Integration and Synthesis Summary for Insects

This Integration and Synthesis Summary includes our jeopardy analysis for insect species that we or EPA determined would "likely be adversely affected" by the proposed action. Our jeopardy analysis of the proposed action's impacts to listed species is split into three major factors: vulnerability, exposure, and toxicity. The tables below contain summaries of vulnerability, exposure, and toxicity. Data and information used for each species include environmental baselines, cumulative effects, exposure information, and expected toxic effects for all species, and a template worksheet to show how species were assessed are in Appendix E. Status of the Species for each species can be found in Appendix B.

Most of these species have low exposure to simazine due to the factors described in the tables or individual rationales below, in combination with reductions in simazine spray drift and runoff resulting from implementation of conservation measures added to the product label (including those developed during this consultation through the Herbicide Strategy[1]; see Conservation Measures section below). We anticipate agricultural exposures in the aquatic habitats where these species occur are at low enough levels where the label measures (including the 15-foot spray drift buffer and three runoff points) are sufficient to reduce exposure from agricultural uses to where we expect only low levels of adverse effects to insects.

Vulnerability

For the insect species that we or EPA determined are "likely to be adversely affected" by the proposed action, we considered several factors for each to determine the current vulnerability of that species to additional stressors. This effort allows us to consider whether a species' current condition is stable, moving toward recovery, or moving toward further decline. In general, we expect the species' vulnerability to additional stressors to be higher if they are near extinction, far from recovery, or moving toward further decline than if their condition is stable or improving. We also identify which species are most (and least) susceptible to additional stressors in general based on information from species listing and recovery documents, or other sources as cited and considered in the Status of the Species and Critical Habitat section of this Opinion (Appendix B).

Our assessment of vulnerability focuses on six factors (as currently understood and available): (1) the species listing status and recent 5-year status review recommendation (if available), (2) distribution, (3) number of populations[2], (4) species population trends, (5) if pesticides have been noted as a threat, , and (6) current and projected future impacts from activities associated with

[1] https://www.regulations.gov/docket/EPA-HQ-OPP-2023-0365

[2] The number will vary in value and importance by species and in some cases is unknown. In general, species with a greater number of populations have greater representation, will be more resilient, and when distributed geographically, will have greater redundancy. Conversely, species with fewer populations, in general, have less representation, are less resilient, and have less redundancy.

environmental baseline and cumulative effects. We obtained the information to create the vulnerability summary from the Status of the Species accounts (Appendix B), overarching Environmental Baseline section of this Opinion, five-year species status reviews, species recovery plans, species status assessments, range and critical habitat information from our ECOS[3] repository, and other sources containing the best available scientific information for the species.

We scored each of the six vulnerability components with high, medium, or low scores. We assigned a high vulnerability ranking to a species if all vulnerability components were scored as high, a mixture of medium and high, or if a threatened species was recommended for uplisting to endangered status in the most recent 5-year status review or proposed rule. We assigned a medium vulnerability ranking if a species' scores were all medium, a mix of high, medium, and low, or a mix of high and low (unless the species has been recommended for uplisting or delisting). We assigned a low vulnerability ranking to species with only low scores, a mixture of low and medium scores, or if the species was recommended for delisting. Considerations regarding specific aspects of the species' vulnerability or beyond what was included in the vulnerability ranking were applicable in our jeopardy analyses for some species depending on unique aspects of their vulnerability factors, recovery needs, or life history. This information is reflected in the rationales for conclusion below.

Exposure

We anticipate listed insect species will be exposed to simazine primarily through direct contact, either as the result of exposure to pesticide applications on-site or through off-site transport via spray drift or runoff. Simazine is moderately mobile in water and is relatively persistent in the environment relative to other pesticides on the market, indicating that off-site transport, particularly through runoff, may result in exposure to listed plant species in areas far from use sites.

Exposure to Agricultural Uses

Simazine has several registered agricultural uses (see Appendix 1-4 of EPA's Biological Evaluation). We characterize the expected level of exposure using overlaps between the species' ranges and agricultural land uses where simazine is registered for use (i.e., overlap data; including a 305-m off-site transport area adjacent to use sites), past simazine usage data (when available; the amount and location where simazine has been used in the past), any species-specific considerations such as life history information (e.g., habitat preferences, dietary needs), and existing protections or conservation actions (e.g., existing label measures, conservation measures from the action agency). Species with greater than 10% overlap between their range and simazine use sites are assigned a high overlap score, species with 5-10% overlap are assigned a medium overlap score, and species with less than 5% total overlap are assigned a low

[3] https://ecos.fws.gov/ecp/

overlap score. In addition to range overlaps, we considered past usage data within a species' range to determine how much of a species' range we expect to be treated with simazine each year of the proposed action. Except where otherwise noted, usage data is provided by EPA applying data from their National and State Summary Use and Usage Matrix, as described in the Usage Analysis section of this Opinion. Species with usage data that indicate a large portion of their range (>10%) is treated with simazine each year are assigned a high usage score. Species that have a medium portion of their range (5-10%) treated with simazine each year are assigned a medium usage score, and species where data indicate a low portion of their range (<5%) is treated with simazine each year are assigned a low usage score.

We determine the agricultural exposure ranking by qualitatively considering both the total overlap and total usage, as well as any additional exposure considerations that might modify the level of exposure likely to occur. When overlap and usage scores are the same, we assign the agricultural exposure ranking the same score (e.g., if both overlap and usage is high, the agricultural exposure ranking is high). In cases where overlap is high and usage is medium or when overlap is medium and usage is low, we use the overlap score as the agricultural exposure ranking to maintain conservative exposure assumptions. As usage is a subset of overlap, the overlap score will always be greater than the usage score. In cases where overlap is high, but usage is low, we anticipate a moderate portion of the range may be treated over the duration of the proposed action even if only a small portion of the range is treated in any given year (particularly if the areas treated occur in different locations each year), leading to an agricultural exposure ranking of medium. For species where there are additional exposure considerations, we adjust the agricultural exposure ranking to reflect this additional information, as appropriate.

Agricultural uses of simazine include labeled uses for corn, vegetables and ground fruit, other crops, citrus, grapes, Christmas trees, and other orchards only within the coterminous United States (CONUS).

Exposure to Non-Agricultural Uses

Simazine has several registered non-agricultural uses, including nurseries (only ornamental conifers, deciduous trees and woody ornamental species), ornamental ponds (1,000 gallons or less), lawns, golf courses and other turf. In many cases, data provided by EPA indicate low to high levels of overlap between species' ranges and non-agricultural UDLs. Overall, nurseries (including ornamental plant uses) represent a very small footprint across the action area; across all species in this consultation, the Nurseries UDL overlaps between 0%-0.2% of species' ranges and 0%-5.6% of species' ranges plus a 305-m buffer. For species known to occur near nurseries, we assess nurseries specifically in our assessment. UDLs for non-agricultural uses sites that represent turf tend to be less defined than those for agricultural UDLs and are less likely to accurately represent the actual footprint of these use sites on the landscape. As such, we assess exposure of species to all non-agricultural uses of simazine in a qualitative manner, considering the life history of species, methods of application, simazine usage, and any existing conservation measures to reduce drift and runoff or otherwise limit exposure to species. To facilitate this analysis, for every species in this Appendix, we reviewed species' documents (e.g., Status of the Species (Appendix B), 5-year reviews, Species Status Assessments, recovery plans, listing rules) to determine if the species could occur on or near non-agricultural simazine use sites (i.e., residential areas where lawns are likely present, golf courses, and nurseries) and the manner in which they may rely on these sites.

Depending on region, cool-season, warm-season, or a combination of turf grass species are managed on golf courses and lawns. Cool-season grasses grow best in cooler conditions, and warm-season grasses thrive in hot, dry weather (USDA, 2004); there is a transition zone across the U.S. where either category of turf grasses may be planted based on microclimate conditions. Exposure to triazines will kill cool-season grasses, but warm-season grasses can tolerate exposure to simazine. As such, EPA estimated where in the U.S. only cool-season grasses are exclusively used in turf based on the U.S. Department of Agriculture's plant hardiness zone map as simazine use is not expected in these areas (USDA, 2023). Because hardiness zones will change over time with environmental conditions, EPA created a static map based on the hardiness zones where they expect warm- and cool-season grasses are grown based on the most recent data mapped (i.e., 1991-2020). EPA determined zones 1a-6a represent cool-season grasses (i.e., white areas) and zones 6b-13b may include warm-season grasses (i.e., black areas) (Figure 1). We expect the cool- and warm-season grass assessment to apply to all turf, including residential, commercial, and golf course turf. We refer to EPA's cool-season map in species assessments where relevant, particularly if a species occurs exclusively in the cool-season zone where we expect simazine will not be used on turf and no exposure will occur from this use.

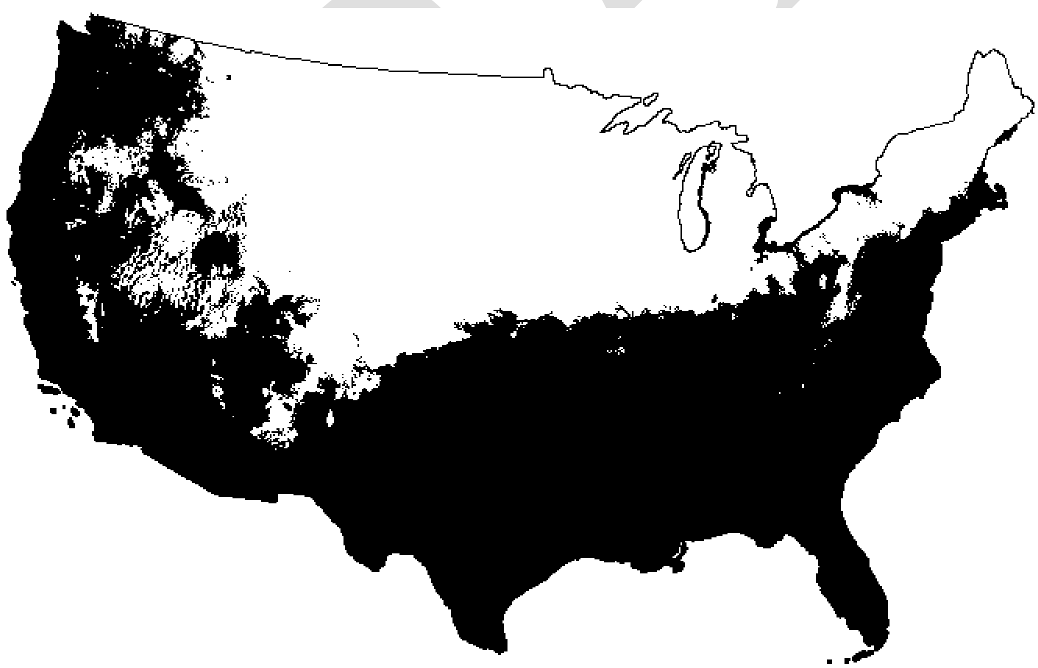

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

Particularly for residential and commercial turf uses, qualitative usage information obtained by EPA from the National Association of Landscape Professionals (NALP) indicate that simazine is no longer commonly used on residential or commercial turf as potential consequences to turf areas related to timing of application has led to preferential use of other herbicides that can be applied more broadly. If simazine were used on residential or commercial turf, it would be applied during the fall and spring as a pre-emergent. In addition, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift.

Particularly for golf course turf uses, we obtained qualitative usage information directly from the Golf Course Superintendents Association of America (GCSAA) and an academic turf scientist that indicate that simazine is used to control winter annual broadleaf and annual bluegrass weeds on golf courses. They are applied as a pre-emergent in early fall and early winter to fairways and roughs, which make up approximately 30% of a golf course's acreage. Triazines are not applied to tee boxes or greens, which make up an additional 6% of golf course acreage. Most applications are made at rates lower than what is on the label (i.e., 1-1.5 lbs a.i./acre). These applications are made only once or twice a year, 45-60 days apart. In general, golf courses typically apply herbicides using dedicated ground equipment with a low boom height (as per the label), and golf course superintendents make use of several tools to monitor soil moisture before any applications are made to help ensure turf and soil conditions do not lead to off-target movement of herbicides. In addition, riparian buffer zones are often used on golf courses between all water features to reduce off target movement (Golf Course Superintendents Association of America [GCSAA], pers. comm., 2025). The no-till methodology and continuous cover of a turf grass area inherent in managing golf course turf are equivalent to additional runoff mitigations (i.e., equivalent to six points on EPA's mitigation menu), and we considered them in our assessment.

For most species in this Appendix, we anticipate that non-agricultural uses will not meaningfully add to the overall level of anticipated exposure considered in our analysis of agricultural uses. Due to runoff and spray drift considerations described above, off-site exposure is not expected to result in effects to most species in this Appendix. In addition, we expect most listed species' habitat requirements precludes them from occupying non-agricultural use sites where simazine may be used. For species whose habitat is known or presumed to occur in non-agricultural use sites of simazine, we consider, individually and qualitatively, the extent and manner of non-agricultural simazine usage within the species' range to generally determine whether a small, moderate, or large number of individuals are likely to be exposed and the expected level of adverse effects from non-agricultural exposure of simazine.

References:

GCSAA (Golf Course Superintendents Association of America). 2025. Personal communication with USFWS HQ staff.

USDA. 2004. Comparing warm-season and cool-season grasses for erosion control, water quality, and wildlife habitat. Natural Resources Conservation Service, U.S. Department of Agriculture. 5 pp.

USDA. 2023. Plant Hardiness Zone Map. Agricultural Research Service, U.S. Department of Agriculture. Accessed from https://planthardiness.ars.usda.gov/ on August 20, 2025.

Toxicity

We characterize the expected toxic effect to species based on the anticipated level of direct and indirect[4] adverse effects to individuals. Our analysis of toxicity assumes individuals are exposed to simazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. Direct effects are based on the anticipated level of mortality and sublethal effects (e.g., reduced growth and reproduction) likely to occur in exposed individuals. Indirect effects are based on the impact a listed species is likely to experience when the organisms they rely on, such as prey or forage, are exposed to simazine and experience adverse effects.

We consider estimated concentrations of simazine on the landscape or within the environment and effects reported in available toxicity studies to determine the level of direct and indirect adverse effects to listed species or critical habitat. Concentrations of simazine can vary greatly depending on where exposure takes place. For instance, exposures on or near use sites are at higher levels than exposures that occur in areas far away from use sites. Based on available toxicity data, we anticipate terrestrial insects that are exposed to simazine on use sites or from off-site transport are not likely to be exposed to levels of simazine that would cause direct adverse effects, including mortality or sublethal effects to growth or reproduction. Based on available toxicity data for aquatic insects, aquatic insects are not likely to be exposed to levels of simazine that would cause mortality, however sublethal effects such as reduced reproduction, could occur at some concentrations of simazine in low flow or low volume aquatic habitats.

We anticipate terrestrial insects that only rely on plant-based resources, such as pollen, nectar, or leaves for food or vegetation as habitat, are likely to experience some indirect adverse effects with simazine exposure. Species that rely on arthropod prey for food resources will experience lower levels of indirect adverse effects (if any) as simazine exposure will not likely reduce the abundance and availability of arthropod prey. We anticipate that aquatic insects that rely on

[4] While our Opinion considers all consequences of the proposed action (per the definition of effects of the action at 50 CFR Part 402.02), the terms "direct" and "indirect" effects were used in EPA's BE, and are used in environmental risk assessment terminology in general, and do not have the same meaning as used in ESA regulations. As used in the effects analysis section, direct effects to species are those caused by the pesticide itself through dietary, dermal, or inhalation routes of exposure. Indirect effects occur when the pesticide acts on elements of the ecosystem that are required by the species, such as alterations to prey or shelter. Thus, in the effects analysis section, we may sometimes continue to use these terms to link back to the analysis in EPA's BE.

plant-based dietary items are likely to experience some indirect adverse effects with simazine exposure.

We determine the overall toxicity ranking for insects by qualitatively assessing both the expected levels of direct adverse effects (e.g., mortality, sublethal effects to growth and reproduction) and indirect adverse effects (e.g., plant-based dietary items and vegetation loss). Given that mortality is the most adverse of direct effects to an individual of a species, we assign the most weight to direct adverse effects resulting in mortality when determining the toxicity ranking. As mentioned previously, available toxicity data indicate terrestrial and aquatic insects are not likely to die directly from simazine exposure at estimated environmental concentrations, but aquatic insects may experience sublethal effects (i.e., reduced growth and reproduction). Thus, we rank insects exposed from low to high depending on the nature and extent of exposure. Ranking for indirect effects will be variable based upon effects to food resources or impacts to habitat vegetation.

Experimental populations, non-essential

We considered the experimental, non-essential population for the Oregon silverspot butterfly (EXPN Entity ID 11398) in this section of the consultation. We do not provide separate analyses and jeopardy determinations for these populations. Rather, we treat all populations of the species (including populations designated as experimental) as a single listed entity when making jeopardy determinations or for other analyses in a section 7 consultation. An "essential experimental population" is a reintroduced population whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild. However, there are no “essential experimental populations” in this consultation. A "nonessential experimental population" is a reintroduced population whose loss would not be likely to appreciably reduce the likelihood of survival of the species in the wild. By definition, a "nonessential experimental population" is not essential to the continued existence of the species. Therefore, no proposed action impacting a population so designated could lead to a jeopardy determination for the entire species. In cases where our assessment of the listed entity (i.e., the non-experimental population(s) of the species) leads to a “not likely to jeopardize” determination, we generally assume any added effects to the nonessential experimental population will not change these determinations. However, we consider the role of the experimental population in the survival and recovery of the species and consider this information in our jeopardy analyses as appropriate.

Conservation Measures

Herbicide Strategy Conservation Measures

As part of the simazine ESA consultation with the Service, EPA is implementing the final Herbicide Strategy to inform and identify any necessary conservation measures where EPA’s analysis indicated there was a risk of population level effects to listed species. The measures identified by EPA, and committed to by the technical registrants, include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[5] necessary in all areas where simazine is used, as well as additional runoff mitigation points for certain simazine uses limited to specific geographic areas when required to protect specific listed species.

The spray drift buffer will be placed on the general label and will apply to all uses of simazine. EPA's Herbicide Strategy provides applicators with options to reduce the distance of this buffer by using other spray drift reduction strategies that we anticipate will result in an equivalent reduction in spray drift entering non-target habitats as stated buffers. These measures and the degree to which applicators can reduce buffers by employing them are described in EPA's Herbicide Strategy and EPA's Ecological Mitigation Support Document to Support Endangered Species Strategies. These documents are provided in Appendix A-1.

This buffer is in addition to current spray drift mitigations that are already on the label, including:

- Restricting use to a maximum windspeed of 10 miles per hour,
- Prohibiting applications during temperature inversions,
- Ground applications only,
- Applying with a release height of no more than 4 feet above the ground or crop canopy for ground applications,
- Selecting nozzles and pressures that deliver coarse or coarser droplets for all applications,

Based on EPA's analyses, the required spray drift conservation measures described above (from the current label and implemented through the Herbicide Strategy) will reduce spray drift from entering species' habitats by >95%. The Service anticipates that this reduction will minimize off-site transport of simazine from spray drift to a level where no more than low levels of effects are likely to occur to birds that rely on plant species through this exposure route.

Additionally, all agricultural labels will include a requirement for applicators to achieve 3 points of runoff mitigation, as described in the Herbicide Strategy, for all agricultural uses. EPA's Herbicide Strategy provides applicators with various options to reduce runoff and erosion and assigns points to each option based on its effectiveness. Applicators must implement sufficient mitigation points to meet the label requirement. Applicators can achieve the required points using the conservation measures identified on EPA's Mitigation Menu website[6]. The menu provides a suite of options, including relief points for certain field characteristics and likelihood for pesticide transport.

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[5] Ecological Mitigation Support Document to Support Endangered Species Strategies

[6] Mitigation Menu website: https://www.epa.gov/pesticides/mitigation-menu

These runoff mitigation points are in addition to runoff mitigations that are already on the label, including:

- Product must not be mixed or loaded within 50 feet of intermittent streams and rivers, natural or impounded lakes and reservoirs.
- Product must not be applied within 66 feet of points where agricultural field (nurseries, Christmas tree plantings, and turf grasses for sod farms) surface water runoff enters perennial or intermittent streams and rivers or within 200 feet of natural or impounded lakes and reservoirs. If this product is applied to highly erodible land, the 66-foot buffer or setback from runoff entry points must be planted to crop or seeded with grass or other suitable crop.
- Do not apply within 66 feet of standpipes in tile-outletted terraced fields.
- Apply this product to the entire tile-outletted terraced field under a no-till practice only when a high crop residue management practice is practiced. High crop residue management is described as a crop management practice where little or no crop residue is removed from the field during and after crop harvest.

We expect implementation of the runoff and erosion reduction measures as required, to minimize off-site transport of simazine to habitats of listed species. EPA's analyses indicated that the general label requirement of three runoff mitigation points will reduce estimated environmental concentrations of simazine in runoff by up to an order of magnitude (i.e., up to 90% reduction, in other words reduce pesticide loading to one-tenth of pre-runoff mitigation levels).

In cases where EPA has identified additional runoff measures are needed, additional points (up to three, i.e., up to 99% reduction) will be required. EPA will communicate where additional runoff mitigation points are needed and for what specific simazine uses through their Bulletins Live! Two online platform, which all applicators are required to check before making pesticide applications. In areas requiring up to six runoff mitigation points total, EPA expects estimated environmental concentrations of simazine will decrease by up to two orders of magnitude (i.e., reduce pesticide loading to one-one hundredth of pre runoff mitigation levels).

For all the species in this document, we expect that the runoff and mitigation measures will reduce exposure concentrations to within one order of magnitude of the exposure level where 95% of plant species are not likely to experience measurable adverse effects.

Summary of Conclusions for Insect Species

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of at least 30 of the 32 insect species in this Appendix. For the remaining 2 insects in this appendix, we plan to continue coordination with EPA and the technical registrants to further assess these species.

In our analysis below, some species that had the same or very similar rationales for their conclusions were grouped together, to increase efficiency and avoid repetition. Relevant information and data unique to each individual species was considered when assigning species to groups and incorporated into the rationales as appropriate. Species-specific information (e.g., environmental baseline, cumulative effects, status of the species, exposure, and toxicity) was considered for all species, including those species in the grouped analyses, and are presented in full in Appendices B and E. Species with rationales that did not fit in a group, or warranted a separate rationale because of their life history, conservation status, or other information indicating that effects could be different, have an individual discussion to provide additional explanation. This approach allowed us to streamline our discussion in this Opinion by avoiding repeating our findings when species in the respective groupings would be expected to be affected similarly. The use of these groupings, therefore, does not mean that our evaluation failed to evaluate each individual species. On the contrary, our detailed process for each species-specific analysis remained the same, including for species for which we summarized our findings in tables below.

Species with low exposure informed by low overlap with agriculture and low likelihood of non-agricultural exposure

For the species in Table 1, we expect low exposure as informed by low overlap between the species' range and agricultural lands where simazine is registered for use. Therefore, our concern for adverse effects is low. While we present some specific information about the species in Table 1 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 1. Species with low exposure informed by low overlap with agricultural areas and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Agricultural Action Area Overlap (% Range)	Determination
Comal Springs dryopid beetle	*Heterelmis comalensis*	High	Low	Medium	2.9	No Jeopardy
Comal Springs riffle beetle	*Stygoparnus comalensis*	High	Low	Medium	2.9	No Jeopardy
Hungerford's crawling water beetle	*Brychius hungerfordi*	High	Low	High	2.5	No Jeopardy

The species in Table 1 have high vulnerabilities. Specifically, pesticides are a noted threat to the Hungerford's crawling water beetle. The species in Table 1 are all aquatic insects and have high and medium toxicity because aquatic insects may experience sublethal effects even at low concentrations of simazine. The Hungerford's crawling water beetle depends on presence of *Dichotomosiphon* algae, which may be susceptible to simazine exposure in low flow streams. The Comal Springs insects feed on detritus, which we do not expect to be affected by simazine exposure.

However, the species in Table 1 have low extents of overlap between their ranges and agricultural simazine use sites (2.5 - 2.9%), including associated off-site transport areas. The total overlap metric we use is a conservative estimate of exposure as it does not fully account for redundancy between registered use sites, assumes exposure is occurring in all possible overlapping areas, assumes spray drift will occur in all directions during treatment of fields, and does not consider information on past simazine usage. As such, we expect that exposure of these species to simazine from agricultural uses will occur in even smaller portions of the species' ranges than the overlaps shown in Table 1.

In addition to agricultural exposure, these three insects may be exposed to simazine from non-agricultural (i.e., turf and nursery) uses. However, these non-agricultural use sites do not provide the species' necessary habitat (e.g., streams) for the Hungerford crawling water beetle and Comal

Springs beetles. In addition, given our understanding of simazine usage on use sites such as golf courses and residential lawns (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the ranges of these species to be limited. In addition, if applied, we anticipate off-site transport of simazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses. Therefore, we expect simazine exposure from non-agricultural uses to be low for these species.

In summary, we expect a small number of individuals of the species in Table 1 will experience exposure to simazine over the project duration. Exposure will be limited to small portions of the species' ranges that overlap with agricultural or non-agricultural use sites and areas of off-site transport, and the few exposed individuals may experience adverse effects to growth and/or reproduction. The Hungerford's crawling water beetle will also experience low levels of indirect effects from loss of algae. Therefore, we determine the overall risk of adverse effects to these species is low. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the registration of atrazine, as proposed, is not likely to jeopardize the continued existence of the species in Table 1.

References:

U.S. Fish and Wildlife Service. 2024. Species Biological Report for Southern Edwards Aquifer Springs and Associated Aquatic Ecosystems. Version 1.4. Albuquerque, New Mexico. 117 pp.

U.S. Fish and Wildlife Service. 2021. Hungerford's Crawling Water Beetle (*Brychius hungerfordi*) 5-Year Review: Summary and Evaluation. East Lansing, Michigan. 15 pp.

U.S. Fish and Wildlife Service. 2012. Hungerford's Crawling Water Beetle (*Brychius hungerfordi*) 5-Year Review: Summary and Evaluation. East Lansing, Michigan. 19 pp.

U.S. Fish and Wildlife Service. 2006. Hungerford's Crawling Water Beetle (*Brychius hungerfordi*) Recovery Plan. Fort Snelling, Minnesota. 91 pp.

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Species with low exposure informed by low past usage from the California Department of Pesticide Regulation's Pesticide Use Reporting data

The species in Table 2 are grouped together because they all occur completely within California and they all have low exposure determined by low levels of past simazine usage within their ranges (% range treated), as informed by the California Department of Pesticide Regulation Pesticide Use Reporting (CalPUR) data. While we present some specific information about the species in Table 2 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 2. Insect species with low exposure informed by low past usage from California Department of Pesticide Regulation, Pesticide Use Reporting Data.

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Bay checkerspot butterfly	*Euphydryas editha bayensis*	High	Low	Medium	< 0.1	No Jeopardy
Behren's silverspot butterfly	*Speyeria zerene behrensii*	High	Low	Low	0.0	No Jeopardy
Callippe silverspot butterfly	*Speyeria callippe callippe*	High	Low	Low	0.2	No Jeopardy
Casey's June beetle	*Dinacoma caseyi*	High	Low	Medium	0.0	No Jeopardy
Delta green ground beetle	*Elaphrus viridis*	High	Low	Medium	0.0	No Jeopardy
El Segundo blue butterfly	*Euphilotes battoides allyni*	High	Low	Medium	0.1	No Jeopardy
Hermes copper butterfly	*Lycaena hermes*	High	Low	Medium	0.1	No Jeopardy
Kern primrose sphinx moth	*Euproserpinus euterpe*	High	Low	Low	0.0	No Jeopardy
Lange's metalmark butterfly	*Apodemia mormo langei*	High	Low	Low	1.3	No Jeopardy
Mission blue butterfly	*Icaricia icarioides missionensis*	High	Low	Low	0.0	No Jeopardy
Mount Hermon June beetle	*Polyphylla barbata*	High	Low	Low	0.0	No Jeopardy
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	High	Low	Low	0.0	No Jeopardy
Ohlone tiger beetle	*Cicindela ohlone*	High	Low	Medium	0.0	No Jeopardy
Palos Verdes blue butterfly	*Glaucopsyche lygdamus palosverdesensis*	High	Low	Medium	0.0	No Jeopardy
Quino checkerspot butterfly	*Euphydryas editha quino (=E. e. wrighti)*	High	Low	Medium	0.2	No Jeopardy

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
San Bruno elfin butterfly	*Callophrys mossii bayensis*	High	Low	Low	0.0	No Jeopardy
Smith's blue butterfly	*Euphilotes enoptes smithi*	High	Low	Low	0.0	No Jeopardy
Zayante band-winged grasshopper	*Trimerotropis infantilis*	High	Low	Medium	0.0	No Jeopardy

The species in Table 2 are highly vulnerable. Additionally, pesticides have been specifically noted as a threat to the Lange's metalmark butterfly and Kern primrose sphinx moth. However, the species in Table 2 have low or medium toxicity because available toxicity data suggests that exposure to simazine is not likely to kill insects, but it may cause indirect effects to the insects through adverse effects to plants they use for nectaring or shelter.

Based on individual reviews of available life history information for each of the 10 species in Table 2, 8 of the 17 species may forage on agricultural lands (e.g., Casey's June beetle, Quino checkerspot butterfly). Ten insects in Table 2 (e.g., Smith's blue butterfly, Delta green ground beetle, Ohlone tiger beetle) may forage on developed or open space developed areas, potentially including residential lawns or golf courses where simazine may be used. However, we anticipate only a small number of individuals of each species are likely to be exposed to simazine given that CalPUR data indicate low usage within their ranges (up to 0.9%). While these species have relatively higher percent overlap between agricultural uses and their ranges, CalPUR simazine usage data indicates that very little simazine was used within the sections where these species' ranges occur from 2013-2022. Given that this usage reporting is mandated by the state of California, these data are provided regularly at a relatively high spatial resolution, and CalPUR includes most agricultural and non-agricultural uses of simazine, we have high confidence that only a small percent of the species' ranges is likely to be exposed to simazine. While CalPUR data does not capture all non-agricultural usage, such as residential applications by consumers, we expect limited exposure from these uses of simazine because of our broad understanding of simazine usage and general information on non-agricultural use practices.

In summary, while the species in Table 2 are highly vulnerable and individuals are likely to experience low to medium levels of indirect adverse effects (i.e., loss of plants for feeding or shelter) if exposed, we expect small numbers of these species are likely to experience low levels of simazine exposure and subsequent indirect effects based on the very small areas of the species' ranges that have experienced simazine usage in the past according to CalPUR data. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the insects in Table 2.

Species with low agricultural exposure informed by low past usage of all herbicides from the USDA's Census of Agriculture and low likelihood of non-agricultural exposure

The species in Table 3 were grouped together as we anticipate they will experience low levels of exposure to simazine based on available data from the USDA's Census of Agriculture (CoA). While we present some specific information about the species below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 3. Species with low agricultural exposure informed by low past usage of all herbicides from the USDA's Census of Agriculture (CoA) and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure	Toxicity Ranking	% Range Treated (CoA)	Determination
Franklin's bumble bee	*Bombus franklini*	High	Low	Low	2.9	No Jeopardy
Island marble butterfly	*Euchloe ausonides insulanus*	High	Low	Low	1.0	No Jeopardy
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	High	Low	Low	1.1	No Jeopardy

All the species in Table 3 have high vulnerability rankings, indicating that they may not be able to withstand additional stressors in their environment. For the Franklin's bumble bee, pesticides are a noted threat.

Despite the high vulnerability of these species, we anticipate only a small number of individuals are likely to experience exposure to agricultural uses of simazine because the USDA Census of Agriculture (CoA) indicates very little herbicide usage (potentially including simazine) occurred on the agricultural crops in the past in the counties where these species' ranges occur. Given that this reporting broadly includes all herbicide usage, we consider CoA data to be conservative estimates of simazine usage. In addition, these data are presented at a relatively high spatial resolution. Therefore, we have high confidence that only a small percentage of the species' ranges are likely to be exposed to simazine. In addition, some of these species exist largely on federal lands where we do not expect simazine will be used. For example, Franklin's bumble bee has been found on the Umpqua, Winema, Klamath, Shasta-Trinity, Six Rivers, and Rogue River-Siskiyou National Forests where we do not expect agriculture or turf to occur. As such, we anticipate no more than a small number of individuals are likely to be exposed to simazine through agricultural uses for these species.

While we expect that some of these species may occur near non-agricultural use sites, we anticipate no more than a small number of individuals of each species will be exposed to simazine from non-agricultural uses. Based on individual reviews of available life history information for each of the three species in Table 3, two may be exposed to simazine spray drift through non-agricultural uses. There was one observation of the Franklin's bumble bee nesting in a residential garage before 1998 (USFWS, 2018), although even with hundreds of survey hours and outreach to citizen scientists since that time, there have been no additional sightings of the bee documented in residential areas, and the species is not likely to occur there (OFWO, pers. comm. 2024). The Oregon silverspot butterfly primarily occurs in grasslands, prairies, or meadows and requires a larval host plant, blue violet (*V. adunca*). Though *V. adunca* can occur on lawns and other mowed grassy areas (USFWS, 2001), traditional lawn maintenance practices prevent the violet from occurring on lawns that might be treated with simazine.

For the species in Table 3, typical exposure concentrations are likely to be lower than levels where toxicity studies have observed direct effects (e.g., mortality or sublethal effects) in insects. Therefore, we expect direct effects to these insects from simazine exposure are unlikely to occur. However, we anticipate simazine exposure is likely to impact some of each insect's plant resources, which would cause indirect adverse effects. Plant resource reductions will not significantly impact these insects because we expect simazine exposure will occur on very small portions of the species' ranges and is not likely to cause adverse effects to all plant resources available to these butterflies.

In summary, we expect low levels of adverse indirect effects (i.e., reductions in plant resources) will occur to small numbers of individuals of these insects because available CoA usage data indicate small areas of their ranges have been treated with any herbicide in the past and we expect similar usage in the future. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species in Table 3. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of these species in the wild.

References:

U.S. Fish and Wildlife Service. 2018. Species Status Assessment for the Franklin's bumble bee (Bombus franklini). Version 1. Portland, Oregon. 73 pp.

U.S. Fish and Wildlife Service. 2001. Revised Recovery Plan for the Oregon Silverspot Butterfly. Portland, Oregon. 121 pp

Species with low agricultural exposure achieved through spray drift and runoff conservation measures and low likelihood of non-agricultural exposure

For the species in Table 4, there is a high level of overlap with simazine use sites and a high level of past usage within its range. However, we expect the species will have low exposure after incorporating spray drift and runoff conservation measures on the simazine label. We expect off-site transport to be low, and our concern for adverse effects is low. While we present some specific information about the species below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 4. Insect species with low agricultural exposure achieved through spray drift and runoff conservation measures and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
Saint Francis' satyr butterfly	*Neonympha mitchellii francisci*	High	Low	Low	General label measures	No Jeopardy

The Saint Francis' satyr butterfly has a high vulnerability ranking, indicating that it may not be able to withstand additional stressors in their environment. The Saint Francis' satyr butterfly occurs in open habitats along streams dominated by sedges (*Carex* species) and other graminoids. Their dispersal is limited, and they are only known to occur on the Fort Bragg Army Installation in North Carolina.

On the Installation, their habitats occur in safety zones near containment and training areas where fire is used to maintain early successional plant species. In the future, the Installation may allow some agriculture on their property, but they do not expect agriculture to occur near containment areas. Based on where the species has been found after extensive surveys, we do not expect exposure to herbicides, including simazine, to occur from agricultural uses. In the unlikely event that simazine is used on the Installation, we expect that it would be used far from the butterfly's habitat in containment areas and the conservation measures on the label (e.g., three points for runoff mitigation and a 15-foot buffer to reduce spray drift) are sufficient to mitigate effects from agricultural simazine exposure within the species' range.

Saint Francis' satyr butterflies do not occur in the areas where turf may be managed on the Installation (e.g., residential areas; Fort Bragg Natural Resources Division, pers. comm., 2025; USFWS Southeast Region, pers. comm., 2025), so we do not expect Saint Francis' satyr butterflies to be exposed to simazine through non-agricultural uses.

Because their sedge-dominated wetland habitats are not near simazine use sites, we expect simazine exposure is highly unlikely to occur from the proposed action, especially after considering conservation measures for both spray drift and runoff. Therefore, we anticipate neither direct nor indirect adverse effects to the Saint Francis' satyr butterfly are likely to occur from the proposed action. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce survival and recovery of the Saint Francis' satyr butterfly in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Saint Francis' satyr butterfly.

References:

U.S. Fish and Wildlife Service. 2020. Saint Francis' Satyr (*Neonympha mitchellii francisci*) 5-Year Review: Summary and Evaluation. Raleigh, North Carolina. 34 pp.

Species with Individual Integration and Synthesis Summaries

The species in Table 5 have individual Integration and Synthesis summaries. For these species, we expect Herbicide Strategy conservation measures to reduce pesticide loading into aquatic habitats by 90-99% (i.e., one to two orders of magnitude) compared to unmitigated runoff and reduce spray drift from entering species' terrestrial habitats by >95%. We anticipate that this reduction will minimize off-site transport and reduce the likelihood, magnitude, and frequency of exposure of simazine to a level where no more than low levels of adverse effects are likely to occur to plants through this exposure route. However, reproduction would be affected for individual plants, which could lead to adverse effects to listed insects with obligate relationships to particular plant species. In addition, while the required conservation measures are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to these species. They may occur on simazine use sites, either agricultural or non-agricultural. For each species, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 5. Species with Individual Integration and Synthesis summaries

Common Name	Scientific Name	Conservation Measures	Determination
Carson wandering skipper	*Pseudocopaeodes eunus obscurus*	General label measures	No Jeopardy
Hine's emerald dragonfly	*Somatochlora hineana*	General label measures + 6-pt PULA	No Jeopardy
Karner blue butterfly	*Lycaeides melissa samuelis*	General label measures	No Jeopardy
Rusty patched bumble bee	*Bombus affinis*	General label measures	No Jeopardy
Taylor's (=whulge) checkerspot	*Euphydryas editha taylori*	General label measures	No Jeopardy
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	General label measures	No Jeopardy
Western regal fritillary	*Argynnis idalia occidentalis*	General label measures	No Jeopardy

Integration and Synthesis Summary: Carson wandering skipper

Scientific Name:	Common Name:	Entity ID:
Pseudocopaeodes eunus obscurus	Carson wandering skipper	462

Conclusion: No Jeopardy

Species Range

Based on range map dated: 7/16/2021; Wherever found; *States within the range:* CA, NV

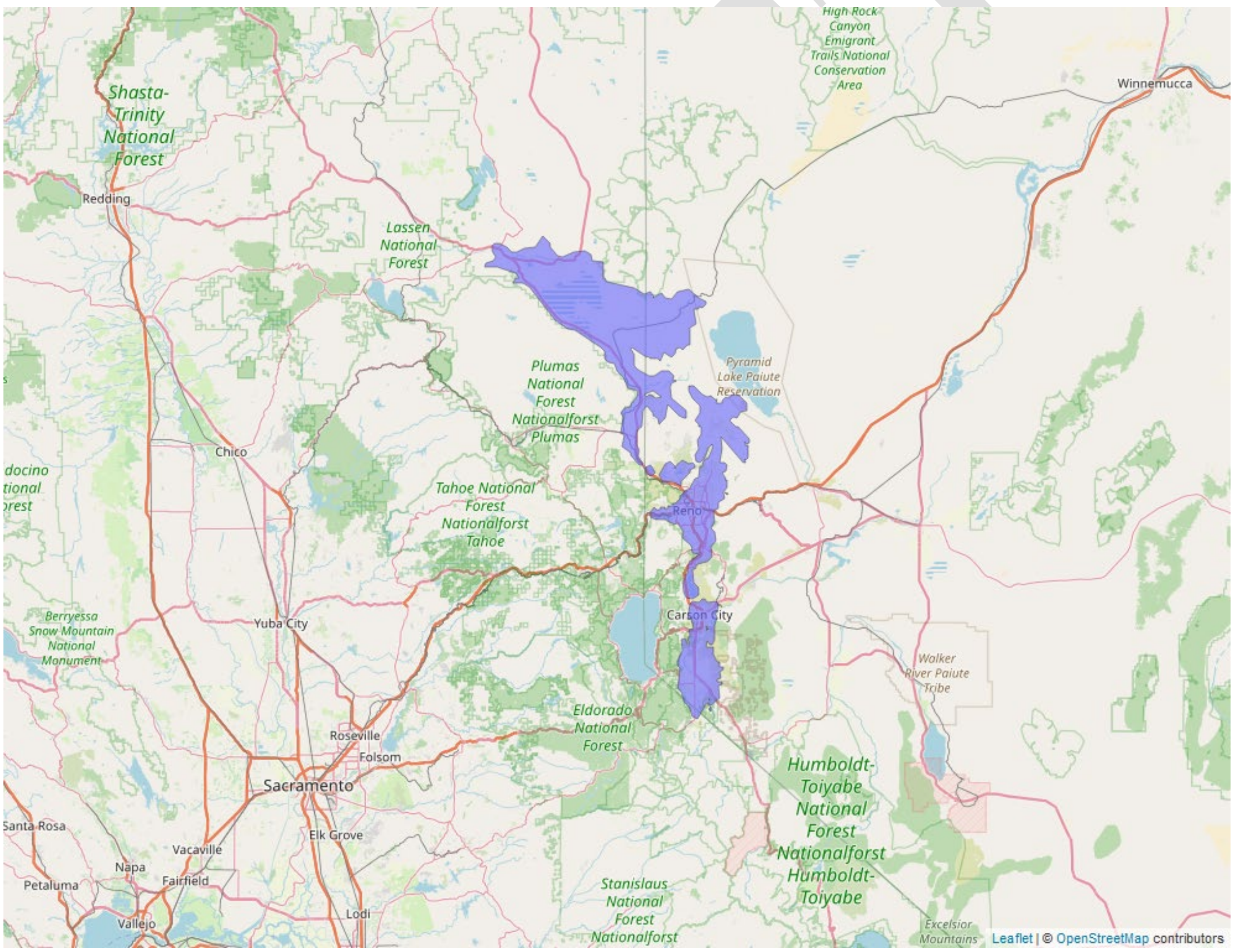

Figure 2. Range map of Carson wandering skipper (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/674.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in status

Most recently completed 5-Year Review: 8/17/2022

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (few)

Species trends: Unknown population trends

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

The Carson wandering skipper is a butterfly found in lowland grassland habitats on alkaline substrates. It requires *Distichlis spicata* as a larval host plant. At the time of listing in 2001, only two Carson wandering skipper populations were known, one in Washoe County, Nevada, and one in Lassen County, California. In 2004, a population was located in Douglas County, Nevada. An additional population discovered in Washoe County in 2005 (Spanish Springs Valley Site #2B) was subsequently determined as likely to be extirpated due to habitat loss and modifications that have occurred in the surrounding area from residential and commercial development. Many additional occupied sites have been found around Honey Lake associated with the Lassen County population. At this time, there are three extant populations (Warm Springs Valley # 1 located on Bureau of Land Management and private lands, Carson River, and Lassen County) and two extirpated populations (Carson City and Spanish Springs Valley).

In 2014, a Conservation Strategy for Honey Lake was completed as a requirement of section 7 consultation for property conveyance of Honey Lake from the U.S. Department of the Army to California State Lands Commission. Though the intent was to provide management objectives, conservation strategies, and monitoring to protect the Carson wandering skipper and its habitat at Honey Lake, we have no information demonstrating implementation of this strategy.

While known Carson wandering skipper populations and distribution have increased since listing, all populations remain at risk. In addition, the loss of the Spanish Springs population further reduces the opportunity for connectivity between remaining populations. While surveys of extant populations continue, we do not have an assessment of trend to understand what the variability in numbers over time means. Current threats to these populations are primarily due to development, non-native plant invasion, livestock grazing, recreational activities (e.g., off-road vehicles use), and small and restricted population vulnerabilities (USFWS 2021, 2022).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.9% of the species' range overlaps with agricultural use sites and up to 29.4% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is approximately 30.3% overlap between the species' range and the agricultural footprint of simazine use sites (Table 6).

Table 6. Agricultural use overlap and annual usage data (% Range Treated) for the Carson wandering skipper.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	0.3	0.3	<0.1	<0.1	<0.1
Corn	<0.1	1.5	1.5	<0.1	1.5	1.5
Grapes	<0.1	0.1	0.1	<0.1	0.1	0.1
Other Crops	0.4	14	14.3	<0.1	<0.1	<0.1
Other Orchards	<0.1	0.9	0.9	<0.1	0.9	0.9
Vegetables and Ground Fruit	0.5	13	13.5	<0.1	0.5	0.5
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**0.9**	**29.4**	**30.3**	**<0.1**	**2.9**	**3**

Usage

Past usage data indicate that up to 3% of the species' range has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

Little is known about the Carson wandering skipper biology. Carson wandering skipper larvae feed solely on succulent, green leaves of saltgrass (*Distichlis spicata*) from March through June to complete its life cycle. After several instar stages, the pupae emerge as adults in May or June. The life span of an adult is 1 to 2 weeks, but they may live longer where abundant nectar sources exist. Carson wandering skippers produce only one brood per year during the June to mid-July flight season (USFWS 2007).

Exposure from Non-Agricultural Uses

. We do not expect the Carson wandering skipper to occur on non-agricultural simazine use sites, and standard use practices for these sites greatly reduce the amount of simazine exposure off-site. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect non-agricultural simazine usage within the range of this species to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For terrestrial insects, we anticipate contact exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., drinking water), we anticipate other routes of exposure will result in much lower levels of exposures to individuals than contact exposure and will not significantly contribute to the overall exposure and resulting effects to individuals.

Based on toxicological data available, terrestrial insects are not sensitive to simazine exposure. We do not anticipate lethal or sublethal effects to the Carson wandering skipper from simazine exposure. EECs for open space developed and developed areas (i.e., non-agricultural use sites) indicate no more than low levels of adverse effects to terrestrial insects from simazine (mortality or sublethal).

Indirect Effects

Plants are sensitive to simazine and exposure will cause death or adverse impacts to their ability to photosynthesize and grow. Because the Carson wandering skipper is solely reliant on saltgrass during its larval stage, which is a crucial time for growth for this butterfly, we expect loss of saltgrass from simazine exposure would impede its ability to feed.

However, *Distichlis spicata* is a common and abundant plant species, thus we expect that not all individuals of this plant will be adversely affected by exposure to simazine.

Effects of the Action Summary

There is a high level of overlap between the species' range and agricultural use sites and associated off-field areas (30.3% total overlap). There is a low level of past usage (3% of the range treated annually), which suggests a medium amount of exposure to simazine. Label conservation measures include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[7] necessary in all areas where simazine is used, which we expect will result in no more than low levels of effects to plant growth from off-site transport of simazine.

Terrestrial insects are not sensitive to simazine exposure, thus we do not anticipate any lethal or sublethal effects to Carson wandering skipper from exposure to simazine. In addition, because of non-agricultural standard use practices, we expect simazine use will not result in indirect adverse effects to the Carson wandering skipper from these uses. However, agricultural uses may result in some indirect effects to the species through reductions in its larval host plant, saltgrass.

The Carson wandering skipper relies solely on saltgrass during the larval stage and produces only one brood per year, thus any impacts to this plant resource would adversely affect this butterfly. Simazine exposure will likely impact the saltgrass's ability to photosynthesize, so it will die or grow poorly. Based on the overlap with off-site agricultural areas, saltgrass in the species' range may be exposed to simazine. However, we expect the skipper is not found near croplands where simazine is used based on its preference for lowland grasslands. Therefore, we expect a small number of individuals are likely to experience adverse effects through loss of saltgrass. Thus, the overall risk of adverse effects to the Carson wandering skipper is low.

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[7] Ecological Mitigation Support Document to Support Endangered Species Strategies

Species Conclusion

The Carson wandering skipper is a butterfly found in three extant populations in Nevada and California. They feed on saltgrass leaves between March and June and survive as adults for 1 to 2 weeks between May and July. The species is highly vulnerable, and its primary threats include development, non-native plant invasions, and effects of small populations.

We do not expect the species to occur on simazine use sites. Based on the overlap analysis, we anticipate exposure will occur from agricultural spray drift in a large portion of the range (29.4%), but Carson wandering skippers are not known to occur near croplands. Because we expect terrestrial insects will not experience direct effects from simazine exposure, our primary concern is indirect effects from loss of its larval host plant, saltgrass. Even though the height of feeding and reproductive activities for this butterfly occurs from March through July, which likely overlaps the use of pre-emergent herbicides like simazine, the skipper's host plant saltgrass is abundant and common, and we do not expect all exposed saltgrass to be unavailable to breeding skippers. We expect a small number of individuals will experience indirect effects through loss of some saltgrass from agricultural simazine exposure, but saltgrass will remain available for successful breeding skippers across the species' range.

After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the Carson wandering skipper. Thus, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of the Carson wandering skipper.

References

U.S. Fish and Wildlife Service. 2022. Carson Wandering Skipper (*Pseudocopaeodes eunus obscurus*) 5-Year Review. Reno, Nevada. 14 pp.

U.S. Fish and Wildlife Service. 2012. Carson Wandering Skipper (*Pseudocopaeodes eunus obscurus*) 5-Year Review: Summary and Evaluation. Reno, Nevada. 44 pp.

U.S. Fish and Wildlife Service. 2007. Recovery Plan for the Carson Wandering Skipper (*Pseudocopaeodes eunus obscurus*). Sacramento, California. 105 pp.

Integration and Synthesis Summary: Hine's emerald dragonfly

Scientific Name:	Common Name:	Entity ID:
Somatochlora hineana	Hine's emerald dragonfly	445

Conclusion: No Jeopardy

Species Range

Based on range map dated: 01-25-2023; Wherever found; *States within the range:* IL, MI, MO, WI

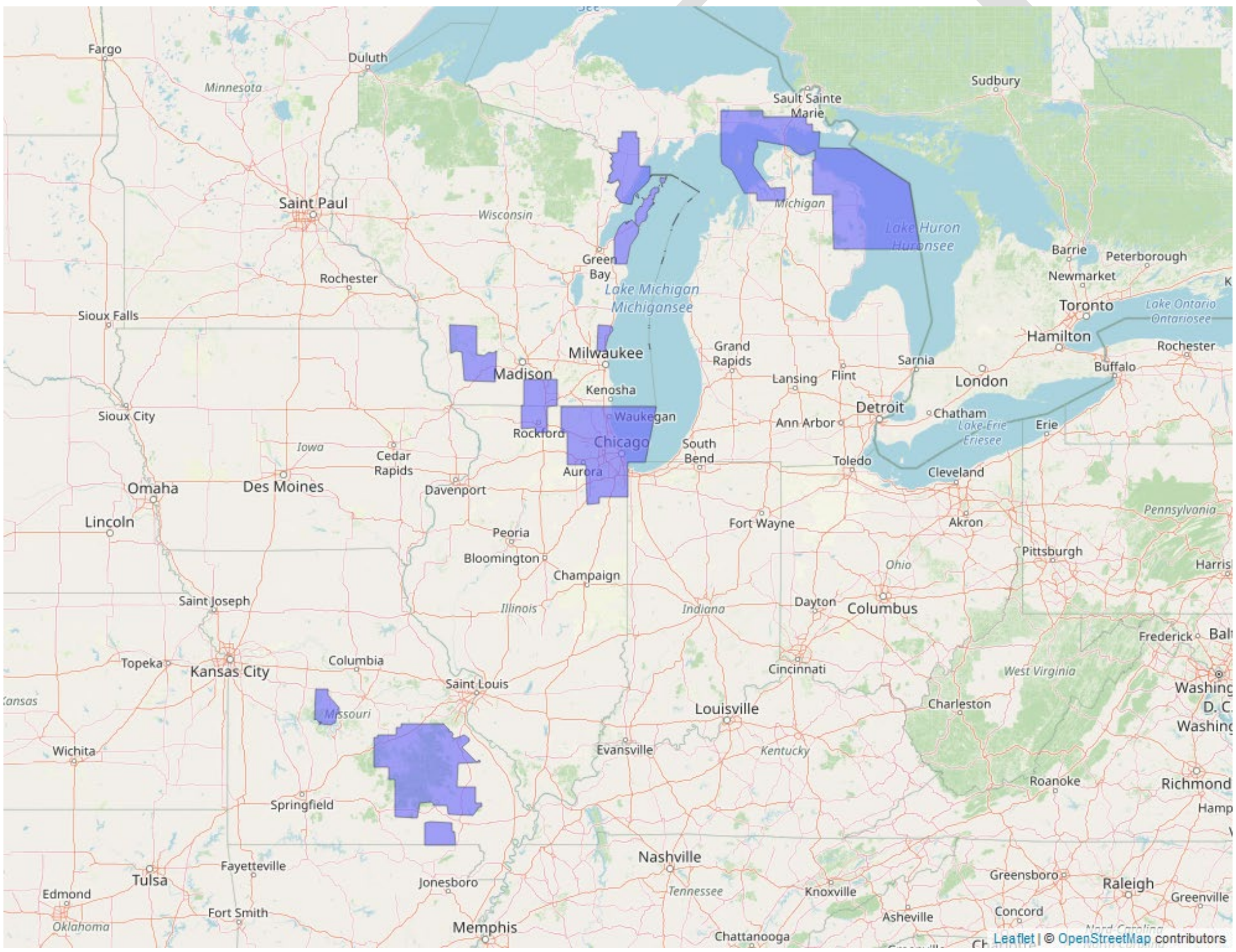

Figure 3. Range map of Hine's emerald dragonfly (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7877.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in status

Most recently completed 5-Year Review: 1/17/2025

Distribution: Species/Populations widespread or wide-ranging

Number of populations: Multiple populations (numerous)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

The Hine's emerald dragonfly is found in marshes, seeps, and sedge meadows. It has a commensal association with a crayfish (*Cambarus diogenes*), meaning dragonfly larvae use crayfish burrows as overwintering refuge when habitats dry up. Since 2019, seven new locations were confirmed, three of which include breeding habitat that differs from typical Hine's emerald dragonfly habitat. Typical habitat was believed to be dolomitic limestone bedrock at or near the surface (within 6 feet); the new populations have soil depths to bedrock that are 60-120 feet. In Illinois, adults are known from Rockton Bog Nature Preserve and both adults and larvae were observed on a private property in Channohon. In Michigan, two new records were recognized as a population. In Wisconsin, a new private property in Rock Couty was confirmed to have adults present in addition to two other private properties in the county. Though there appear to be many populations across the species' range (<50), some are not viable. Most populations are small and disjunct (USFWS 2025).

Of the 16 subpopulations within the northern Wisconsin and Michigan populations, habitat of five are entirely managed and protected by federal or state agencies and others are not completely protected and managed. Hine's emerald dragonfly breeding sites currently known or verified in the future within the Hiawatha National Forest will be protected under the federal Threatened and Endangered Species and Regional Forest Sensitive Species Plan. Most habitat within the three Illinois subpopulations is protected and managed by county and state agencies and state laws. Private land exists within Illinois Subpopulation 1, and it is currently being managed to benefit Hine's emerald dragonfly. The habitat within the Ozaukee County, Wisconsin Population is protected and managed by the Wisconsin Department of Natural Resources and the University of Wisconsin. The entire Hine's emerald dragonfly habitat area that has been identified within the Southwest Wisconsin Population is managed and protected by the Wisconsin Department of Natural Resources. In Missouri, most habitat in two of the five subpopulations are completely protected and managed by either the U.S Forest Service or Missouri Department of Conservation. The Forest Plan for the Mark Twain National Forest identifies several actions supporting management of Hine's emerald dragonfly habitat (e.g., control of non-native and/or undesirable (e.g., woody) plant species, restoration of local hydrology, and methods to minimize unauthorized vehicle and heavy equipment access near fens with known or suspected Hine's emerald dragonfly). There is an ongoing captive rearing project, though success of this project was not discussed in the 2019 5-Year Review.

Fragmentation and destruction of suitable habitat are believed to be the main reasons for this species' endangered status and continue to be the primary threats to its recovery. The known breeding sites in Illinois occur along the Des Plaines River floodplain, which has been fragmented by industrial and urban development. In Wisconsin, land development for agriculture, light industry, and tourism are principal threats. Off-road vehicle use and possibly logging, creation of water impoundments, real estate development, road development and maintenance, pipeline construction, and changes in hydrology are potential threats in Michigan. In addition, the species is vulnerable to loss of habitat caused by off-site hydrology alterations and ground watershed development affecting the groundwater-fed seeps and springs. Many of the threats to habitat vary across the range of the species but also vary in magnitude and ability to be mitigated. Direct loss of habitat is the most severe of all of the threats but occurs infrequently due to laws protecting wetlands and measures taken to preserve habitat. Other threats to hydrology or from fragmentation and contamination can also have a permanent impact on habitat and even entire populations of the species but our ability to manage or prevent these threats is limited. Invasive plant species are the most widespread of the threats; however, the magnitude of this threat and our ability to manage it depends on the invasive species and the degree that it has encroached upon Hine's emerald dragonfly habitat. Management of impacts from invasive plants and animals will be an ongoing effort (USFWS 2013, 2019, 2025).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 18.0% of the species' range overlaps with agricultural use sites and up to 94.9% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[8] between the species' range and the agricultural footprint of simazine use sites (Table 7).

Table 7. Agricultural use overlap and annual usage data (% Range Treated) for the Hine's emerald dragonfly.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	0	0	0	0	0	0
Corn	14.9	29.7	44.6	9.5	21.8	31.3
Grapes	<0.1	0.2	0.2	<0.1	0.2	0.2
Other Crops	2.4	33.3	34.7	0	0	0
Other Orchards	0.2	3.8	4.0	0.2	3.8	4.0
Vegetables and Ground Fruit	0.5	10.1	10.6	0.1	2.2	2.3
Christmas Trees	<0.1	0.8	0.8	<0.1	0.8	0.8
Total	**18.0**	**94.9**	**100[8]**	**9.8**	**28.8**	**38.6**

Usage

Past usage data indicate that up to 38.6% of the species' range has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

The Hine's emerald dragonfly lifecycle encompasses both terrestrial and aquatic environments. Adults are capable of flight and nymphs are aquatic. Larvae emerge as adults between late spring (May in Illinois and late June in Wisconsin) and summer. The known flight season for Hine's emerald dragonfly adults lasts up to late August in Wisconsin and early October in Illinois. Females oviposit by repeatedly dipping their abdomens up to 200 times in shallow water from June to late August in Illinois and early to late July in Wisconsin; usually in seepage marshes, seepage sedge meadows, sedge hummocks, muck along sluggish water, and in small muck-bottomed pools. Hine's emerald dragonfly nymphs live in water for 2 to 4 years then crawl out and shed for a final time, emerging as a flying adult. Females most likely lay more than 500 eggs

[8] Total overlap is capped at 100%.

during their lives. Reproductive adults establish breeding sites and territories, using these areas to mate and oviposit. Fully adult Hine's emerald dragonflies may live up to 6 weeks, and they primarily eat insects while flying (USFWS 2001).

Exposure from Non-Agricultural Uses

We do not expect simazine will be applied to residential or golf course turf in the northern parts of the species' range because turf in this area of the country includes cool season grasses, on which simazine would not be applied (Figure 1). Simazine could be used in Missouri, where both cool and warm season grasses are used for turf. Though Hine's emerald dragonflies may forage on insects in golf course wetlands, we anticipate there is a low likelihood of exposure to the species through these non-agricultural uses because they typically occur in spring-fed wetlands, wet meadows, and marshes, and likely only occur in golf courses for short periods of time. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect non-agricultural simazine usage within the range of this species to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

In addition to label measures, Hine's emerald dragonfly is in a Pesticide Use Limitation Area (PULA) that requires an additional three runoff mitigation points (i.e., six points total) for all uses except mixed greens in Washington, peaches and nectarines in California, and all strawberries. Because the species is not found in Washington or California, the strawberry exception is relevant for the Hine's emerald dragonfly, but the EECs for strawberries are already low. We anticipate these additional runoff points will further reduce simazine residues in runoff by another order of magnitude (i.e., up to 99% reduction in simazine runoff residues in total).

Effects of the Action: Toxicity

Direct Effects

Terrestrial Phase

For terrestrial insects, we anticipate contact exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., drinking water), we anticipate other routes of exposure will result in much lower levels of exposures to individuals than contact exposure and will not significantly contribute to the overall exposure and resulting effects to individuals.

Based on toxicological data available, terrestrial insects are not sensitive to simazine exposure. We do not anticipate lethal or sublethal effects to the terrestrial phase of Hine's emerald dragonfly from agricultural or non-agricultural simazine exposure.

Aquatic Phase

The Hine's emerald dragonfly's aquatic habitat is used for breeding and developing larvae and typically includes temporary vernal pools, sand or gravel washes, and small streams that are often seasonal. In Illinois and Wisconsin, adults occur in shallow, calcareous seepage marshes; or marshy margins of small, sluggish, calcareous streams overlaying dolomite bedrock. The seepage marshes are often dominated by *Typha* spp. and can be broadly defined as fen or fen-like communities. Larvae may remain in aquatic habitats for 2-4 years before emerging as adults between late spring and late summer.

Available toxicity data suggests that aquatic invertebrates are more sensitive to simazine than terrestrial invertebrates. Based on toxicity data for aquatic invertebrates, we expect that exposure to simazine from runoff or spray drift can result in altered growth of individuals exposed to some agricultural uses. However, given that the simazine label requires conservation measures, including a 15-foot buffer and three points of mitigation to reduce spray drift and runoff, respectively, and the Hine's emerald dragonfly is in PULA that requires an additional three runoff points for most uses, we expect all EECs for agricultural uses are low enough to cause no more than low levels of adverse effects (Table 8). Based on these conservation measures, we do not anticipate the aquatic life-stage of the Hine's emerald dragonfly will experience more than low levels of direct adverse effects to reproduction.

Table 8. Maximum estimated environmental concentrations (EECs; µg/L) of simazine associated with the highest overlapping use layers within the Hine's emerald dragonfly range.

HUC2[9]	Habitat	Corn	Developed	Grapes	OSD[10]	Other Crops	Other Orchards	VGF[11]	Christmas Trees
4	Low flow or low volume	4.2	1.1	6.7	3.6	2.9	8.9	16.0	8.9
7	Low flow or low volume	4.6	10.9	6.0	3.8	5.7	9.5	12.5	9.0
10b	Low flow or low volume	6.8	1.0	5.6	2.8	5.6	8.5	6.0	8.8

For non-agricultural uses of simazine such as applications made to residential turf or golf course turf, we do not expect that simazine would be applied for these uses since warm season grasses do not grow within the range of the Hine's emerald dragonfly. EECs for open space developed and developed areas (i.e., non-agricultural use sites) are also well below the threshold for any effects to aquatic invertebrates from simazine (mortality or sublethal).

Indirect Effects

Terrestrial Phase

Hine's emerald dragonfly adults are general predators, feeding on insects they capture while flying (NatureServe 2015). We do not anticipate effects to adult dragonfly prey from exposure to simazine. Terrestrial plants are sensitive to exposure from simazine. Thus, we anticipate some effects to riparian plants and other vegetation within the fen habitat of the Hine's emerald dragonfly. However, we do not anticipate simazine will adversely impact all of the habitat.

Aquatic Phase

In the aquatic phase as larvae, Hine's emerald dragonfly feed on oligochaetes, larval mayflies, caddisflies, mayflies, isopods, and smaller larvae of related dragonflies (USFWS 2001). As larvae grow, their prey items or prey size likely change. We expect that Hine's emerald dragonfly larvae are opportunistic predators that do not rely on specific prey items. Available toxicity data indicate that aquatic invertebrate species, particularly aquatic arthropods, are

[9] HUC = hydrologic unit code. In this case a HUC2, which is the broadest designation in a hierarchical nationwide system to delineate watersheds created by the U.S. Geological Survey. See https://nas.er.usgs.gov/hucs.aspx.

[10] OSD = open space developed. Generally, refers to lawns, turf areas, golf courses and similar land uses.

[11] VGF = vegetables and ground fruit. Generally, refers to vegetables, sweet corn, and fruit grown on the ground.

sensitive to simazine and may experience reduced growth at high EECs. However, based on the required label measures and the additional runoff mitigations required specifically for the Hine's emerald dragonfly (i.e., 6-point PULA), we anticipate simazine EECs within the dragonfly's aquatic habitats will be low enough to cause no more than low levels of adverse effects to aquatic individuals.

Aquatic plants are sensitive to exposure from simazine. Thus, we anticipate some effects to riparian plants and other aquatic vegetation within the species' fen habitat . However, we do not anticipate simazine will adversely impact all plant-based resources. We expect plant-based resources will replenish over time in any dynamic aquatic system (flowing or non-flowing) based on several mesocosm and microcosm studies discussed in the main body of the Opinion. As such, we anticipate a temporary loss of certain aquatic invertebrate prey and aquatic vegetation will result in no more than low levels of adverse indirect effects to the Hine's emerald dragonfly.

Effects of the Action Summary

There is a high level of overlap between the species' range and agricultural use sites and associated off-field areas (up to 100% total overlap) and a high level of past usage (up to 38.6% range treated annually), which suggests a high amount of exposure to simazine. However, we expect label conservation measures, including a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[12] necessary in all areas where simazine is used will result in no more than low levels of adverse effects to reproduction for Hine's emerald dragonfly from some off-site transport of simazine. In addition, the species is in a six-point PULA, meaning it requires an additional three runoff points for most agricultural simazine uses (except strawberries, which already have low EECs).

The Hine's emerald dragonfly has terrestrial and aquatic phases. It is an adult in the terrestrial phase, and we do not anticipate direct effects to terrestrial Hine's emerald dragonflies. We anticipate the low impacts to plant-based habitat from agricultural simazine use will not impede the dragonfly's ability to breed or shelter because simazine exposure will not adversely affect all plants in its habitat. Even though the species remains as a developing larva in the aquatic phase for 2-4 years and high simazine EECs would cause sublethal effects to aquatic individuals, we anticipate no more than low levels of direct effects to the larvae from simazine exposure because the required conservation measures on all product labels and an additional species-specific six-point PULA required for the Hine's emerald dragonfly will result in substantial reductions in simazine residues from spray drift and runoff. Therefore, we anticipate no more than low levels of adverse effects to growth for the aquatic phase of the dragon fly and the invertebrate prey the larval dragonfly requires. We anticipate temporary low effects to aquatic plant-based habitat from simazine exposure.

[12] Ecological Mitigation Support Document to Support Endangered Species Strategies

While a large number of individuals will be exposed to simazine based on the high level of overlap between the species range and the action area, we anticipate exposed individuals will not experience more than low levels of adverse effects to given the required label and additional species-specific conservation measures. As such, the overall risk of adverse effects to the species is low.

Species Conclusion

The Hine’s emerald dragonfly is found in wetlands in Wisconsin, Michigan, Illinois, and Missouri. It relies on crayfish burrows for winter refuge. As adults, it is a terrestrial flier that eats insects and as a nymph, it is aquatic and eats aquatic invertebrates. Many occupied areas across the range are protected by state, federal, or local landowners. Threats to the species include habitat loss from development and agriculture, decreases in water quality, and invasive plant species.

We do not expect the species to occur on agricultural simazine use sites, but based on the overlap analysis, we anticipate exposure will occur from drift from agricultural use sites in a large portion of the range (94.9%). Hine’s emerald dragonflies may occur on non-agricultural use sites, particularly golf courses, but they typically occur in spring-fed wetlands, wet meadows, and marshes, and likely only occur in golf courses for short periods of time. Based on available toxicity information, we expect terrestrial insects will not experience direct effects from simazine exposure. While we expect direct sublethal effects to aquatic phase individuals from exposure at high simazine EECs, label conservation measures and the additional three runoff points from the Hine’s emerald dragonfly PULA result in simazine EECs low enough to cause no more than low levels of adverse effects to growth. Similarly, we do not expect losses of aquatic prey at these concentrations. We expect temporary losses of plant-based habitat resources that will result in no more than low levels of adverse indirect effects to the Hine’s emerald dragonfly.

After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the Hine’s emerald dragonfly. Thus, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of the Hine’s emerald dragonfly.

References

U.S. Fish and Wildlife Service. 2025. Hine’s Emerald Dragonfly (*Somatochlora hineana*) Status Review: Summary and Evaluation. Moline, Illinois. 18 pp. + appendix.

U.S. Fish and Wildlife Service. 2019. Hine's Emerald Dragonfly (*Somatochlora hineana*) 5-Year Review. Barrington, Illinois. 10 pp.

U.S. Fish and Wildlife Service. 2013. Hine's Emerald Dragonfly, *Somatochlora hineana* (Odonata: Corduliidae) 5-Year Review: Summary and Evaluation. Barrington, Illinois. 52 pp.

U.S. Fish and Wildlife Service. 2001. Hine's Emerald Dragonfly (*Somatochlora hineana* Williamson) Recovery Plan. Fort Snelling, Minnesota. 133 pp.

Integration and Synthesis Summary: Karner blue butterfly

Scientific Name:	Common Name:	Entity ID:
Lycaeides melissa samuelis	Karner blue butterfly	420

Conclusion: No Jeopardy

Species Range

Based on range map dated: 1/15/2025; Wherever found; *States within the range:* MI, MN, NH, NY, OH, WI

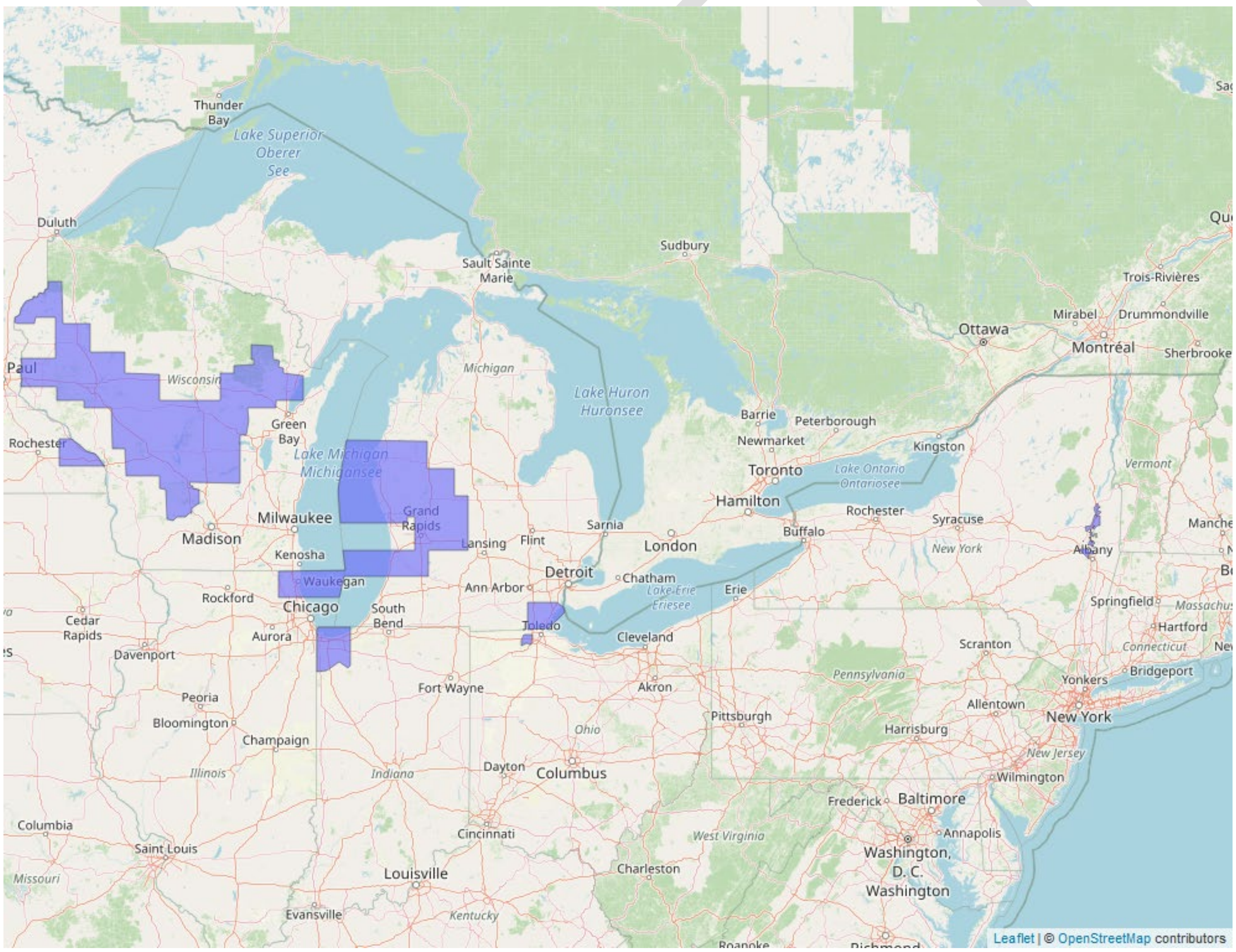

Figure 4. Range map of Karner blue butterfly (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6656.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in status

Most recently completed 5-Year Review: 12/17/2019

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Karner blue butterfly is dependent on wild lupine (*Lupinus perennis*) as a larval host plant and as a nectar source. These plants historically occurred in savanna and barrens habitats typified by dry sandy soils, and now occur in remnants of these habitats, as well as locations such as roadsides, military bases, and some forest lands. The species formerly occurred in a band extending across 12 states from Minnesota to Maine and in the province of Ontario, Canada; they show two distinct population clusters. The eastern population historically consisted of occurrences in Illinois, Indiana, Michigan, Ohio, New York, and New Hampshire and Ontario, Canada and the western population consisted of occurrences in Minnesota and Wisconsin. Karner blue butterflies are likely extirpated from Illinois, Minnesota, Indiana, and Ontario. In New Hampshire, New York, and Ohio, Karner blue butterfly populations are declining and/or are found in very low numbers. Wisconsin supports the largest and most widespread Karner blue butterfly populations range wide. As of the 2019 5-Year Review, Wisconsin populations were reported to be rebounding from a population decrease in 2012 due to widespread drought. Survey trends were compared on Wisconsin sites over 17 years for the Karner blue butterfly. Although declines were found for the species, higher trends in abundance were found at “reserve” properties (those “where recovery will be expected to occur”) than rights-of-way and forestry land, which could be the result of a higher level of habitat management in reserve areas.

Decline and loss of populations and habitat in Minnesota, Indiana, and New York are not compensated for by the numerous populations in Wisconsin. Threats persist for the species in all states including loss of habitat due to natural succession, lack of management, invasive species and commercial, industrial and residential development. The Recovery Plan (2003) recommends avoidance of insecticide use in association with the Karner blue butterfly, particularly during flight season (mid-May through mid-June and in July). In addition, certain biopesticides can be toxic to larvae. The population at Indiana Dunes National Park declined in conjunction with documented warming conditions, despite habitat management, restoration, and population augmentation efforts. Due in part to this discovery, the Karner blue butterfly recovery team recently designated a climate change sub-team tasked with exploring the species' sensitivity to climate change and its adaptive capacity. As discussed in their draft report, the Karner blue butterfly likely has low adaptive capacity to tolerate changes associated with climate change, due to the limited capacity to adapt via dispersal, behavior (e.g., single larval host plant), or evolving in place. Further, the species' and its host plant's vulnerability to the direct and indirect effects of climate change is high (USFWS 2003, 2012, 2019).

Michigan has a state-wide Habitat Conservation Plan in place for this species (Wisconsin's Habitat Conservation Plan appears to have expired).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 32.7% of the species' range overlaps with agricultural use sites and 67.3% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[13] between the species' range and the agricultural footprint of simazine use sites (Table 9).

Table 9. Agricultural use overlap and annual usage data (% Range Treated) for the Karner blue butterfly.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	25.2	51.3	76.5	5.5	10.6	16.1

[13] Total overlap is capped at 100%.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Grapes	<0.1	1.7	1.7	<0.1	1.7	1.7
Other Crops	3.6	55.6	59.2	<0.1	<0.1	<0.1
Other Orchards	0.6	14.2	14.8	0.2	5.8	6
Vegetables and Ground Fruit	3.2	31.2	34.4	0.2	2.4	2.6
Christmas Trees	0.2	8	8.1	0.1	7.1	7.3
Total	**32.7**	**67.3**	**100**[13]	**6**	**25.9**	**32**

Usage

Past usage data indicate that up to 32% of the species' range has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

The Karner blue butterfly is not known to occur on agricultural use sites. As such, while there is overlap between the species' range and agricultural use sites, we do not anticipate individuals are likely to be exposed directly on agricultural use sites. Thus, we only consider exposure that occurs off-site as relevant to the species.

The endangered Karner blue butterfly depends on wild lupine (*Lupinus perennis*) as a larval host plant and as a nectar source. These plants historically occurred in savanna and barrens habitats typified by dry sandy soils and now occur in remnants of these habitats. Across most of the species' range (e.g., Wisconsin), wild lupine is common.

The Karner blue butterfly usually has two hatches each year. In April, the first group of caterpillars hatch from eggs that were laid the previous year (overwintered eggs). These individuals mature and lay eggs in June on or near wild lupine plants, which become the second generation of adult butterflies appearing in July. July-born adults mate and lay eggs that will not hatch until the following spring. The height of breeding activity (i.e., when larvae may be present) from mid-April through July is expected to coincide with the active pesticide application period (i.e., spring through summer) in nearby agricultural areas. Thus, pesticide exposure from spray drift is likely throughout some of the most critical time periods in the Karner blue butterfly's life cycle.

Exposure from Non-Agricultural Uses

We do not anticipate the Karner blue butterfly will occur in developed, open space developed, or nurseries areas that contain non-agricultural use sites of simazine. The species' host plant, the wild lupine, typically occurs in open habitat with high levels of sun exposure, indicating that there is a low likelihood of their occurrence in these non-agricultural use sites. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of this species to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For terrestrial insects, we anticipate contact exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., drinking water), we anticipate other routes of exposure will result in much lower levels of exposures to individuals than contact exposure and will not significantly contribute to the overall exposure and resulting effects to individuals.

Based on toxicological data available, terrestrial insects are not sensitive to simazine exposure. We do not anticipate lethal or sublethal effects to the Karner blue butterfly from simazine exposure.

Indirect Effects

Terrestrial plants like wild lupine are sensitive to exposure from simazine. Because feeding and reproductive activities for this butterfly are heavily reliant on wild lupine and simazine exposure will adversely impact this plant-based resource for the Karner blue butterfly, agricultural simazine use may impede the butterfly's ability to reproduce. Of particular concern is the first breeding cycle of the year, which we expect to occur in April and may coincide with pre-emergent herbicide use.

Effects of the Action Summary

There is a high level of overlap between the species' range and off-field agricultural areas exposed to spray drift (67.3% off-site overlap) and a high level of past usage (25.9% of the off-site portion of the range treated annually), indicating a high amount of exposure to simazine. Label conservation measures include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[14] necessary in all areas where simazine is used, which we expect will result in no more than low levels of effects to plant growth from off-site transport of simazine.

Terrestrial insects are not sensitive to simazine exposure, thus we do not anticipate any lethal or sublethal effects to Karner blue butterfly from exposure to simazine. In addition, because of non-agricultural standard use practices, we expect simazine use will not result in indirect adverse effects to the Karner blue butterfly from these uses. However, agricultural uses may result in some indirect effects to the species through reductions in its larval host plant, wild lupine, if it occurs near agricultural areas.

The Karner blue butterfly relies solely on wild lupine during the larval stage and impacts to this plant resource would adversely affect the butterfly. Simazine exposure will likely impact the lupine's ability to photosynthesize, so it will die or grow poorly. Based on the overlap with off-site agricultural areas, lupine in the species' range may be exposed to simazine. Even though agricultural areas overlap with the Karner blue butterfly, the species is not found near croplands where simazine is used, we expect conservation measures will greatly limit the amount of simazine that drifts or runs off of use areas, and the butterfly breeds twice in a season. Because simazine is a pre-emergent herbicide, we expect lupine may be lost during the first cycle. Even though a large portion of the range may be exposed to simazine, we expect a small number of individuals are likely to experience adverse effects through loss of lupine from simazine exposure. Thus, the overall risk of adverse effects to the Karner blue butterfly is medium.

Species Conclusion

The Karner blue butterfly is found in disjunct populations in Michigan, Minnesota, New Hampshire, New York, Ohio, and Wisconsin. It is dependent on wild lupine (*Lupinus perennis*), which grows in savanna and barren habitats where it receives plenty of sunlight. Karner blue butterfly is threatened by habitat loss from natural plant succession, invasive species, and development.

We do not expect the species to occur on simazine use sites. Even though we anticipate exposure will occur from agricultural spray drift in a large portion of the range (67.3%), we expect

[14] Ecological Mitigation Support Document to Support Endangered Species Strategies

terrestrial insects will not experience direct effects from simazine exposure, and our primary concern is indirect effects from loss of its larval host plant, wild lupine. Even though the height of feeding and reproductive activities for this butterfly occurs from April through July, which likely overlaps the use of pre-emergent herbicides like simazine, the butterfly's host plant wild lupine is abundant and common in the species' habitat, and we do not expect all exposed lupines to be unavailable to breeding butterflies. We expect a small number of individuals will experience indirect effects through loss of lupines from agricultural simazine exposure, primarily during the first reproduction cycle in April, and lupine will remain available for successful breeding butterflies across the species' range.

After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the Karner blue butterfly. Thus, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of the Karner blue butterfly.

References

U.S. Fish and Wildlife Service. 2019. Karner Blue Butterfly (*Lycaeides melissa samuelis*) 5-Year Review: Summary and Evaluation. Bloomington, Minnesota. 27 pp.

U.S. Fish and Wildlife Service. 2012. Karner Blue Butterfly (*Lycaeides melissa samuelis*) 5-Year Review: Summary and Evaluation. New Franken, Wisconsin. 129 pp.

U.S. Fish and Wildlife Service. 2003. Karner Blue Butterfly Recovery Plan (*Lycaeides melissa samuelis*). Fort Snelling, Minnesota. 293 pp.

Integration and Synthesis Summary: Rusty patched bumble bee

Scientific Name:	Common Name:	Entity ID:
Bombus affinis	Rusty patched bumble bee	10383

Conclusion: No Jeopardy

Species Range

Based on range map dated: 6/9/2025; Wherever found; *States within the range:* IA, IL, IN, MA, MD, ME, MN, OH, VA, WI, WV

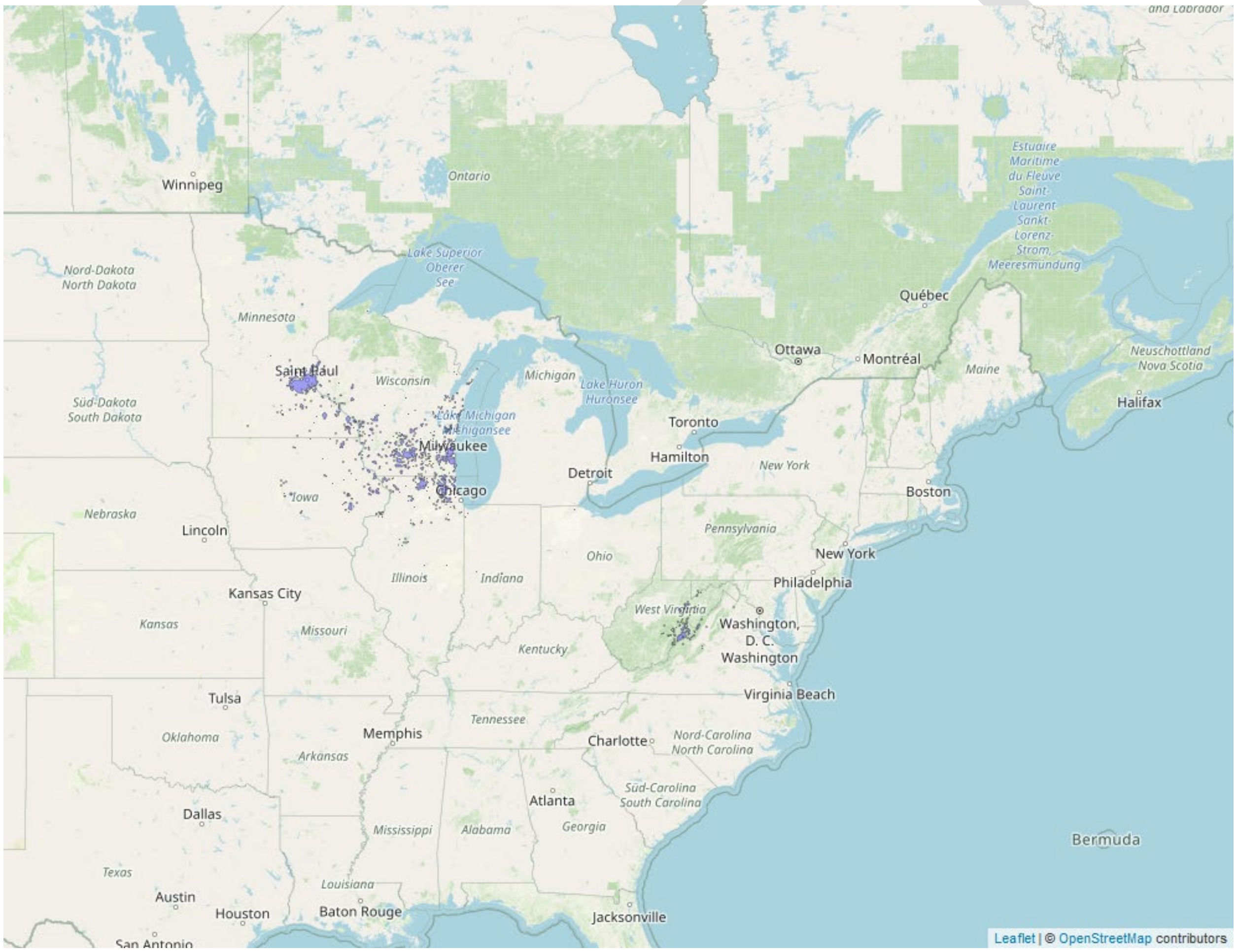

Figure 5. Range map of rusty patched bumble bee (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/9383.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in status

Most recently completed 5-Year Review: 8/18/2022

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The rusty patched bumble bee has been observed and collected in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes, and residential parks and gardens. It is a colonial species with an annual cycle that starts in early spring when colonies are initiated by solitary queens emerging from overwintering sites, progresses with the production of workers throughout the summer, and ends with the production of males and new queens in late summer and early fall. Survival and successful recruitment require floral food resources from early spring through fall, undisturbed nest sites in proximity to foraging resources (e.g., within 1 km), and overwintering sites for the next year's queens. The maximum dispersal distance of the rusty patched bumble bee is likely 1-10 km. Bumble bees are generalist foragers and gather pollen and nectar from a wide variety of flowering plants. The rusty patched bumble bee is a short-tongued species, so they are not able to easily access the nectar in flowers with deep corollas (all the petals of a flower). The species is one of the first to emerge early in the spring and the last to hibernate, so to meet its nutritional needs, the rusty patched bumble bee requires a constant and diverse supply of flowers that bloom throughout their long lifecycle, from April through September. Populations consist of tens to hundreds of colonies, and the health (long-term productivity) of populations is affected by the quantity and quality of nectar and pollen resources available and the proximity of these resources to nesting habitat. Since the late 1990s, rusty patched bumble bee distribution and abundance has declined. Five percent of the historical locations were occupied by the rusty patched bumble bee between 1996-2016, and the relative abundance of the rusty patched bumble bee declined from 8% historically to 1%. The number of occupied states declined by 68%, the number of occupied counties declined by 89%, and the number of occupied ecoregions declined by 60%. As of 2016, the species existed in 6 ecoregions across 41 counties in 13 states and one province (Illinois, Indiana, Massachusetts, Maryland, Maine, Minnesota, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, Wisconsin, and Ontario). The species' range is currently 8% of its historical range, a reduction that has likely led to loss of spatial heterogeneity and adaptive diversity. Similarly, the loss of occurrences has increased the risk of ecoregion-wide extirpations due to catastrophic events (e.g., severe drought and prolonged, high temperatures) (USFWS 2016).

Prior to its listing in 2017 (82 FR 10285), the species experienced a widespread and precipitous decline in spatial extent and in the number of extant populations. The cause of the decline is unknown, but evidence suggests a synergistic interaction between an introduced pathogen and exposure to pesticides. A variety of pesticides are widely used in agricultural, urban, and even natural environments. Native bees are simultaneously exposed to multiple pesticides, including insecticides, fungicides, and herbicides. The pesticides with greatest effects on bumble bees are insecticides and herbicides: insecticides are specifically designed to kill insects, including bumble bees, and herbicides reduce available floral resources, thus indirectly affecting bumble bees. Herbicides can also have direct effects on bees (USFWS 2016). Since 2017, the number of observations of rusty patched bumble bee has increased in the Upper Midwest and Appalachia, and the total number of individual bees observed across its range increased from 450 to 1,301 by 2021. Although the increased number of detections of individual bees in new locations is encouraging, this does not provide a complete assessment of overall population health. Survey effort has generally increased across the range, and these positive trends may be an artifact of increased survey effort (USFWS 2022). Many of the existing populations continue to face effects of past and ongoing stressors, including pathogens, pesticides, habitat loss and degradation, climate change, and small population dynamics (USFWS 2016). Estimated spring food resource availability declined over the past 22 years, specifically the availability of spring-flowering forest understory plants. This is particularly important for the rusty patched bumble bee because poor resource availability early in the spring can compound the effects of other stressors. These threats continue to adversely affect the species and may have increased in severity and imminence. It is likely that several risk factors are acting synergistically on the species, and the combination of multiple stressors is likely more harmful than a single stressor acting alone. As fewer and fewer populations persist, the ability to withstand normal environmental stochasticity is diminished, and thus the decline to extinction is accelerated. Only 2% of the extant sites are on federally protected lands and 18% are within a broader group of protected lands, including state, tribal, and multijurisdictional properties (USFWS 2022).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 20% of the species' range overlaps with agricultural use sites and 80% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[15] between the species' range and the agricultural footprint of simazine use sites (Table 10).

Table 10. Agricultural use overlap and annual usage data (% Range Treated) for the rusty patched bumble bee.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	17.6	49.2	66.8	12.6	35.5	48.1
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	1.8	39.6	41.3	<0.1	<0.1	<0.1
Other Orchards	0.1	3.5	3.7	0.1	3.5	3.7
Vegetables and Ground Fruit	0.5	14.5	15	0.4	9.8	10.2
Christmas Trees	<0.1	1.6	1.6	<0.1	1.6	1.6
Total	**20**	**80**	**100[15]**	**13.1**	**50.5**	**63.6**

Usage

Past usage data indicate that up to 63.6% of the species' range has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

The rusty patched bumble bee has been observed and collected in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes, and residential parks and gardens (USFWS 2016).

[15] Total overlap is capped at 100%.

The rusty patched bumble bee is typically most active from spring to late summer/early fall. We expect simazine applications are likely to coincide with the species' most active periods, indicating that exposure is likely to occur throughout the bee's life cycle.

Exposure from Non-Agricultural Uses

The rusty patched bumble bee has been observed and collected in a variety of habitats, including residential parks and gardens (USFWS 2016). As such, we expect the species is likely to occur in developed, open space developed, and nursery areas, indicating that some exposure to non-agricultural uses of simazine may occur. Standard use practices for these sites greatly reduce the amount of simazine exposure off-site. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of this species to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For terrestrial insects, we anticipate contact exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., drinking water), we anticipate other routes of exposure will result in much lower levels of exposures to individuals than contact exposure and will not significantly contribute to the overall exposure and resulting effects to individuals.

Based on toxicological data available, terrestrial insects are not sensitive to simazine exposure. We do not anticipate lethal or sublethal effects to the rusty patched bumble bee from simazine exposure.

Indirect Effects

The rusty patched bumble bee survival and successful recruitment require floral food resources from early spring through fall, undisturbed nest sites in proximity to foraging resources, and overwintering sites for the next year's queens. Plants are sensitive to simazine and exposure will cause adverse impacts to their ability to photosynthesize and grow or potentially death. Rusty patched bumble bees do not travel far to acquire floral resources and have been observed feeding in agricultural landscapes. Thus, impacts to their floral resources near (within 1-10 km) a colony would adversely indirectly impact this bee.

Simazine exposure will adversely impact plant resources for the rusty patched bumble bee and potentially impede its ability to reproduce.

Effects of the Action Summary

There is a high level of overlap between the species' range and agricultural use sites and associated off-field areas (up to 100% total overlap) and a high level of past usage (63.6% of the range treated annually), indicating a high amount of exposure to simazine. Label conservation measures include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[16] necessary in all areas where simazine is used, which we expect will result in no more than low levels of effects to plant growth from off-site transport of simazine.

Terrestrial insects are not sensitive to simazine exposure, thus we do not anticipate any lethal or sublethal effects to rusty patched bumble bees from exposure to simazine. In addition, because of non-agricultural standard use practices, we expect simazine use will not result in indirect adverse effects to the rusty patched bumble bee off-site from these uses. However, agricultural uses and on-site non-agricultural uses may result in indirect effects to the species' plant resources. The rusty patched bumble bee requires a large amount of floral resources for nectar and pollen for their colonies to survive, so any impacts to plant resources would adversely affect this bumble bee. Because they are generalists, conservation measures are expected to reduce the amount of simazine that affects plants from off-site transport, bees use a variety of habitats including many areas where we expect simazine will not be used (e.g., prairies, woodlands, marshes), and we do not expect all exposed plants to die, we expect a large number of individuals will experience low levels of indirect effects through loss of plant resources from simazine exposure. Thus, the overall risk of adverse effects to the rusty patched bumble bee is medium.

Species Conclusion

The rusty patched bumble bee has been observed and collected in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes, and residential parks and gardens. The species is found across 8% of its historical range. It is a colonial species that requires large amounts of floral resources within 10 km of its colony. Evidence suggests the cause of the species decline at the time of listing as endangered in 2017 was due to an introduced pathogen and exposure to insecticides and fungicides. Many of the existing populations continue to face

[16] Ecological Mitigation Support Document to Support Endangered Species Strategies

the effects of past and ongoing stressors, including pathogens and pesticides, as well as habitat loss and degradation, climate change, and small population dynamics.

Even though we anticipate agricultural simazine use sites overlap with a large portion (up to 100%) of the rusty patched bumble bee's range and 63.6% of the range has been treated in the past, we expect terrestrial insects will not experience direct effects from simazine exposure, and our primary concern is indirect effects from loss of floral resources from off-site transport from agricultural uses or from simazine use on non-agricultural sites. Because they are generalists, conservation measures are expected to reduce the amount of simazine that affects plants from off-site transport, rusty patched bumble bees use a variety of habitats including many areas where we expect simazine will not be used (e.g., prairies, woodlands, marshes), and we do not expect all exposed plants to die, we expect a large number of individuals will experience low levels of indirect effects through loss of plant resources from simazine exposure.

After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the rusty patched bumble bee in the wild.

References

U.S. Fish and Wildlife Service. 2022. Rusty Patched Bumblebee (*Bombus affinis*): Status Review Summary and Evaluation. Bloomington, Minnesota. 21 pp.

U.S. Fish and Wildlife Service. 2021. Recovery Plan for the Rusty Patched Bumblebee (*Bombus affinis*). Bloomington, Minnesota.

U.S. Fish and Wildlife Service. 2016. Species Status Assessment for the Rusty Patched Bumble Bee (*Bombus affinis*). Final report v. 1.0. 100 pp.

Integration and Synthesis Summary: Taylor's (=whulge) checkerspot

Scientific Name:	Common Name:	Entity ID:
Euphydryas editha taylori	Taylor's (=whulge) checkerspot	7495

Conclusion: No Jeopardy

Species Range

Based on range map dated: 3/7/2024; Wherever found; *States within the range:* OR, WA

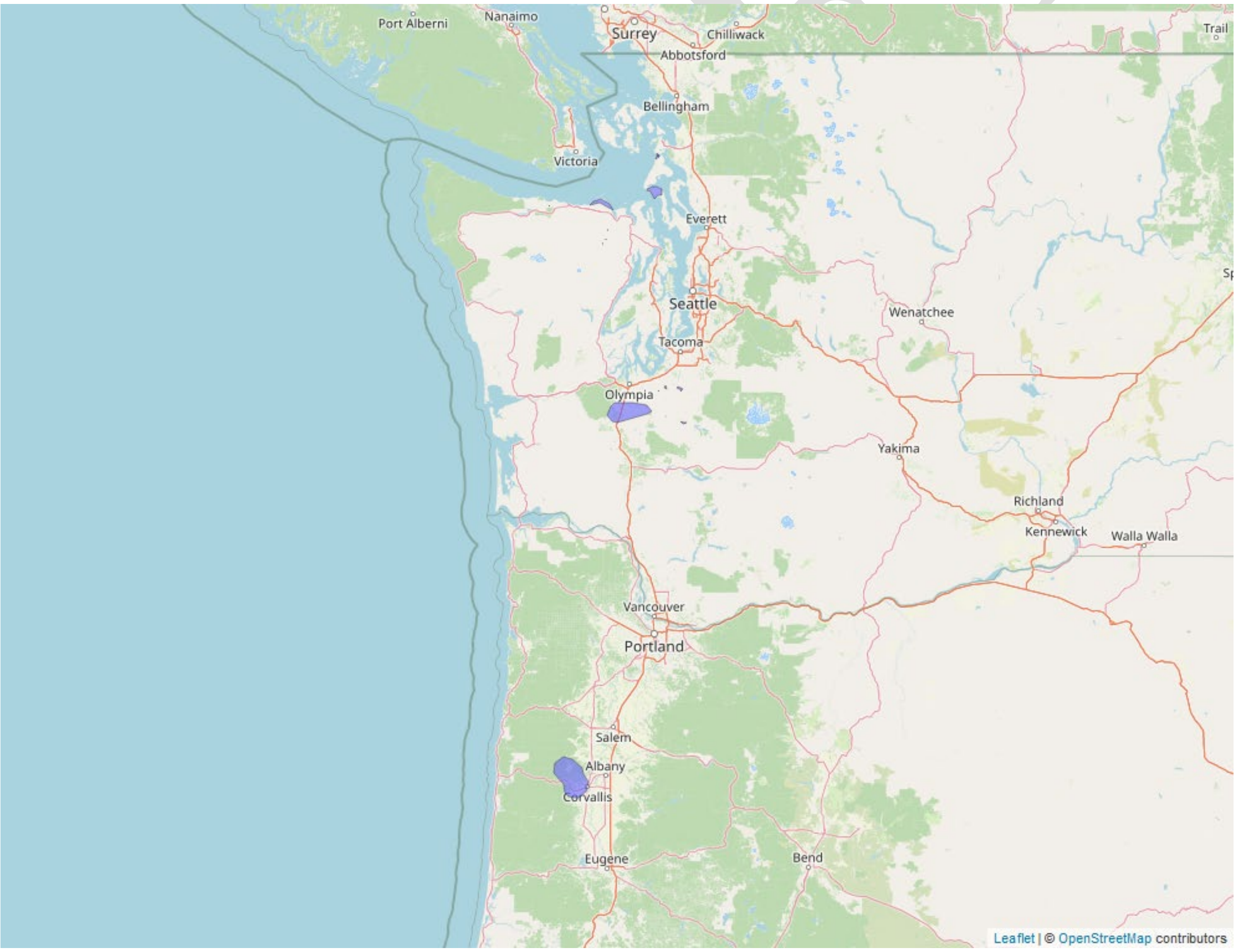

Figure 6. Range map of Taylor's (=whulge) checkerspot (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5907.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in status

Most recently completed 5-Year Review: 8/28/2024

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Taylor's checkerspot butterfly was listed as endangered in 2013 (78 FR 61451). The distribution of the Taylor's checkerspot butterfly has been reduced from more than 80 populations to the 14 occupied locations with small populations that are known range-wide today. Some of the populations that have been extirpated disappeared in the decade prior to listing, and some declined from robust population sizes of 1,000s of individual butterflies to zero within a 3-year interval and have not returned. In the south Puget prairies, only one native local population remains, while others are the result of reintroduction efforts. Most remaining populations of Taylor's checkerspot butterflies are small; 5 of the 14 known populations are estimated to have fewer than 100 individuals. In addition, nearly all the sites are isolated or substantially degraded and most harbor few of the larval food and nectar plants needed to support viable Taylor's checkerspot butterfly populations. Taylor's checkerspot butterflies occupy a matrix of forested, agricultural, urbanized, and coastal habitats such as, but not limited to, prairies, meadows, coastal bluffs, coastal beach deposits, montane meadows, old forest clearings, and rocky balds in forested areas. These habitats are unevenly distributed throughout the species' historical range with extensive suitable or restorable but unoccupied habitat in the south Puget Sound and with smaller areas of occupied, suitable habitat in the Willamette Valley, North Olympic peninsula, and British Columbia (USFWS 2013, 2024).

In the original listing documents for the Taylor's checkerspot, spraying of *Bacillus thuringiensis* var. kurstaki (BtK) on over 100,000 acres to control a spongy moth (Lymantria dispar, formerly referred to by the common name "gypsy moth") was listed as a possible contributor to the extirpation of some populations in Pierce County, Washington around 1992, though there were contemporaneous large changes in habitat and application areas did not include all the populations that were extirpated (USFWS 2013). As of 2023, the BtK threat is addressed through coordination with the Service when a spongy moth infestation is detected near occupied Taylor's checkerspot habitat. In addition, known extant populations and planned translocations are on sites managed for natural resource conservation, including federal lands, where pesticide usage is likely to be constrained to restoration or management that will benefit the Taylor's checkerspot and include conservation measures, where appropriate. Based on currently known locations, Taylor's checkerspot are unlikely to occur within close proximity to agricultural lands (Washington Field Office, pers comm., 2023).

The threats of land development and loss of habitat from conversion to other uses (agriculture); impacts of military training and recreation; existing and likely future habitat fragmentation and habitat disturbance; long-term fire suppression; and ongoing loss and degradation of habitat associated with native and non-native invasive species continue. These factors have resulted in the present isolation and limited distribution of the subspecies and are currently ongoing and will continue into the foreseeable future. The combination of ongoing threats coupled with small population sizes and highly variable population dynamics leads us to conclude that the Taylor's checkerspot butterfly is currently in danger of extinction throughout its range (USFWS 2013, 2024).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 5.7% of the species' range overlaps with agricultural use sites and 94.3% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[17] between the species' range and the agricultural footprint of simazine use sites (Table 11).

[17] Total overlap is capped at 100%.

Table 11. Agricultural use overlap and annual usage data (% Range Treated) for the Taylor's checkerspot.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	0.4	15	15.5	0.4	15	15.5
Grapes	0.1	4.4	4.5	0.1	4.4	4.5
Other Crops	2.2	25.6	27.8	2.2	25.6	27.8
Other Orchards	0.4	23.2	23.6	0.4	23.2	23.6
Vegetables and Ground Fruit	0.5	26.1	26.7	0.5	26.1	26.7
Christmas Trees	2.1	47.8	49.9	2.1	47.8	49.9
Total	**5.7**	**94.3**	**100[17]**	**5.7**	**94.3**	**100[17]**

Usage

Past usage data indicate that up to 100% of the species' range[17] has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

The Taylor's checkerspot butterfly flight period begins in late April and extends into early July. In Oregon, the flight season may last for up to 45 days. Eggs hatch after 13 to 15 days and then live colonially in a loose silk web during early development, Larvae then enter diapause during mid- to late summer and overwinter in this state until the following late winter or early spring (late February or March). Because the height of feeding and reproductive activities for this butterfly occurs essentially from April through July, it may be more vulnerable to the effects of methomyl during the larval and adult stages if applications are made at this time. Taylor's checkerspot uses prairies, meadows, balds, forest openings, and coastal beach deposits with abundant host plants, nectar sources, limited woody vegetation, and generally low growing native herbaceous vegetation (USFWS 2024).

Oviposition host plants vary by site but are constrained to the Plantaginaceae, Valerianaceae, Gentianaceae, and Orobanchaceae plant families (Table 2). The most used oviposition host plants for Taylor's checkerspot butterflies are narrow-leaf plantain (Plantago lanceolata), harsh paintbrush (*Castilleja hispida*), and in British Columbia, skullcap speedwell (*Veronica scutellata*)

Some occupied areas occur near agriculture. However, extant populations and planned translocations occur on sites managed for natural resource conservation and/or federal lands where pesticide usage is likely to be constrained to habitat restoration or management that will benefit the Taylor's checkerspot. Where these habitat restoration or management activities occur, they will include conservation measures to protect the species, where appropriate (Washington Field Office, pers comm., 2023).

Exposure from Non-Agricultural Uses

We do not expect the Taylor's checkerspot to occur on non-agricultural use sites of simazine, and we anticipate that standard use practices for these sites greatly reduce the amount of simazine exposure off-site. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of this species to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For terrestrial insects, we anticipate contact exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., drinking water), we anticipate other routes of exposure will result in much lower levels of exposures to individuals than contact exposure and will not significantly contribute to the overall exposure and resulting effects to individuals.

Based on toxicological data available, terrestrial insects are not sensitive to simazine exposure. We do not anticipate lethal or sublethal effects to the Taylor's checkerspot butterfly from simazine exposure.

Indirect Effects

Taylor's checkerspot larvae feed on and oviposition on host plants from four families (Plantaginaceae, Valerianaceae, Gentianaceae, and Orobanchaceae) depending on the site. The most used oviposition host plants for Taylor's checkerspot butterflies are narrow-leaf plantain (*Plantago lanceolata*), harsh paintbrush (*Castilleja hispida*), and in British Columbia, skullcap speedwell (*Veronica scutellata*). Plants are sensitive to simazine and exposure will cause death or adverse impacts to their ability to photosynthesize and grow. Because the Taylor's checkerspot butterfly is reliant on plant species for feeding and breeding, loss of these plants from simazine exposure will potentially impede the Taylor's checkerspot butterfly's ability to feed.

Effects of the Action Summary

There is a high level of overlap between the species' range and agricultural use sites and associated off-field areas (up to 100% total overlap). There is also a high level of past usage (up to 100% of the range treated annually), which suggests a high amount of exposure to simazine. Label conservation measures include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[18] necessary in all areas where simazine is used, which we expect will result in no more than low levels of effects to plant growth from off-site transport of simazine.

Terrestrial insects are not sensitive to simazine exposure, thus we do not anticipate any lethal or sublethal effects to Taylor's checkerspot butterfly from exposure to simazine. In addition, because of non-agricultural standard use practices, we expect simazine use will not result in indirect adverse effects to the Taylor's checkerspot from these uses. However, exposure from agricultural uses may result in indirect effects to the species' larval host plants.

The Taylor's checkerspot butterfly requires specific plants for larval development, and any impacts to these plant resources would adversely affect this butterfly. From exposure to simazine, some of these plants will likely die or experience reduced growth. However, extant populations and planned translocations are currently on sites managed for natural resource conservation and/or federal lands where pesticide usage is likely to be constrained to habitat restoration or management that will benefit the Taylor's checkerspot, and include conservation measures to protect the species, where appropriate (Washington Field Office, pers comm., 2023). Therefore, the overall risk of adverse effects to the Taylor's checkerspot butterfly from simazine exposure is low.

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[18] Ecological Mitigation Support Document to Support Endangered Species Strategies

Species Conclusion

The Taylor's checkerspot butterfly is found in coastal habitats, including prairies, meadows, and coastal bluffs, some of which are near agricultural areas. There are 14 known occupied locations with small populations range-wide, reduced from 80 known populations historically. Ongoing threats to the species include small population sizes, habitat loss and degradation, habitat fragmentation, long-term fire suppression. Pesticides from spraying to control a spongy moth was a possible contributor to the extirpation of some populations in the past, but risks associated with pesticides have been reduced by improved coordination with the Service when moth infestations arise and because extant populations occur on federal and other lands managed for conservation with considerations for the Taylor's checkerspot butterfly.

Agricultural simazine use sites overlap with a large portion (up to 100%) of the Taylor's checkerspot butterfly's range and usage data indicates that up to 100% of the range has been treated in the past. We do not expect exposed individuals to die, though the species may experience low levels of indirect effects through loss of host plants. We expect this species does occur near agricultural lands based on known locations of extant populations and planned translocations. In addition, they occur on lands managed for natural resource conservation and do not occur on non-agricultural use sites. We expect host plant loss will cause low levels of indirect effects to a small number of individuals.

In summary, we anticipate minimal exposure to simazine on field and through spray drift and expect impacts to be highly localized and affect only a very few individuals over the duration of the proposed action. While the species is highly vulnerable, we do not expect the very small number of individuals experiencing indirect effects from host plant loss will cause species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Taylor's checkerspot in the wild.

References

U.S. Fish and Wildlife Service. 2024. Taylor's Checkerspot Butterfly (*Euphydryas editha taylori*) 5-Year Review: Summary and Evaluation. Lacey, Washington. 10 pp.

U.S. Fish and Wildlife Service. 2024. Recovery Plan for Taylor's Checkerspot Butterfly (*Euphydryas editha taylori)*. Portland, Oregon. 41 pp.

U.S. Fish and Wildlife Service. 2024. Species Biological Report for Taylor's Checkerspot Butterfly (*Euphydryas editha taylori*) Version 1.0. Pacific Region (Region 1) Lacey, WA 110 pp.

U.S. Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for the Taylor's Checkerspot Butterfly and Threatened Status for the Streaked Horned Lark. Federal Register 78(192):61452-61503.

Integration and Synthesis Summary: Valley elderberry longhorn beetle

Scientific Name:	Common Name:	Entity ID:
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	436

Conclusion: No Jeopardy

Species Range

Based on range map dated: 11/12/2021; Wherever found; *States within the range:* CA

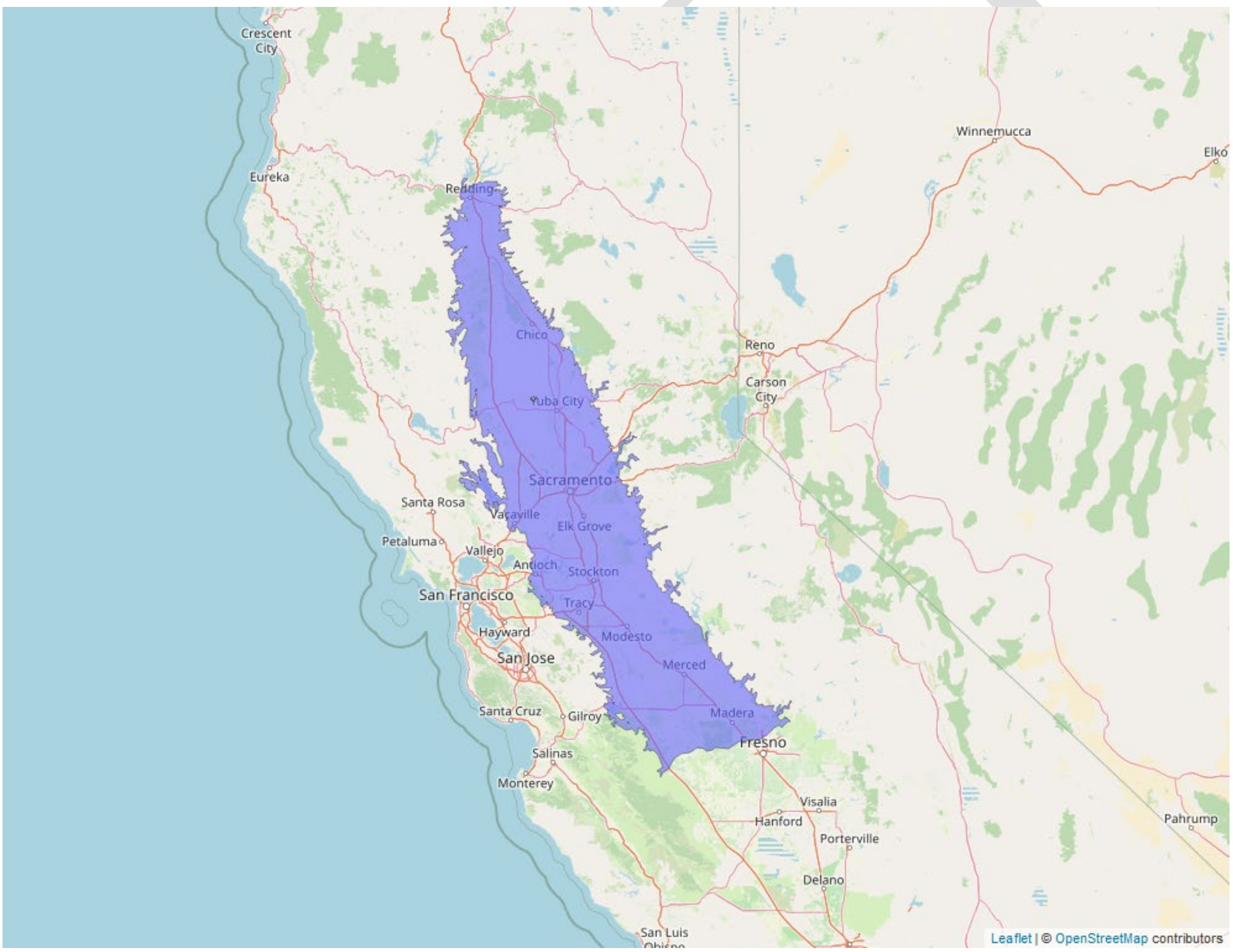

Figure 7. Range map of valley elderberry longhorn beetle (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7850.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-Year Review recommendation: No change in status

Most recently completed 5-Year Review: 9/26/2023

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (numerous)

Species trends: Unknown population trends

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The valley elderberry longhorn beetle is endemic to the Central Valley of California and found only associated with its hostplant, elderberry (*Sambucus* spp.). The species is naturally rare in its habitat. Occupancy of elderberry by the valley elderberry longhorn beetle is generally low but tends to be highest in riparian communities. Abundance data for the species is unknown because finding an adult is rare; most occurrences are based on the presence of exit holes in elderberry and not actual individuals. There are three Management Units for the species: Putah Creek (31 occurrences), Sacramento River (145 occurrences), and San Joaquin River (44 occurrences). The valley elderberry longhorn beetle is distributed throughout available habitat in a widely dispersed metapopulation. At local scales, the valley elderberry longhorn beetle occupies elderberry plants in clumps at scales that vary with the watershed. Local aggregations generally cover 25-50-m scales along the American River and Putah Creek but are more spread out (200-300 m) along the Cosumnes River. Groups of local aggregations vary as well, but overall separate aggregations occur at scales of 200-800 m along all three river systems. These clumps of local aggregations appear more likely to represent discreet demographic units for the valley elderberry longhorn beetle. A habitat patch is more likely to be occupied if there are other occupied habitats within 10-20 km (USFWS 2014, 2019), and populations along larger rivers have a lower extinction probability than those along smaller rivers (USFWS, 2023).

Threats to the valley elderberry longhorn beetle's host plant due to effects related to levee vegetation management are likely to continue. A levee vegetation strategy defined by California Department of Water Resources for some facilities in the Central Valley may, in the short term, result in fewer impacts to elderberry shrubs found on flood control levees. However, we are uncertain if this strategy will be effective in providing protection to elderberry shrubs found within these areas of the Central Valley. Loss of habitat at locations adjacent to roads, trails, and associated infrastructure remains a threat. Pruning activities, if conducted appropriately, can result in a temporary loss of the host plant of the valley elderberry longhorn beetle and monitoring of these activities is necessary to ensure that elderberry characteristics important to the life history of the beetle are preserved. Invasive non-native plants may be impacting the species through modification or loss of habitat due to competition for space and resources with its host plant, but additional information is needed to evaluate the magnitude of this threat. Climate models developed for evaluating climate change effects in California, including the Central Valley, indicate increased temperatures and significant changes to hydrologic conditions from climate change that are expected to affect riparian systems and other habitats where the presence of the valley elderberry longhorn beetle has been observed in the Central Valley. Effects of climate change are also expected to benefit invasive Argentine ants, which will attack and consume exposed insect larvae of the beetle. Drought conditions are also likely to become more common in California, especially with water supply needs for nearby developed areas, and will affect the survival of elderberry. The best available scientific information indicates potential impacts from pesticides to the Valley elderberry longhorn beetle and its habitat; however, further studies are needed to characterize the magnitude or impact of pesticides to the species both in localized areas as well as across the species' range. Pesticide use in the Central Valley remains high and could increase due to climate change effects (e.g., warmer temperatures) that may enhance the pathogenicity of crop pests for agricultural fields that are commonly found adjacent to remnant riparian vegetation.

The California Public Resources Code and Lake and Streambed Alteration Program work synergistically with the Endangered Species Act to provide protections to the species and its habitat. Under the Natural Community Conservation Planning Program, the valley elderberry longhorn beetle receives protections under permitted plans, including obligations to continue to implement the conservation plans in their entirety under the terms of their permits (USFWS 2014, 2019, 2023).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 49.3% of the species' range overlaps with agricultural use sites and 50.7% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[19] between the species' range and the agricultural footprint of simazine use sites (Table 12).

Table 12. Agricultural use overlap and annual usage data (% Range Treated) for the valley elderberry longhorn beetle.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)
Citrus	0.2	11.5	11.7
Corn	6.5	36.1	42.6
Grapes	5.5	22	27.5
Other Crops	14.3	53.4	67.6
Other Orchards	22.7	45.3	68.1
Vegetables and Ground Fruit	5.8	40.8	46.5
Christmas Trees	<0.1	<0.1	<0.1
Total	**49.3**	**50.7**	**100[19]**

Usage

Mandatory reporting data from the state of California indicates that, between 2013-2022, the maximum yearly overlap between the species' range and agricultural areas reporting any pesticide usage was 37.2%. Of those areas reporting pesticide usage, up to 29.8% reported use of any herbicide. Based on this reporting data, we expect 0.9% of the species' range is likely to be treated with simazine annually, specifically (Table 13). This pesticide usage data is based on data reported by more than 28,297 growers within the species' range. The high number of reporters suggests that these usage metrics will be stable over time.

[19] Total overlap is capped at 100%.

Table 13. Past usage of all pesticides, herbicides, and specifically simazine in the areas near the valley elderberry longhorn beetle's range according to the California Department of Pesticide Regulation's Pesticide Use Reporting

% overlap with all pesticide usage areas	% overlap with all herbicide usage areas	% overlap with simazine usage areas
37.2	29.8	0.9

Additional Exposure Considerations

The Valley elderberry longhorn beetle primarily occurs in riparian areas along rivers in several counties in California such as the Merced River (Merced County), the American River (Sacramento County), and Putah Creek (Yolo County) of the Central Valley of California. Adults are present from March through early June (peak late April to mid-May). The valley elderberry longhorn beetle feeds exclusively on the elderberry shrub (*Sambucus* spp.) throughout all stages of its life. Adults feed on the leaves, flowers, and nectar of the host plant. The shrub blooms from March through early June. Females lay eggs singly on elderberry leaves and at the junction of leaf stalks and main stems, with all eggs laid on new growth at the outer tips of elderberry branches. After hatching, the larva creates a feeding gallery (set of tunnels) in the pith at the stem center. While only one larva is found in each feeding gallery, multiple larvae can occur in one stem if the stem is long enough to accommodate multiple galleries. Adult beetles emerge from the pith just as the shrub begins to bloom. Because elderberry is the host plant for the beetle, environmental and habitat conditions that favor a robust elderberry community also benefit the beetle.

The Valley elderberry longhorn beetle is an herbivorous specialist that feeds almost exclusively on blue elderberry (*Sambucus cerulea*) and requires the riparian moist woodlands in which the plant grows throughout all stages of its life and as such, we do not expect this species to forage on fields.

Exposure from Non-Agricultural Uses

We do not expect the valley elderberry longhorn beetle to forage on non-agricultural simazine use sites, and we anticipate that standard use practices for these sites greatly reduce the amount of simazine exposure off-site. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of this species to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For terrestrial insects, we anticipate contact exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., drinking water), we anticipate other routes of exposure will result in much lower levels of exposures to individuals than contact exposure and will not significantly contribute to the overall exposure and resulting effects to individuals.

Based on toxicological data available, terrestrial insects are not sensitive to simazine exposure. We do not anticipate lethal or sublethal effects to the valley elderberry longhorn beetle from simazine exposure.

Indirect Effects

The valley elderberry longhorn beetle feeds exclusively on elderberry shrubs (*Sambucus* spp.) throughout all stages of its life. Adults feed on the leaves, flowers, and nectar of the host plant and lay their eggs on elderberry leaves. Plants are sensitive to simazine and exposure will cause death or adverse impacts to their ability to photosynthesize and grow. Loss of elderberry in the species' habitat would affect the beetle's ability to feed and reproduce. Even though the valley elderberry longhorn beetle range is surrounded by agriculture, the species is not believed to forage on agricultural fields where we expect effects to plants to be highest. We anticipate simazine exposure will adversely impact elderberry, but we expect low levels of elderberry loss in the riparian habitats where the valley elderberry longhorn beetle is found.

Effects of the Action Summary

While there is a large extent of overlap between the action area and the species' range, state mandated pesticide usage reporting data indicate that a very small portion of the species' range has been treated with simazine in the past (up to 0.9% annually). Thus, we anticipate a moderate portion of the species' range is likely to experience exposure from agricultural uses of simazine. Label conservation measures include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[20] necessary in all areas where simazine is used, which we expect will result in no more than low levels of effects to plant growth from off-site transport of simazine

[20] Ecological Mitigation Support Document to Support Endangered Species Strategies

Terrestrial insects are not sensitive to simazine exposure, thus we do not anticipate any lethal or sublethal effects to valley elderberry longhorn beetle from exposure to simazine. In addition, because of non-agricultural standard use practices, we expect simazine use will not result indirect adverse effects to the valley elderberry longhorn beetle from these uses. However, agricultural uses may result in some indirect effects to the species' larval host plant, elderberry.

The valley elderberry longhorn beetle relies solely on elderberry for feeding and reproduction, thus impacts to this plant resource would adversely affect this beetle. Simazine exposure will likely impact the elderberry's ability to photosynthesize, so it will die or grow poorly. Based on the overlap with off-site agricultural areas, elderberry in the species' range may be exposed to simazine. However, we expect the beetle is not found near croplands where simazine is used because the species prefers riparian areas. Therefore, we expect a small number of individuals are likely to experience adverse effects through loss of elderberry from simazine exposure. Thus, the overall risk of adverse effects to the valley elderberry longhorn beetle is low.

Species Conclusion

The valley elderberry longhorn beetle is listed as threatened and is endemic to the Central Valley, California. They are herbivorous and rely on elderberry for breeding and larvae survival. Valley elderberry longhorn beetles occur in a widely dispersed metapopulation, suggesting the species is able to disperse distances of 10 or more kilometers. The species is threatened primarily by effects to their host plants through levee vegetation management and riparian vegetation removal for development, but pesticides in general are listed as a threat. Magnitude and specific impacts of pesticides on the species are not documented. They are also threatened by invasive Argentine ants, which have expanded into the species' range recently.

Even though agricultural simazine use sites overlap with a large portion (up to 100%) of the valley elderberry longhorn beetle's range, only 0.9% of the range has been treated with simazine in the past according to reporting from the California (CalPUR). We do not expect exposed individuals to die, but the species may experience low levels of indirect effects through loss of host plants near agricultural fields that are exposed through spray drift. We do not expect the valley elderberry longhorn beetle to forage on field because they are primarily found in riparian areas. We expect host plant loss will cause low levels of indirect effects to a small number of individuals.

In summary, we anticipate minimal exposure to simazine on field and through spray drift and expect impacts to be highly localized and affect only a very few individuals over the duration of the proposed action. While the species is highly vulnerable, we do not expect the very small number of individuals experiencing indirect effects from host plant loss will cause species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the valley elderberry longhorn beetle in the wild.

References

U.S. Fish and Wildlife Service. 2023. 5-Year Review, Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). Sacramento, California. 11 pp.

U.S. Fish and Wildlife Service. 2019. Revised Recovery Plan for Valley Elderberry Longhorn Beetle. Pacific Southwest Region, Sacramento, California. 18 pp.

U.S. Fish and Wildlife Service. 2014. Withdrawal of the Proposed Rule To Remove the Valley Elderberry Longhorn Beetle From the Federal List of Endangered and Threatened Wildlife. Federal Register 79: 55879-55917.

Integration and Synthesis Summary: Western regal fritillary

Scientific Name:	Common Name:	Entity ID:
Argynnis idalia occidentalis	Western regal fritillary	12381

Conclusion: No Jeopardy

Species Range

Based on range map dated: 8/29/2024; Wherever found; *States within the range:* AR, CO, IA, IL, IN, KS, MN, MO, MT, ND, NE, OK, SD, WI, WY

Figure 8. Range map of western regal fritillary (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/12017.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Proposed Threatened

Most recent 5-Year Review recommendation: N/A

Most recently completed 5-Year Review: None available for this species

Distribution: Species/Population widespread or wide-ranging

Number of populations: Multiple populations (numerous)

Species trends: Declining population(s) – one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes, herbicides

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

The western regal fritillary is a butterfly found in Arkansas, Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin, and Wyoming. They occur where large unconverted grasslands remain, which includes riparian zones and other moist habitats in the western portions of the range. There are 21 populations across three regions: the Midwest, Northern Great Plains, and Central Great Plains. In the Midwest, populations are restricted to small, isolated patches of prairie remnants that are generally less than 98.9 ac in size, scattered across a landscape primarily dominated by agriculture. The Northern and Central Great Plains are the remaining strongholds for the western subspecies, as large, intact grasslands remain, but these are more susceptible to drought and may provide lesser-quality habitat than the tall-grass prairie remnants in the Midwest. The Northern Great Plains representation unit experiences shorter growing seasons and colder weather patterns than those in the Central Great Plains, which may also reduce the quality of the habitats. Approximately 84% of the subspecies' range is privately owned. Regal fritillaries need large, contiguous blocks of native grasslands, violets to support larvae, warm season bunchgrasses for shelter, and nectar sources for adults.

The western subspecies is generally considered to have a declining population trend, largely a result of land conversion to agriculture and development. Habitat fragmentation generally decreases east to west across the western subspecies' range, and as the size and number of suitable prairie remnants increases, there is a corresponding increase in size, number, and long-term viability of the western subspecies' populations. Threats to the species include continued habitat loss (e.g., agricultural and other development), broad applications of herbicides, invasive and woody plant encroachment, periodic disturbances like fire, drought, and effects of climate change (USFWS 2024).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 20.2% of the species' range overlaps with agricultural use sites and 79.8% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[21] between the species' range and the agricultural footprint of simazine use sites (Table 14).

Table 14. Agricultural use overlap and annual usage data (% Range Treated) for the western regal fritillary.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	16.4	43.2	59.6	4.5	10.3	14.9
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	3.3	38.6	41.8	<0.1	<0.1	<0.1
Other Orchards	<0.1	0.8	0.9	<0.1	0.7	0.7
Vegetables and Ground Fruit	0.4	6.8	7.2	<0.1	0.5	0.5
Christmas Trees	<0.1	0.6	0.6	<0.1	0.6	0.6
Total	**20.2**	**79.8**	**100[21]**	**4.6**	**12.1**	**16.7**

Usage

Past usage data indicate that up to 16.7% of the species' range has been treated with simazine annually from agricultural uses.

[21] Total overlap is capped at 100%.

Additional Exposure Considerations

The western regal fritillary has one generation per year. In the late summer and early fall, females lay eggs that hatch into larvae within 2 to 3 weeks. The western regal fritillary larvae are feeding specialists, and their only food source is violets (*Viola* spp.). They overwinter in nearby grassland vegetation before emerging in early spring to search for violets. In late May through mid-July, the larvae pupate in the leaf litter of warm season grasses and emerge as adults beginning in June. Adults rely on nectar sources for food, and reproductive rates improve when nectar plants are abundant and high-quality. Adult males live for approximately 4 to 6 weeks and begin to die off in mid-July; adult females live for 8 to 12 weeks and may survive into late October.

The western regal fritillary is a landscape-level species that needs large, intact grasslands at a landscape scale, and depends on a shifting mosaic of large, well-connected, diverse grasslands with violets for larvae; nectar sources for adults; and warm season, native bunchgrasses for shelter at all life stages. The grasslands need to be generally more than 3.86 square miles (1,000 hectares) and maintained by periodic disturbances (e.g., fire, haying, and grazing) that maintain the grasslands by reducing woody plants and encroachment.

The western regal fritillary cannot survive in altered landscapes, including row crop fields, nonnative pastures, developed areas surrounding prairie remnants, or forests. As a result, the regal fritillary is considered a grassland specialist and an indicator of the health of native prairie (USFWS 2024).

Exposure from Non-Agricultural Uses

We do not expect the western regal fritillary to occur on non-agricultural simazine use sites, and standard use practices for these sites greatly reduce the amount of simazine exposure off-site. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of this species to be limited.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. In addition, three runoff mitigation points are required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

Effects of the Action: Toxicity

Direct Effects

For terrestrial insects, we anticipate contact exposure will result in the highest levels of exposure. While individuals may be exposed through other routes (e.g., drinking water), we anticipate other routes of exposure will result in much lower levels of exposures to individuals than contact exposure and will not significantly contribute to the overall exposure and resulting effects to individuals.

Based on toxicological data available, terrestrial insects are not sensitive to simazine exposure. We do not anticipate lethal or sublethal effects to the western regal fritillary from simazine exposure.

Indirect Effects

Because the western regal fritillary is highly reliant on one plant for larval development and adults require large swaths of high-quality prairie plants for nectaring, loss of violets in the species' habitat would affect its ability to feed and reproduce. Even though the western regal fritillary's range is interspersed with agriculture, the species is not believed to forage on agricultural fields where we expect effects to plants to be highest. We anticipate simazine exposure will adversely impact violets, but we expect low levels of violet loss in the intact prairie habitats where the western regal fritillary is found.

Effects of the Action Summary

Even though there is a high level of overlap between the species' range and agricultural use associated off-field areas (79.8% total overlap) and a high level of past usage (12% of the off-site areas containing simazine concentrations), the western regal fritillary is a prairie specialist, and we do not expect it to use agricultural or non-agricultural simazine use sites. The regal fritillary cannot survive in altered landscapes, including row crop fields, nonnative pastures, developed areas surrounding prairie remnants, or forests. As a result, the regal fritillary is considered a grassland specialist (USFWS 2024). Label conservation measures include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[22] necessary in all areas where simazine is used, which we expect will result in no more than low levels of effects to plant growth from off-site transport of simazine.

Terrestrial insects are not sensitive to simazine exposure, thus we do not anticipate any lethal or sublethal effects to western regal fritillary from exposure to simazine. In addition, because of non-agricultural standard use practices, we expect simazine use will not result indirect adverse

[22] Ecological Mitigation Support Document to Support Endangered Species Strategies

effects to the western regal fritillary from these uses. However, agricultural uses may result in some indirect effects to the species' larval host plant, violets.

The western regal fritillary relies solely on violets for larval feeding and reproduction, thus any impacts to this plant resource would adversely affect the species. Simazine exposure will likely impact the violet's ability to photosynthesize, so it will die or grow poorly. Based on the overlap with off-site agricultural areas, violets in the species' range may be exposed to simazine. However, we expect the western regal fritillary to not be active near croplands where simazine is used because the species is a prairie specialist. Therefore, we expect a small number of individuals are likely to experience adverse effects through loss of violets from simazine exposure. Thus, the overall risk of adverse effects to the western regal fritillary is low.

Species Conclusion

The western regal fritillary is a butterfly found in the Midwest and Great Plains of the U.S., across 21 populations. It is a prairie specialist, meaning it does not use converted landscapes like agricultural or non-agricultural simazine use sites. In the Midwest, populations are restricted to small, isolated patches of prairie remnants that are generally less than 98.9 ac in size, scattered across a landscape primarily dominated by agriculture. Populations in the Great Plains regions are larger, but the large intact prairies here may be lower quality than in the Midwest due to drought. Regal fritillaries need large, contiguous blocks of native grasslands, violets to support larvae, warm season bunchgrasses for shelter, and nectar sources for adults. Threats to the species include habitat loss (e.g., agricultural and other development), broad applications of herbicides, invasive and woody plant encroachment, periodic disturbances like fire, drought, and effects of climate change (USFWS 2024).

Even though areas subject to off-field agricultural simazine exposure overlap with a large portion (79.8%) of the western regal fritillary's range and 12.1% have been exposed to simazine in the past through off-field transport, the species is a prairie specialist, and we do not expect the western regal fritillary to forage on-field. We do not expect exposed individuals to die, but the species may experience indirect effects through loss of violets and nectaring plants near agricultural fields that are exposed through spray drift. We expect host plant loss will cause low levels of indirect effects to a small number of individuals.

In summary, we anticipate minimal exposure to simazine on field and through spray drift and expect impacts to be highly localized and affect only a small number of individuals over the duration of the proposed action. We do not expect the small number of individuals experiencing indirect effects from host plant loss will cause species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the western regal fritillary in the wild.

References

U.S. Fish and Wildlife Service. 2024. Endangered and Threatened Wildlife and Plants; Endangered Status for the Eastern Regal Fritillary, and Threatened Status With Section 4(d) Rule for the Western Regal Fritillary. Proposed Rule. Federal Register 89:151:63888-63909.

Species requiring further analysis

In our draft Biological Opinion, we focused our analyses on 1) species with low expected exposure to simazine (due to low overlap, usage, or conservation measures adopted prior to consultation), and 2) species with more than low levels of exposure that benefited from conservation measures identified through the Herbicide Strategy that aimed to reduce off-site transport of simazine (i.e., listed plants and listed animals that depend on plant resources). For the species in Table 15, we identified the need for further coordination. We expect Herbicide Strategy conservation measures to reduce pesticide loading into aquatic habitats by up to 90% (i.e., one order of magnitude) compared to unmitigated runoff, and reduce spray drift from entering species' terrestrial habitats by >95%. We anticipate that this reduction will minimize off-site transport of simazine to a level where no more than low levels of adverse effects are likely to occur to plants through this exposure route. While the required conservation measures are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to these species. They may occur on simazine use sites, either agricultural or non-agricultural. We intend to continue coordinating with EPA and simazine registrants between the release of this draft Opinion and the transmission of the final Opinion to gain information regarding the exposure and effects of each species to simazine. As such, we have not yet made determinations for these species.

Table 15. Species requiring further analysis

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking
Fender's blue butterfly	*Icaricia icarioides fenderi*	Low	High	Low
Poweshiek skipperling	*Oarisma poweshiek*	High	High	Low