

Action Plan for Taylor's Checkerspot Butterfly Conservation in Oregon



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PREFACE

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Cover photograph: Taylor's checkerspot butterfly. *Photo by Tom Kaye. All photos by IAE.*

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Table of Contents

PREFACE.....I

ACKNOWLEDGMENTS.....III

INTRODUCTION 1

BACKGROUND..... 1

 Current conservation status 1

 British Colombia..... 2

 Washington 2

 Oregon..... 2

 Threats in Oregon.....3

 Habitat quality 3

 Population size, number, and distribution.....4

 Predation, parasites and disease 5

 Limited and evolving knowledge of the species.....5

 Population Trends in Oregon.....5

 Historic distribution in Oregon.....6

 Habitat Assessments (2016)..... 6

 Field methods.....6

 Site habitat quality rankings..... 9

GOALS, OBJECTIVES, AND ACTIONS FOR FUTURE CONSERVATION OF TAYLOR’S CHECKERSPOT IN OREGON 10

 Goal 1: Restore and maintain quality habitat (with heterogeneity) for Taylor’s checkerspot population persistence and expansion at existing sites 10

 1-1. Adaptively manage guidelines for mowing, herbicide use, prescribed fire, and other habitat restoration practices at Taylor’s checkerspot occupied sites 10

 1-2. Develop and regularly update management plans for Taylor’s checkerspot occupied sites 10

 1-3. Control invasive species at Taylor’s checkerspot occupied sites, particularly tall oatgrass and false brome..... 11

 1-4. Secure Taylor’s checkerspot occupied sites that lack conservation easements or deed restriction..... 12

 1-5. Maintain and enhance habitat quality at occupied sites 12

 Goal 2: Increase number of total populations on secured lands, building network or metapopulation structure where possible..... 13

2-1. Collect detailed habitat quality data (grid method) at priority Taylor’s checkerspot introduction sites, and rapid assessment data at potential introduction sites in the Eugene recovery zone 15

2-2. Develop site specific management plans for priority Taylor’s checkerspot introduction sites 15

2-3. Coordinate and establish a Taylor’s checkerspot captive rearing program in Oregon 16

2-4. Restore and prepare habitat for Taylor’s checkerspot introductions on secured lands, prioritizing sites where there are opportunities for connectivity to adjacent, occupied sites 17

2-5. Implement Taylor’s checkerspot introductions on secured conservation lands, prioritizing areas with opportunities for connectivity to adjacent Taylor’s checkerspot occupied sites, or with the potential to build a new network for the species..... 18

2-6. Enhance connectivity between Taylor’s checkerspot populations and unoccupied but suitable habitat 18

Goal 3: Contribute information to range-wide recovery planning for Taylor’s checkerspot 19

3-1. Monitor Taylor’s checkerspot populations annually at occupied sites and any sites with butterfly introductions..... 19

3-2. Evaluate scenarios for dual management of Fender’s blue butterfly and Taylor’s checkerspot butterfly 19

3-3. Implement research to understand the lifespan of Taylor’s checkerspot to improve population monitoring and size estimates 20

3-4. Implement research to understand the dispersal behavior of Taylor’s checkerspot to improve understanding of meta-population dynamics 20

NEXT STEPS20

REFERENCES21

APPENDIX 1: FIELD PROTOCOLS23

APPENDIX 2: SITE QUALITY RANKINGS (OREGON 2016)29

APPENDIX 3: MAPS.....32

APPENDIX 4: ACTION SUMMARY.....39

Figures

Figure 1. Taylor’s checkerspot butterfly..... 1
Figure 2. Taylor’s checkerspot occupied sites in Oregon as of 2016. 3
Figure 3. TCB larva on English plantain host plant. 4
Figure 4. Taylor’s checkerspot larvae on reintroduced golden paintbrush at Beazell Memorial Forest. 4
Figure 5. Abundance of Taylor’s checkerspot butterflies at Oregon sites. 5
Figure 6. Adult population growth rates at the two Oregon populations of Taylor’s checkerspots. 6
Figure 7. Estimated historic range of Taylor’s checkerspot in Oregon..... 7
Figure 8. Overview of sites with habitat assessments for Taylor’s checkerspot completed in 2016... 8
Figure 9. Prescribed fire at Baskett Slough NWR. 10
Figure 10. False brome. 11
Figure 11. Potential recovery zones for Taylor’s checkerspot butterfly in Oregon, mirroring those used for Fender’s blue butterfly in the Willamette Valley. 14
Figure 12. Taylor’s checkerspot nectaring on a strawberry flower..... 17

Tables

Table 1. Nectar species likely used by Taylor’s checkerspot in Oregon..... 9
Table 2. Invasive species control needs at Taylor’s checkerspot occupied sites as of 2016..... 12
Table 3. Taylor’s checkerspot host and nectar habitat enhancement opportunities at Taylor’s checkerspot occupied sites in Oregon..... 13
Table 4. Sites where baseline grid or rapid habitat assessments should be completed..... 15
Table 5. Tentative schedule for management plan development at priority Taylor’s checkerspot introduction sites..... 16
Table 6. Site management needs identified at priority Taylor’s checkerspot introduction sites with 2016 habitat assessment data. 17
Table 7. List of priority sites for Taylor’s checkerspot introductions in Oregon..... 18
Table 8. Wild Oregon populations of Taylor’s checkerspot in need of annual monitoring..... 19

INTRODUCTION

The purpose of this action plan is to identify tasks to promote the recovery of Taylor's checkerspot butterfly (*Euphydryas editha taylori*; Figure 1) in Oregon for the 9 year period of 2017-2025. This plan provides a review of the species' current conservation status in Oregon and Washington, and describes its historical distribution and threats to the species in Oregon. Goals, objectives, and tasks are identified to improve the status of Taylor's checkerspot in



Figure 1. Taylor's checkerspot butterfly.

Oregon, including habitat restoration needs within currently or recently occupied areas and priority sites for Taylor's checkerspot introductions in Oregon. Each task is linked to implementing organization(s) and timeframe.

An Oregon Action Planning Team for Taylor's checkerspot was convened to guide the development of this plan. This team included species experts, Willamette Valley landowners and managers, agency staff from Oregon and Washington, soil and water conservation district staff, university faculty, and other knowledgeable persons. The team participated in two full-group meetings, and a subset met independent of the larger group to help develop field protocols for habitat assessments. All team members were also provided the opportunity to provide edits to improve this action plan document.

The action plan will contribute directly to the overall Recovery Plan for Taylor's checkerspot which is under development by the US Fish and Wildlife Service.

BACKGROUND

Current conservation status

Once found on over 80 sites in the Willamette Valley, Oregon, western Washington, and Vancouver Island, British Columbia, Canada, Taylor's checkerspot is currently recognized throughout its range as an endangered species (USFWS 2013) and is also listed as endangered by the state of Washington. Its NatureServe Global status is G5T1 (Critically Imperiled).

Taylor's checkerspot has experienced prairie habitat loss from development, agriculture, and forest succession, is currently limited to a small number of populations, some of which are on unsecured private lands, and has poorly understood habitat requirements. Surveys have to determine the current status of the species across its range have found many populations to be extirpated and discovered few new populations. Life history and habitat research (Hays et al.

2000, Severns and Warren 2008, Page et al. 2009, Severns and Grosboll 2011, Grosboll 2011) has improved our understanding of the biology of the species and its interactions with the environment.

Taylor's checkerspot is now restricted to 1 population on Denman Island, a small island off of Vancouver Island, British Columbia, 2 populations near Corvallis, Oregon, and 7 extant and 3 recently reintroduced populations in Washington.

British Colombia

In British Columbia, Taylor's checkerspot historically occupied at least 24 prairie-oak and coastal meadow sites in southern Vancouver Island, but today persists on only 1 site, Denman Island (COSEWIC 2011).

Washington

In Washington, Taylor's checkerspot was historically documented from over 40 locations, ranging from the San Jan Islands south to the Cowlitz River (Stinson 2005). It currently occurs in a total of 10 locations in Washington. There are 6 extant populations on the northeast Olympic Peninsula (Eden Valley, Dan Kelly Ridge, Sequim, Bear Mountain, 3 O'clock Ridge, and Upper Dungeness) (WDFW 2014), a single population on Joint Base Lewis McChord (Range 76-JBLM), which has supported 1000's of butterflies in recent years (Olson and Linders 2010, Linders 2012), and 3 additional sites where reintroduction efforts are underway (Range 50-JBLM, Scatter Creek South, and Glacial Heritage Preserve). The JBLM reintroduction site supports 100-1000 individuals, while the latter two sites have small numbers of butterflies.

Oregon

Oregon Taylor's checkerspot populations today are concentrated in two areas – Beazell Memorial Forest, owned and managed by the Benton County Natural Areas and Parks Department, and the Cardwell Hill - Bonneville Power Administration Powerline Corridor (Figure 2).

Beazell is located in Kings Valley, northwest of Corvallis. The site consists of a network of six meadows within a matrix of conifer-oak forest. Four of these meadows (North, Middle, Summit and South) are currently occupied by Taylor's checkerspot, though occasional butterflies have been observed in the other two meadows (Bird Loop and Caretaker's). North, Middle and Summit meadows are on the upper, primarily south facing slopes of the site. Total acreage across five of these meadows (all except Caretaker's) is approximately 40 acres, though the area occupied by Taylor's checkerspot is likely closer to 20 acres.

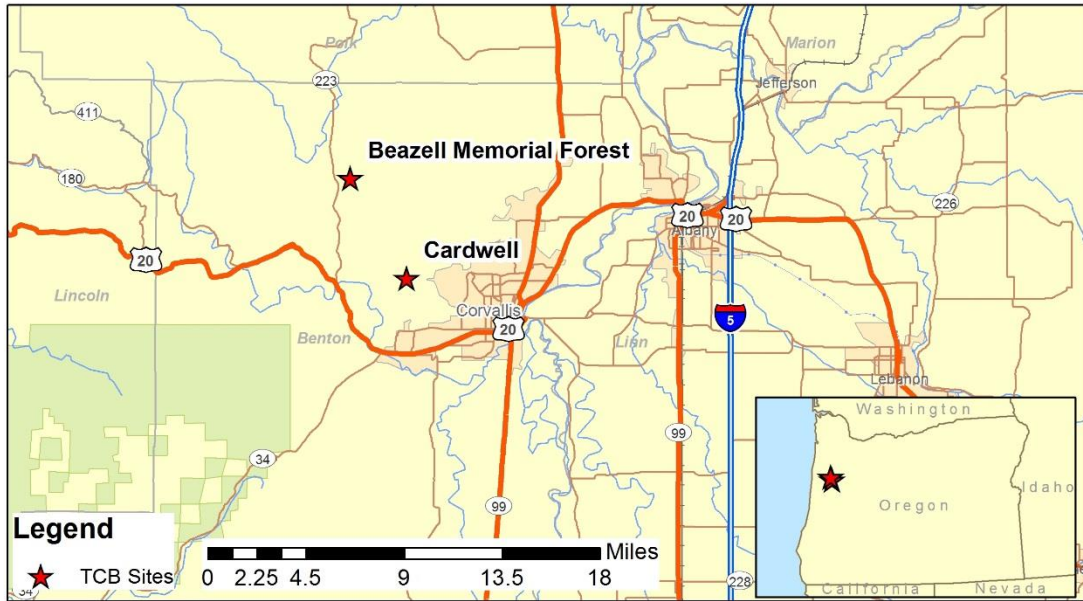


Figure 2. Taylor's checkerspot occupied sites in Oregon as of 2016.

The Cardwell area is located west of Corvallis and north of Philomath. There is a network of three meadows that are or recently have been occupied by Taylor's checkerspot, under two different private ownerships. All are on private land that is not secured by conservation easement or other protection, though both of the private landowners have thus far been open and receptive to restoration work and conservation. The largest of the meadows, Cardwell Crestmont, is approximately 13 acres in size, and is immediately below the BPA powerline, and includes the BPA access road. The other two meadows, Cardwell Little and Cardwell Big are 0.7 acres and 1.8 acres in size, respectively. Taylor's checkerspot has not consistently been present in Cardwell Little since 2014.

Threats in Oregon

Habitat quality

Habitats at both of the currently occupied sites in Oregon, Bezell and Cardwell, are at risk from invasion by aggressive introduced perennial grass species, particularly false brome (*Brachypodium sylvaticum*), tall oatgrass (*Arrhenatherum elatius*), and tall fescue (*Festuca arundinacea*), which have been identified to reduce habitat quality for Taylor's checkerspot (Severns and Warren 2008). In the absence of a naturally occurring wildfire cycle or intensive native grazing, both sites also are dependent upon regular maintenance to limit encroachment by trees (e.g., - Douglas fir – *Pseudotsuga menziesii*), shrubs (Himalayan blackberry – *Rubus armeniacus*), and hawthorn (*Crataegus monogyna*).

Additional factors limiting habitat quality are host and nectar plant resources. Research and observations in Washington Taylor's checkerspot populations highlight the probable importance of clusters of host plants and nectar plants for Taylor's checkerspot populations. In Oregon, English plantain (*Plantago lanceolata*; Figure 3) is the primary host plant, making clusters of this species (a minimum of four to five 4 square meter clusters) per 25 m x 25 m area) essential. Golden paintbrush (*Castilleja levisecta*) is another identified host plant for Taylor's checkerspot (Figure 4), but has newly been reintroduced to Oregon – until recently this species was extirpated from the state.



Figure 3. TCB larva on English plantain host plant.

Population size, number, and distribution



Figure 4. Taylor's checkerspot larvae on reintroduced golden paintbrush at Beazell Memorial Forest.

The Oregon Taylor's checkerspot populations are small, and have very limited distribution in the state (Figure 2). In low population years, the two Taylor's checkerspot populations in Oregon may each have fewer than 400 butterflies. Though these populations are only roughly 5 miles apart, they are separated by unsuitable habitat. The distribution of the species in Oregon extremely limited, but the chance for natural recolonization between the two Oregon populations is still extremely low.

Small populations are typically at risk from genetic drift - when the number of individuals in a population has declined, and genetic diversity is reduced, it can result in random shifts in the frequency of alleles (versions of genes) within populations. Such shifts can reduce the resiliency of populations, for example in their ability to adapt to environmental variation.

Small populations with extremely limited distributions can also experience greater risk of extinction from environmental variation. Insect population dynamics are often affected by to variation in climate and weather. Extreme weather events (e.g., periods of drought) that negatively affect Taylor's checkerspot larvae, adults, host or nectar plant resource availability could easily affect both Oregon Taylor's checkerspot populations

simultaneously.

Predation, parasites and disease

Taylor's checkerspot is at risk from several ecological interactions. Predation from crab spiders or other arthropods may directly reduce larvae and adult butterfly population sizes. Diseases or parasites (introduced and natural) of the butterfly may reduce population sizes through mortality or via decreases in fecundity. Factors negatively affecting the butterfly's host plant, such as disease or predators, may also result in butterfly population declines due to diminished larval food plant availability. The fungal pathogen *Pyrenopeziza plantaginis* has infected English plantain at Taylor's checkerspot sites in Oregon and Washington, reducing plantain leaves available for Taylor's checkerspot during post-diapause larval stages (Stone et al 2011).

Limited and evolving knowledge of the species

Information gaps for Taylor's checkerspot can pose a threat to the species where they impede accurate monitoring and population estimates, management and recovery planning. Areas in need of more research across all or part of Taylor's checkerspot's range include the following:

- Fine and coarse scale habitat needs for adults, larvae and diapause
- Life history information, such as adult life span
- Dispersal capability, including behavior around barriers and dispersal distance of males and females.

Population Trends in Oregon

Population sizes of Taylor's checkerspot adults at Beazell and Cardwell Hill have varied substantially since monitoring began in 2005 (Figure 5).

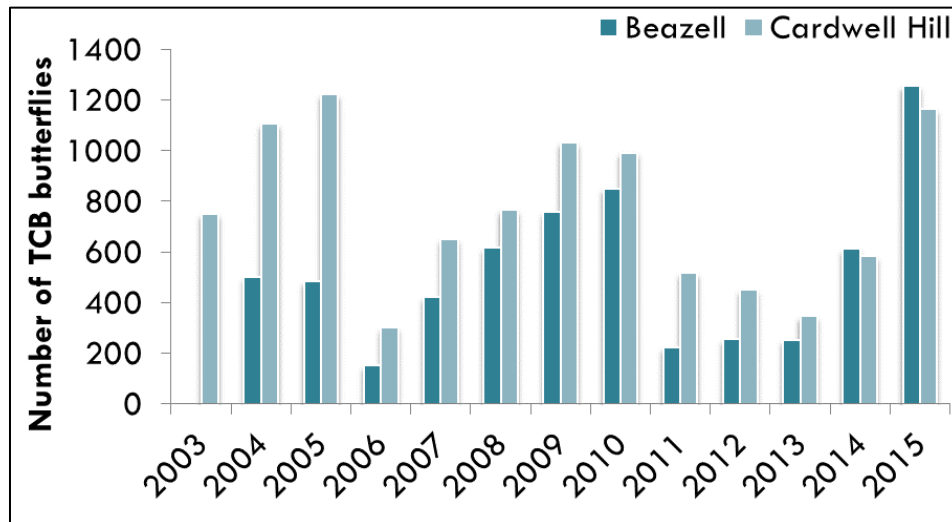


Figure 5. Abundance of Taylor's checkerspot butterflies at Oregon sites.

The total number of butterflies in each of these population networks is generally similar, each with as many as 1200-1300 butterflies in high population years, and as few as 150-300 butterflies in poor performance years (Ross 2015). The population growth rates at the two locations, which are within 4.6 miles (7.4 km) of each other, are highly correlated, suggesting that the populations are responding to the same weather variables from year to year (Figure 6). This correlation between the two populations means they may face the same threats from extreme weather events.

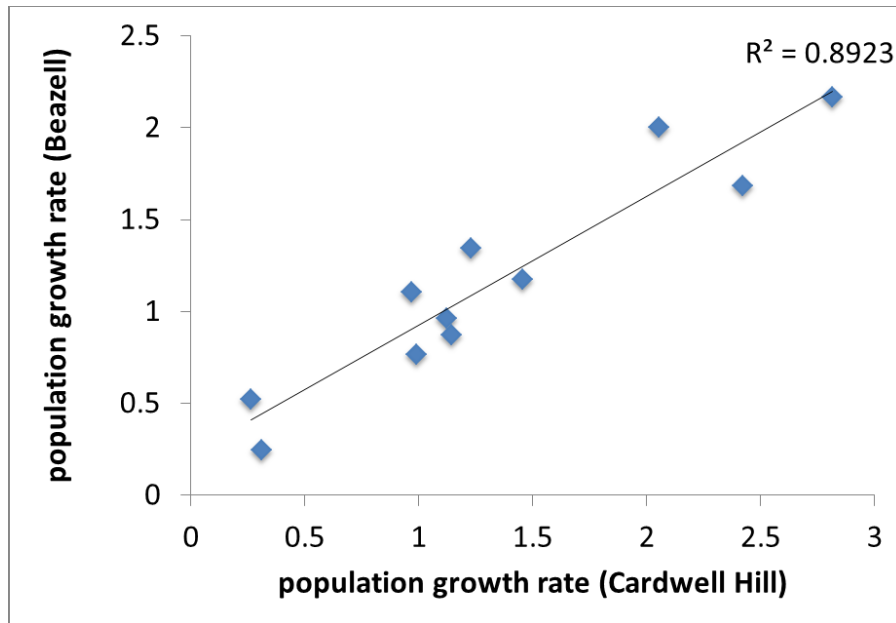


Figure 6. Adult population growth rates at the two Oregon populations of Taylor's checkerspots.

Historic distribution in Oregon

The historical distribution of the species in Oregon, based on collection records and lepidopterist accounts, is approximately 12 areas (Figure 7), ranging from a northern extent at Falls City in Polk County (west of Monmouth), south through Benton County, to the Coburg Hills on the northeast side of Eugene, in Lane County.

Habitat Assessments (2016)

Field methods

To inform development of this action plan, field assessments were completed in April and May 2016 at a total of 55 sites/units throughout the Willamette Valley, ranging from Yamhill County to Lane County (Figure 8). Some sites, e.g., Baskett Slough National Wildlife Refuge, are divided into management units, which were assessed separately. All sites assessed are under public land ownership (e.g., National Wildlife Refuge or County), protected by conservation easement, or otherwise engaged in conservation (e.g., Partners for Fish and Wildlife or other agreement). We utilized two different field assessment methods: Grid habitat assessments and Rapid habitat assessments. Field protocols are included in Appendix 1.

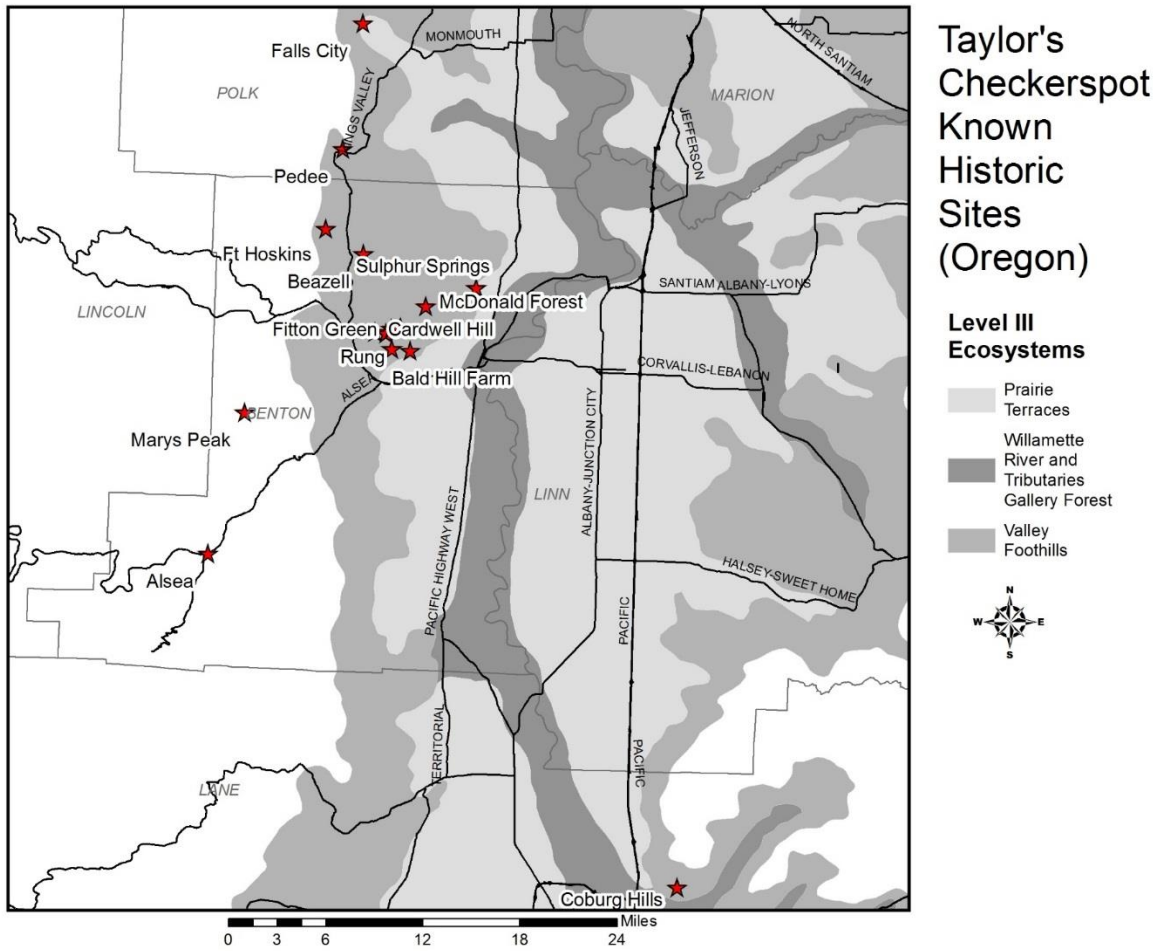


Figure 7. Estimated historic range of Taylor's checkerspot in Oregon.

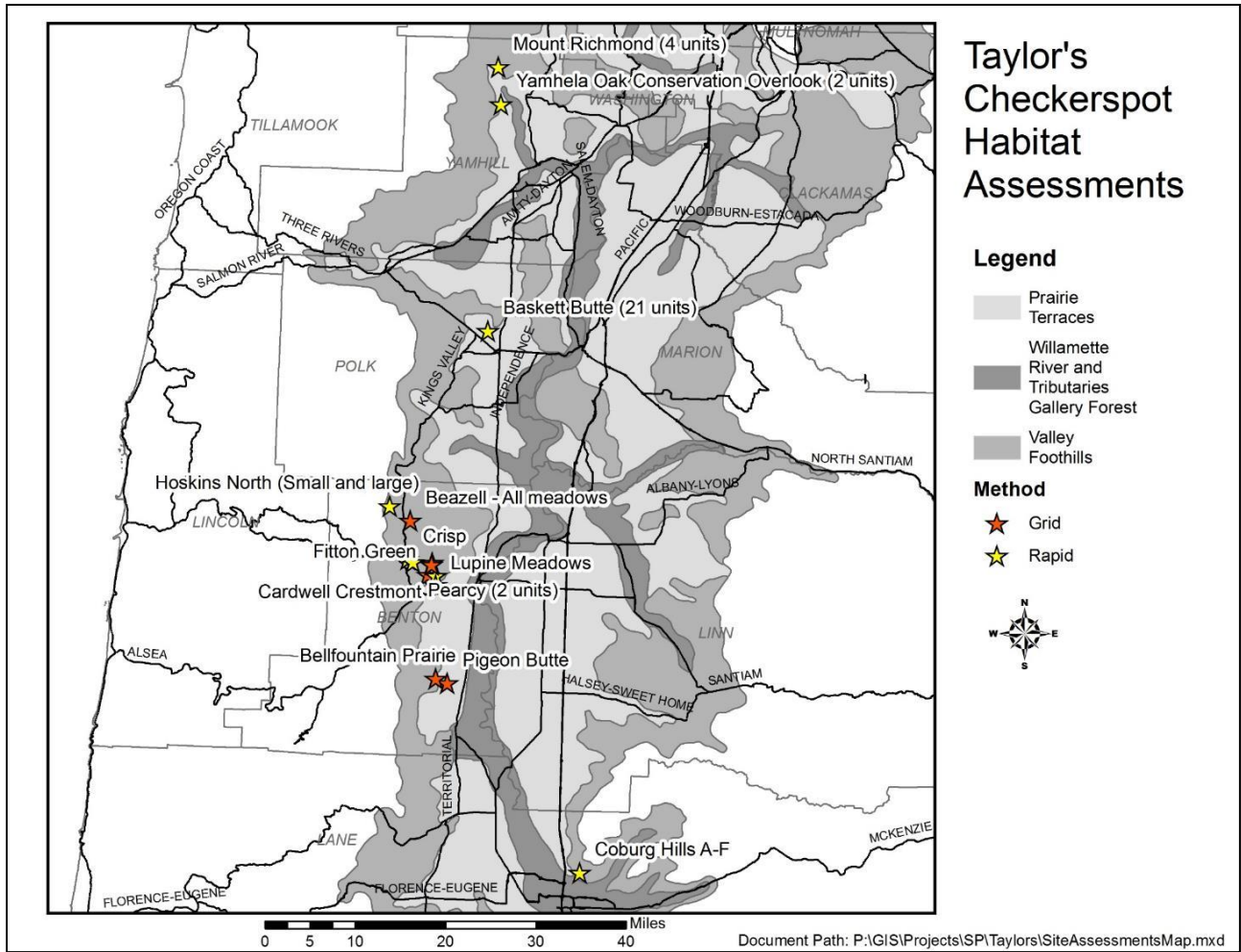


Figure 8. Overview of sites with habitat assessments for Taylor's checkerspot completed in 2016.

Grid habitat assessments were completed at 12 sites/units. The grid assessment methodology was modeled after Washington Department of Fish and Wildlife methods, and focused on butterfly host plant abundance (primarily English plantain), nectar species abundance and diversity (Table 1), vegetation structure, and invasive/weedy vegetation within grid cells of 25 m x 25 m. This method consumes more time and resources than the rapid assessment method, and was applied at currently or recently occupied sites, and at known high quality habitat locations.

Rapid habitat assessments were completed at 43 additional sites, and calculated from grid data for the 12 grid sites. The rapid assessment methodology utilized a Taylor's checkerspot Habitat Index (Modeled after the Prairie Calculator/Fender's blue butterfly Module in use for Fender's blue butterfly (*Icaricia icarioides fenderi*) and Prairie Habitat Index (Prairie Calculator) (IAE and Willamette Partnership 2014). The habitat quality indices collected data on the following site-level variables: habitat heterogeneity, connectivity, Taylor's checkerspot population, nectar, host,

vegetation structure, native/non-native cover and threat from aggressive exotic species, such as false brome, tall oatgrass, and Himalayan blackberry.

Field assessment data were analyzed to:

- Rank all assessed sites by habitat quality for Taylor's checkerspot
- Identify sites currently ready for Taylor's checkerspot introduction, and specific areas within sites with greatest suitability, as appropriate.
- Identify specific habitat management actions needed at occupied sites and potential reintroduction sites.

Table 1. Nectar species likely used by Taylor's checkerspot in Oregon.

Scientific Name	Common name	Origin
<i>Collinsia parviflora</i>	blue eyed Mary	Native
<i>Calochortus tolmiei</i>	Tolmie's startulip	Native
<i>Fragaria virginiana</i>	Strawberry	Native
<i>Linanthus bicolor</i>	Babystars	Native
<i>Lomatium utriculatum</i>	common lomatium	Native
<i>Lomatium triternatum</i>	nineleaf biscuitroot	Native
<i>Plectritis congesta</i>	Seablush	Native
<i>Taraxacum officinale</i>	Dandelion	Exotic
<i>Pyrus</i> spp.	Pear	Exotic

Site habitat quality rankings

We considered higher habitat quality sites to be those with greater host and nectar plant abundance, low vegetation structure, more cover of bare ground and native plant species, and less cover of tall or invasive plant species. Across all sites sampled, habitat quality was highest at Fitton Green Natural Area (unoccupied site), Beazell North Meadow (Taylor's checkerspot occupied site), Lupine Meadows (Taylor's checkerspot unoccupied site), Cardwell Crestmont (Taylor's checkerspot occupied site) and Beazell Middle Meadow (Taylor's checkerspot occupied site). A full list of sites assessed and habitat quality scores are included in Appendix 2. Maps of each site, showing host and nectar resources, and the most threatening invasive species at each site, are included in Appendix 3.

The five highest ranked sites ready for Taylor's checkerspot introduction (described as those with habitat quality equal to or greater than currently occupied sites) included Fitton Green Natural Area South Meadow, Lupine Meadows, Baskett Slough NWR Area 7, Baskett Slough NWR Area 3 Upper and Baskett Slough NWR Area 5 Lower. Additional sites with habitat quality equal to or greater than currently occupied sites included Bald Hill Farm Northeast Meadow, Finley NWR Bellfountain Prairie, and Baskett Slough NWR Area 4 Upper (See Appendix 2). It is impossible to determine whether butterfly introductions at any of these sites would be successful, but based on best available information, these sites should be the highest priority. Introduction may not be

currently feasible at all sites due to management resources, availability of butterflies for translocation, and other priorities.

GOALS, OBJECTIVES, AND ACTIONS FOR FUTURE CONSERVATION OF TAYLOR'S CHECKERSPOT IN OREGON

The Oregon Taylor's Checkerspot Action Planning Team developed three major goals with specific objectives and actions to promote Taylor's checkerspot conservation. These goals are as follows (and see Appendix 4 for a summary).

- Goal 1: Restore and maintain quality habitat (with heterogeneity) for Taylor's checkerspot population persistence and expansion at existing sites
- Goal 2: Increase number of total populations on secured lands, building network or metapopulation structure where possible
- Goal 3: Contribute information to range-wide recovery planning for Taylor's checkerspot

Goal 1: Restore and maintain quality habitat (with heterogeneity) for Taylor's checkerspot population persistence and expansion at existing sites

1-1. Adaptively manage guidelines for mowing, herbicide use, prescribed fire, and other habitat restoration practices at Taylor's checkerspot occupied sites

Guidelines for management of sites occupied by Taylor's checkerspot are critical to promote habitat restoration and management procedures that will minimize adverse effects to the butterfly, e.g. from prescribed fire (Figure 9) or mowing. Such guidelines have been developed in the USFWS biological opinion for habitat restoration prairie habitats (PROJECTS Biological Opinion USFWS 2015), and should be updated regularly as new information becomes available.



Figure 9. Prescribed fire at Baskett Slough NWR.

1-2. Develop and regularly update management plans for Taylor's checkerspot occupied sites

Establishing and maintaining management plans for each Taylor's checkerspot site will provide a roadmap to achieve and maintain desired future habitat conditions and control threats to the species. Management plans should include monitoring plans/schedules and measures to assess the effectiveness of habitat restoration and management, along with guidelines to ensure management actions are compatible with Taylor's checkerspot and other sensitive species at the

site. The USFWS requires approved management plans to be in place for a site to contribute to species recovery (USFWS 2010).

Benton County developed prairie management plans and a Taylor's checkerspot management plan as part of its Habitat Conservation Planning process in 2006-2010. These plans can be updated with current and specific actions needed for Taylor's checkerspot.

The Cardwell sites currently lack management plans, though management is occurring in coordination with the Partners for Fish and Wildlife program and Institute for Applied Ecology.

1-3. Control invasive species at Taylor's checkerspot occupied sites, particularly tall oatgrass and false brome

Invasive species pose a significant threat to the abundance and diversity of Taylor's checkerspot host and nectar plants at currently occupied sites. Tall oatgrass and false brome are common in forest and prairie habitats surrounding sites currently occupied by Taylor's checkerspot, are present within actual occupied habitat, and will continually spread if unchecked. Maps developed from 2016 field assessments identifying areas with higher concentrations of tall exotic shrubs, false brome, and tall oatgrass are shown in Appendix 3, Maps 1-4. Table 2 summarizes high priority invasive species control needs for Taylor's checkerspot occupied sites.



Figure 10. False brome.

Benton County has completed significant work in the meadows to remove invasive shrubs such as Scots broom (*Cystisus scoparius*), hawthorn, and encroaching Douglas fir. Continued work is needed to control spread of tall oatgrass and false brome in these meadows, as these species impede use by the butterfly (Severns and Warren 2008).

Mowing of invasive shrubs has occurred in the Cardwell sites, along with some spot spraying of false brome. However, the spread of false brome from the surrounding forest is likely to continue, requiring regular management to prevent the false brome from dominating the meadows. The Cardwell Little meadow has inconsistently supported Taylor's checkerspot in the last few years, potentially as a result of false brome invasions.

Table 2. Invasive species control needs at Taylor's checkerspot occupied sites as of 2016.

Site	Actions	Implementing Party	Complete by:
Beazell Bird Loop	Aggressively control tall oatgrass.	Benton County	Incremental annual work. All sites in phased treatment per TCB habitat management guidelines (Objective 1-1).
Beazell Middle Meadow	Aggressively control tall oatgrass.		
Beazell North Meadow	Continue to control false brome and tall oatgrass spread.		
Beazell South Meadow	Aggressively control tall oatgrass.		
Beazell Summit Meadow	Aggressively control tall oatgrass.		
Cardwell Crestmont	Aggressively control false brome, and mow to control exotic shrubs.	USFWS/IAE	
Cardwell Little	Aggressively control false brome, particularly on west side of meadow.	USFWS/IAE	
Cardwell Big	Aggressively control false brome as it spreads from perimeter of meadow. Maintain low cover of exotic shrubs.	USFWS/IAE	

1-4. Secure Taylor's checkerspot occupied sites that lack conservation easements or deed restriction

Without conservation easement or other long term protections, sites cannot contribute to the recovery of Taylor's checkerspot, and are at risk from change in land use and/or change in ownership.

None of the Cardwell sites are under conservation easement. Continued engagement of the Cardwell landowners, and their engagement in short- and long-term conservation is essential for Taylor's checkerspot.

1-5. Maintain and enhance habitat quality at occupied sites

The gridded habitat assessments conducted in 2016 at all occupied Oregon sites provide spatially linked information about host and nectar plant resources at each meadow in the Beazell and Cardwell Taylor's checkerspot areas. In addition to invasive species control (see Objective 1-2), ensuring sufficient host (plantain) and nectar plants are available for butterflies is top priority. Current abundance of host and nectar plants is shown in Appendix 3, Maps 1-4). Table 3

includes a summary of priority opportunities for host and nectar plant enhancement at currently occupied Taylor's checkerspot sites.

Table 3. Taylor's checkerspot host and nectar habitat enhancement opportunities at Taylor's checkerspot occupied sites in Oregon.

Site	Actions	Implementing Party	Complete by:
Beazell Bird Loop	Add host plants and nectar plants.	Benton County	2021: All sites
Beazell Middle Meadow	Augment nectar diversity with Calochortus		
Beazell North Meadow	Expand habitat down slope via host and nectar plant management.		
Beazell South Meadow	Add nectar plant diversity.		
Beazell Summit Meadow	Augment host plants and nectar diversity.		
Cardwell Crestmont	Add nectar diversity.	USFWS/IAE	
Cardwell Little	Augment host plants and nectar plants to create connected central core area of higher density host and nectar resources.	USFWS/IAE	
Cardwell Big	Augment host plants to create connected central core.	USFWS/IAE	

Goal 2: Increase number of total populations on secured lands, building network or metapopulation structure where possible

Reintroduction of Taylor's checkerspot will be required to expand the number of populations of the species in Oregon. Assessing the readiness and restoration needs of potential sites for reintroductions is crucial prior to any movement of butterflies to these sites, and several assessments were completed in 2016. Habitat quality assessments and prioritization of introduction sites will need to be repeated as habitat restoration occurs over time.

Distributing new populations on the landscape across the historic range of the species and/or at sites with connectivity to existing populations will be a priority. Recovery zones, defined geographic areas with goals for numbers of populations of certain sizes that tie to down listing and de-listing targets for threatened and endangered species, have not yet been identified for Taylor's checkerspot anywhere across its range. Recovery zones are usually one of the critical factors under consideration when planning species reintroductions. Recovery zones have been defined for other threatened and endangered prairie species in Oregon (USFWS 2010), including Fender's blue butterfly. Given that Taylor's checkerspot and Fender's blue use similar

habitat, and that the estimated historic range of Taylor's checkerspot in Oregon overlaps most of Fender's blue butterfly's range, using the Fender's blue butterfly recovery zones for Taylor's checkerspot is suggested until a recovery plan for Taylor's checkerspot identifies specific recovery zone boundaries. Figure 11 displays this potential recovery zone layout – three zones of approximately similar size. The northern Salem zone includes Yamhill, Polk, Marion and part of Washington County. The central Corvallis zone includes primarily Benton and Linn Counties, and the southern zone is primarily Lane County.

In each recovery zone, targets for the number and size/extent of protected and managed populations or population networks need to be set. This document assumes such populations will be distributed across the three recovery zones, with at least two in each zone.

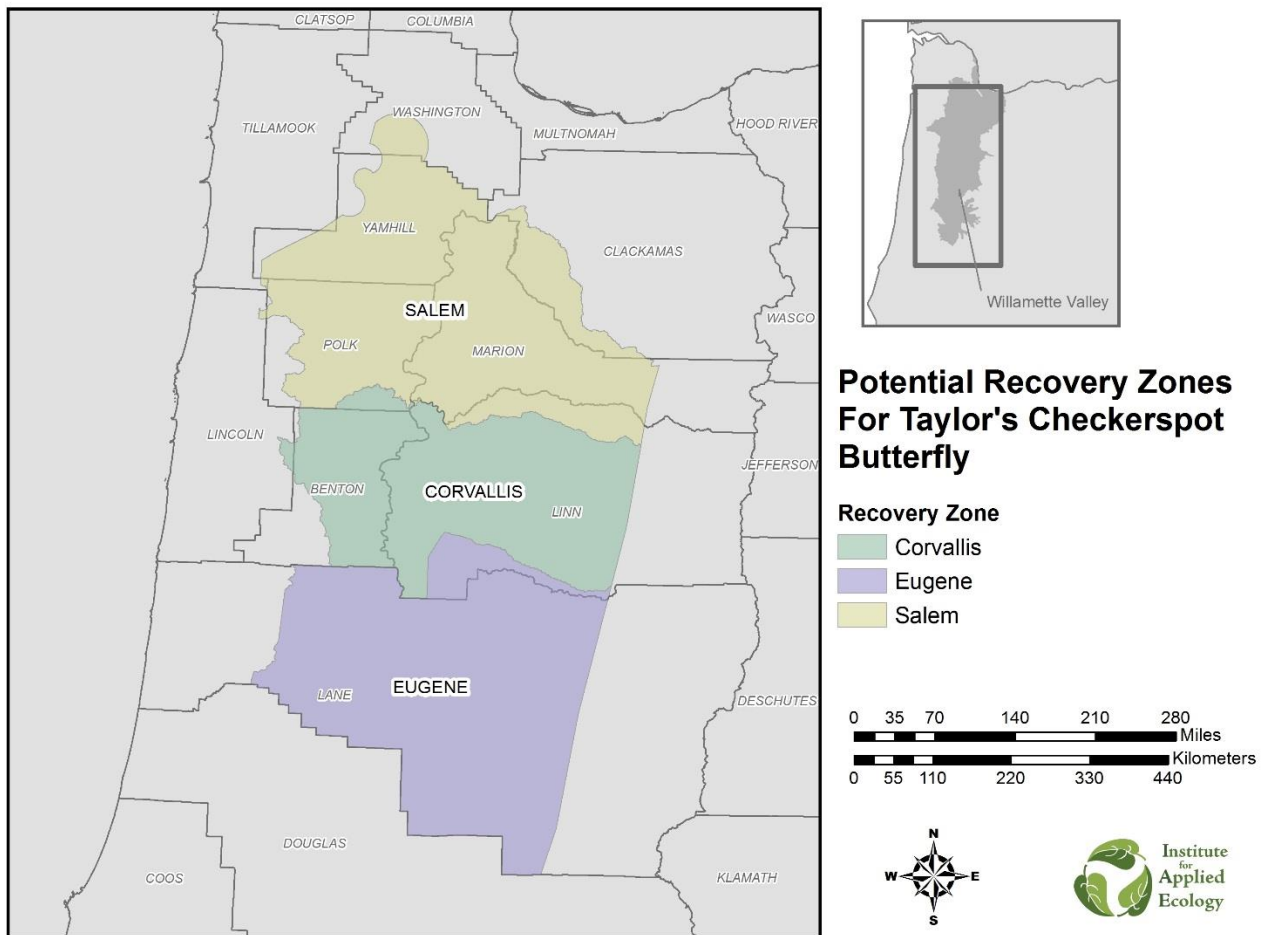


Figure 11. Potential recovery zones for Taylor's checkerspot butterfly in Oregon, mirroring those used for Fender's blue butterfly in the Willamette Valley.

2-1. Collect detailed habitat quality data (grid method) at priority Taylor's checkerspot introduction sites, and rapid assessment data at potential introduction sites in the Eugene recovery zone

While rapid habitat assessments were completed in all three recovery zones, detailed and gridded habitat data were collected at a subset of sites in 2016, all in the Corvallis recovery zone. The same sampling method should be used to collect data at all potential priority introduction sites, with an eye to distributing those sites across the recovery zones, to better inform habitat management and preparation for future butterfly introductions (Table 4).

Table 4. Sites where baseline grid or rapid habitat assessments should be completed.

Site	Actions	Implementing Party	Complete by:
Lupine Meadows	Collect baseline grid habitat data.	IAE	2018
Baskett Slough NWR Area 3 Upper		IAE	
Baskett Slough NWR Area 7		IAE	
Bald Hill Farm Perimeter Meadows		IAE	
Cardwell Hill FBB Conservation Area - North (Crisp)		IAE	
Fern Ridge Reservoir	Collect rapid habitat assessment data.	IAE	2017
West Eugene Wetlands – Eugene BLM		IAE	2017

2-2. Develop site specific management plans for priority Taylor's checkerspot introduction sites

Establishing and maintaining management plans for each priority Taylor's checkerspot introduction site will provide a roadmap to achieve and maintain desired future butterfly-ready habitat conditions and control threats to the species. Ideally these plans can be developed using spatially explicit habitat information, such as obtained in the 25 m x 25 m grid cells (e.g., as shown in Appendix 3, Map 5, for Fitton Green). As with the management plans for currently occupied sites described in Objective 1-2, management plans should include population and habitat monitoring measures and procedures. Table 5 includes a preliminary schedule for management plan development that is contingent upon landowner and manager willingness and guidance, as well as funding.

Table 5. Tentative schedule for management plan development at priority Taylor's checkerspot introduction sites.

Site	Actions	Implementing Party	Complete by:
Fitton Green Natural Area	Develop management plan that includes habitat preparation, Taylor's checkerspot introductions, habitat maintenance, and monitoring	Benton County	2017
Lupine Meadows		Greenbelt Land Trust	2020
Baskett Slough NWR Area 3 Upper		USFWS	2019
Baskett Slough NWR Area 7		USFWS	2019
Bald Hill Farm Perimeter Meadows		Greenbelt Land Trust	2020
Cardwell Hill FBB Conservation Area - North		Benton County	2019
Fern Ridge or West Eugene Wetlands		ACOE or BLM	2021

2-3. Coordinate and establish a Taylor's checkerspot captive rearing program in Oregon

The captive rearing program for Taylor's checkerspot in Washington is critical to support butterfly introductions, and a similar program will be needed to support butterfly introductions to new sites in Oregon. Without a captive rearing program, butterfly larvae (or adults) would have to be taken from one of the two existing occupied sites.

Preliminary steps to establish a captive rearing program for use in Oregon may include, but are not limited to:

- Convening a working group of captive rearing specialists and lepidopterists, including the Oregon Zoo and others
- Evaluating strengths and weaknesses of existing captive rearing programs for Taylor's checkerspot and related taxa
- Completing a feasibility study and developing a potential operational management plan for an Oregon captive rearing facility
- Identifying funding sources for short and long term program support

2-4. Restore and prepare habitat for Taylor's checkerspot introductions on secured lands, prioritizing sites where there are opportunities for connectivity to adjacent, occupied sites

Habitat restoration should occur as outlined in management plans. Habitat restoration needs identified during 2016 habitat assessments are included in Table 6. Priority actions include augmenting strawberry, as a primary nectar plant, augmenting host plants (e.g., plantain and paintbrush), controlling exotic grasses, and creating/maintaining the low vegetation structure Taylor's checkerspot prefers.



Figure 12. Taylor's checkerspot nectaring on a strawberry flower.

Table 6. Site management needs identified at priority Taylor's checkerspot introduction sites with 2016 habitat assessment data.

Site	Actions	Implementing Party	Complete by:
Fitton Green South Meadow	Augment strawberry cover and nectar diversity in central core area. Maintain vigilance against false brome and tall oatgrass.	Benton County	2018
Lupine Meadows	Increase bare ground availability through reducing thatch/plant litter accumulation.	Greenbelt Land Trust	2019
Baskett Slough NWR Area 3 Upper	Maintain low vegetation structure, control tall oatgrass.	USFWS	2020
Baskett Slough NWR Area 7	Maintain low vegetation structure, control tall oatgrass.	USFWS	2020
Bellfountain Prairie	Augment host plants throughout site.	USFWS	2021
Additional sites as identified and data from grid assessments become available.			

2-5. Implement Taylor's checkerspot introductions on secured conservation lands, prioritizing areas with opportunities for connectivity to adjacent Taylor's checkerspot occupied sites, or with the potential to build a new network for the species

Introductions of Taylor's checkerspot to new sites is critical to achieve the goal of increasing the number of total populations of the species. These introductions should occur on protected and managed lands across the proposed recovery zones for the species. Introductions should also prioritize areas where there are opportunities to connect to adjacent Taylor's checkerspot occupied sites, or where sufficient habitat exists to building a new network/metapopulation of the species.

The list of priority sites for introduction includes five sites currently (Table 7), but could expand and change as additional habitat data are collected, particularly in the Salem and Eugene recovery zones. Information gained during preliminary introductions will also likely shape the planning for future introductions through adaptive management.

Table 7. List of priority sites for Taylor's checkerspot introductions in Oregon.

Site	Actions	Implementing Party	Complete by:
Fitton Green South Meadow	Complete Taylor's checkerspot introductions.	USFWS/IAE	2019
Lupine Meadows		USFWS/IAE	2020
Baskett Slough NWR Area 3 Upper		USFWS/IAE	2021
Baskett Slough NWR Area 7		USFWS/IAE	2021
Bellfountain Prairie		USFWS/IAE	2022
Additional sites as restored and identified.		USFWS/IAE	2023-2027

2-6. Enhance connectivity between Taylor's checkerspot populations and unoccupied but suitable habitat

To reach the goal of increasing the number of total populations and build network or metapopulation structure where possible is the task of enhancing connectivity. Connecting the two populations of Taylor's checkerspot at Beazell and in the Cardwell are is currently not feasible (adjoining lands are private and forested). The meadows of Beazell and the Cardwell area already exhibit network structure. Work by Benton County at Beazell has been completed to

enhance corridors between occupied meadows. Further connections can be established and enhanced between the currently occupied habitat and suitable, but unoccupied patches, at these sites, particularly where they may be prioritized for Taylor's checkerspot introductions.

Enhancing connectivity will involve creation of corridors and stepping stones of habitat with host and nectar species present for Taylor's checkerspot. Work by Benton County is underway to establish a corridor with stepping stones between the south meadow of Fitton Green and the BPA-Cardwell corridor (Appendix 3, Map 6). As additional Taylor's checkerspot introduction sites are restored in preparation for Taylor's checkerspot introductions, the potential for further network connections should be evaluated and established as opportunities are available.

Goal 3: Contribute information to range-wide recovery planning for Taylor's checkerspot

3-1. Monitor Taylor's checkerspot populations annually at occupied sites and any sites with butterfly introductions

Tracking population persistence, dynamics, and trends over time is critical to understanding population trajectories, recovery, and providing data for adaptive management of sites with butterfly populations. Annual monitoring should continue at all Taylor's checkerspot occupied sites, including wild populations and sites where Taylor's checkerspot introductions occur. This process is likely to be coordinated and supported by the USFWS.

Table 8. Wild Oregon populations of Taylor's checkerspot in need of annual monitoring.

Site	Actions	Implementing Party	Complete by:
Bezell Memorial Forest (All meadows)	Monitor populations (annually)	Benton County/USFWS	Complete annually
Cardwell Crestmont		USFWS	
Cardwell Little		USFWS	
Cardwell Big		USFWS	
New sites with introductions (To be determined)		USFWS	

3-2. Evaluate scenarios for dual management of Fender's blue butterfly and Taylor's checkerspot butterfly

Upland prairie habitat acquisition in the Willamette Valley has been driven by protecting lands for Fender's blue butterfly, which was listed in 2000, 13 years before Taylor's checkerspot. As a

result, a significant proportion of lands with prairie habitat that is secured for conservation already supports Fender's blue butterfly populations. Limiting Taylor's checkerspot introductions to locations where Fender's blue butterflies do not exist would severely hinder and delay recovery efforts for Taylor's checkerspot. Therefore, evaluation of how management for the two species can be integrated together may benefit Taylor's checkerspot, and potentially create a management regime that is mutually beneficial for the two butterflies and other prairie-dependent organisms, and that leverages limited conservation lands and funding.

First steps in this evaluation may include:

- Regular review and evaluation of best management practices (BMPs) for Taylor's checkerspot habitat restoration (Objective 1-1).
- Comparison of management guidelines for Taylor's checkerspot with those existing for Fender's blue butterfly.
- Analysis of the potential outcomes of synchronized management for the two species.

3-3. Implement research to understand the lifespan of Taylor's checkerspot to improve population monitoring and size estimates

Monitoring protocols for butterflies often involve multiple site surveys/butterfly counts to catch the peak flight period of the species (the period of time, often only a day or two, at which the largest number of adult butterflies have emerged and are flying). The accuracy of population estimates is heavily influenced by the timing of surveys relative the peak. Learning more about the phenology and lifespan of Taylor's checkerspot will allow surveyors to refine and improve survey protocols, and improve population estimates.

Research to achieve this objective could include, but is not limited to, mark and recapture studies and comparison of monitoring methods. Any research involving handling of butterflies will have to occur with appropriate research permits from the USFWS.

3-4. Implement research to understand the dispersal behavior of Taylor's checkerspot to improve understanding of meta-population dynamics

The structure of habitat occupied by Taylor's checkerspot in Washington and Oregon can be quite different – large and wide open areas occur at some sites in Washington, especially in the South Puget Sound, but and small meadows surrounded by forest are typical at the occupied sites in Oregon. To fully understand how to build sustainable and functional networks for Taylor's checkerspot in Oregon, multi-year studies of butterfly dispersal distance are needed.

NEXT STEPS

This Action Plan will function best as a document regularly updated by the Oregon Taylor's checkerspot Action Planning Team. We suggest convening this group at least once per year to report on actions completed and planned for the future, and to review any new information about the species. This Action Plan may also be revised as needed to align with the USFWS Recovery Plan for Taylor's checkerspot once it is complete.

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APPENDIX 1: FIELD PROTOCOLS

Included in this appendix are:

1. Grid sampling definitions. These include the variables and cover classes/indices used to sample them in a 25 x 25 m grid of Taylor's checkerspot habitat at a site.
2. Grid sampling datasheet
3. Rapid assessment protocol: Taylor's Checkerspot Habitat Index (and Nectar worksheet).

Habitat Variable	Abundance class (and Coded Value in Geodb)								Questions /Comments	
	0	1	2	3	4	5	6	7		8
Checkerspot food resources										
Plantago lanceolata (PLLA) patches	0	Present/no patches	1 to 3	4 to 5	6 or more					Patch = 4 sq m with >40 plants (10/m sq); any size. Two plants @ 15x15x20 cm = 9000 cubic cm.
C. levisecta patches	0	Present/no patches	1 to 5	6 to 10	11 to 15	>16				Patch = 4 sq m with at least 8 plants (2/m sq); indicate species in Comments
Key nectar	0	<25	25-99	100-499	500-999	1000-1999	2000-4999	5000-9999	10000+	No. flower units
Fragaria virginiana cover		0<1% but present	1-5%	6-10%	11-20%	20-50%	50-75%	75-100%		
Structural characteristics										
Exotic shrubs >30cm	0%	1-5%	6-10%	11-20%	>21%					Absolute cover
Dominant exotic shrub	CVSC	RUAR	ROEG	CRMO						Indicate dominant
% cover Veg Ht1 1-20 cm	None	1-5%	6-30%	31-75%	>76%					Absolute cover
% cover Veg Ht2 > 20 cm	None	1-5%	6-30%	31-75%	>76%					Absolute cover
Ground level % cover	0%	1-5%	6-10%	11-20%	>21%					Absolute cover; includes bare soil, rock, lichen, litter (loose and on ground), moss, trash.
Thatch >2 cm	0	1-5%	6-10%	11-20%	20-50%	50-75%	75-100%			Absolute cover
Invasive Species										
All exotic grass	0	1-5%	6-10%	11-20%	20-50%	50-75%	75-100%			Absolute cover
Other exotic grass spp	AGST	DAGL	FEAR	HOLA	POPR	LUCA				Indicate dominant
Exotic forb	0%	1-5%	6-20%	>21%						Absolute cover
Exotic forb spp	HVRA	LEVU	RUAC	PLLA	GEDI	VICIA	DACA	CIAR		Indicate dominant
Other variables of interest										
Road bed		approximate cover								
Road type	GR - gravel	PA - paved	old - not used anymore	DRT - dirt trail						
Other natives Catlin found notable	ERLA	SIVI	ACMI							Indicate dominant
Native grass	0%	1-5%	6-10%	11-20%	>21%					Absolute cover
Native grass spp.	FERO	DACA	ELGL	KOCR						Absolute cover
Trees cover	0	1-10%	11-20%	20-30%	30-40%	40-50%	60-70%	70-80%	80-90%	Absolute cover
Native Shrubs	0%	1-5%	6-10%	11-20%	>21%					Absolute cover
Native shrub spp	SVAL	TODI	MANE							Indicate dominant
Comments										Any additional info unique or of interest in the cell.

cell	Hosts	Nectar	Structure	Invasive/native species
	Plantago lanceolata patches			
	Castilleja levisecta patches			
	Plectritis congesta/Collinsia spp			
	Calochortus tolmiei			
	Fragaria virginiana			
	Lianthus bicolor			
	Lomatium utriculatum			
	Lomatium triternatum			
	Plectritis congesta			
	Taraxacum spp			
	Pyrus spp.			
	Exotic shrubs > 30cm			
	% cover Veg Ht1 1-20 cm			
	% cover Veg Ht2 > 20 cm			
	Ground level % cover			
	Thatch > 2 cm			
	Roadbed			
	Road surface			
	Tall oatgrass			
	Brachypodium sylvaticum			
	Centaurea pratensis			
	Other exotic grass			
	Other exotic grass spp			
	Exotic forb			
	Exotic forb spp			
	Native grass			

TAYLOR'S CHECKERSPOT BUTTERFLY CALCULATOR MODULE- VERSION 5/2/16							
SITE NAME:		Date:	Investigators:				
Q #	Category	Index Categories	Data entry	Weights	Weighted Data	Sub score	Indicator Name
Answer questions 1-4 about HABITAT HETEROGENEITY and CONNECTIVITY with GIS or aerial photos. Contact USFWS for information about							
1	How heterogeneous is the habitat in terms of its topography?						
Select only one choice. Enter a "1" next to the most accurate description.							
Habitat Heterogeneity	Flat field, no topography.			0	0	%	Topo
	Some slope to habitat, but really only one aspect.			1	0		
	Habitat includes one hill feature and at least two aspects.			2	0		
	Habitat is very topographically diverse, with multiple hill features, gullies and aspects.			3	0		
2	How heterogeneous is the site in terms of habitat structure?						
Select only one choice. Enter a "1" next to the most accurate description for the majority of prairie at the site.							
Habitat Heterogeneity	Includes no oak habitat elements.			0	0	%	Oak
	Includes occasional oaks, but far fewer than 2 /ha.			2	0		
	Includes 3-5 oaks on average per ha throughout.			3	0		
	Includes variable sized patches of oak savanna throughout the site that do not create barriers.			2	0		
	Includes patches of dense oaks that are not habitat, but provide heterogeneity.			1	0		
3	Is the site connected to other sites with Taylor's checkerspot butterfly?						
Enter a "1" next to ALL the statements below that apply with no barriers (hills, forested swaths greater than 100 m deep, urban areas) to butterfly							
Connectivity	Site completely isolated by barriers or distance			0	0	%	Links
	Within 3-4 km of TCB-occupied site			2	0		
	Within 2-3 km of TCB-occupied site			3	0		
	Within 1-2 km of TCB-occupied site			4	0		
	Within 0.5-1 km of TCB-occupied site			6	0		
4	Are there barriers to this connectivity?						
Enter a "1" next to ALL the statements below that apply to your site.							
Connectivity	Dense conifer forest between this site and occupied site			1	0	%	Barriers
	Dense oak woodland between this site and occupied site			2	0		
	Patchy forest barriers between this site and occupied site			3	0		
	No barriers to connectivity with occupied site			4	0		
Questions 5-7. Butterfly HOST ABUNDANCE, Taylor's checkerspot POPULATION SIZE and HABITAT AREA. Contact the USFWS Oregon Fish							
5	What is the abundance of host plants at the site?						
Select only one choice. Enter a "1" next to the approximate number of patches of host plants at the site (PLLA patch = 4 m ² , 10 pl/m ²).							
Host	Not present			0	0	%	Host
	Trace to 1 patch			1	0		
	1-10 patches			2	0		
	10-30 patches			3	0		
	30-50 patches			4	0		
	50-70 patches			5	0		
	>70 patches			6	0		
6	How many Taylor's checkerspot butterflies are known to occupy the site?						
Select only one choice. Enter a "1" next to the 5 yr average (or average of existing data if < 5 yrs).							
Population	Never seen at site			0	0	%	Pop
	1-10 individuals			1	0		
	11-25 individuals			2	0		
	26-50 individuals			3	0		
	51-100 individuals			4	0		
	101-300 individuals			5	0		
	More than 300 individuals			6	0		
7	Use GIS or other means to estimate the area of CURRENTLY occupied habitat at the site, as defined by the portion of the site known to be						
Select only one choice. Enter a "1" next to the appropriate area. Surveys for host species may be required if current data are not available.							
Occupancy	Less than 1 hectare (ha)			1	0	%	Occ
	1 hectare or more but less than 3 hectares			2	0		
	3 hectares or more but less than 6 hectares			3	0		
	6 hectares or more			4	0		

8-10. NECTAR SPECIES. Complete a walk through of the site during peak Taylor's flight season or just post peak to assess nectar species flower abundance. Enter data gathered in the field in the Nectar Worksheet. Then use the Nectar worksheet to calculate the information to answer the following questions.

8	How diverse are native nectar resources during the flight season?						
	Place a "1" next to the choices describing the diversity of nectar species available during early, peak and late flight season.						
	Nectar	No species.		0	0	%	NecDiv
		One species peak flight season.		1	0		
		Two or more species peak.		2	0		
		One species early		1	0		
		Two or more species early.		2	0		
One species late.			1	0			
Two or more species late.		2	0				
9	For how many periods (Early, Peak, Late) are nectar needs satisfied by native nectar? (e.g., at least 1-2 species present)						
	Select only one choice. Use Nectar worksheet to calculate totals per flight period.						
	Nectar	None.		0	0	%	NecPer
		One period.		1	0		
Two periods.			2	0			
All three periods.			3	0			
10-11. VEGETATION STRUCTURE. Complete a walk through of the site during peak Taylor's flight season or just post peak to assess vegetation							
10	How much of the site has low statured (<30 cm ht) vegetation?						
	Structure	0-5%		0	0	%	VegHt
		6-10%		1	0		
		11-25%		2	0		
		26-50%		3	0		
		51-75%		4	0		
76-100%			5	0			
11	How much of the site is covered by bare ground (defined as open soil, rock, moss, lichen, litter, woody debris, etc)?						
	Structure	0-5%		0	0	%	BareGr
		6-10%		1	0		
		11-25%		2	0		
		26-50%		3	0		
		51-75%		4	0		
76-100%			5	0			
Complete a walk through of the site to answer question 11 about PROBLEM VEGETATION.							
12	How much of the habitat area is covered by tall non-native grasses or shrubs > 0.75 meters high?						
	Select only one choice. Based on field surveys in late May or June, enter a "1" next to the approximate vegetative cover of tall grasses (e.g., tall						
	Problem Vegetation	<5%		4	0	%	Veg
		5-15%		3	0		
		16-25%		2	0		
		26-50%		1	0		
>50%			0	0			

COMPOSITE INDICATORS TABLE			
Category	Composite Indicator Description	Weight in Final Score	Sub Score
Do not enter data below. Data will automatically transfer from the Main Indicators Table.			
Heterogeneity	Heterogeneity = AVERAGE (Topo, Oak)	1.0	#DIV/0!
Connectivity	Connectivity = (Average (Links, AdjProt))	1.0	#DIV/0!
Host	Host	2.0	%
Population	Population	1.0	%
Occupancy	Occupancy	1.0	%
Nectar	Nectar = AVERAGE(NectDiv, NectPer, NectTot)	2.0	#DIV/0!
Structure	Structure = Average(VegHt, BareGr)	2.0	#DIV/0!
Minimal Problem Vegetation	Minimal problem vegetation	1.0	%

NATIVE NECTAR WORKSHEET- VERSION 04/01/16							
Use the Abundance Index below to describe the quantity of flowering units (FUs) of nectar species available throughout the habitat at the site. The habitat area is defined as the area with TCB use at the site. In the shaded cells, enter the abundance index value that describes the quantity of FUs for each species in the habitat area, the remaining values will calculate automatically.							
Abundance Index: 1 = <25 2 = 25- <100 3 = 100- <500 4 = 500- <1,000 5 = 1000- <2,000 6 = 2,000- <5,000 7 = 5,000- <10,000 8 = 10,000- <15,000 9 = 15,000- <20,000 10 = 20,000+							
Nectar Species	Flowering Unit (FU)	Data Entry: FU Abundance Index Value	Phenology	Diversity/Abundance			
				Early	Peak	Late	
<i>Calochortus tolmiei</i>	Flower		Late				
<i>Fragaria virginiana</i>	Flower		Early, Peak				
<i>Linanthus bicolor</i>	Flower		Peak, Late				
<i>Lomatium utriculatum</i>	Head		Early, Peak				
<i>Lomatium triternatum</i>	Head		Early, Peak				
<i>Plectritis congesta</i>	Head		Peak, Late				
<i>Taraxacum spp</i>	Head		All				
<i>Pyrus spp.</i>	Tree		Early, Peak				
<i>Ranunculus occidentalis</i>	Flower		Early, Peak				

Total FU through flight season

0

APPENDIX 2: SITE QUALITY RANKINGS (OREGON 2016)

Sites assessed for Taylor's checkerspot habitat quality in 2016. Sites currently occupied by Taylor's checkerspot are in bold. The habitat quality score is scaled from 0% to 100%; a site scoring 100% would theoretically have perfect habitat quality for Taylor's checkerspot.

Site/Unit	Ownership	Assessment Method	Habitat Quality Score
Fitton Green South	Benton County	Grid	81%
Beazell North	Benton County	Grid	77%
Lupine Meadows North Hill	GLT	Rapid	76%
Cardwell Crestmont	Private	Grid	75%
Beazell North Annex	Benton County	Grid	75%
Beazell Middle	Benton County	Grid	75%
Baskett Area 7	USFWS	Rapid	75%
Beazell Summit	Benton County	Grid	74%
Baskett Area 3 Upper	USFWS	Rapid	72%
Beazell South	Benton County	Grid	70%
Baskett Area 5 Lower	USFWS	Rapid	69%
Bald Hill Farm NE Meadow	GLT	Rapid	69%
Finley Bellfountain	USFWS	Grid	68%
Baskett Area 4 Upper	USFWS	Rapid	68%
Cardwell Big	Private	Grid	67%
Baskett Area 3 Lower	USFWS	Rapid	65%
Beazell BIRD_LOOP*	Benton County	Grid	65%
Baskett Area 5 West Restored	USFWS	Rapid	64%
Baskett Area 4 Lower	USFWS	Rapid	64%
Finley Pigeon	USFWS	Grid	63%

Site/Unit	Ownership	Assessment Method	Habitat Quality Score
Baskett Area 5 East	USFWS	Rapid	62%
Baskett Area 1	USFWS	Rapid	61%
Cardwell Little *	Private	Grid	61%
MtRichmond Oak Grove	YSWCD Easement	Rapid	61%
Bald Hill Farm Lupine meadow	GLT	Rapid	58%
Baskett Area 6	USFWS	Rapid	56%
Baskett Area 9 upper	USFWS	Rapid	56%
Yamhela Oak Conservation Savanna	YSWCD	Rapid	56%
Baskett Area 10 Z	USFWS	Rapid	54%
Bald Hill Farm Taylor's meadow	GLT	Rapid	54%
Benton County FBB Conservation Site- North	Benton County	Rapid	54%
Bald Hill Farm_1st try meadow	GLT	Rapid	51%
Benton County FBB Conservation Area-South	Benton County Easement	Rapid	51%
Baskett_14Z Restored	USFWS	Rapid	50%
MtRichmond_Restored	YSWCD Easement	Rapid	48%
MtRichmond_Savanna	YSWCD Easement	Rapid	48%
Baskett_Area 5 West	USFWS	Rapid	45%
Baskett_Area 12 M Restoration	USFWS	Rapid	42%
Baskett_Area 10	USFWS	Rapid	41%
Baskett_Area 7 Z	USFWS	Rapid	40%
Baskett_Area 9 lower	USFWS	Rapid	40%
Mt Richmond_FBB Unit	YSWCD Easement	Rapid	33%
Hoskins Big North	Benton County	Rapid	33%

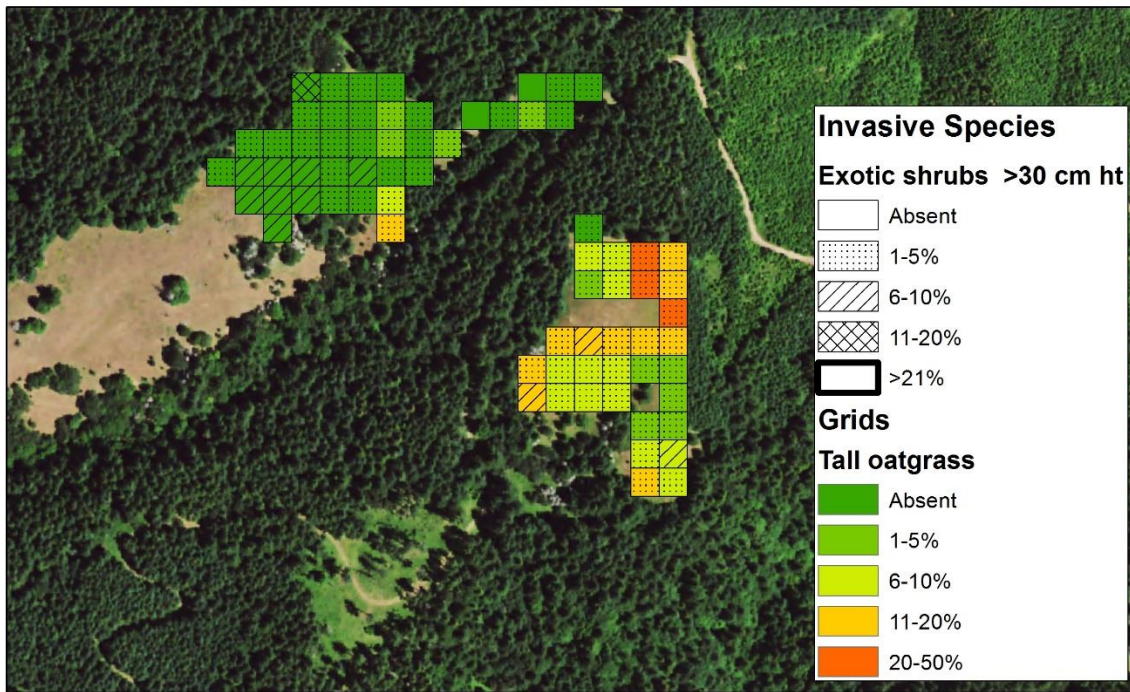
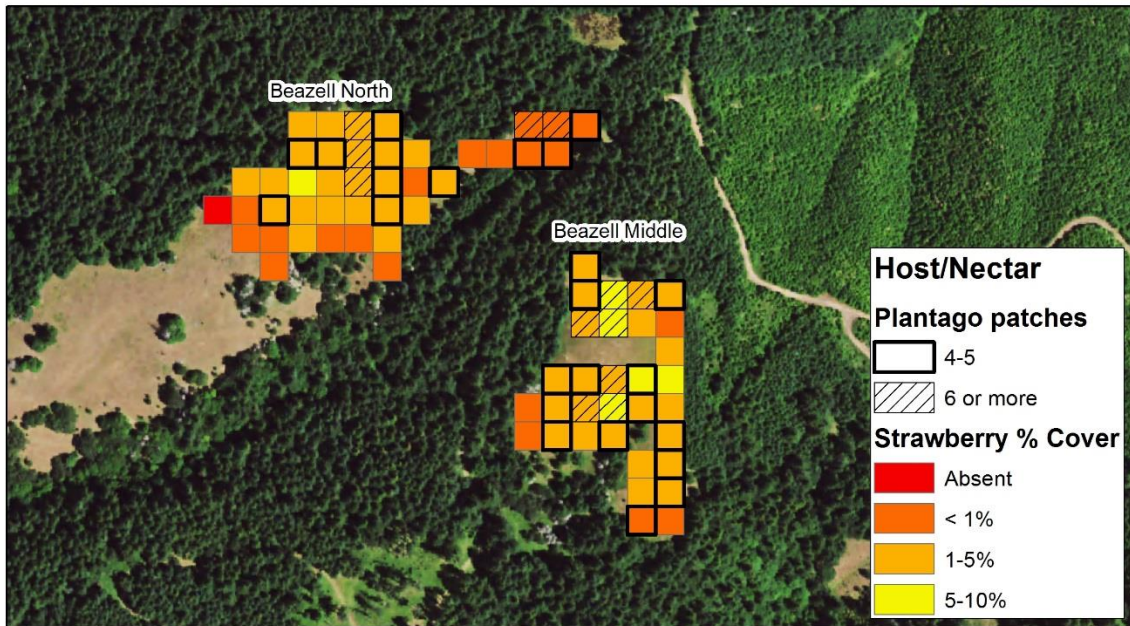
Site/Unit	Ownership	Assessment Method	Habitat Quality Score
Baskett_Area 8	USFWS	Rapid	32%
Coburg B	TNC	Rapid	31%
Baskett_Area 2	USFWS	Rapid	31%
Coburg F	TNC	Rapid	30%
Pearcy West	Benton County Easement	Rapid	29%
Hoskins Small North	Benton County	Rapid	29%
Baskett Area 13 Z Restoration	USFWS	Rapid	29%
Yamhela Oak Conservation Restored	YSWCD	Rapid	25%
Coburg A	TNC	Rapid	9%
Coburg D	TNC	Rapid	8%
Coburg C	TNC	Rapid	7%
Coburg E	TNC	Rapid	7%

* Formerly occupied site.

APPENDIX 3: MAPS

Bezell Taylor's Checkerspot Sites - North & Middle Meadows

25 m x 25 m grid cells

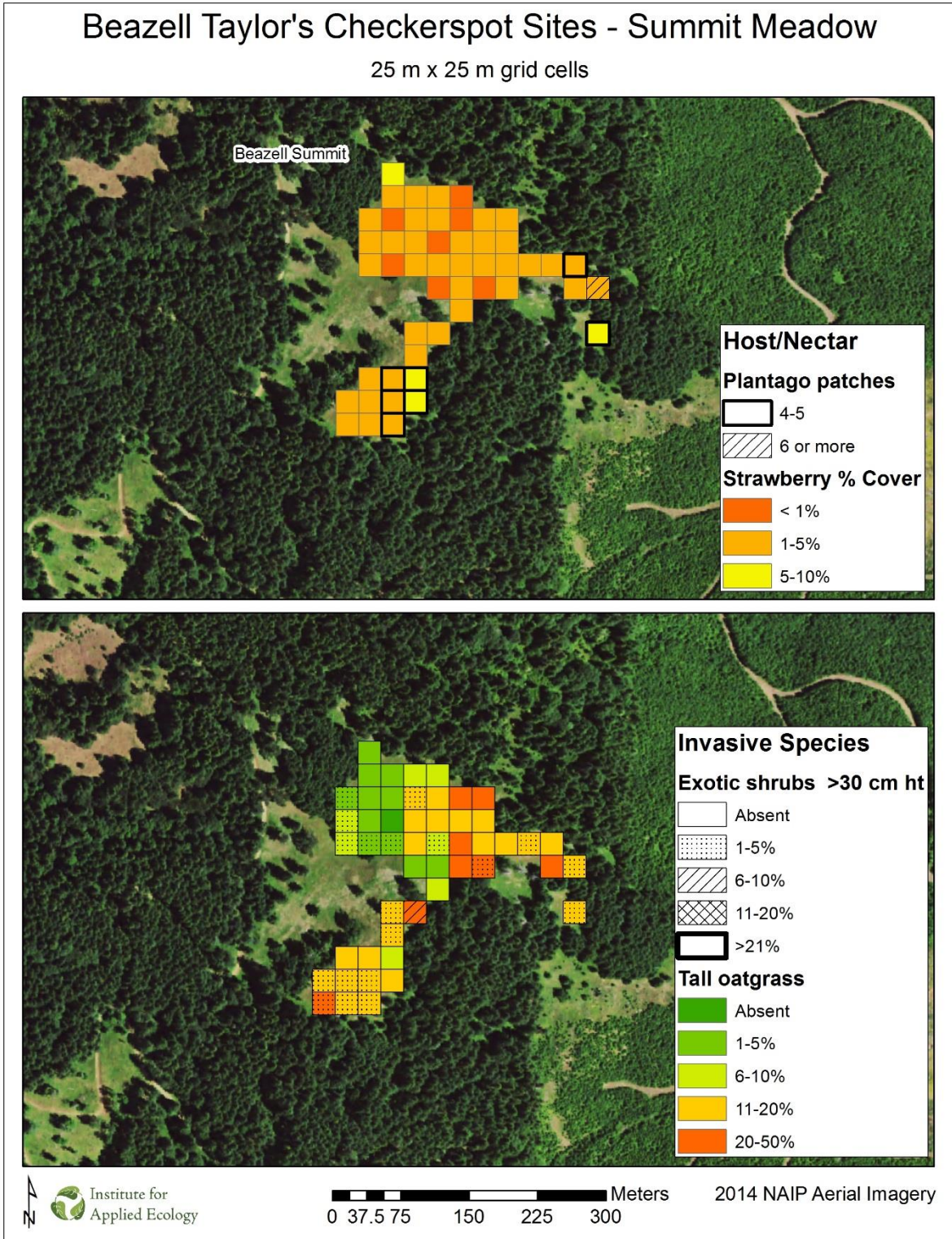


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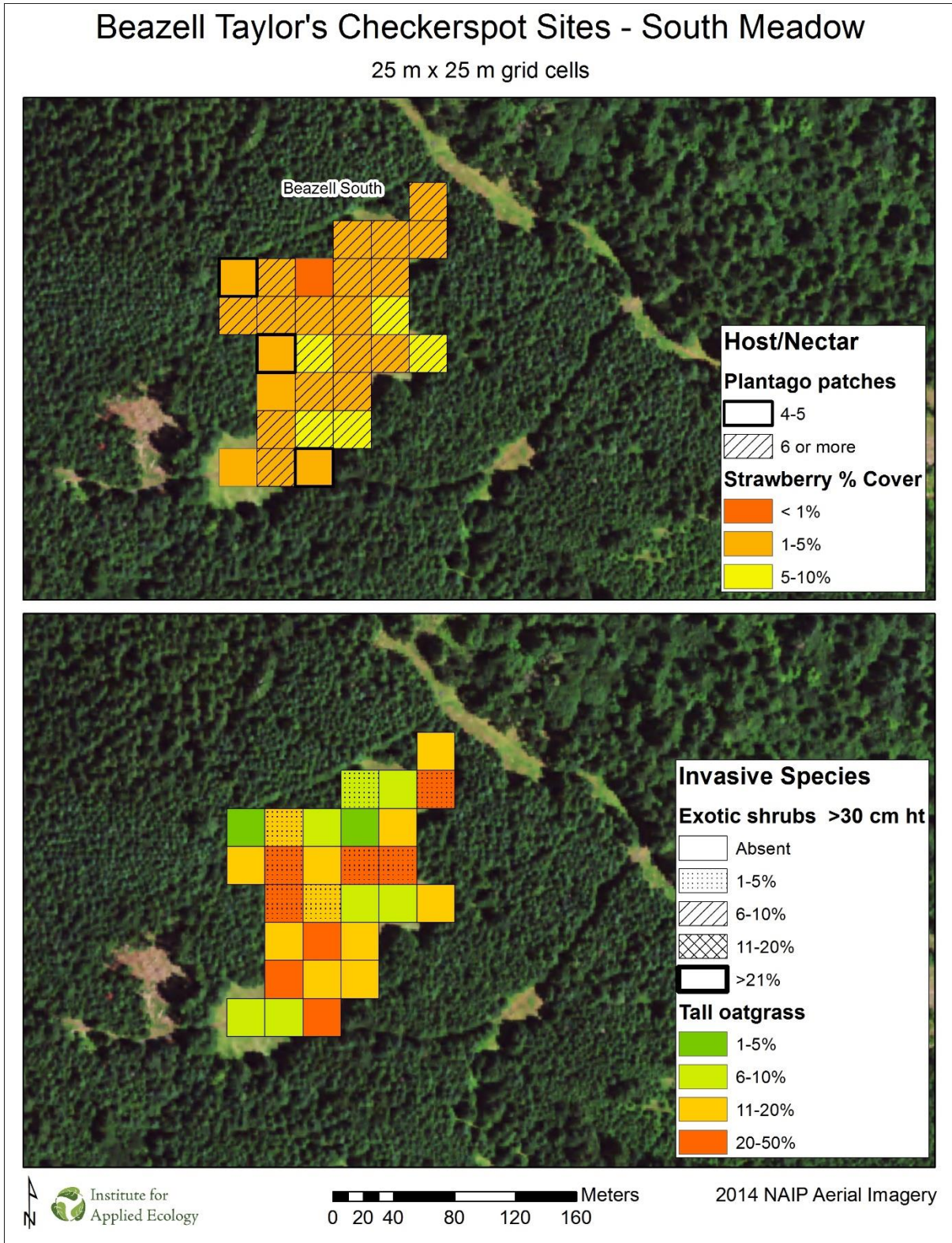
0 37.5 75 150 225 300 Meters

2014 NAIP Aerial Imagery

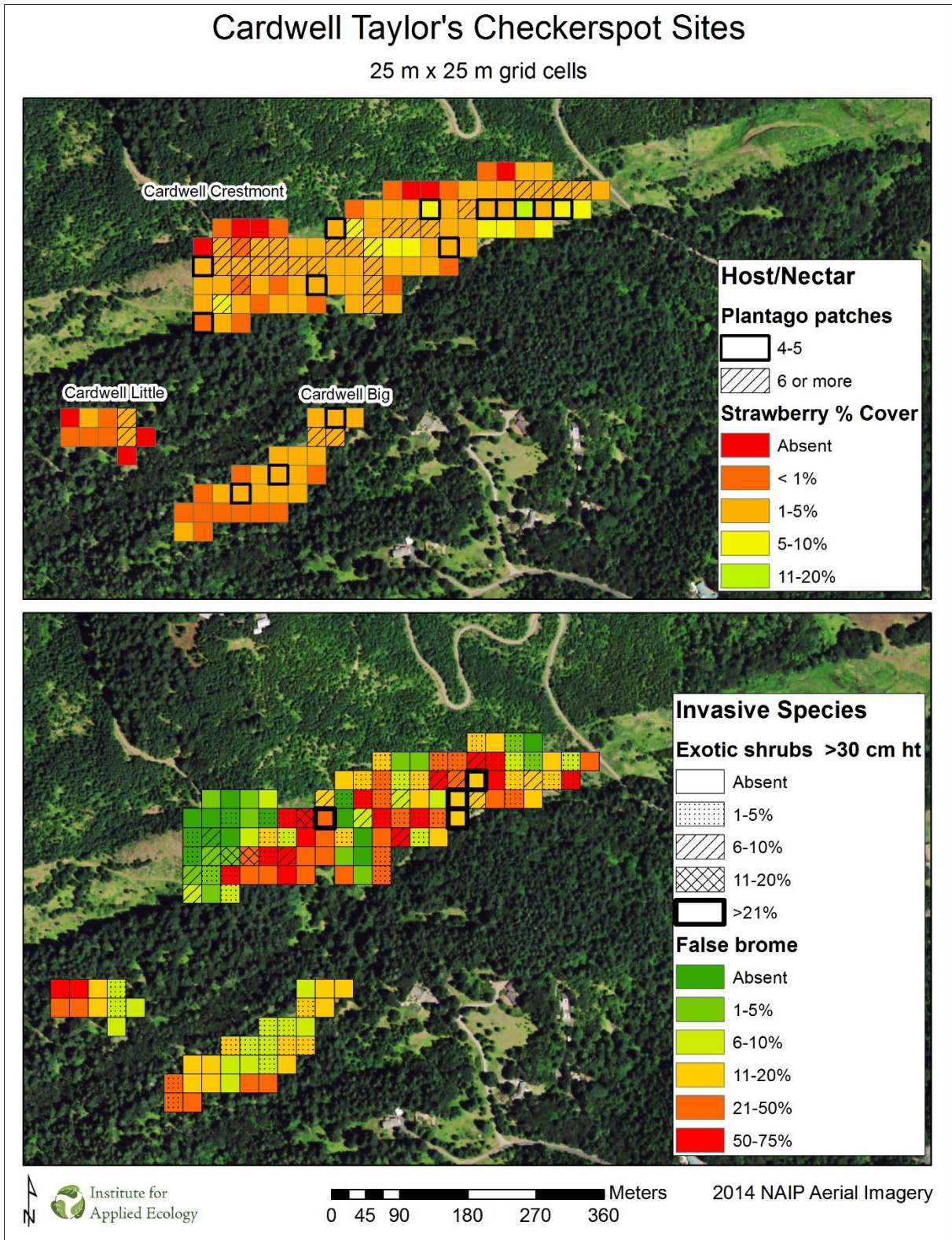
Map 1. Host/nectar resources and exotic species threats in north and middle meadows at Bezell Memorial Forest.



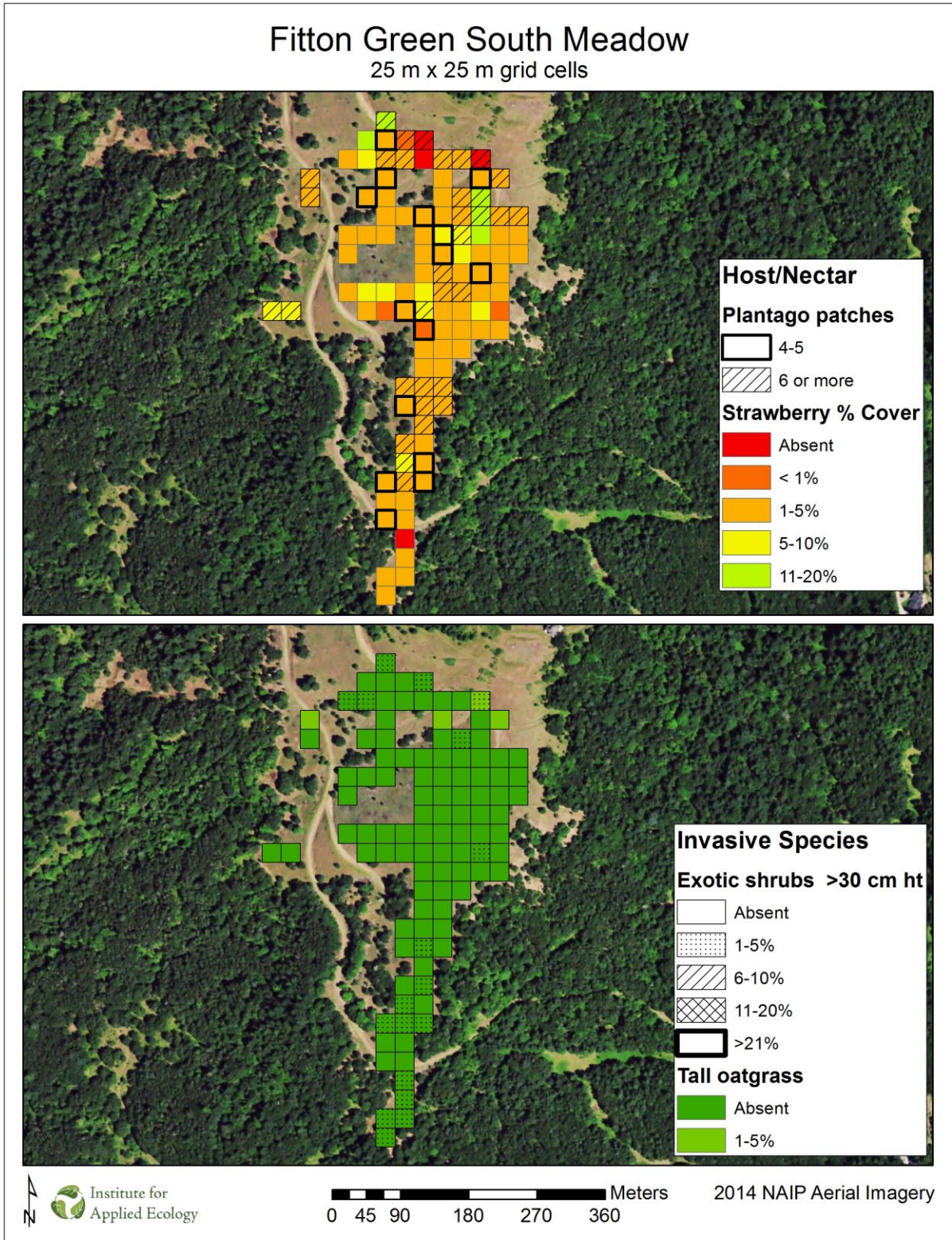
Map 2. Host/nectar resources and exotic species threats in the summit meadow at Bezell Memorial Forest.



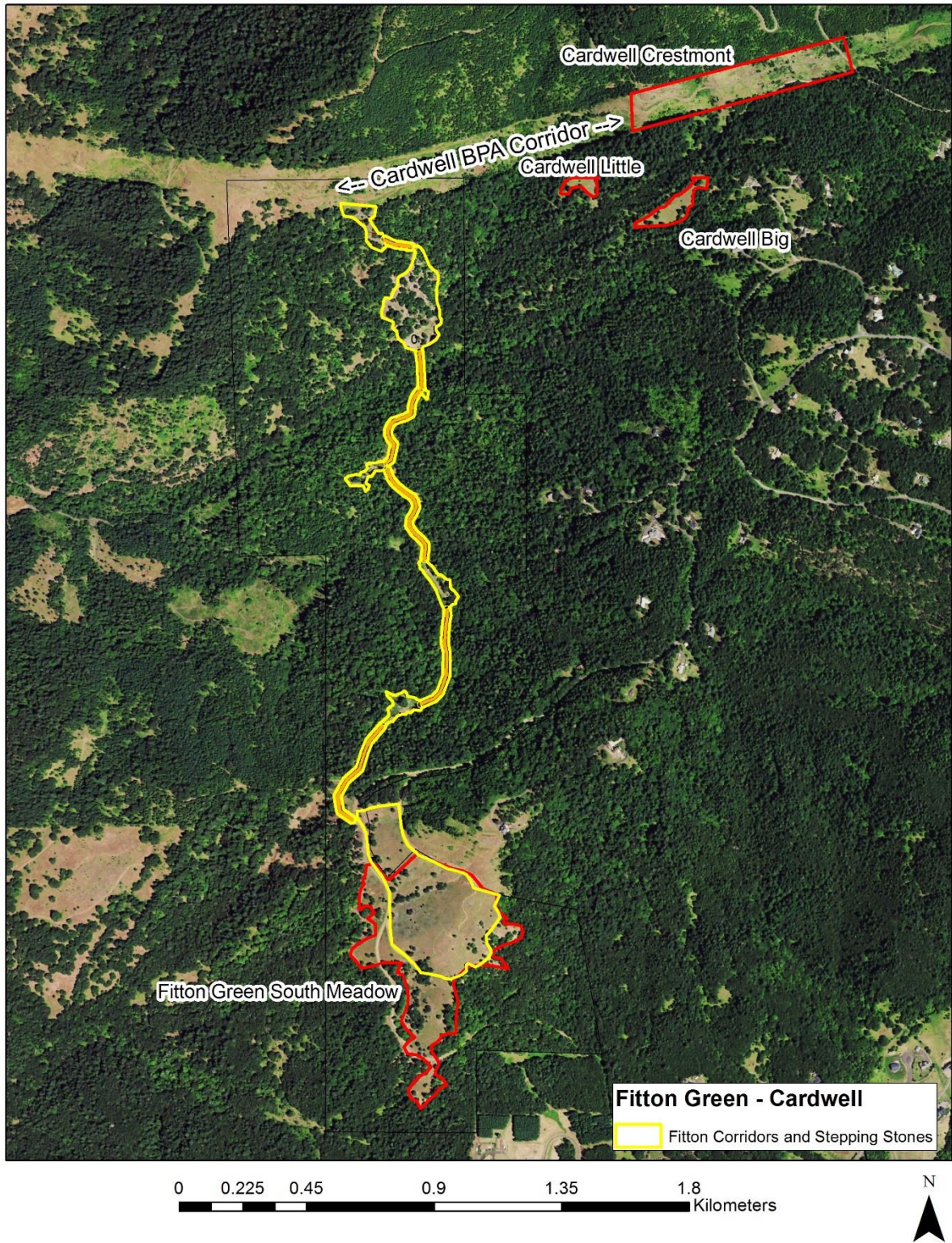
Map 3. Host/nectar resources and exotic species threats in south meadow at Bezell Memorial Forest.



Map 4. Host/nectar resources and exotic species threats in Cardwell meadow areas.



Map 5. Host/nectar resources and exotic species threats at Fitton Green Natural Area, south meadow.



Map 6. Corridor under development between Fitton Green South Meadow and the BPA- Cardwell Corridor.

APPENDIX 4: ACTION SUMMARY

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Objective	Site	Actions	Implementing Party	Complete by:
Goal 1: Restore and maintain quality habitat (with heterogeneity) for Taylor's checkerspot population persistence and expansion at existing sites				
1-1. Adaptively manage guidelines for mowing, herbicide use, prescribed fire, and other habitat restoration practices at Taylor's checkerspot occupied sites			USFWS	Regular basis.
1-2. Develop and regularly update management plans for TCB occupied sites			Benton County, USFWS	2018
1-3. Control invasive species at TCB occupied sites, particularly tall oatgrass and false brome.	Bezell Bird Loop	Aggressively control tall oatgrass	Benton County	Incremental annual work. All sites in phased treatment per TCB habitat management guidelines (Objective 1-1).
	Bezell Middle Meadow	Aggressively control tall oatgrass		
	Bezell North Meadow	Continue to control false brome and tall oatgrass spread		
	Bezell South Meadow	Aggressively control tall oatgrass		
	Bezell Summit Meadow	Aggressively control tall oatgrass		
	Cardwell Crestmont	Aggressively control false brome, and mow to control exotic shrubs	USFWS/IAE	
	Cardwell Little	Aggressively control false brome, particularly on west side of meadow	USFWS/IAE	

Objective	Site	Actions	Implementing Party	Complete by:
	Cardwell Big	Aggressively control false brome as it spreads from perimeter of meadow, and maintain low cover of exotic shrubs	USFWS/IAE	
1-4. Secure TCB occupied sites that lack conservation easement or deed restriction.	Cardwell Crestmont	Pursue conservation easements, safe harbor agreements and management agreements.	USFWS	2021: All sites
	Cardwell Big			
	Cardwell Little			
1-5. Maintain and enhance habitat quality at occupied sites.	Beazell Bird Loop	Add host plants and nectar plants	Benton County	2021: All sites
	Beazell Middle Meadow	Augment nectar diversity with Calochortus	Benton County	
	Beazell North Meadow	Expand habitat down slope via host and nectar plant management.	Benton County	
	Beazell South Meadow	Add nectar plant diversity.	Benton County	
	Beazell Summit Meadow	Augment host plants and nectar diversity.	Benton County	
	Cardwell Crestmont	Add nectar diversity.	USFWS/IAE	
	Cardwell Rung North	Augment host plants and nectar plants to create connected central core.	USFWS/IAE	
	Cardwell	Augment host plants to create connected	USFWS/IAE	

Objective	Site	Actions	Implementing Party	Complete by:
	Rung South	central core.		
Goal 2: Increase number of total populations on secured lands, building network or metapopulation structure where possible				
2-1. Collect detailed habitat quality data (grid method) at priority Taylor's checkerspot introduction sites, and rapid assessment data at potential introduction sites in the Eugene recovery zone	Lupine Meadows	Collect baseline grid data.	IAE	2018: All sites
	Baskett Slough NWR Area 3 Upper		IAE	
	Baskett Slough NWR Area 7		IAE	
	Bald Hill Farm Perimeter Meadows		IAE	
	Cardwell Hill FBB Conservation Area - North		IAE	
	Fern Ridge Reservoir	Collect rapid habitat assessment data.	IAE	2017
	West Eugene Wetlands – Eugene BLM		IAE	
	2-2. Develop site specific management plans for priority Taylor's checkerspot introduction sites.	Fitton Green Natural Area	Develop management plan that includes, habitat preparation Taylor's checkerspot introductions, habitat maintenance, and monitoring.	Benton County
Lupine Meadows		Greenbelt Land Trust		2020
Baskett Slough NWR Area 3 Upper		USFWS		2019

Objective	Site	Actions	Implementing Party	Complete by:
	Baskett Slough NWR Area 7		USFWS	2019
	Bald Hill Farm Perimeter Meadows		Greenbelt Land Trust	2020
	Cardwell Hill FBB Conservation Area - North		Benton County	2019
	Fern Ridge or West Eugene Wetlands		ACOE or BLM	2021
2-3. Coordinate and establish a captive rearing program in Oregon			USFWS, IAE	2019
2-4. Restore and prepare habitat for Taylor's checkerspot introductions on secured lands, prioritizing sites where there are opportunities for connectivity to adjacent, occupied sites	Fitton Green South Meadow	Augment strawberry cover and nectar diversity in central core area. Maintain vigilance against false brome and tall oatgrass.	Benton County	2018
	Lupine Meadows	Increase bare ground availability through reducing thatch/plant litter accumulation.	Greenbelt Land Trust	2019
	Baskett Slough NWR Area 3 Upper	Maintain low vegetation structure, control tall oatgrass.	USFWS	2020
	Baskett Slough NWR Area 7	Maintain low vegetation structure, control tall oatgrass.	USFWS	2020

Objective	Site	Actions	Implementing Party	Complete by:
	Bellfountain Prairie	Augment host plants throughout site.	USFWS	2021
	Additional sites as identified.			
2-5. Implement Taylor's checkerspot introductions on secured conservation lands, prioritizing areas with opportunities for connectivity to adjacent Taylor's checkerspot occupied sites, or with the potential to build a new network for the species	Fitton Green South Meadow	Complete Taylor's checkerspot introductions.	USFWS/IAE	2019
	Lupine Meadows		USFWS/IAE	2020
	Baskett Slough NWR Area 3 Upper		USFWS/IAE	2021
	Baskett Slough NWR Area 7		USFWS/IAE	2021
	Bellfountain Prairie		USFWS/IAE	2022
	Additional sites as identified.		USFWS/IAE	2023-2027
2-6. Enhance connectivity between Taylor's checkerspot populations and unoccupied but suitable habitat			TBD	2020
Goal 3: Contribute information to range-wide recovery planning for Taylor's checkerspot				
3-1. Monitor Taylor's checkerspot populations annually at occupied sites and any sites with butterfly introductions	Bezell Memorial Forest (All meadows)	Monitor populations annually	Benton County	Complete annually.
	Cardwell Crestmont		USFWS	
	Cardwell Little		USFWS	

Objective	Site	Actions	Implementing Party	Complete by:
	Cardwell Big		USFWS	
	New sites with introductions (To be determined)		USFWS	
3-2. Evaluate scenarios for dual management of Fender's blue butterfly and Taylor's checkerspot butterfly			USFWS	2018
3-3. Implement research to understand the lifespan of Taylor's checkerspot to improve population monitoring and size estimates			USFWS, ACUB	2019
3-4. Implement research to understand the dispersal behavior of Taylor's checkerspot to improve understanding of meta-population dynamics			USFWS, ACUB	2020