WASHINGTON REPORT
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EPA Herbicide Strategy for ESA Mitigations- Released Aug. 20, 2024

EPA's Final Herbicide Strategy for ESA: What Could Change

The following description has been endorsed by the Weed Science Society of America (WSSA) and reviewed by the WSSA ESA Committee. Special thanks to Bill Chism for leading this effort.

1: What is the Endangered Species Act (ESA)?

The Endangered Species Act is a long-standing federal law, passed in 1973, requiring government agencies to ensure any actions they take do not jeopardize a species that has been federally listed as endangered or threatened. When an agency has a proposed a project or an action that might affect a listed species or its habitat, they consult with the agencies responsible for the ESA, the U.S. Fish and Wildlife Service (terrestrial ESA species) or the National Marine Fisheries Service (aquatic ESA species). This is known as "***a consultation***" with "***the Services***''. The Services may then recommend changes to the project or action to protect listed species or habitats. A pesticide registration or reregistration under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) are actions that must also comply with the Endangered Species Act.

Meeting this ESA responsibility is a formidable task, considering the tens of thousands of pesticide products and registration amendments for which EPA is required to review the potential effects for over 1,700 U.S. listed species. Due to previous lawsuits by environmental groups, the EPA has developed new strategies to protect endangered species and their habitats from pesticides. These include the Vulnerable Species Action Plan, the final Herbicide Strategy, the draft Insecticide and Rodenticide Strategies, and in the future the draft Fungicide Strategy. The EPA has also developed a draft "Hawaii Strategy" aimed at protecting ESA species from pesticide use in Hawaii since approximately 40 percent of all ESA listed species occur in Hawaii. The final protections will be described on pesticide labels and in bulletins located in the website Bulletins Live! Two.

2: What is the Final Herbicide Strategy?

On August 20, 2024 the EPA released a "Herbicide Strategy to Reduce Exposure of Federally Listed Endangered and Threatened Species and Designated Critical Habitats from the Use of Conventional Agricultural Herbicides." This 79-page document reflects the EPA's three-step process to identify runoff/erosion and spray drift mitigation to protect listed species and their habitats as part of EPA's conventional herbicide registration and re-evaluation processes.

The Herbicide Strategy covers only conventional herbicides for agricultural uses in the lower 48 states. The mitigations identified in the strategy address potential impacts to listed plants (terrestrial, wetland, and aquatic), which are the types of species likely to be most impacted by herbicides. By identifying mitigations to protect plants, listed animal species that depend on plants would also be protected. This includes animals that depend on plants for food and shelter (habitat). By identifying and defining mitigations for these listed plant and animal species, EPA will consider and apply the Herbicide Strategy as appropriate in FIFRA herbicide registration and re-registration actions, which should result in reductions of population-level impacts to over 900 listed ESA species in the lower 48 states.

The Herbicide Strategy is not self-implementing and will require individual label changes. The strategy considers field and regional conditions and is intended to allow growers to select mitigation options that work best for their situation. Herbicide labels will start to change within one to three years, but it may take several years for the process to be completed for all herbicides.

3: How will the Herbicide Strategy affect pesticide use?
In cases where a herbicide has the potential to impact listed species or their habitat, the EPA could require spray drift mitigations, and/or runoff/erosion mitigations on the product label with more restrictive mitigation in specific geographic areas called Pesticide Use Limitation Areas (PULAs). PULAs identify the critical areas where listed species are most likely to occur. The applicator will be required to visit EPA's Bulletins Live! Two to determine whether the fields(s) are within listed species PULAs and have more restrictive mitigations in that area. The applicator can do this on the day of the herbicide application, but can also plan ahead and check up to 6 months prior to the application.

4: What about fungicides, insecticides, and rodenticides?
The EPA is developing strategies to protect threatened and endangered species and their critical habitat for all types of conventional pesticides. Similar to herbicides, EPA's strategies for fungicides, insecticides, and rodenticides will identify the need for, the level of, and the geographic placement of mitigations to protect endangered species.

5: How can I reduce spray drift?
Spray drift mitigations were developed to reduce the likelihood of impacts to listed species and designated critical habitat. EPA's mitigation approach includes minimum droplet size, maximum windspeed, and maximum release height requirements, as well as requirements for downwind spray drift buffers when needed. The maximum downwind buffer distances for different application methods are: aerial 0 to 320 feet, ground boom 0 to 230 feet, and airblast, in orchards for plant growth regulators (e.g., fruit and blossom thinning uses are included in the herbicide strategy), 0 to 160 feet. Chemigation applications for overhead and impact sprinklers do not have spray drift buffers but other mitigation measures may be identified. Applicators can use various mitigation strategies to reduce the size of the required downwind buffers. Some examples include using coarser droplet size, drift reducing adjuvant, hooded sprayers, treating a reduced proportion of the field, a drift reducing adjuvant, presence of downwind windbreaks, reducing the single application rate, or weather conditions that include relative humidity greater than 60% at time of application.

Each of these mitigations reduce the buffer as a percentage of the maximum and are additive such that two mitigations of 75% and 25% reduction would add to 100% reduction in the buffer requirement. Some managed areas can be included in the buffer area, for example: agricultural fields, roads, grassy areas next to field, or field borders. Some application methods are not prone to spray drift and will not require a buffer. Examples include: in-furrow sprays, tree trunk drench, tree injection, soil injection, or small area applications (< 1/10 acre or < 1,000 sq ft).

6: How can I reduce runoff/erosion?
EPA's Mitigation Menu was developed to reduce pesticide off-site movement via runoff or due to soil erosion. The product label and/or bulletins will outline mitigation requirements of 0 to 9 mitigation points that will depend on factors such as the herbicide used, crop, application parameters, and site-specific geographic conditions. EPA's Mitigation Menu Website includes descriptions of each mitigation and mitigation relief measure, cross references to NRCS conservation practice standards, and will include a runoff point calculator.

EPA's mitigation measures for erosion/runoff risk reduction include field characteristics like slope ≤ 3% or predominantly sandy soil, in-field runoff mitigation measures (conservation tillage, contour farming, cover crops, in-field vegetative strips, management of irrigation water, or terrace farming), measures adjacent to the treated field (grassed waterway, vegetated filter strips, riparian area), and systems that capture runoff and discharge (water retention systems such as ponds or sediment basins), and application parameters (partial field treatment, reduced annual application rate, soil incorporation). If certain mitigation measures are in place, then no further runoff/erosion mitigations are needed: such as systems with permanent basins, tailwater return systems, or subsurface tile-drains with controlled drainage structures. Similarly, some application methods such as tree injection, soil injection, or small area applications (less than 1/10 acre or < 1,000 sq ft) are not prone to runoff/erosion and will not require further mitigation.

Each of these mitigations have a point value of 1 to 4 mitigation points. Other ways to receive mitigation points include working with a technical expert in runoff/erosion control, such as a USDA NRCS technical service provider or independent crop consultant in runoff/erosion control, participating in a conservation program to reduce runoff, or tracking mitigation measures used on their field. Mitigation points are additive for example if a grower uses three practices worth: 1 point, plus 2 points, plus 3 points, the three combined runoff/erosion control practices add up to 6 mitigation points. Thus, in this example if a herbicide for their crop or site requires 6 points this grower would have enough runoff/erosion mitigation points to use that herbicide.

7: Mitigation Relief Points for Runoff Vulnerability:
The EPA has determined that for counties with medium, low, and very low runoff potential, less runoff/erosion mitigation is needed to reduce risks to listed species. Therefore, the EPA assigned "Relief Points" based on runoff vulnerability that count toward the required mitigation points.

Counties with **medium runoff** vulnerability will receive 2 relief points, counties with **low runoff** vulnerability will receive 3 relief points, and counties with **very low runoff** vulnerability will receive 6 relief points. These points reduce the amount of additional mitigation that may be needed, such that a field in a county identified with 6 relief points due to very low runoff potential would not need to Implement any other runoff/erosion mitigations for a product that requires 6 mitigation points. Relief points will reduce mitigation needs for approximately 80% of cultivated agricultural acres and 95% of specialty and minor crop production acres.

8: Pesticide use in critical areas: Pesticide Use Limitation Areas (PULA)
The EPA's Bulletins Live! Two is a website designed to provide information for specific geographic areas (PULAs) where listed species or their critical habitat are found. If EPA requires additional mitigations in these areas, those pesticide-specific requirements will be outlined for each PULA The applicator will be required to check EPA's Bulletins Live! Two within 6 months of the application to determine whether the application site is in a PULA. If it is, the pesticide label and/or bulletins on the EPA's Bulletins Live! Two website would identify the amount or type of additional mitigation needed. The EPA is developing an approach to refine the PULAs (maps) where the listed species and their critical habitat are found. This refinement process is intended to ensure that additional mitigation steps are required where they are most needed to protect listed species and their habitat.

For more information: WSSA ESA Website. https://wssa.net/endangered-species/

EPA Finalizes Vulnerable Species Action Plan
On September 26, 2024, the U.S. Environmental Protection Agency (EPA) released a Vulnerable Species Action Plan (VSAP) as part of its Endangered Species Act (ESA) Workplan implementation for pesticide products. The VSAP builds on EPA's June 2023 Vulnerable Species Pilot Project (VSPP).

In the VSAP released in September 2024, EPA identified 27 species listed by USFWS in the lower 48 states as "vulnerable species" and within the scope of the VSAP. These species include various types of plants and animals, adding seven species that were not originally included in June 2023 pilot project. The final VSAP also removed seven species from the pilot project after determining that they did not meet the definition of a vulnerable species. Over time, EPA expects to add species in the VSAP through formal consultations or coordination with the U.S. Fish and Wildlife (FWS).

Seven Species from the pilot project (VSPP) that are **NOT included** in the final VSAP:

1) **American burying beetle**
    - The American burying beetle (*Nicrophorus americanus*) was included in the Vulnerable Species Pilot. EPA rereviewed the available information from FWS on that species and decided not to include it in the VSAP because the species does not meet the vulnerability factors used for the VSAP. In the most recent Status of the Species Assessment (2019), FWS rated the American burying beetle as moderate to high for resiliency, and moderate for representation, and shows a "stable to increasing" population trend (FWS, 2019b). In 2020, the FWS downlisted the American burying beetle from endangered to threatened,

suggesting that the species vulnerability is decreasing. In FWS's recent biological opinions for malathion and Enlist, additional mitigations beyond those that were adopted on the general label were not needed for this species to avoid jeopardy. FWS does not currently identify pesticides as a major threat to this species. However, since this species is an invertebrate, it is a species that would be evaluated the draft Insecticide Strategy.

2) Okeechobee gourd
3) Ouachita rock pocketbook
4) Rayed bean
5) Riverside fairy shrimp
6) San Diego fairy shrimp
7) **Taylor's Checkerspot butterfly**
    - When this species was listed in 2013, FWS identified pesticides as a threat to the species. Specifically, in the 2013 Determination of Endangered Status for the Taylor's Checkerspot, FWS stated "Because the species exists within a matrix of rural agricultural lands and low-density development, herbicide and insecticide use may have direct effects on the species and its host plants." Since then, FWS has collaborated and consulted with pesticide applicators in occupied areas to avoid and minimize the impacts of pesticides. Correspondence from FWS provided to EPA in 2023 indicated that pesticide use within occupied areas is almost entirely done to manage and restore habitat, and is done in ways designed to minimize impact to Taylor's checkerspot individuals. In addition, FWS concluded that extant populations and planned translocations occur either on sites managed for conservation and/or federal lands where the use of pesticides that may affect Taylor's checkerspot requires consultation. They also noted that individuals are currently unlikely to occur within an agricultural matrix. (Information provided by FWS to EPA in 2023). In the recent draft recovery plan for this species, FWS no longer identifies pesticides as a threat (USFWS, 2022d27). In FWS's biological opinions for malathion and Enlist, FWS did not identify additional mitigations to avoid jeopardy or adverse modification for this species and its critical habitat in addition to those already on the label (USFWS, 2022a and 2023b). Also, in the 2024 draft biological opinion for methomyl, the species is not listed as being potentially jeopardized by the use of methomyl nor is the designated critical habitat concluded to be adversely modified from the use of this insecticide (USFWS, 2024a). Since pesticide exposure is comprehensively managed, at present, in the entirety of the species habitat and range, EPA has concluded the species does not currently need the additional protections afforded by inclusion in the VSAP.

Twenty-Seven Vulnerable Species Included in the final September 2024 VSAP:

1) Attwater's greater prairie-chicken
2) Buena Vista Lake ornate shrew

   Lake Wales Ridge Plants - the Lake Wales Ridge (LWR) area in central Florida is an ancient sandy scrub habitat that hosts a variety of unique plant and animal species, some found nowhere else in the world. Millions of years ago, when sea levels were higher and covered the majority of land in Florida, the ridge was a long thin island. There are a **total of twelve endangered plant species** in this region; the Vulnerable Species Pilot included 7 of the species but the current VSAP **includes all 12,** (listed below 3 to 14)) as the mitigations would cover the entire group. These species will be handled as a group because they are all encompassed in this unique region of the LWR, FL.

3) Avon Park harebells – Lake Wales Ridge, FL
4) Carter's mustard - Lake Wales Ridge, FL
5) Florida ziziphus - Lake Wales Ridge, FL
6) Garrett's mint - Lake Wales Ridge, FL
7) Highlands scrub hypericum - Lake Wales Ridge, FL
8) Lewton's polygala - Lake Wales Ridge, FL
9) Sandlace 0- Lake Wales Ridge, FL
10) Scrub blazingstar - Lake Wales Ridge, FL
11) Scrub mint - Lake Wales Ridge, FL
12) Short-leaved rosemary - Lake Wales Ridge, FL
13) Snakeroot - Lake Wales Ridge, FL
14) Wireweed - Lake Wales Ridge, FL
15) Leedy's roseroot (MN & NY)
16) Madison cave isopod
17) **Mead's milkweed**
    - Described as having a low resiliency, a low redundancy, and a low representation which support that the species has low population numbers that are in decline. There are 212 estimated populations of Meads milkweed, but only 3 are described by FWS as having high viability to the point where the population has the ability to survive or live successfully. The recovery criteria for the species requires 21 of these populations to have high viability to be delisted. Many of the other populations (approximately 130) are described as having low population numbers that are regularly mowed and unable to reproduce. The species is described as being found on hay meadows, indicating that it is on or on the margin of potential use sites and can be directly exposed to pesticides. The FWS 5-year Review (USFWS, 2012) includes herbicide or pesticide application as current threats including reference to herbicide damage to Mead's milkweed plants in occurrence records for three populations. Indirect effects of increased pesticide use can result in the direct decline of the Mead's milkweed primary pollinators, which include miner bees (*Anthophora abrupta*), western honeybees (*Apis mellifera*) and small bumblebees (Bombus spp) (USFWS, 2022a). Research has reported constant herbicide application as a contributing factor in the decline of Mead's milkweed in railroad prairies. In the draft methomyl biological opinion, FWS determined that jeopardy is likely without mitigations (USFWS, 2024a).
18) Ozark cavefish
19) Palmate-bracted bird's beak
20) Poweshiek skipperling (MI & WI)

21) Rusty patch bumblebee

- Described as having low population numbers that are in decline. Populations started a precipitous decline around 2007 likely due to several interacting stressors, including pesticides, pathogens, climate change, habitat loss (and resulting loss of nectar sources and nesting spaces), and small population biology (USFWS, 2021a). As described in the FWS biological opinion, there are 69 populations and many of the current populations are documented by only a few individuals. For example, 95 percent of the known populations are documented by five or fewer individuals and the maximum number found at any site was 30. Another factor discussed by FWS is with the rusty patched bumble bee the effective population sizes are inherently small due to their eusocial structure, haplodiploidy reproduction, and the associated ''diploid male vortex.'' This reproductive strategy makes the rusty patched bumble bee particularly vulnerable to the effects of a small population size. Along with the loss of populations, a marked decrease in the range and distribution has occurred in recent times. Since 2000, the species' distribution has declined across its range (representing an 87% loss of spatial extent expressed as a loss of counties with the species). As of August 2018, the species to be extant in 94 counties and one Canadian District (USFWS, 2023b). There is evidence of the species visiting pollinator attractive use sites and can be directly exposed to pesticides. The rusty patched bumble bee has also been observed and collected in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes, and urban use sites such as parks and gardens. In the draft methomyl biological opinion, FWS determined that jeopardy is likely without mitigations (USFWS, 2024a).

22) Scaleshell mussel

23) Spring creek bladderpod (TN)

24) White Bluffs bladderpod (WA)

25) Whorled sunflower

- FWS describes the Whorled sunflower as having a low resiliency, a low redundancy, and a low representation indicating that the species has low population numbers that are in decline (USFWS, 2023c). As described in the 2023 FWS status of the species assessment, the range is reduced to only eight natural populations, and extant populations vary in size, but tend to be relatively small and isolated, making it more difficult for the species to withstand and recover from stochastic or catastrophic events. Further, the species is likely suffering genetic isolation and reduced adaptive capacity. These conditions result in low viability for the species. In FWS's recent biological opinion for Enlist, additional mitigations were needed for this species to avoid adverse modification of its critical habitat. In the draft methomyl biological opinion, FWS determined that jeopardy and adverse modification are likely without mitigations (USFWS 2023b and 2024a). The 2023 Status of the species assessment describes that the species is found on roadsides, railroads, and agricultural fields which indicates the species and its pollinators are on or near multiple pesticide use sites and could be directly exposed to pesticides.

26) Winged mapleleaf
27) Wyoming Toad

The VSAP also explains that when EPA has developed a different strategy that applies to a pesticide, it will apply that strategy before applying the VSAP. The VSAP would thus supplement that strategy to the extent that the strategy does not cover pesticide uses and exposure routes to a vulnerable species. The VSAP includes mitigations for common exposure routes, including spray drift and runoff, but also addresses other routes of pesticide exposure to the vulnerable species. Examples include on-field exposure to a vulnerable species and pesticide volatilization. This action plan, along with the Ecological Mitigation Support document, are available in the public docket EPA-HQ-OPP-2023-0327 at regulations.gov, and on EPA's website.

WSSA Science Policy Fellows Reports on Two ESA Species.
Sarah Chu, PhD Candidate at Texas A&M, WSSA Science Policy Fellow
Rusty-Patched Bumble Bee

Biology
The rusty-patched bumble bee (*Bombus affinis*) is a social species that lives within a colony, made up of a queen, workers, and males. Depending on the cast within the colony, the bumble bee can have different sizes and colors. The rusty patched bumble bee size is 19-23 mm for the queen, 9-16 mm for the worker, and 14-17 mm for the male (Fish and Wildlife Service 2024). Regardless of the cast, the rusty patched bumble bee has a yellow thorax, with a black spot or band between the wings that can go towards the back in a V-shape (Figure 1; Figure 2). The bottom of the thorax is black. In workers and males, the first abdominal segment is yellow, and the second has a patch of rusty hairs on the front portion of that segment, with yellow hairs on the back and sides (Figure 1; Figure 2; Fish and Wildlife Service 2024). Queens are entirely yellow on the first two abdominal segments, and the rest are black (Figure 1; Evans 2020).

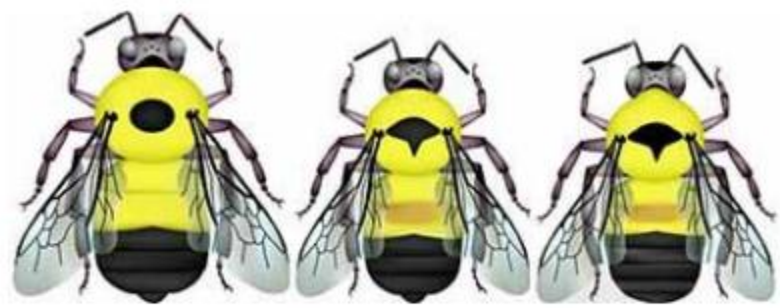

Figure 2. Queen, worker, and male
Elaine Evans, Bee Lab, University o

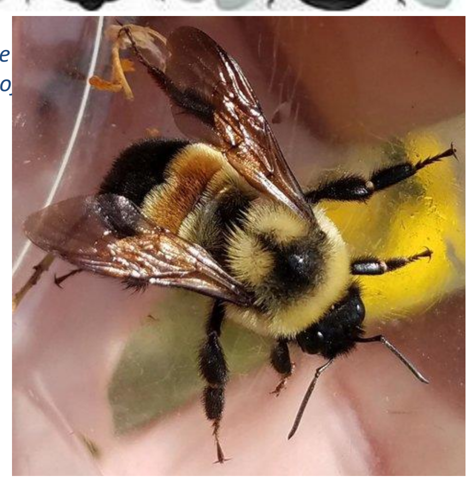

Figure 1 Rusty-patched bumble bee.

Life Cycle
The rusty-patched bumble bee has an annual life cycle. As previously stated, the rusty patch bumble bee lives in a colony, which starts with a foundress queen. The foundress queen emerges from its overwintering chamber

to initiate colonies, having stored sperm from mating the previous autumn to fertilize eggs. She then proceeds to identify a suitable nesting site, typically an abandoned rodent burrow, to rear the first workers within the colony, which can take up to five weeks to develop into workers (Fish and Wildlife Service 2024). She must tend to the larva alone; therefore, at the beginning of the colony, floral resources are required nearby to contribute to the overall success of the colony. Once workers are reared, more eggs are laid, which are then tended by the workers throughout the summer and early fall to develop into males, workers, and the next generation of queens. Before winter, the new queens disperse from the nest to mate with males from other colonies. The previous colony, including the males, workers, and foundress queen, died before the winter. Queens generally overwinter in soft soil a few centimeters deep and sometimes use compost or mole hills to overwinter in shaded areas (Goulson, et al. 2010).

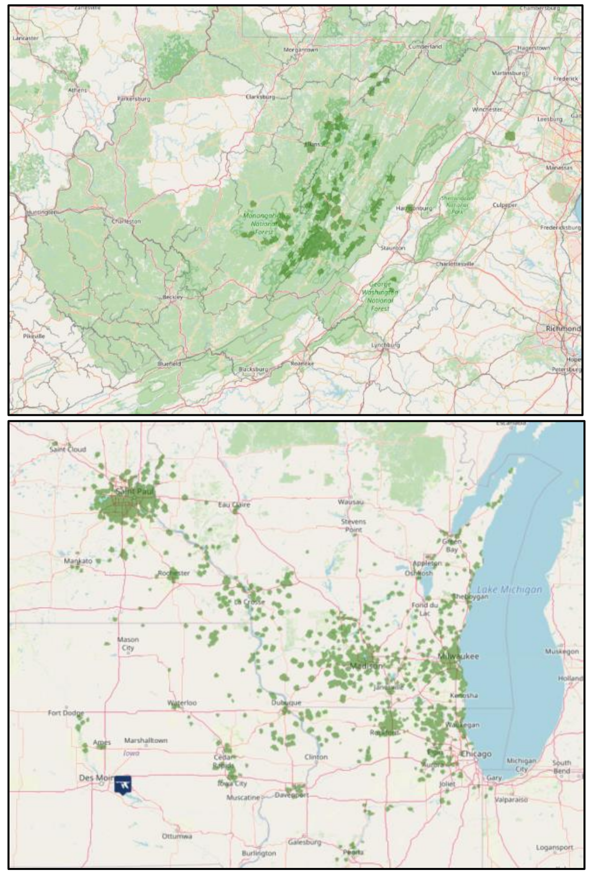

Figure 3. Maps displaying the current range of the rusty-patched bumble bee (Fish and Wildlife Service 2024)

Habitat

The rusty patch bumblebee has been observed in a variety of habitats, such as prairies, woodlands, marshes, agricultural landscapes, residential parks, and gardens. Historically, the rusty patch bumblebee was distributed throughout the eastern United States and Upper Midwest, from Maine to northeastern Georgia. However, more recent maps (Figure 3) display populations in West Virginia, Saint Paul, MN, Southern Wisconsin, and Northern Illinois (Fish and Wildlife Service 2024). They require areas that support sufficient food, overwintering sites for queens, and undisturbed nesting sites (Potts et al. 2010; Goulson et al. 2015). Rusty-patched bumble bees are a short-tongued species and a generalist forager so that they will go after flowers with shorter corollas for nectar (Fish and Wildlife Service 2024).

Reason for Endangerment

Pathogens

The decline of many bumble bee species occurred with the collapse of commercially bred western bumble bees (*Bombus occidentalis*), used traditionally for pollination within greenhouses. The collapse was attributed to *Nosema bombi*, a fungus that entered the wild population of bumble bees through transmission from shared forage sources. However, the pattern of loss in the wild species cannot be solely explained by the fungus. Thus, the true reason for the decline is up for debate (Szabo et al., 2012; Manley et al., 2019). Other pathogens, such as deformed wing virus, acute bee paralysis virus, and parasites, could also contribute to the decline. Little is known about the impact of these diseases on the rusty-patched bumble bee, as no specific studies on this single species have occurred.

Pesticides

It is estimated that insecticides and herbicides have a significant impact on bumble bee populations; as insecticides are used to kill unwanted insects, a side effect can be killing wanted insects. Herbicides are attributed to a reduction in available floral resources, indirectly impacting bumble bees. The exact lethal or sublethal effects of bumble bees are unknown; however, insecticide applications have been known to reduce male production, reduce egg hatch, and reduce queen progeny and longevity (Samuelson et al., 2018; Mommaerts and Smagghe, 2011). Bumble bees are more vulnerable to insecticide exposure due to the first month of their annual life cycle; the entire population depends on a single queen's ability to forage and provide for the growing workers; they generally forage during the morning and late evening; they have smaller colonies. Therefore, a single worker is more important; the nest location is underground and can be exposed to pesticide residue, and larvae consume large amounts of unprocessed pollen, which is known to contain higher amounts of pesticide residue than honey (Fish and Wildlife Service 2017).

Habitat loss and degradation

Historically, the rusty-patched bumble bee occupied native grasslands and most of the landscape has been lost or fragmented (Fish and Wildlife Service 2017). However, due to the generalist forager and nesting habitat nature of the rusty-patched bumble bee, critical habitat is not the primary driver of endangerment (Fish and Wildlife Service 2020). This loss of habitat may compound the loss of the species with other stressors, such as climate change, which can change the availability of resources, nesting habitats, or increased temperatures (Fish and Wildlife Service 2017).

Conclusion

Although the decrease in the population of rusty-patched bumble bees is not yet well understood, steps are being taken to monitor and conserve the current population (Figure 3). The increased awareness of pollinators, in general, may provide additional suitable habitats for the rusty-patched bumble bee; therefore, assisting conservation efforts. However, further research needs to be conducted on the life cycle of rusty-patched bumble bees and the development of appropriate regional bumble bee-specific flower recommendations to help in conservation efforts.

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<u>Taylor's Checkerspot Butterfly</u>

Introduction

Taylor's checkerspot butterfly (*Euphydryas editha taylori*) is a distinctive and colorful species known for its vibrant orange, black, and white markings (Fig. 1). Historically found in the Pacific Northwest of the United States and southern Canada, this butterfly has experienced a dramatic decline in population, leading to its designation as an endangered species. Here we will explore the biology, life cycle, habitat, reasons for its endangered status, and ongoing efforts to prevent its extinction.

Figure 4. Taylor's checkerspot. Photo by Washington Department of Fish and Wildlife.

Biology
Taylor's checkerspot is a medium-sized butterfly with a wingspan of approximately 1.5 to 2 inches (Britten et al., 1995). Its wings are characterized by a complex pattern of orange, black, and white, which provides camouflage against predators. The butterfly belongs to the Nymphalidae family, known for their vibrant colors and intricate wing patterns (Pyle, 2002). The larvae are tan with small dark spines along the dorsal and lateral surfaces in the first instar and gradually become darker and spinier through successive instars (Guppy and Shepard, 2001). Taylor's checkerspot exhibits sexual dimorphism, with females typically larger than males. Adult butterflies feed on nectar from various flowering plants, with a preference for species such as camas (*Camassia* spp.) and Indian paintbrush (*Castilleja exserta*). The larvae, or caterpillars, feed primarily on the leaves of host plants like buckhorn plantain (*Plantago lanceolata*) and native species such as harsh paintbrush (*Castilleja hispida*) (Severns and Grosboll, 2011).

Life Cycle
The life cycle of Taylor's checkerspot consists of four stages: egg, larva (caterpillar), pupa (chrysalis), and adult (Fig. 2). The cycle begins in spring when females lay clusters of eggs on the underside of host plant leaves. After approximately 10 days, the eggs hatch into larvae, which undergo several molts as they grow (USFWS, 2022). During the larval stage, the caterpillars feed voraciously on host plant leaves, storing energy for the next stage. As they reach full size, they enter the pupal stage, forming a chrysalis where metamorphosis occurs. This stage lasts for several weeks, culminating in the emergence of an adult butterfly. Adults live for about two to four weeks, during which they mate, lay eggs, and the cycle begins again (Schultz and Crone, 2005).

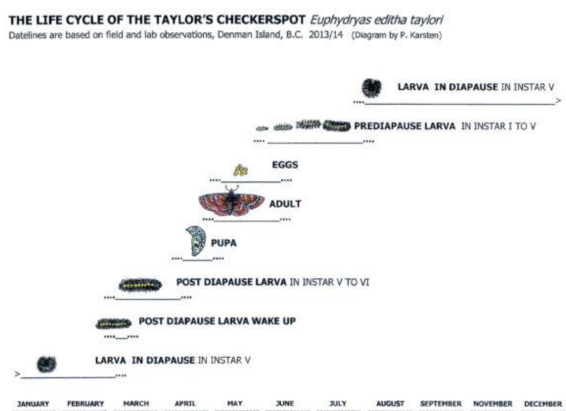

Figure 5. Taylor's checkerspot life cycle. (illustration by P Karsten), Garry Oak Ecosystem Recovery Team, 2024.

Habitat
Taylor's checkerspot inhabits prairie and grassland ecosystems, favoring open areas with abundant host plants and nectar sources. These habitats are typically characterized by well-drained soils, a mix of native grasses and forbs, and minimal tree cover (Britten et al., 1995). Historically, the butterfly was widespread across the Pacific Northwest, from British Columbia

to northern California. However, its range has drastically contracted due to habitat loss and fragmentation. Native grasslands, the habitat of Taylor's checkerspot, have declined to about 3% of the area they occupied in 1850 throughout the Willamette Valley-Puget Trough-Georgia Basin ecoregion (Grosboll, 2005). This decline is primarily due to development for agriculture, urbanization, gravel mining, succession to forest, and non-native invasive species.

Reasons for Endangerment

The primary reasons for the endangerment of Taylor's checkerspot are habitat loss, degradation, and fragmentation. Urban development, agriculture, and invasive species have significantly reduced the availability of suitable habitats. Fire suppression has also altered prairie ecosystems, allowing woody vegetation to encroach and outcompete the butterfly's host plants (Buckingham et al. 2016). Climate change poses additional threats, potentially altering the availability and timing of food resources. The small, isolated populations that remain are vulnerable to genetic bottlenecks, disease, and environmental stochasticity, further exacerbating the risk of extinction (Severns and Grosboll, 2011).

Importance in the Ecosystem

Taylor's checkerspot butterfly plays a crucial role in the ecosystems it inhabits. As a pollinator, it contributes to the reproductive success of various flowering plants, including those that are rare and endangered. This pollination is essential for maintaining the biodiversity and health of prairie ecosystems. Furthermore, Taylor's checkerspot serves as an indicator species, reflecting the overall health of its habitat (Ehrlich, 1992). The presence or absence of this butterfly can provide valuable insights into the condition of the prairie ecosystem, including the impact of environmental changes and human activities. Because butterflies are sensitive to habitat changes and pollution, their populations can signal broader environmental shifts (Ehrlich and Hanski, 2004). As an umbrella species, conservation efforts aimed at protecting Taylor's checkerspot can benefit many other species that share its habitat. By focusing on the preservation and restoration of prairie ecosystems for the butterfly, other plants and animals that depend on the same environment also receive protection. This holistic approach helps maintain ecological balance and promotes biodiversity.

Conservation Efforts

Efforts to conserve Taylor's checkerspot and prevent its extinction have been multifaceted, involving habitat restoration, captive breeding, and reintroduction programs:

Habitat Restoration

Restoring and managing prairie habitats is crucial for the survival of Taylor's checkerspot. Conservation organizations and government agencies have undertaken efforts to restore native plant communities, control invasive species, and reintroduce fire as a management tool to maintain open grasslands. These actions help to recreate the conditions necessary for the butterfly's life cycle (USFWS, 2013).

Captive Breeding and Reintroduction

Captive breeding programs have been established to bolster wild populations. By breeding butterflies in controlled environments, conservationists can increase the number of individuals available for reintroduction into restored habitats. These programs also provide valuable insights into the species' biology and reproductive needs (WDFW, 2021).

Monitoring and Research

Ongoing monitoring of wild populations and habitats is essential to assess the effectiveness of conservation strategies and make data-driven decisions. Research on the butterfly's ecology, genetics, and interactions with its environment helps inform management practices and improve conservation outcomes (WDFW, 2021). Research to implement restrictions on herbicide use that are known to harm the butterfly's host plants or nectar sources are often limited but essential.

Public Engagement and Policy

Engaging the public and policymakers in conservation efforts is vital for long-term success. Public education campaigns raise awareness about the importance of prairie ecosystems and the species that depend on them. Policy measures, such as land use regulations and funding for conservation initiatives, support habitat protection and restoration efforts.

Conclusion

The plight of Taylor's checkerspot butterfly underscores the broader challenges facing many endangered species. Habitat loss, climate change, and other anthropogenic factors have brought this once-common butterfly to the brink of extinction. However, through concerted conservation efforts involving habitat restoration, captive breeding, and public engagement, there is hope for the recovery of Taylor's checkerspot. Protecting this species not only preserves a unique and beautiful butterfly but also contributes to the health and resilience of prairie ecosystems.

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Congress Passes Stopgap Spending Bill

On Wednesday, September 25, just five days before FY’2024 funding for the government was set to expire, Congress passed a Continuing Resolution (CR) to fund the government until December 20, 2024. Members of the House of Representatives passed the CR on a bipartisan vote of 341-82. The Senate subsequently voted and passed the CR on a vote of 78-18 and it was signed by the President before the September 30 deadline.

Farm Bill Authorization Expired on Sep. 30.

The 2018 farm bill, which was already extended one year in FY 2023, has now expired on Sep 30, 2024. The Farm Bill is a complicated piece of legislation with different programs with many different provisions for each title of the Farm Bill with varied expirations and authorizations.

The federal crop insurance program is permanently authorized. It doesn't need to be reauthorized by a farm bill. The Supplemental Nutrition Assistance Program (SNAP), which accounts for about 80% of the spending in the farm bill, is reauthorized through appropriations bills and continuing resolutions (CRs). As of October 1, 2024, the government is operating under a continuing resolution (CR) through Dec. 20, 2024.

The Inflation Reduction Act (IRA), extended four major conservation programs and their funding authority through FY 2031: the Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), the Agricultural Conservation Easement Program and the Regional Conservation Partnership Program. Notably however, the Conservation Reserve Program (CRP) wasn't extended to 2031, so it's authority expired Sep. 30, 2024. The same is true for the Healthy Forest Restoration Program and Watershed Rehabilitation Program.

Then there are other Farm Bill programs that are impacted by "Permanent Law", such as some commodity support programs and dairy that would "drop off the cliff" come January 1, 2025. Permanent law provides support based on a parity price from the 1910-1914 period that does not recognize productivity gains and technological advances in agriculture or modern marketing and policy approaches.

Finally, Farm Bill programs that rely on mandatory funding are typically most affected. In the Research Title (VII), this would include programs like the Specialty Crops Research Initiative (SCRI) and the Organic Agriculture Research and Extension Initiative (OREI) that receive mandatory funding every year and do not depend on year-to-year discretionary appropriations. Research title programs that are funded with discretionary appropriations on year-to-year basis include the USDA NIFA AFRI competitive grants program, the IR-4 project, Smith-Lever and Hatch capacity funds, and the Crop Protection and Pest Management (CPPM) program. You could make the argument that this is the one time where discretionary funded programs are better off compared to mandatory funded programs. Either way, Congress must address the Farm Bill by January 1, 2025 or things will get crazy out in rural America.

<u>USDA-ARS NP 304 Crop Protection and Quarantine Stakeholder Review</u>

In March, the USDA-Agricultural Research Service (ARS) held a stakeholder meeting to review their National Program 304 (NP304) and layout research priorities for 2025-2030. The NP304 covers four main components in crop protection and quarantine: 1) Systematics and Identification; 2) Weeds; 3) Insects and Mites; and 4) Postharvest Protection of Commodities.

Many thanks to those who could attend and represent weed and invasive plant science interests: Ian Burke, Carroll Moseley, John Byrd, Bill Chism, Jim Anderson, Gaylon Morgan, Dave Horvath, and Emily Unglesbee. A special thanks goes to USDA-ARS scientist **Steven Mirsky** for his presentation on advancements and application of technology for managing weeds in cropping systems during the meeting. Last, but not least, we'd like to thank **Dr. Steve Young**, USDA ARS National Program Leader for Weeds and Invasive Species, for his excellent guidance and leadership in this stakeholder review.

The 2025-2030 strategic plan was released on July 27, 2024. Overall, the plan reflects well on the priorities and challenges facing weed and invasive plant science: *……"**ARS will leverage recent advances in robotics and machine learning, herbicide resistance management, integrated approaches including cover crops and harvest weed seed control, bio-based chemistries and control tactics, gene editing and RNAi, and plant physiology and***

***development, that provide novel, affordable, safe, and effective management strategies, and to anticipate and prevent the introduction and spread of weeds and invasive plants**."*

Can ARS rise to meet the challenges facing growers and land managers struggling with some of the most intractable weeds and invasive plants? WSSA is working on a letter to USDA Secretary Vilsack discussing the importance of funding for federal programs for weed and invasive plant management. During the stakeholder meeting, several of the major commodity groups, including cotton, soybean, sorghum, sugarbeets, voiced their concerns that a lack of new weed management tools coupled with herbicide resistance issues are greatly impairing their ability to effectively manage weeds resulting in significant crop yield losses. Simply stated, federal research programs focused on weed and invasive plant management are not receiving enough attention and funding. It is paramount that USDA leadership and Congress hears about these challenges and getting the letter endorsed by as many grower and stakeholder groups as possible will be key to this ongoing and important effort.

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Meetings of the National and Regional Weed Science Societies
Dec. 9 - 12, 2024 North Central Weed Science Society (NCWSS), Kansas City, MO **www.ncwss.org**
Jan. 6 - 10, 2025 Northeastern Weed Science Society (NEWSS), Annapolis, MD **www.newss.org**
Jan. 20 - 23, 2025 Southern Weed Science Society (SWSS), Charleston, SC **www.swss.ws**
Feb. 24 - 27, 2025 Weed Science Society of America (WSSA), Vancouver, BC **www.wssa.net**
Mar 10-13, 2025 Western Society of Weed Science (WSWS), Seattle, WA **www.wsweedscience.org**
Jul. 14 - 17, 2025 Aquatic Plant Management Society (APMS), Providence, RI **www.apms.org**