the Zerene hotspot that Darlene and I observed, about 6 or 7 years ago, but that was a seasonal, or one year hot spot, it wasn't consistent.

Up in mountain habitat, which I do like, I used to spend a lot of time in hiking, the flower show up at the Sunrise, or Paradise is always the hotspot. I can remember one year, I can't remember how many years back it was right now, I was hiking out of Sunrise down into a place called Forest Lake, and on the way down I ran into Mormon Fritillaries. Thousands of Mormon Fritillaries. I've never seen anything like it since or before, so that was a hotspot, but here again, it was just one of those yearly, I mean a year phenomenon, it only just lasted one season.

When I was a boy in the Lakewood area before Villa Plaza and Lakewood Town Center, the area was definitely a hot spot. There were butterflies all over the place there, and as long as they left it alone, the population stayed pretty constant. I remember that, I remember good populations of fritillaries. Lots of Milbert's Tortiseshells, because a lot of nettle grew out there, as well as Red Admirals, and this was pretty constant. I remember that over the years, because as a early teen going out there and spending some time in these fields, it was originally owned by St. Francis Cabrini, they had a girls' school there, and they had an area...

PHONE RINGS & INTERRUPTS

...that we used to spend time on, and it was undisturbed except by some cattle, and whenever the cattle were around of course I didn't go out there because there was a bull that was pretty mean to me. But I went, every time I did go out there, every year, things were pretty constant.

The McChord thing, that was a hotspot here again for only one year, I remember. But I can't think of any that I would call to be really consistent, especially out here in the South Sound. The populations are changing, we know that for sure, generally on the downward side, although I'm noticing certain species seem to be on an upswing, like the Meadow Fritillary.

In the mountains, I was hiking up to an area called Indian Henry's Hunting Ground, it's a back country place, and there were California Tortiseshells. It was an influx of them, they're a migratory specie. They were, if you've ever observed, or seen photographs or visited the Monarch sanctuaries down in Mexico, what I observed this day with the California Tortiseshell up at Indian Henry's was similar. Every tree was covered with freshly hatched California Tortiseshells. And they were everywhere. They tend to do this, I know that in the last couple years there's been an influx of them as well. Ann Potter can testify to that down around the Mount Adams area; she's since seen similar influxes of these as I've just observed. But that was quite impressive. They were hanging on to every small tree, bush, blade of grass you could think of. But that deals with a migratory species. It comes and goes.

Maija: Where would you go right now? I mean, not right now August, but right now 2003?

Barry: Actually, the mountains. If there's a flower show and there's a good host plant source, then you're going to see a lot of butterflies. An example of a lot of nectar plants but no host plants I observed last Saturday when I went hiking down at Mt. St. Helens. Great masses of pearly everlasting and various other sub-alpine nectar sources—we observed only three butterflies that day, and it was a good day. Because there's not a lot of host plants out there yet. The area's still revegetating after the eruption. So, we weren't surprised. I think we saw one Mormon Fritillary, one woodland skipper, and one rather tattered Mylitta Crescentspot. And that was it. So, the host plants are just not available out there yet.

But you go up to an area that's established such as the sub-alpine meadows of Mt. Rainier and the Cascades, you're going to see pretty good diversity and great numbers. Even though this year was very dry, a friend of mine who is a volunteer at Paradise said that the butterfly show is down because of the dryness. He says the season was pretty short this year. But when the season is in its height, butterflies are all over the place, so I'd say the mountains are the best.

Maija: Moving to the questions that are much less butterfly oriented, the first one is kind of an aesthetic question about: have you noticed changes in the typical succession of colors in the prairie?

Barry: Well, the springtime, since the restoration's happened, if you're looking for blue, the camas is incredible. This year probably is the best I've ever seen it. Out at Glacial, out at Mima, and even to some degree out at Rocky Prairie. The camas show was the best I've ever seen, which I think is really a testimony to the restoration efforts, that it really seems to come back quickly after the restoration activity has taken place. Give it a couple of years.

Grasses? The grasses are doing very well, I would consider that the silver show, the fescue because its, it really plants well. If you have to go in and do it by hand with the volunteer work, it really plants well and it, in proper soil with good conditions, it establishes quickly and becomes drought tolerant real fast. So, yeah, I would say that to answer the next question, have you noticed a change in the fescue, yes, I have, and that has, here again, it's because of part of my part effort. The natural occurring fescue seems to be doing fine, but that which we planted is doing better because of the start we do give it.

Darlene: They were saying that some of the fescue wasn't seeding...

Barry: Oh, that's because of the dryness we've been having here. But as far as the established plant community, it's doing quite nicely, and the artificially established plant communities are doing great. So I'm pretty proud of that.

Maija: Have you noticed changes in the distributions of host and nectar plants listed here?

Barry: Nectar plants, things are pretty much the same every year. I, y'know, you're looking at some plants people would call weeds, and they're doing very well. Y'know things like the cat's ear, it's a primary nectar plant during the springtime, and it hasn't changed, I mean, you can mow that stuff, you can in, and even some herbicides don't seem to have a lot of effect on it, it comes back.

So, nectar plants like lupine, lupine by the way is not a good nectar source at all, come to find out lupine probably doesn't even put out nectar, an interesting little insight on it...it does seem to attract things like aphids, which put out honeydew, which attracts butterflies. So, if you want to call it a nectar source, I guess we could. Lupine, especially out at Rocky Prairie, is doing very well. In fact, it's getting to be one of the better populations. Out at places like Mima and Glacial Heritage, don't see much going on. The lupine there hasn't really changed much over that last 5 years that I can tell, especially out at Glacial Heritage. The lupine you see coming into the site hasn't gotten any more widely distributed than that in the last 5-6 years. The lupine that's found along the southwest edge is just kind of hanging on. But out at Rocky Prairie, it seems to be proliferating pretty well.

Lomatiums, noticed this year on Fort Lewis, lomatiums are doing exceedingly well. The lomatiums that I've noticed out at Glacial Heritage were in the areas that were burned here in the last 2 years, doing very well. They seem to like the areas that have been disturbed, but disturbed in a nice way.

Camas, better, definitely better. Manroot? I actually see very little, if any in the South Puget Prairies south of Olympia lots of it on Fort Lewis, it seems to be doing fine. Cinquefoil I see everywhere, couldn't tell you whether it's getting better or worse, I just notice it.

Vetch, it's getting, more of it's showing all the time, it's nice looking, but I don't think it's a good thing to have, but it is distributing itself quite nicely, I don't see any reduction, I actually see an increase in that.

Fleabane looks pretty much the same from year to year to me, I haven't noticed anything specific there as far as changes in its size.

Thistle, believe it or not, the Canadian thistle out on Glacial Heritage is disappearing. I suspect because of the weevil that's been introduced to it. And I've noticed that the thistle which used to be quite prolific down along the river by the bat houses is almost all gone now, because it didn't get a chance to flower. The flowerhead actually will start and wither because of this small weevil.

White-topped aster? Couldn't answer your question on that one.

Another, not a host plant or nectar plant, but just a thought in regards to the seed pods on Scotch Broom: the weevil, when it has infested the plant, does a good job on the plant. It just isn't distributed enough yet to really be really effective, but when it does do its job it usually wipes out the entire seed pod population on a plant—it'll do it. But it just doesn't do it everywhere.

Violets are everywhere, no problem there, they reseed itself very naturally once they get a place to reseed to. We've also been introducing the seed manually as well in certain areas because of the fact that there was never anything there and when they did clear it off they had to start something somewhere.

Paintbrush, the Golden Paintbrush out at Rocky Prairie is doing exceedingly well, paintbrush activity out at Glacial Heritage and Mima Mounds is really very little. The paintbrush out at Scatter Creek seems to be doing well from what I observed earlier this year. So out at Rocky prairie, the Golden is doing excellent, and to reiterate once again out at Glacial I only know of one small little spot and that was introduced, that was planted as I recall.

Maija: Distribution of these nectar plants is patchy now, were they more widely/evenly spread in the past?

Barry: No, actually not, it's always been pretty patchy.

Maija: Have you noticed changes in forbs that you don't consider potential butterfly nectar plants, yarrow, for example?

Barry: Yarrow, it's a good nectar source, but here again it depends on where it is, I've never seen yarrow to be particularly good out on the prairie. But at my house where we have some yarrow planted I've seen Skippers nectar on it, I've never seen that happen in the field. I can't think of anything else, I've mentioned Tansy Ragwort which is not a forb, but it's a great nectar source, you just have to be very careful of it. You do have to pull it.

Maija: So when you first started surveying out there, what were the common prairie weeds, and has that changed through time?

Barry: What do we want to call a weed?

Maija: Well, Scotch Broom, Ox-eye, thistle, turf grasses, St. John's Wort, tansy ragwort, blackberry...

Barry: Okay, I see. Scotch Broom of course, the battle's on and we're making headway there. So it's decreased in the areas of my observation, anyway.

Ox-eye, it's, as soon as the Broom goes away, Ox-eye comes in, so it's getting more. Here again, last year was an Ox-eye year. This year is a moderate Ox-eye year. No big deal. But last year they were everywhere. So it's holding its own and it has good years, and it has okay years. Never has bad years. I've never seen a bad year for Ox-eye. It's out there. It's out there all the time. And it is a nectar source, believe it or not.

Thistle, going down. In fact, the one little patch of bull thistle that we rely on for late-summer fritillaries is almost nonexistent this year, that was out on the old airstrip at Glacial. So overall thistle seems to be not a problem out on my observed areas.

Turf grasses, since I'm not a real expert on grasses I couldn't tell you how they're doing. Grosboll could tell you more on that, I think.

St. John's Wort, it's pretty much the same. It's there about the same every year, I've never noticed a change in the amount in a given area. It's an exotic, but it's not really, I don't think to be overly invasive. Here again there's a natural control on it, the beetle. And some years I notice the beetles everywhere and some years hardly at all. This year I haven't noticed much, last year they were all over the place.

Tansy Ragwort, not a problem, even though it's one of those really big bad guys. It's not a problem. I've seen very little in my observed areas. And when I do see it, cut the seed head off, pull the plant, and that's it. Take the seed head with you.

Blackberry, yeah it's getting worse. Where it is, it's getting worse. So that's another area that I think needs to be addressed a little more aggressively. I don't think we're spending enough time getting rid of it. Especially out at Rocky Prairie.

Maija: Do you have any fire-related observations about the South Puget Sound Prairies?

Barry: You mean in regards to how effective it is? It's very effective. It seems to revitalize the prairie, which we've known for years it does. The fire that they did 2 years ago out at Glacial was very effective. In fact, except for a little scatter-seeding we did with grass, the viola and lomatiums, lots of lomatium, and there's a couple other plants I can't think of, grew back on their own. Because the fire was a perfect fire, it was a swift, burn-the-surface-off type of fire only, and so any seeds that were embedded in the moss and the lichens survived. And they did very well. The area's just gorgeous right now. It just needs a little grass restoration, I think. As far as other plants, the forb and other plants and grasses that we want to keep, they did very well. I was very impressed.

Maija: Do you recall any bird observations surveying the prairies, and if so what was their use of the prairie—I have examples listed here...

Barry: You noted swallows diving at butterflies?

Maija: Uh-huh.

Barry: Really? What size butterflies?

Maija: Lots of moths, some Ochres, and I've seen a swallowtail being chased after very quickly.

Barry: By a swallow? Swallowtails are as big as the swallow. Actually, when it comes to birds, we try to keep a little eye on it, we've noticed the Northern Harrier and such... Bluebirds, just about 3 weeks ago we noticed a flock of them out at Glacial. I'd say probably quite young, but they were all together, perhaps 7 or 8 birds. I've never seen a nighthawk out there, have you? It's kind of like a big swallow. Never noticed any, but I'm sure they're out there because they're, that would be an evening observation more anyway, and we rarely get out there in the evening. But you've made a note of a nesting nighthawk, did you see one?

Maija: Yeah, I almost stepped on one when I was surveying.

Barry: Did you really? I've never, never seen that.

Maija: It had a clutch of 3 eggs out on Lower Weir.

Barry: Oh, that's sensational. Sparrow or sparrow like birds hanging out on the Scotch Broom? Yeah, Scotch Broom might be an invasive, but birds like it cause it's great cover and pheasants, I've noticed pheasants in and out of the stuff. Course the pheasants here again, that's an exotic too, but it's a good exotic. And it does afford very good cover for nesting birds. Y'know, ground nesting birds just love the stuff. It's just too bad that it has to be Scotch Broom.

I've noticed, as far as raptors I've noticed a constant variety in number through the years, that doesn't seem to change much. I've noticed that out at Glacial Heritage there's always a couple of Northern Harriers, I never fail to see at least 2. White-shouldered kites, they're called black-shouldered kites now, I guess, or something or like that. Seen those two years ago, a pair of them over Glacial, and I saw some down in Nisqually too, but, as far as the varieties, lots of red-tail hawks, there's also the American Kestrel, those are actually increasing, I think, cause I see them more often now. But other hawks, Cooper's and such, I couldn't tell you, because I'm not that cognizant of the field marks, so I couldn't give you a good observation. But I know what the red-tail looks like, I know what the kite looks like, and for sure I know what the Northern Harrier looks like.

Maija: And what about other fauna like toads, snakes, alligator lizard, deer, and coyote?

Barry: Alligator lizards. I see those every once in awhile, surprises me.

Deer, lots of deer, especially out at Glacial, we've seen elk. That was a lone elk, though, it wasn't part of a herd. We did see literally a herd of deer out there one day, and throughout our observations, at all prairie locations we've seen deer. And they seem to be doing just fine. They adapt pretty well to a little disturbance here and there, in fact I think they like it.

Coyotes, have observed the young, we saw some kits, or I guess they'd be called pups, out at the south end of the runway one day at Glacial Heritage. Heard them all over the place, but pretty rare do we see the animal. We see their scat everywhere, so we know that they're very, very common out at the south prairies.

Snakes, yeah, toads rare. Snake, you see the usual number of, especially in the early spring you'll see garter snakes all over the place. But I've never seen a toad, that's interesting.

Maija: We saw the one the first day we surveyed for butterflies out on Upper Weir. It was coming from a lake.

Barry: Nope, never have seen a toad.

Maija: Have you seen any changes in distribution or in the behavior of these fauna in response to the prairie or the prairie disturbance?

Barry: It's kind of hard to quantify, it really is, because...

Maija: Unless something disappears?

Barry: Unless something disappears, right, because the bird fauna in the prairies, I mean, it doesn't hang around one spot, you know, like certain butterflies, like the hoary elfin butterflies, they hang around their patch of kinnikinnick, they don't go anywhere beyond

that hardly, birds don't do that kind of thing. And so, as far as changes in habitat affecting the bird population, I haven't really noticed that. Really haven't.

Maija: Do you recall any interesting observations made by your neighbors/co-workers/colleagues on South Puget Sound prairies that stuck with you, particularly on changes through time?

Barry: I guess that the one thing that constantly comes to the core group of volunteers that work out here is the changes that we have wrought ourselves, we've actually made a difference, and it's nice to record it to me, because I don't think a lot of people really understand what we've done out here.

Rocky Prairie's a good example of the change that has literally changed the whole face of that particular piece of property. When I first started out in it, we had, the Scotch Broom problem was a huge concern. That was fifteen years ago, may be more. Today, Darlene and I can take care of the Scotch Broom problem ourselves on our monthly tour of the property. There's not a problem anymore, as long as you keep a handle on it.

Take a look at Glacial Heritage. It started out as basically a Scotch Broom jungle with a couple of prairie remnants that were promising. Now, the majority of the property is being transformed. Here again, not by nature—machines and hands, so we're doing it to her. I think that's the one thing that people, not only co-workers, but people that we take out to visit these spots we tell them what it looked like, show them a picture, and show them what it is today, and they're quite amazed.

The restoration work really is, it really is working, it's just that you have to keep up, keep it up, you have to keep on it. The plants and the problems we're dealing with aren't going to go away by themselves; you've got to keep on them. Anything exotic tends to think it owns the place, and you have to constantly remind it that it's only here temporarily, and we're going to make it permanently temporary, no. Basically, it's the transformations that have been going on over the past few years that people have made observations to me.

Maija: How would you compare the prairie that you saw when you first started to the prairies you see now?

Barry: Well, as I've just indicated, the differences are striking. It's, there are some areas that people would not have considered to be prairie because of all the invasives, or the fact that the wooded area had moved back into the areas. Which by normal, natural situations would have been the proper thing. You know, you have the woods moving back into prairie areas, as long as they're not disturbed, the woods are going to move back in naturally. Succession. But since we have such small prairie areas left, we're maintaining that wood edge so that it doesn't succeed the prairie, and I think we've done that pretty effectively. So, the areas that I have been involved in over the last 15 years, the changes have been remarkable. I think it's for the good. Of course, there are some concerns...

Pat comes in.

Barry: Like I said, the restoration work has been most effective, even on areas that are just now starting to get some sustained activity on them. Like on Fort Lewis I can even see the differences out there, like in Weir, in Johnson for sure. I remember being out on Johnson a couple years ago, and the areas where the Puget Blues are found was heavily overgrown, now it's been reestablished as prairie, even though it's rocky, lumpy-bumpy, but it's still prairie, and it seems to definitely enhance the blue population out there.

Yeah, wherever there's been activity to eliminate the Scotch Broom, things have turned around, it's just that you have to maintain that activity once you start it. Scotch Broom does have a shelf life, if you will, the seeds have a have life of anywhere from 10 to 50 years depending who you're talking to. So there's going to be a lot of seed growth over the years that you have to be on top of.

And hopefully, when you get to a situation where the prairie has been pretty much restored the first time, you should be able to maintain it mechanically, by which I mean hand methods. That's the most effective, it might not be the most efficient, but it's the most effective way of maintaining the elimination of invasives. A good example of that, the activities going on out at the west side of Glacial, is a good example of how good mechanical means work, when I say mechanical I do mean using weed pullers and the hands, not mowing.

Mowing actually is pretty destructive, I think. But at first you have to do it. You have really no choice. But once you finished with that, you should be more selective in the way you go about controlling the plant. I think that the methods they're using are correct, notice though that mowing isn't a constant thing, you might have to mow an area twice, I don't think you need to do it a third time.

I think that once you let the Broom know that it's not wanted, then you go in and get serious about getting rid of the root stock itself. Broom that's 2 to 3 feet tall is energetic, it'll come back if you mow it, no doubt. Old stuff, you can cut it down and usually it stays cut down. The brand new stuff, especially if you get a dry year like this, for sure, the really young stuff probably won't even go beyond this year because it's just too arid for it. Here again, you can't mow that, you've got to go in and pull that. Or use an herbicide.

And, I don't have a lot of opinion on herbicide yet, I really don't know what to say about it, it's just the term is a negative term, as far as it's a poison. I don't like the use of those, but there are times you have no choice. Especially at the beginning, with the heavy infestations, but after that, I still think that you need to get the legions of people to come out and do the job. Hard to find a group consistent in size to do this, but we know it works. The Thursday workdays out at Glacial Heritage are testament to that.

Darlene: Tuesdays?

Barry: Thursdays. Oh, I'm sorry, it's the second Saturday, I take that back. Second Saturday, when we have a lot of folks from around the country decide come and give a hand, and it works pretty well.

Maija: What do you think the value of the South Puget Sound prairie is to the region, keeping them clear and keeping them restored, keeping the butterflies on them?

Barry: I guess to me it's sort of a quality of life thing. The concrete jungle is not a good quality of life as far as I'm concerned, we need our wildlife and the environment is still required for a healthy earth. You take away all the greens, and the grasses and the living things, the earth isn't healthy. The world itself isn't healthy. We can't restore the beauty of a natural place by using artificial means, I mean, artificially, let's put it that way. A flower garden in a backyard isn't the same. It's basically designed for people, it's not designed for the rest of the living things on this earth. And I do believe it's an absolute necessity that we maintain the wild places. It's a matter of legacy too.

You know, young people today, like yourself, are, I think, becoming more sensitized to the need for saving the wild places left on earth. And it's for our own good, it does maintain the health of the earth, it gives us the mental ability to get away to the prairies and such or the mountains or any place that's non-inhabited by a lot of people. My way of thinking tends to be a little slower, I tend to take a rest mentally. It still required, we're still wild animals, even though people like to call us civilized, we're still wild animals. We need a place to regress back to.