Restoration Plan Final Draft – Pollinators on the Brink: Restoring Rare Blue Butterflies and Their Native Host Plants in the Pacific Northwest

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Introduction

Prairie ecosystems in the Pacific Northwest (PNW) once flourished with ecological complexity and vibrant insect life, including a suite of endemic blue butterfly species: the Fender's blue (*Icaricia icarioides fenderi*), Puget blue (*Icaricia icarioides blackmorei*), and Silvery blue (*Glaucopsyche lygdamus*). These butterflies are not only visually iconic, but also serve as critical indicators of habitat health and biodiversity integrity. However, prairie habitat degradation, driven by agricultural conversion, fire suppression, invasive species, and climate change, has severely imperiled their populations (Schultz et al., 2017; Pailthorp, 2025).

This chapter centers on the restoration of the Puget blue, a species of particular conservation concern in Washington and British Columbia, and uses comparative research from the more extensively studied Fender's blue and Silvery blue to guide effective recovery strategies. The federally listed Fender's blue, for instance, has informed our understanding of host plant specialization, metapopulation structure, and the effectiveness of targeted restoration techniques, insights that are directly relevant to managing Puget blue populations. Likewise, research on the Silvery blue contributes to understanding broader butterfly responses to environmental stressors and can help refine multispecies approaches to habitat management. Restoring the Puget blue and its native plant associations, particularly lupine species, is essential for rebuilding prairie ecosystem function and resilience. Through a cross-border, multispecies lens, this chapter examines the ecological significance of these butterflies, identifies the primary threats to their persistence, and highlights current conservation efforts across Oregon, Washington, and British Columbia. It culminates in a phased restoration plan guided by SMART goals, designed to promote long-term habitat resilience and pollinator recovery by integrating ecological, social, and economic dimensions of stewardship.

Geographic Scope and Problem Overview

This restoration chapter focuses on three critical regions of the Pacific Northwest: the Willamette Valley in Oregon, the South Puget Sound in Washington, and the Garry oak ecosystems of southern British Columbia. These areas contain some of the last remaining fragments of the once-vast prairie landscapes where endemic blue butterflies co-evolved with native flora. Central to these relationships are lupines in the pea family (Fabaceae), which serve dual roles as larval host plants and adult nectar sources. These plants are keystone components of prairie pollinator networks, sustaining not only butterflies but also a broad array of other native invertebrates (Wiman, 2022; Schultz, 2015). Centuries of land conversion for agriculture, urban development, and the suppression of natural fire regimes have drastically reduced these prairie systems. In the Willamette Valley, prairie loss exceeds 98%, leaving only small, scattered patches of suitable habitat (Severns, 2010). Similar trends are evident in Washington's glacial outwash prairies and British Columbia's Garry oak ecosystems, where development and invasive species pose persistent threats. These conditions hinder dispersal, limit reproductive success, and reduce resilience to environmental change. Without coordinated, science-based interventions, the Fender's and Puget blue butterflies are likely to experience further declines, with the Puget blue at particular risk due to its limited range and fragmented habitat. The Silvery blue, though currently more widespread, may follow a similar trajectory and could shift from being a species

of concern to one warranting formal protection if current trends continue (Presidio, 2024; Schultz et al., 2017).

Species Overview and Conservation Comparison

The following table summarizes key ecological and conservation distinctions across the three focal species:

Table 1: Blue Butterfly Species Comparison

Species	Range	Main Host Plant	Conservation Status	Key Threats	Recovery Approach
Fender's Blue	Willamette Valley, OR	*Lupinus sulphureus spp. kincaidii*	Federally listed (Threatened)	Habitat loss, fragmentation	Prescribed fire, reintroductions, host plant restoration
Puget Blue	Thurston Co., WA	*Lupinus albicaulis*	Not federally listed ("Species of Greatest Conservation Need")	Woody encroachment, climate change	Site-based management, connectivity planning
Silvery Blue	BC & Northern WA	General lupines, other pea family, most commonly attracted to *Vicia caroliniana*	Not listed (Common)	Urbanization, agriculture	Community science, habitat protection

To justify the recovery actions outlined in Table 1, it's important to highlight proven on-the-ground methods that support butterfly conservation. The recovery of the Puget blue butterfly requires a phased approach that begins with improving habitat quality and connectivity within regions before attempting broader landscape-scale linkages. Most existing populations are small, isolated, and vulnerable to woody encroachment, habitat degradation, and climate change. Drawing on lessons from the recovery of Fender's blue in Oregon and conservation strategies for the more widespread Silvery blue, this plan emphasizes the creation of intra-regional habitat corridors by restoring native prairie patches with *Lupinus albicaulis* (the larval host plant) and a diverse array of nectar species. Like the success seen with Fender's blue, prescribed fire and mowing can be used to maintain open conditions and support host plant growth; they are carefully timed to avoid disrupting butterfly life stages. This strategy works best when genetic diversity, source population health, and climate resilience are considered. Community engagement, as demonstrated with the Silvery blue, is also essential; mobilizing volunteers through community science programs can expand monitoring efforts, foster local stewardship, and build public support for prairie conservation. Long-term recovery will depend on adaptive management guided by ongoing monitoring of population trends, habitat quality, and corridor effectiveness. By first reconnecting fragmented populations within regions, this approach builds a stronger ecological foundation for future efforts to link larger landscapes across the Puget lowlands.

SMART Restoration Goals

To guide this plan, the following SMART goals are proposed:

Table 2: SMART Goals Summary

SMART Criteria	Goal Description
Specific	Restore high-quality prairie habitat and viable Puget blue populations within their native range in South Puget Sound and adjacent lowlands of Washington. Prioritize *Lupinus albicaulis* restoration, open habitat structure, and connectivity between currently fragmented sites. Use recovery models and habitat metrics adapted from Fender's blue and Silvery blue conservation.
Measurable	By 2055, establish: • 5 connected and resilient Puget blue sites, each with ≥15 hectares of restored prairie and ≥70% cover of host lupine and native nectar plants. • Demonstrated adult butterfly movement and larval presence across at least 3 habitat corridors. • Monitoring data showing stable or increasing Puget blue populations at all sites.
Achievable	Use proven, species-appropriate methods by: • Removing woody encroachment and invasive grasses to open prairie canopy. • Enhancing and connecting sites using targeted plantings of *Lupinus albicaulis* and native forbs. • Applying strategic mowing and, where appropriate, prescribed fire, adapted from Fender's blue site management. • Engaging local communities and volunteers in butterfly monitoring, modeled after Silvery blue outreach programs.
Relevant	Aligns with: • Washington's State Wildlife Action Plan, listing Puget blue as a Species of Greatest Conservation Need (SGCN). • Regional biodiversity goals for prairie ecosystems and pollinators. • Transboundary strategies that support broader prairie-pollinator conservation in the Pacific Northwest.
Time-bound	Implement across a phased 30-year timeline (more information listed under the section Restoration and Stewardship Strategy).

Restoration and Stewardship Strategy

Phase I: Baseline Assessment and Habitat Recovery (2025–2030)

Primary Focus: Puget blue
Reference Strategies: Fender's blue host plant restoration; Silvery blue outreach models
Key Partners: WDFW, NGOs, Tribal Nations, private landowners

- Map historical and current Puget blue habitat across South Puget Sound and nearby lowlands.
- Remove invasive species (Scotch broom [*Cytisus scoparius*], and although Himalayan blackberry [*Rubus bifrons*] is not directly harming Puget Blues, it displaces native plants that provide food and habitat, and creates dense, impenetrable thickets that limits movement and access to resources) to open up prairie structure.
- Restore native plant communities, prioritizing *Lupinus albicaulis* and key nectar species.
- Apply prescribed fire and rotational mowing to maintain habitat (Schultz et al., 2017).
- Partner with Indigenous communities for culturally inclusive stewardship practices.
- Launch community awareness campaigns modeled after Silvery blue outreach programs in BC (Presidio, 2024).

Phase II: Reintroduction and Population Support (2030–2040)

Primary Focus: Puget blue
Reference Strategies: Fender's blue reintroduction protocols; Silvery blue transboundary monitoring
Key Partners: USFWS, JBLM, universities, First Nations

- Reintroduce Puget blue to restored sites with adequate host plant cover and prairie quality.
- Enhance Puget blue–ant mutualisms through field observation and habitat structure support to help align Puget blue restoration with broader ecological functioning in prairie systems.
- Use successful Fender's blue translocation models to guide site selection and monitoring (Wiman, 2022).
- Monitor Silvery blue populations in BC and northern WA as regional biodiversity indicators.
- Expand lupine and nectar plantings in strategic locations to support connectivity and reintroduction success.

Phase III: Monitoring, Adaptation, and Stewardship (2040–2055)

Primary Focus: Puget blue
Reference Strategies: Adaptive management from Fender's blue programs; community science from Silvery blue models
Key Partners: Conservation districts, local schools, community groups, land trusts

- Establish long-term monitoring protocols for Puget blues, host plants, and habitat conditions.
- Use adaptive feedback loops to refine management actions and corridor designs
- Develop intra-regional connectivity corridors linking fragmented Puget blue sites in South Puget Sound.
- Begin planning for broader inter-regional corridors connecting to Willamette Valley and BC sites.
- Train citizen scientists to collect data on butterfly abundance, vegetation metrics, and climate impacts.
- Institutionalize community science networks following successful Silvery blue engagement in BC (Jacobson, 2025).

Ecological, Social, and Economic Considerations

Restoring blue butterflies is ecologically essential because they represent sensitive bioindicators of grassland integrity. Their decline often signals broader biodiversity loss (Schultz, 2015). Restoration also benefits other pollinators, ground-nesting birds, and native plant species. Socially, butterflies offer an entry point for public engagement. Local landowners, schools, and Indigenous communities have shown strong interest in pollinator recovery as part of cultural revitalization and climate resilience (Jacobson, 2025). Economically, proactive recovery reduces the need for emergency Endangered Species Act listings, which are costly and restrictive (Pailthorp, 2025). A phased, partnership-based approach spreads costs across agencies and leverages existing programs like WDFW prairie recovery and the South Sound Prairie Landscape Working Group (Morgenweck, 2003).

Discussion & Conclusion

The conservation of rare blue butterflies faces several key challenges. Habitat fragmentation has led to small, isolated patches that hinder butterfly movement and reduce gene flow. Invasive species, particularly aggressive plants like Scotch broom, outcompete native lupines, the essential host plants for larvae (LaBar, 2012). Additionally, climate change disrupts flowering times, larval development periods, and can shift the geographic ranges of both butterflies and their host plants (Schultz et al., 2017). To address these threats, recommended actions include expanding collaborative planning across jurisdictions, institutionalizing funding mechanisms to support long-term conservation goals, and investing in research focused on butterfly mutualisms and climate adaptation strategies. Future research priorities should include collecting longitudinal data on Puget blue population dynamics, evaluating the effectiveness of

the habitat from prescribed fire versus mowing in various prairie types, and conducting genetic studies to inform assisted migration or translocation efforts.

Restoring rare prairie blue butterflies and their host plants is not only ecologically urgent but also socially enriching and economically strategic. By aligning restoration across Oregon, Washington, and Canada with a shared vision, we can ensure the persistence of these delicate pollinators and the prairie ecosystems they support. A resilient future is possible, one where butterflies, communities, and ecosystems thrive together.

Literature Cited

Bringing silvery blue butterflies to the Presidio. The Presidio. (2024, April 15). Retrieved from: https://presidio.gov/about/press/bringing-silvery-blue-butterflies-to-the-presidio

Jacobson, K. (2025, April 4). *Meet Watershed heroes Dennis Plank and Gail Trotter: Protectors of glacial heritage preserve, a rare prairie ecosystem*. The Daily Chronicle. Retrieved from: https://chronline.com/stories/meet-watershed-heroes-dennis-plank-and-gail-trotter-protectors-of-glacial-heritage-preserve-a,378226

LaBar, C., Schultz, C. B. (2012, April) "Investigating the Role of Herbicides in Controlling Invasive Grasses in Prairie Habitats: Effects on Non-target Butterflies." *Natural Areas Journal* 32(2), 177-189. Retrieved from: https://doi.org/10.3375/043.032.0207

Metzler, P. (2014, Fall). A thesis on "Investigations Into The Spatial Growth Patterns of Kincaid's Lupine." University of Oregon. Bechelor of Arts. Retrieved from: https://scholarsbank.uoregon.edu/server/api/core/bitstreams/7d90f911-325c-470b-a659-be5e8a5665d7/content

Morgenweck, M. (2003, October). *Butterfly populations on Fort Lewis: A historic perspective*. The Nature Conservancy. Retrieved from: https://cascadiaprairieoak.org/wp-content/uploads/2014/03/Morgenweck-M.-2003.-Butterfly-Populations-on-Fort-Lewis-A-Historic-Perspective.pdf

Moyer, J. (2024, January 24). *How a rare butterfly returned*. High Country News. Retrieved from: https://www.hcn.org/issues/54-11/north-wildlife-how-a-rare-butterfly-returned/

Pailthorp, B. (2025, March 17). *Butterfly populations have declined, but ecologists say they're resilient*. KNKX Public Radio. Retrieved from: https://www.knkx.org/environment/2025-03-17/status-of-butterflies-us-species-decline-ecologists-resilience-prairie-habitat

Severns, P. (2010). *Interactions between two endangered butterflies and invasive, exotic grasses in western Oregon, USA*. Cascadia Prairie Oak Partnership. Retrieved from: https://cascadiaprairieoak.org/documents/Severns_2010.pdf

Schultz, C. B., Crone, E. E., & Warchola, N. (2017). *Balancing ecological costs and benefits of fire for population viability of disturbance‐dependent butterflies*. *Journal of Applied Ecology*. Retrieved from: https://doi.org/10.1111/1365-2664.12983

Schultz, C. B., Henry, E., Carleton, A., Hicks, T., Thomas, R., Potter, A., Collins, M., Linders, M., Fimbel, C., Black, S., Anderson, H. E., Diehl, G., Hamman, S., Gilbert, R., Foster, J., Hays, D., Wilderman, D., Davenport, R., Steel, E., … Reader, B. (2011, July). *Conservation of prairie-oak butterflies in Oregon, Washington, and British Columbia*. Northwest Science, 85(2):361-388. Retrieved from: https://doi.org/10.3955/046.085.0221

Schultz, C. B. (2015, Winter). *Flying towards recovery: Conservation of Fender's Blue Butterfly*. News of the Lepidopterists' Society. Retrieved from: https://www.lepsoc.org/sites/all/themes/nevia/lepsoc/Conservation%20Matters%20-%20Fenders%20Blue.pdf

SPECIES FACT SHEET Retrieved by: Washington Department of Fish and Wildlife

Wiman, M. (2022, February 9). *2021 update on the Fender's Blue Butterfly*. Institute for Applied Ecology. Retrieved from: https://appliedeco.org/2021-update-on-the-fenders-blue-butterfly/