

The 2025 Surveys of Fender's Blue Butterfly and Kincaid's Lupine Sites in Yamhill County,
Oregon

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Map of Yamhill Oaks Preserve Fender's Blue Butterfly Habitat Areas

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INTRODUCTION

Surveys were conducted in Yamhill County, Oregon during May and June of 2025 at known sites of Fender's blue butterfly (*Icaricia icarioides fenderi*) and Kincaid's lupine (*Lupinus oreganus*) that included peak butterfly counts and an assessment of habitat conditions for the Institute for Applied Ecology, U.S. Fish and Wildlife Service, and Yamhill County Department of Public Works. This work specifically monitored the results of on-going habitat management in designated management areas, on private properties, and along Yamhill County roadsides during the 2015-2025 field seasons. These management studies included techniques for controlling several invasive plant species including bracken fern, purple vetch, and sickle-keeled lupine that threatened Kincaid's lupine and butterfly populations. This included studies of the impact using early season mowing and glyphosate herbicide applications on Kincaid's lupine. A summary of these management experiments as they affected Kincaid's lupine was included in the 2018 report (Hammond, 2018).

The adult butterfly flight season was more normal in 2025 compared to the previous few years. A few adults initially appeared during the first week of May with the peak taking place during the third week in May. Considerable numbers were still flying during the first week of June, but relatively few butterflies were still present by the second week of June.

A conservative population estimate of Fender's blue butterflies for each of the metapopulation areas described below in 2025 can be made by taking the highest count of male butterflies at the peak of the flight season, and doubling that number to account for females assuming an equal sex ratio. An additional 20% of the combined male-female number is added to this sum to account for butterflies in the tail ends of the flight season that would not have been present on the peak day count. This is probably a very conservative estimate for large populations that are dispersed over large geographic areas where many butterflies were probably missed during the surveys, but is probably accurate for small populations with a more limited geographic distribution. For several large sites, separate subcounts were made for different subareas on the sites that had substantially different habitat conditions of temperature and aspect or different management histories. The peak subcount for these subareas was then used for calculating the total population estimate.

A comparison of this peak count method with the distance sampling method for generating population estimates was included in the 2023 report (Hammond, 2023). Previous studies in Yamhill County were summarized in the 2007, 2010, and 2016 reports (Hammond, 2007, 2010, 2016),

RESULTS

1. Yamhill Co. – Beaver Creek Road (Gopher Valley Metapopulation)

Very large patches of Kincaid's lupine are located on both the north and south sides of Beaver Creek Road in Gopher Valley. This site was surveyed five times in 2025 at the peak of the lupine blooming as shown below, but no Fender's blue butterflies were present.

May 10	0
May 23	0
May 30	0
June 3	0
June 9	0

Previous management in 2016 to control woody brush and trees along Beaver Creek Road was outlined in the 2024 report (Hammond, 2024). As a result of this work, large patches of lupine have been growing vigorously and blooming along the entire length of the road during 2021-2025. However over the past few years, trees and brush were starting to grow back again, particularly poison oak, blackberry, and young oak trees that were starting to shade the lupine. During April of 2025, woody brush and trees were again cut along the roadsides, thus allowing the lupine to flourish in full sunlight this year. In addition, this management uncovered a large population of a second rare and sensitive prairie plant along the more shady south side of the road. This is the thin-leaved peavine (*Lathyrus holochlorus*).

2. Yamhill Co. – Deer Creek County Park (Gopher Valley Metapopulation)

The habitat at Deer Creek County Park in Gopher Valley consists of pristine native prairie with a rich diversity of native plants. This site was surveyed five times in 2025 with the following results.

May 10	0
May 23	0
May 30	1
June 3	0
June 9	0

Thus, a single male Fender's blue butterfly was seen at Deer Creek Park on May 30, and was again seen several days later in 2025. No females were seen. The butterfly was not present at this site in 2017-2018, but one male and one female were seen in 2019. In 2020-2023, a small colony of the butterfly successfully became re-established. Yamhill County has designated Deer Creek Park as a mitigation site under its Habitat Conservation Plan for Kincaid's lupine and Fender's blue butterfly. In 2014, the site was threatened with invasive blackberry, Scotch broom brush, and small trees. Yamhill County management conducted extensive habitat renovation work during the 2015-2016 field seasons, and cleared away all of the woody vegetation. As a result of this work, the Kincaid's lupine has been growing vigorously and expanding rapidly over the hill during 2017-2025, and habitat conditions throughout the site were excellent in 2021-2023. However as of the 2023 field season, young Scotch broom seedlings were becoming widely established over a considerable part of the habitat on the hill, although fortunately not within the Kincaid's lupine patches. During 2024, these broom plants were spot-sprayed with herbicide that killed much of the young broom seedlings, and a follow-up spray was conducted during March of 2025.

The mowing management in recent years has uncovered large populations of several other rare and sensitive prairie plants including thin-leaved peavine (*Lathyrus holochlorus*), western columbine (*Aquilegia formosa*), and fernleaf biscuitroot (*Lomatium dissectum*). This is in addition to the other diversity of native prairie species such as wild strawberry (*Fragaria virginiana*), wild iris (*Iris tenax*), mariposa lily (*Calochortus tolmiei*), red fescue grass (*Festuca rubra*), American vetch (*Vicia americana*), and mules ear (*Wyethia angustifolia*).

The historical peak numbers of male butterflies present over the past seven years are shown below. Cold, rainy weather conditions during the springs of 2022-2023 may have caused the drop in butterfly numbers during 2023-2024. Considering the abundance and coverage of lupine at Deer Creek Park at present, a small colony of several dozen butterflies might be expected in a year with favorable, warm weather conditions.

2019	1 male
2020	5 males
2021	2 males
2022	3 males
2023	1 male
2024	0
2025	1 male

3. Yamhill Co. – Gopher Valley Road (Gopher Valley Metapopulation)

Large patches of Kincaid's lupine occur on the roadsides of Gopher Valley Road in two areas. Area 1 is located at the junction of Gopher Valley Road and Dupee Valley Road. Area 2 includes the roadside lupine patches on both the west and east sides of the road adjacent to the Yamhill Oaks Preserve. In Area 1, the habitat was recently renovated in 2021 by cutting young oak and conifer trees that had shaded and overgrown the lupine. In 2022-2025, the lupine was just starting to recover from this suppression. No butterflies have been present in Area 1 over the past few years.

However, Yamhill County management has been conducting extensive mowing and cutting of woody vegetation along the roadsides of Area 2 in recent years, uncovering considerable lupine that had been previously shaded. As a result, these lupine patches were growing quite vigorously during the 2019-2025 field seasons. Area 2 was surveyed five times in 2025 with the following numbers of male butterflies.

May 10	1
May 23	2
May 30	1
June 3	0
June 9	0

Peak numbers of male butterflies observed in the roadside lupine patches are shown below for the past few years. The increases in 2020-2021 appear to be the result of the roadside management work that greatly expanded the amount of lupine available for the butterfly, while the reduced number of butterflies over these past four years was likely due to the adverse weather conditions during the springs of 2022-2024.

2016	4
2017	1
2018	2
2019	0
2020	5
2021	4
2022	0
2023	1
2024	1
2025	2

4. Yamhill Co. – Yamhill Oaks Preserve (Gopher Valley Metapopulation)

The butterflies in Area 2 covering the Yamhill Oaks Preserve were surveyed five times during the 2025 field season with the following counts of males.

May 10	14
May 23	63
May 30	36
June 3	34
June 9	8

Habitat at this site consists of pristine native prairie with a high diversity of native plants. Large patches of Kincaid's lupine have been spreading in recent years over many different parts of the preserve. The attached map shows the location of these habitat areas. Separate male butterfly counts were made for each of the lupine areas as shown below.

	<u>Roadside</u>	<u>Northwest</u>	<u>North Central</u>	<u>Northeast</u>	<u>North Ravine</u>
May 10	1	0	0	1	2
May 23	2	0	3	22	9
May 30	1	0	1	14	7
June 3	0	0	1	21	2
June 9	0	0	0	8	0

	<u>South Ravine</u>	<u>South Central</u>	<u>Southwest</u>	<u>Pugh Area</u>
May 10	1	4	0	5
May 23	3	5	6	13
May 30	2	5	2	3
June 3	2	2	2	4
June 9	0	0	0	0

The following table shows the total peak count of male butterflies and the population estimate for 2016-2025. The large drop in 2019 was the result of the prescribed fire during the fall of 2018 that burned most of the habitat, and apparently killed most of the diapausing larvae. However, the fire was highly beneficial for removing invasive woody shrubs like poison oak and young trees, and the lupine in the treated areas was greatly flourishing and spreading during 2019-2025. As a consequence, butterflies had returned to all of the previously occupied habitat areas during 2020, and the population recovered from the fire to the approximate level of 2018. During 2021, the population doubled in size to an estimated 300 butterflies, the highest number ever seen at Yamhill Oaks Preserve. This population explosion was likely the result of very favorable weather conditions in 2021 that resulted in particularly high survival of larvae, combined with lupine that have greatly spread within the original lupine patches during the past

few years. In addition, lupine has been rapidly spreading into new areas previously not occupied, probably resulting from long-distance seed dispersal. Conversely during the last three years, some lupine patches have greatly declined, either because of ecological succession or because of particularly dry conditions.

In 2022, cool, rainy weather persisted throughout May and June that was highly favorable for lupine growth and spread, but these conditions apparently resulted in high mortality of the developing butterfly larvae. As a consequence, the butterfly population sharply dropped in numbers during 2022, but recovered to previous levels in 2023 as shown below. Similar numbers were present in 2025, but butterfly numbers appear to be dynamically shifting from area to area in response to the expansion or decline of individual lupine patches.

	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>
Roadside	4	1	2	0	5	4	0	1	1	2
Northwest	0	0	0	0	1	1	0	0	0	0
North Central	5	6	5	0	4	14	1	4	3	3
Northeast	16	16	31	6	19	43	20	24	16	22
North Ravine	4	5	5	1	7	14	3	5	8	9
South Ravine	16	8	14	3	12	16	3	17	5	3
South Central	0	0	0	2	3	6	1	4	4	5
Southwest	0	0	0	1	2	1	1	1	1	6
Pugh Area	0	0	0	3	10	28	5	8	11	13
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Total Peak Count	45	36	57	16	63	127	34	64	49	63
Population Estimate	108	86	137	38	151	305	82	154	118	151

The changing dynamics of Kincaid's lupine patches and associated Fender's blue butterflies at Yamhill Oaks Preserve are discussed in more detail as follows.

(1.) The Northwest lupine patch was always quite small, and has severely declined and almost disappeared in recent years. It is on a very dry, south-facing aspect, and only a few small, stunted plants were still visible during the 2024-2025 field seasons. No butterflies have been present in these last four years.

(2.) The North Central lupine patch has been experiencing severe ecological succession to tall competing exotic grass, and has not been so productive in butterfly numbers in recent years as shown in the above table.

(3.) The Northeast lupine patch has been the largest area of lupine at Yamhill Oaks for many years, and has always supported the largest number of butterflies. The older central areas of this patch have also been experiencing severe ecological succession to tall grass and braken fern, but the patch has been rapidly expanding into new adjacent areas over the past few years. Thus, butterfly numbers have been maintained at a relatively stable high level over time.

(4.) The North Ravine lupine patch has been rapidly expanding in recent years. Although it has a relatively cool, mesic aspect, good numbers of butterflies have been produced in this patch over the past ten years except in 2019 following the prescribed fire and in 2022 during the cold weather year. Butterfly numbers have been slowly increasing over the past three years.

(5.) The South Ravine lupine patch has also been expanding some in recent years, but during the last two years the lupine plants have been growing very poorly for unknown reasons. In turn, this has resulted in a sharp drop in butterfly numbers during the 2024-2025 field seasons.

(6.) The South Central lupine patch did not exist prior to 2018 when a few lupine plants became established, apparently resulting from long distance seed dispersal. Since then, this patch has been rapidly expanding, and has been consistently supporting small numbers of butterflies over the past seven years.

(7.) The Southwest lupine patch near the road is quite small, but has existed for many years. It never supported any butterflies until 2019. Since then, it has been slowly expanding with a few butterflies present every year. However in 2025, butterfly numbers sharply increased.

(8.) The Pugh Area lupine patch is located on a steep west-facing hillside that has a very dry and warm aspect. It was initially a very small colony of lupine that had no butterflies, but it has been slowly expanding over the hillside during the past seven years. During this time, butterflies have greatly proliferated on the site, and this patch has been supporting the second highest number at Yamhill Oaks for several years aside from the Northeast patch. In 2024-2025, this patch was particularly successful in producing butterflies that were consistently present throughout the adult flight season from May 10 to June 3 of this year. The warm, dry aspect appears to result in high larval survival during years with a cold, rainy spring.

Thus, one of the strengths of the Yamhill Oaks Preserve is that it supports lupine patches growing under a variety of cold, mesic to warm, xeric aspects and habitat conditions. This helps to maintain butterfly populations despite years with variable weather conditions. During a hot, dry spring, larvae might survive better in the cool, mesic habitat, while a cool, wet spring may favor larval survival in a warm, dry habitat.

5. Yamhill Co. – Old Moores Valley Road – Sid Freidman property (Moores Valley Metapopulation)

This site along Old Moores Valley Road is located just south of Area 5. A small patch of Kincaid's lupine covering an estimated 41 square meters is located at the northwest corner of the Freidman property, and an additional 40 square meters of lupine is located along the adjacent county road right of way on both the west and east sides of the road within a zone of remnant native prairie. This site was surveyed on five days in 2025 with the following results.

May 10	0
May 20	0
May 24	0
May 30	0
June 6	0

As in previous years, the growing season in Moores Valley was quite delayed during 2025 because of the cool, wet conditions in the spring. Most of the lupine was still in the early spike phase on May 10, and much of the lupine was still in bloom on June 6. Habitat conditions at this specific site were very poor in the past because of infestations of both tall oat-grass and braken fern. The lupine on the Freidman property was still mostly suppressed this year by the tall oat-grass, and adjacent conifers are increasingly shading the site. However, conditions along the roadsides have been greatly improved these last few years by treatments of a grass-specific herbicide and by hand removal of the braken fern during the spring. As a consequence, the lupine along the roadsides was flourishing and blooming extensively during 2019-2025.

6. Yamhill Co. – Area 5 Old Moores Valley Road (Moores Valley Metapopulation)

This site is limited to a strip of native prairie located in the county road right of way along Old Moores Valley Road just south of the junction with Moores Valley Road. A rich diversity of native prairie plants is found at this site, and large patches of Kincaid's lupine are

located on both sides of the road. These patches were surveyed over five days in 2025 with the following results.

May 10	0
May 20	0
May 24	0
May 30	0
June 6	0

Butterfly numbers have dropped in this area over the past ten years compared to a peak of 10 male Fender’s blue butterflies in 2013. The population appears to have become mostly extinct during the 2017-2025 field seasons, due in part to the wet, cold weather conditions in Moores Valley during the spring development season. In 2025, 2 silvery blue butterflies were seen at this site on May 10, but no Fender’s blue butterflies were present this year.

In the past, very dense stands of tall oat-grass have severely repressed the lupine along the roadsides of this area. The grass-specific herbicide Poast (sethoxydim) was applied to this habitat area during April in both 2015 and 2019. As a consequence of these herbicide treatments, the lupine has responded with vigorous growth and extensive blooming in the 2019-2025 time period. In 2025, herbicide was again applied to this area on March 23 and again on April 9 with good results. Exotic grass was mostly killed, allowing the lupine to flourish this year.

During 2020-2022, a severe soil erosion problem developed in the ditch along the west side of the road, creating a deep gully through particularly dense stands of Kincaid’s lupine. Yamhill County management filled in the gully and installed netting to help reduce the erosion problem. This work was successful and the disturbance only minimally affected the lupine. During the 2023-2025 field seasons, dense and vigorous stands of lupine were successfully spreading through this disturbed area.

7. Yamhill Co. – Old Moores Valley Road – Toby Van Hee property (Moores Valley Metapopulation)

This site along Old Moores Valley Road is located north of the junction with Moores Valley Road. Patches of Kincaid’s lupine were growing vigorously and expanding rapidly along both the county road right of way and also on the adjacent Van Hee property during 2018-2023. However in 2024, the lupine was severely suppressed by dense stands of tall oat-grass on the

Van Hee property. Both tall oat-grass and purple vetch were also suppressing lupine along the county road right of way. In 2024-2025, the vetch was hand-pulled along the road from among the lupine patches. Also in 2025, the tall oat-grass was eliminated along the roadside, and the growth of grass was less severe on the Van Hee property, allowing the lupine to grow better than during the previous year.

In previous years, a few male Fender's blue butterflies (1-2) have been present at this site in 2014-2016, 2019, and in 2023. These lupine patches were surveyed five times during the 2025 field season with the following results.

May 10	0
May 20	0
May 24	0
May 30	0
June 6	0

8) Yamhill Co. – Area 6 Moores Valley Road – Thornton property (Moores Valley Metapopulation)

This area consists of two sites within the county road right of way along Moores Valley Road. The first site is located near the junction with Old Moores Valley Road very close to the main habitat portion of Area 5. The second site is located on a dry, south-facing hillside further east along the road. Lupine patches occur on both the north and south sides of the road at both sites, and some lupine also occurs on the adjacent Thornton property near the fence line. These sites were surveyed five times during the 2025 field season with the following results.

May 10	0
May 20	0
May 24	0
May 30	0
June 6	0

During the past five years, Kincaid's lupine has been growing very poorly along the roadside of Moores Valley Road. Some of this was due to suppression with exotic tall oat-grass at Site 1 near the junction with Old Moores Valley Road, and most lupine was severely repressed in 2023 by tall vegetation. This area was successfully treated with a grass-specific herbicide in 2024 that killed most of the grass. As a consequence, the lupine was growing much more vigorously in 2025, and some even bloomed. In addition, a young ponderosa pine plantation is located on the north side of the road at Site 1 that was densely shading small repressed lupine plants. In 2024, the land owner cut off the lower limbs of the pine trees, allowing much more sunlight into the understory. This resulted in vigorous growth and blooming of a large patch of lupine that extended out on to the county road right of way.

At Site 2 over the past few years, the lupine has been growing very poorly because of severe heat and drought-like conditions on the steep, south-facing hillside. Only a few plants at the bottom of the hill next to the road were able to bloom in 2024-2025. Also, a few plants on the adjacent Thorton property were able to bloom this year.

9. Yamhill Co. – Sarah Miranda property (formerly Richard Blaha property) (Moores Valley Metapopulation)

This site is located along NW Fairdale Road. A large area of Kincaid's lupine covering about 600 square meters is located on a remnant area of native prairie that is dominated by Roemer's fescue bunchgrass. About two thirds of this lupine is located in a pasture that has been subject to occasional light livestock grazing in the past, and the lupine has been actively expanding in recent years. Unfortunately, the pasture received very heavy livestock grazing during the spring of 2023 that ate most of the lupine down to the bare ground, and very little lupine was able to bloom in the pasture that year. In 2024-2025, the lupine was beginning to grow back with moderate blooming. However, the lupine outside of the pasture was growing and blooming vigorously in 2023-2025. This site was surveyed five times in 2025 with the following results. While two male silvery blue butterflies were seen on May 10, no Fender's blue butterflies were present this year.

May 10	0
May 20	0
May 24	0
May 30	0
June 6	0

Summary of the total number of male Fender’s blue butterflies in the Moores Valley Metapopulation for 2014-2025

2014	16	2019	2	2024	0
2015	14	2020	4	2025	0
2016	4	2021	2		
2017	0	2022	0		
2018	0	2023	2		

Thus, butterfly numbers have been very low in the Moores Valley Metapopulation area over the past ten years, even though the lupine has been flourishing along the roadsides due to the habitat management. This may be the result of unusually cold spring weather conditions in Moores Valley. Cold air and fog from the Coast Range often settles down in Moores Valley during the spring, when the top of adjacent Oak Ridge is exposed to warm, sunny weather at the same time. The last few years were particularly cold with cloudy and rainy weather, and lupine growth and flowering were delayed by about two weeks compared to the top of Oak Ridge. In turn, this may have resulted in heavy mortality of developing butterfly larvae. It is possible that the population actually went extinct in 2017-2018, and again in 2022, and was re-founded by stray females coming from Oak Ridge. As of the 2024-2025 field seasons, the butterfly might again be extinct in Moores Valley.

10. Yamhill Co. – Area 1 Oak Ridge Road – Marvin King property (Oak Ridge Metapopulation)

Area 1 on Oak Ridge is located along the east and north sides of Oak Ridge Road, and is comprised of both the county road right of way and the adjacent Marvin King property. Large patches of Kincaid’s lupine are present covering about 1300 square meters. This site was surveyed five times in 2025 with the following numbers of male butterflies.

May 10	0
May 20	1
May 24	2
May 30	0
June 6	0

Much of this habitat has been severely degraded over the past few years, and has been badly overgrown with tall oat-grass, braken fern, and Scotch broom brush that has been repressing the lupine. As a consequence, butterfly numbers have been greatly reduced during 2016-2025 compared to previous years. Nevertheless, butterflies and lupine are still persisting on the King property despite these problems. At present, all of this habitat needs to be brushed to remove the Scotch broom brush from the King property. In addition, the braken fern needs to be cut with weed-eaters during June, and a grass-specific herbicide spray during March and April would be highly beneficial for restoring the habitat for the lupine and butterflies. Mr. and Mrs. King are supportive of such work, but require assistance with this management.

Along the county road right of way, Scotch broom brush has again re-grown and is repressing considerable lupine. Thus, it is suggested that this brush should be cut along the entire road bordering the King property in late 2025 or early in 2026. Previous county management clearing the brush in 2019 greatly improved the roadside habitat, and was primarily responsible for the butterflies seen in 2020-2024 as shown below. With the re-growth of the brush, butterfly numbers dropped sharply in 2025. Historical peak counts of Fender's blue butterfly males in Area 1 are shown as follows.

2002	68
2015	30
2016	13
2017	8
2018	8
2019	12
2020	8
2021	7
2022	14
2023	10
2024	7
2025	2

11. Yamhill Co. – Area 2 Oak Ridge Road – Charles Goodwin property (Oak Ridge Metapopulation)

The Area 2 habitat along Oak Ridge Road is comprised of both the county road right of way and the adjacent Charles Goodwin property. Large patches of Kincaid’s lupine are present covering an estimated 4000 square meters. In 2014, the first comprehensive survey was conducted on the Goodwin property since 2011 with the permission and assistance of Mr. Goodwin. Over the past few years, Kincaid’s lupine has greatly increased and spread over much of the Goodwin property to the west and southwest corners of the meadow. At present, both the lupine and butterfly are now widely distributed throughout the Goodwin property, and have greatly increased along the entire length of the county road right of way as well. Subcounts were made for the roadside and adjacent Goodwin property, and for the interior of the Goodwin property not observable from the road during the 2014 survey. In 2015-2025, Mr. Goodwin did not want any additional surveys done on his property. Thus, the following surveys over five days in 2025 were limited to observations of male Fender’s blue butterflies along the roadside.

May 10	9
May 20	6
May 24	12
May 30	15
June 6	2

Mr. Goodwin has continued to manage his property with mowing, so it is not overgrown with Scotch broom, tall oat-grass, and braken fern like the adjacent King property in Area 1. In addition, Yamhill County management has successfully controlled tall oat-grass along the roadside with applications of the grass-specific herbicide Poast, while infestations of exotic purple vetch (*Vicia villosa*) have been successfully controlled by mowing above the lupine plants during June. Specific details of this management work were discussed in the 2019 report (Hammond, 2019). As a consequence, the lupine was growing and blooming along the roadsides with great vigor during the 2020-2025 field seasons, and numerous female butterflies were seen ovipositing on the lupine in this managed habitat. The most recent mowing for purple vetch was conducted during late June of 2024.

The following table shows the extrapolated peak counts in parenthesis for male Fender’s blue butterflies in Area 2 for the 2014-2025 field seasons based upon the 2014 count of butterflies in the interior of the Goodwin property. In 2021-2023, the roadside peak count reached the highest number ever seen at this site.

	<u>Roadside</u>	<u>Interior Goodwin</u>	<u>Total</u>
2014	38	62	100
2015	34	(? 56)	(? 90)
2016	39	(? 64)	(? 103)
2017	9	(? 15)	(? 24)
2018	24	(? 40)	(? 64)
2019	30	(? 49)	(? 79)
2020	32	(? 53)	(? 85)
2021	45	(? 73)	(? 118)
2022	45	(? 73)	(? 118)
2023	45	(? 73)	(? 118)
2024	35	(? 57)	(? 92)
2025	15	(? 25)	(? 40)

Thus, butterfly numbers were sharply reduced in 2025 in both Area 1 and 2 this year, and this was even more dramatic in Area 4 as discussed below. It is possible that extreme heat and drought in late summer on these warm, dry south-facing aspects may have resulted in heavy mortality of the diapausing larvae during the 2023-2024 field seasons. Since the summer of 2025 was cooler, it is hoped that numbers will improve in 2026.

12. Yamhill Co. – Area 3 Oak Ridge Road – Carol Hebert property (Oak Ridge Metapopulation)

The Area 3 habitat on Oak Ridge is comprised of both the county road right of way and the adjacent Carol Hebert property. Ms. Hebert has never allowed butterfly surveys to be conducted on her property, so all butterfly observations have been limited to the county roadside and what could be observed from the road on the Hebert property. Large patches of Kincaid’s lupine are located in the road right of way and on the Hebert property immediately adjacent to the road. These cover an estimated 500 square meters on the road right of way and perhaps an

additional 600 square meters on the Hebert property next to the road. In particular, the lupine appears to have spread considerably on the Hebert property in recent years, while the lupine on the road right of way has been released from suppression by dense stands of woody brush including poison oak, young trees, and exotic sweet pea by Yamhill County management over the past eight years. Specific details of this management were included in the 2019 report (Hammond, 2019). In late June of 2024, both exotic purple vetch and sweet pea were mowed along the road. Butterflies were surveyed five times in 2025 with the following numbers of male butterflies.

May 10	12
May 20	6
May 24	13
May 30	13
June 6	6

During the 2019-2025 field seasons, butterflies emerged and continued to fly in Area 3 over an extended time period. Thus, butterflies flying in early May were probably not the same butterflies flying during early June when several freshly emerged males and females were still observed. Butterfly numbers doubled during this time period due in large part to the improved habitat conditions along the roadsides resulting from Yamhill County management. In both 2022 and 2024, the cold and rainy weather conditions resulted in the adult butterfly flight season being delayed by about two weeks, with butterflies still flying during the middle of June. Moreover, the population was severely reduced in numbers compared to 2021 and 2023 with more favorable weather conditions. Again, cold, rainy weather during the spring appears to result in higher larval mortality compared to warm, dry weather. Conversely, butterfly numbers were reduced in 2025, perhaps due to the very hot, dry summers over the past two years as discussed with Areas 1 and 2 above. Peak counts of males for 2014-2025 are shown below.

2014	36
2015	26
2016	20
2017	12
2018	14
2019	32
2020	26
2021	32
2022	10
2023	34
2024	17
2025	13

13. Yamhill Co. – Area 4 Oak Ridge – Zakocs and Aplin properties (Oak Ridge Metapopulation)

The habitat of Area 4 on Oak Ridge is located on the Ed Zakocs and Michael Aplin properties. There are four major patches of Kincaid's lupine on the Zakocs property covering an estimated 10,000 square meters, and two major patches of lupine on the Aplin property that now cover about 4000 square meters. These lupine patches have been growing and expanding rapidly on both properties over the past few years. The locations of these lupine patches are illustrated on the attached map. Zakocs 5 lupine patch shown on the map was formerly covered with invasive sickle-keeled lupine (*Lupinus albicaulis*) that was rapidly spreading over the Zakocs property and smothering out the Kincaid's lupine. The sickle-keeled lupine was successfully eradicated with herbicide applications as discussed in the 2018 and 2019 reports (Hammond, 2018, 2019), and some isolated plants of Kincaid's lupine were becoming established within the Zakocs 5 area as of the 2020-2025 field seasons. In 2024, a new patch of lupine (Zakocs 8) had become established at the southwest corner of the Zakocs property, apparently resulting from long distance seed dispersal. At the same time, much of the lupine in the original patches (Zakocs 1, 3, and 4) was becoming severely impacted from succession to exotic tall oat-grass

domination, apparently resulting from increased soil nitrogen enrichment. As a result, ecological succession has been reducing the growth and vigor of the lupine in these patches, and has severely reduced the numbers of butterflies as well. This was discussed in greater detail with the 2024 report (Hammond, 2024).

Area 4 was only surveyed three times during the 2025 field season around the peak of the butterfly flight season. The number of male butterflies is shown below for each individual lupine patch (locations shown on map).

	<u>Zakocs 1</u>	<u>Zakocs 2</u>	<u>Zakocs 3</u>	<u>Zakocs 4</u>	<u>Zakocs 5</u>	<u>Aplin 6</u>	<u>Aplin 7</u>	<u>Zakocs 8</u>
May 24	7	15	1	4	0	86	17	0
June 2	2	12	2	4	0	93	13	0
June 7	0	2	0	2	0	38	5	0
Peak Count	7	15	2	4	0	93	17	0
Total Peak Count	138 males							

Thus, butterfly numbers were at peak at various times in different lupine patches between May 24 (Zakocs 1, Zakocs 2, Aplin 7) and June 2 (Zakocs 3, Aplin 6). This is the result of variance in aspect and moisture conditions with butterflies on warm, dry aspects peaking first, and butterflies on cool, wet aspects peaking later (Aplin 6). Total population size in 2025 is estimated at around 331 butterflies.

The following table compares peak male butterfly numbers by lupine patch during 2018-2021, and in 2024-2025. Overall numbers in Area 4 were in sharp decline in 2024-2025 compared to previous years, partly resulting from the ecological succession problems in many of the Zakocs lupine patches. These declines on the Zakocs property have been partially compensated by strong numbers of butterflies on the Aplin property.

Comparison of Peak Male Butterfly Numbers in Area 4 by Lupine Patch During 2018-2025

	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2024</u>	<u>2025</u>
1. Zakocs 1	68	68	75	46	14	7
2. Zakocs 2	5	14	20	35	23	15
3. Zakocs 3	24	12	38	14	7	2
4. Zakocs 4	19	8	38	58	8	4
5. Zakocs 5	0	0	0	0	0	0
6. Aplin 6	30	41	41	56	44	93
7. Aplin 7	0	20	15	9	15	17
8. Zakocs 8	0	0	0	0	1	0
<hr/>						
Total	146	163	227	218	111	138

As shown in the above table, the history of individual lupine patches and the butterflies that they support has been quite variable over the past eight years (locations shown on enclosed map). The history of each lupine patch is discussed in detail as follows.

(1.) Zakocs 1 lupine patch has been rapidly expanding each year, and has probably quadrupled in size since 2013. It includes the top of the hill that is relatively warm and dry, and a lower north-facing aspect that is cooler and moister. Butterfly numbers were increasing each year since 2013 with the expanding extent of lupine coverage, but have been declining over the past five years. While this decline is partly due to poor weather conditions during this time, much of the Zakocs 1 lupine patch is presently experiencing severe decline due to lupine ecological succession and invasion by exotic tall oat-grass. Severe summer heat and drought over the past few years may have contributed to the decline in 2025.

(2.) Zakocs 2 lupine patch began as a purely Kincaid's lupine patch in 2013, but rapidly became overgrown with the infestation of sickle-keeled lupine by 2015. With the elimination of the sickle-keeled lupine and suppression of Kincaid's lupine by herbicide treatment in 2017,

butterfly numbers greatly decreased in 2017-2018. However, the Kincaid's lupine recovered in 2019-2021, and this patch is now rapidly expanding. In turn, butterfly numbers have also been increasing over the past five years, although the western part of this lupine patch is currently being overgrown with an infestation of tall oat-grass. This site has a cool, north-facing aspect, and supported the highest number of butterflies on the Zakocs property during the 2024-2025 field seasons.

(3.) Zakocs 3 lupine patch is located at the top of the hill and on the south slope with a warm, dry aspect. It has experienced a massive expansion in size since 2013, and now covers most of the south-facing slope. Butterfly numbers reached the highest level during the favorable weather year of 2016 with 78 butterflies present, but numbers sharply declined during the dry springs of 2019 and 2021. Much of the older, central portion of this lupine patch has severely declined over the past few years because of lupine ecological succession as discussed in the 2024 report (Hammond, 2024). The severe summer heat and drought over the past few years may be responsible for the near disappearance of butterflies from this lupine patch during the 2024-2025 field seasons.

(4.) Zakocs 4 lupine patch is located at the bottom of the hill with a warm, dry south-facing aspect. It also has quadrupled in size since 2013, and is currently expanding at a rapid rate as well. Unfortunately, most of this lupine patch is also in severe decline due to lupine ecological succession, and much is currently being overgrown with exotic tall oat-grass. The highest number of butterflies (88) occurred in 2015, and 58 were still present in 2021. As with the Zakocs 3 lupine patch, the massive drop in butterfly numbers during the 2024-2025 field seasons may have resulted from the severe summer heat and drought in recent years.

(5.) Zakocs 5 lupine patch on the northwest side of the hill was a sickle-keeled lupine site with virtually no Kincaid's lupine when it was eliminated with herbicides in 2017. Since then, scattered small patches of Kincaid's lupine have become established, apparently resulting from long-distance seed dispersal. Thus butterflies are expected to become re-established in future years as the Kincaid's lupine spreads and expands, but no butterflies were yet seen during the 2024-2025 field seasons.

(6.) Aplin 6 lupine patch is located on a cool, north-facing aspect. It has been rapidly expanding for many years, and although the central portions of the patch are starting to show indications of lupine ecological succession, this has not affected butterfly numbers as yet. Because of the cool, mesic conditions, butterflies fly in large numbers over an extended time period without a clear peak, and butterflies flying during the first two weeks of May are probably not the same butterflies flying during the first two weeks of June. As a consequence, the peak count numbers shown in the above table are probably not indicative of the total butterfly production levels in this lupine patch. During the 2024-2025 field seasons, this lupine patch produced the most butterflies in all of Area 4, with a particularly massive population explosion

of butterflies this year with 93 seen on the peak day and large numbers flying into June. While 2025 was probably an exceptional year for butterfly production, the continued expansion of lupine at this site will likely sustain large numbers over the next few years.

(7.) Aplin 7 lupine patch is located higher on the hill with a warm, drier aspect. It did not exist until five years ago. A few isolated plants had become established in 2018, apparently by long-distance seed dispersal, and the lupine has quickly spread and formed a very large patch as of the 2024-2025 field seasons. Butterflies quickly became established in this patch from the adjacent Aplin 6 patch. Although butterfly numbers dropped during the dry year of 2021, this patch has been consistently producing moderate numbers of butterflies over the past few years including the 2024-2025 field seasons. By contrast, butterfly numbers in the Aplin 6 patch with cool, mesic conditions reached the highest number ever (56) at that time in 2021. At present, these two patches will likely continue to expand and merge together in the next few years.

(8.) Zakocs 8 lupine patch has just become established over the past 3-4 years. It began as an isolated plant resulting from long-distance seed dispersal on the southwest part of the hill with a dry, south-facing aspect. As of the 2024-2025 field seasons, it had expanded into a small patch covering about 20 square meters, and the first male Fender's blue butterfly was seen in this patch on May 15, 2024. Because habitat conditions are very similar to that of the Aplin 7 lupine patch, this new patch is expected to rapidly expand over the next few years.

The following table summarizes peak numbers of male Fender's blue butterflies and a population estimate for the Oak Ridge Metapopulation in 2016-2021, and in 2024-2025. Data was incomplete in 2022-2023.

	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2024</u>	<u>2025</u>
Area 1	13	8	8	12	8	7	7	2
Area 2	103	24	64	79	85	118	92	40
Area 3	20	12	14	32	26	32	17	13
Area 4	524	99	146	163	227	218	111	138
Total Peak Count	660	143	232	286	346	375	227	193
Population Estimate	1584	403	518	686	830	900	545	463

Butterfly numbers in the Oak Ridge Metapopulation have remained somewhat stable over the past 10 years. Sharp decreases on the Zakocs property have been partially compensated by increases on the Aplin property. These decreases appear to have resulted from a combination of poor weather conditions over the past few years, and lupine ecological succession. However, without the large number of butterflies on the Aplin property, the population estimate for the Oak Ridge Metapopulation during 2025 would only have been about 200 butterflies.

14. Yamhill County – Hacker Road (Turner Creek Metapopulation)

The Hacker Road habitat consists of a narrow strip of native prairie along the county road right of way that includes a surprisingly rich diversity of native prairie herbs and grasses. Late June observations in 2020 showed large populations of both *Brodiaea coronaria* and *Clarkia amoena*. Kincaid's lupine is abundant on the north side of the road extending for about a quarter of a mile, but also occurs on the south side of the road. In 2024, butterfly surveys were conducted over five days with the following results.

May 10	0
May 20	0
May 24	0
May 30	0
June 6	0

A single male silvery blue butterfly was seen at this site on May 10, but no Fender's blue butterflies were present during the 2025 field season. In recent years, only a few butterflies have occupied this habitat as shown by the historical peak counts below. In 2023, the population may have died out due to the poor weather conditions during the spring of 2022. Also, part of this decline in recent years may be due to a resurgence of tall-growing exotic grasses that are overgrowing the lupine during the butterfly flight season, particularly tall oat-grass. Applications of a grass-specific herbicide were conducted at this site on March 3 and again on April 9 of 2025. Unfortunately, these treatments were not very effective in controlling the tall oat-grass this year, perhaps because of excessive moisture on the grass. Thus, grass-specific herbicide treatments are planned again for the spring of 2026.

Historical Summary of Fender's Blue Butterflies at Hacker Road in 2015-2025

2015	4 males, 1 female
2016	6 males, 3 females
2017	8 males
2018	5 males, 1 female
2019	1 male, 1 female
2020	0
2021	1 male
2022	1 male
2023	0
2024	0
2025	0

15. Yamhill Co. – Tupper Road (Turner Creek Metapopulation)

Small patches of Kincaid's lupine are distributed along the north side of Tupper Road on the county road right of way near the junction of Turner Creek Road for about a quarter of a mile. However, this lupine has been badly overgrown with tall, dense stands of tall oat-grass in the past, including the 2018-2025 field seasons. No Fender's blue butterflies have been present during this time period. Because of the close proximity to the habitat along Hacker Road and Belt Road, butterflies would probably occupy this site if the tall oat-grass was absent. During the spring of 2025, applications of a grass-specific herbicide were conducted at this site on March 3 and again on April 9. Unfortunately, these treatments were not effective in controlling the tall oat-grass, perhaps because of moisture on the grass at the time of application. Thus, grass-specific herbicide treatments are planned again for the spring of 2026. This site was surveyed for Fender's blue butterflies over five days in 2025 with the following results.

May 10	0
May 20	0
May 24	0
May 30	0
June 6	0

16. Yamhill Co. – Sonja Kalbsleisch and Norvella Koelling Properties (Turner Creek Metapopulation)

Both of these sites along Belt Road and NW Richmond Road were not surveyed during the 2023-2025 field seasons. Both sites have major management problems as discussed in the 2022 report (Hammond, 2022), and butterfly numbers have been low at both sites in recent years. In 2022, the peak count was 3 males and 4 females on the Koelling property and only 1 female was seen on the Kalbsleisch property. Also, access to the Kalbsleisch property has become difficult because dense thickets of blackberry have overgrown the north access gate on Belt Road. This site is rapidly becoming overgrown with exotic Scotch broom brush. Habitat on the Koelling property was being degraded by a dense growth of exotic purple vetch that was overgrowing the Kincaid's lupine. Both property owners require assistance with management on their properties.

POSSIBLE RECENT EFFECTS FROM SUMMER HEAT AND DROUGHT

The Oak Ridge metapopulation suffered a severe drop in numbers of Fender's blue butterflies during the 2025 field season. This may be the result of severe summer heat and drought during August over the past few years. Ambient air temperatures were often 90-100 degrees Fahrenheit for many days at a time, and these temperatures must have been much higher at the soil surface level where the early instar larvae were in diapause. The combination of extreme heat and drought may have crossed the lethality threshold for the larvae, resulting in the death of most larvae in habitats with a warm, south-facing aspect.

Comparison of peak butterfly numbers during the last favorable year in 2021 with those in 2025 showed sharp drops in all areas. Area 1 dropped from 7 to 2, Area 2 dropped from 118 to 40, Area 3 dropped from 32 to 13, and Area 4 dropped from 218 to 138.

The most severe decreases took place in the lupine patches on the Zakocs property. These are very large lupine patches that have supported large numbers of butterflies in the past. Zakocs lupine patch 1 is mostly located on a warm, dry aspect at the top of the hill. In 2021, it produced 46 butterflies (75 in 2020), but only 7 in 2025. Zakocs lupine patch 3 is even hotter and drier on the south side of the hill. In 2021, it produced 14 butterflies (38 in 2020), but only 2 in 2025. Zakocs lupine patch 4 at the bottom of the hill still has a warm, south-facing aspect. In 2021, it produced 58 butterflies, but only 4 in 2025. Of all the lupine patches on the Zakocs property, only the Zakocs lupine patch 2 has a cooler and moister north-facing aspect. In 2021, it produced 35 butterflies, and 15 butterflies in 2025. This was the highest number of butterflies in any lupine patch on the Zakocs property this year.

In dramatic contrast, the two lupine patches on the adjacent Aplin property produced many more butterflies compared to the Zakocs property. In particular, Aplin lupine patch 6 is located on a very cool, mesic north-facing aspect that usually supports a very long adult flight season from early May to the middle of June, long after all butterflies have disappeared from the Zakocs property. In 2021, it produced 56 butterflies, and these greatly increased during 2025 to 93 butterflies! This was the highest number of butterflies found anywhere within the Oak Ridge metapopulation in 2025. By contrast, Aplin lupine patch 7 is located on a warmer, drier aspect higher on the hill. It increased from 9 butterflies in 2021 to 17 butterflies in 2025.

In conclusion, the total population estimate for the Oak Ridge metapopulation of Fender's blue butterflies was about 900 in 2021, but this dropped to 463 in 2025. However, without the extra butterflies produced on the Aplin property, this number would have dropped even more severely to an estimated 200 butterflies this year. This demonstrates the value of having lupine patches distributed across a variety of warm to cool habitat types.

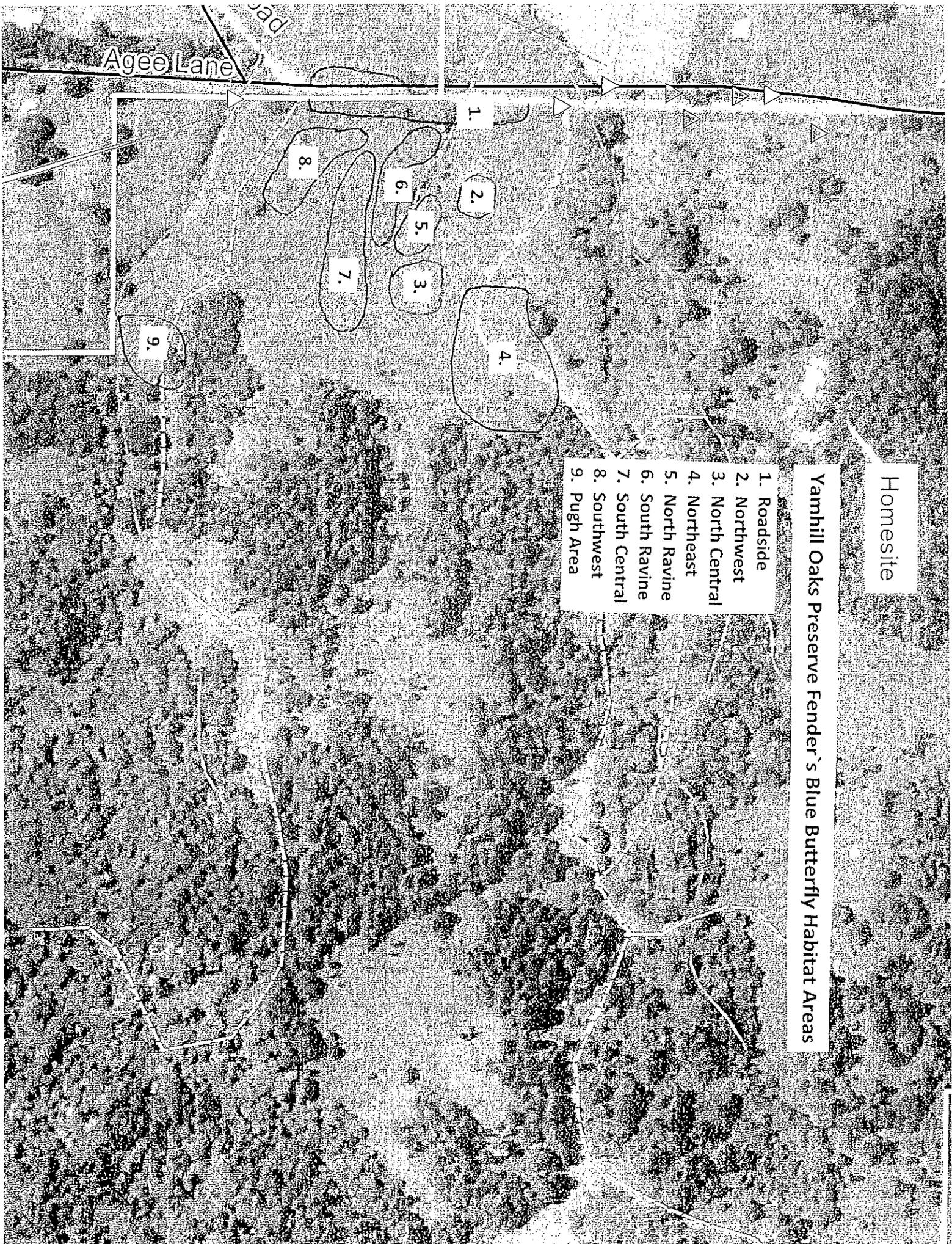
LITERATURE CITED

- Hammond, P.C. 2007. The 2007 study of the Fender's blue butterfly (*Icaricia icarioides fenderi*) in Benton, Polk, and Yamhill Counties, Oregon. The Nature Conservancy and U.S. Fish and Wildlife Service. 50 pp.
- Hammond, P.C. 2010. The 2010 study of the Fender's blue butterfly (*Icaricia icarioides fenderi*) in Benton, Polk, and Yamhill Counties, Oregon. Oregon Dept. of State Lands and U.S. Fish and Wildlife Service. 43 pp.
- Hammond, P.C. 2016. The 2016 surveys of Fender's blue butterfly and Kincaid's lupine sites in Benton and Yamhill Counties, Oregon. Institute for Applied Ecology and U.S. Fish and Wildlife Service and Yamhill County Department of Public Works. 22 pp.
- Hammond, P.C. 2018. The 2018 surveys of Fender's blue butterfly and Kincaid's lupine sites in Benton and Yamhill Counties, Oregon. Institute for Applied Ecology and U.S. Fish and Wildlife Service and Yamhill County Department of Public Works. 25 pp.
- Hammond, P.C. 2019. The 2019 surveys of Fender's blue butterfly and Kincaid's lupine sites in Benton and Yamhill Counties, Oregon. Institute for Applied Ecology and U.S. Fish and Wildlife Service and Yamhill County Department of Public Works. 30 pp.
- Hammond, P.C. 2021. The 2021 surveys of Fender's blue butterfly and Kincaid's lupine sites in Benton, Polk, and Yamhill Counties, Oregon. Institute for Applied Ecology and U.S. Fish and Wildlife Service and Yamhill County Department of Public Works. 31 pp.
- Hammond, P.C. 2022. The 2022 surveys of Fender's blue butterfly and Kincaid's lupine sites in Benton, Polk, and Yamhill Counties, Oregon. Institute for Applied Ecology and U.S. Fish and Wildlife Service and Yamhill County Department of Public Works. 31 pp.
- Hammond, P.C. 2023. The 2023 surveys of Fender's blue butterfly and Kincaid's lupine sites in Polk and Yamhill Counties, Oregon. Institute for Applied Ecology and U.S. Fish and Wildlife Service and Yamhill County Department of Public Works. 25 pp.
- Hammond, P.C. 2024. The 2024 surveys of Fender's blue butterfly and Kincaid's lupine sites in Polk and Yamhill Counties, Oregon. Institute for Applied Ecology and U.S. Fish and Wildlife Service and Yamhill County Department of Public Works. 25 pp.

Homestead

Yamhill Oaks Preserve Fender's Blue Butterfly Habitat Areas

1. Roadside
2. Northwest
3. North Central
4. Northeast
5. North Ravine
6. South Ravine
7. South Central
8. Southwest
9. Pugh Area



Oak Ridge - Yamhill County
Lupine Patches Area 4

