Integration and Synthesis Summary for Plants

Dicots and non-flowering plants in terrestrial or flowing wetland habitats

This Integration and Synthesis Summary includes our jeopardy analysis for plant 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.

The species in this I&S appendix were grouped together as they occur in similar types of habitats (i.e., terrestrial or flowing wetlands) and were predicted by EPA to be exposed to similar concentrations of simazine from agricultural or non-agricultural uses. 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 terrestrial or flowing wetland 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) adequately reduce simazine concentrations to levels where effects are expected to be low.

Dicot and non-flowering plants are placed together simply for ease of organization. Monocot plants with similar exposure profiles are found in a separate I&S Appendix.

Vulnerability

For the plant species that we or EPA determined are "likely to be adversely affected" by the proposed action, we considered several factors for each listed plant 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

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

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 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 plant species will be exposed to simazine primarily through direct contact, either as the result of exposure to pesticide applications on-field or through off-field 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,

[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.

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

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 or soil preferences), 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 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, Christmas trees, grapes, and other orchards only within the conterminous United States.

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.

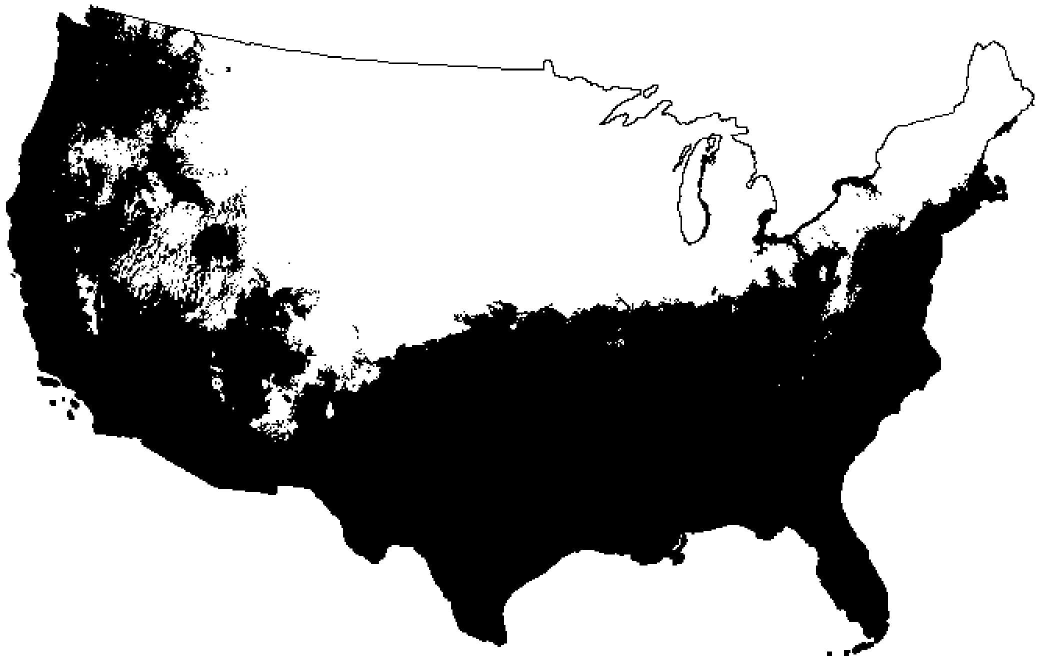

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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 conservation measures (i.e., equivalent to six points on EPA's mitigation menu), and we considered them in our assessment.

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 more than low levels of adverse effects to most listed plants 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 near 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

[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.

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) 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 those that act as pollinators or seed dispersers, are exposed to simazine and experience adverse effects.

Given that herbicides like simazine are designed to control plants, we assume listed plant species are sensitive to simazine exposure. In general, we anticipate individuals exposed to simazine are likely to experience direct adverse effects in the form of reduced biomass and growth, which, in severe cases, would result in mortality of individuals. Based on the available toxicity data in plants for simazine, we use the HC_{05} (i.e., the exposure concentration where we expect more than 95% of plant species would not experience measurable impacts) for biomass at seedling emergence and compare that to the estimated environmental concentration (EEC) of simazine for each listed species to determine the anticipated level of adverse effects simazine. In contrast, available toxicity data indicate that animal species, including potential pollinators and seed dispersers of listed plant species, are not likely to die from simazine exposure, suggesting that indirect adverse effects are not likely to occur to listed plant species.

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.

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

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

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 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,
- 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,
- and ground application only

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 listed 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.

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

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

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).

For all the species in this document, we expect the spray drift and runoff measures, including the 3 runoff points and 15-spray drift buffers required under the Herbicide Strategy, 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. We anticipate this level of mitigation will protect listed plant species by reducing the number of individuals exposed (by reducing the extent of off-site transport of simazine residues) and reducing the level of adverse effects that will occur to exposed individuals (by reducing estimated exposure concentrations).

Summary of conclusions for dicots and non-flowering plants in terrestrial or flowing wetland habitats

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of simazine with conservation measures, and the cumulative effects, it is the Service's biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of at least 171 of the 175 plant species in this Appendix. For the remaining 4 plants 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 indicated that effects could be different, would have had an individual discussion to provide additional explanation. This approach allowed us to streamline our discussion in this Opinion by avoiding repeating our findings when we expected species in the respective groupings would 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

The species in Table 1 are grouped together as they have low concern of adverse effects due to low exposure as informed by low overlap between the species' range and agricultural lands where simazine is registered for use and a low likelihood of exposure from non-agricultural use. 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	Agricultural Exposure Ranking	Toxicity Ranking	Total Agricultural Area Overlap (% Range)	Determination
Monterey clover	*Trifolium trichocalyx*	High	Low	High	4.1	No Jeopardy
Nichol's Turk's head cactus	*Echinocactus horizonthalonius var. nicholii*	High	Low	High	3.2	No Jeopardy

Given that herbicides like simazine are designed to control plants, we assume all listed plant species are sensitive to simazine exposure and no significant difference in the toxicity of simazine among major plant taxa (e.g., dicots, monocots, non-flowering plants) is expected. In general, we anticipate individuals exposed to simazine, from agricultural or non-agricultural use sites, are likely to experience direct adverse effects in the form of reduced biomass and growth, which, in severe cases, would result in mortality of individuals. As such, the species in Table 1 have high toxicity rankings. We do not expect reductions in pollinators and seed dispersers of listed plant species from simazine exposure, and therefore, indirect adverse effects are not likely to occur for these species.

In addition, the species in Table 1 have high vulnerability rankings. While these species may be more vulnerable to adverse effects from pesticides, all species in this group have a low exposure ranking. The low exposure ranking results from the combination of several factors. First, the species in Table 1 have low total overlap between their ranges and agricultural use areas (including application sites and spray drift and runoff areas). Second, the conservation measures already on the label are expected to reduce exposure of the species to runoff and spray drift from agricultural use sites. These measures include restricting use to a maximum windspeed of 10 miles per hour, prohibiting applications during temperature inversions, 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, using ground applications only, and maintaining buffers from waterways. These measures, combined with conservation measures implemented through the Herbicide Strategy (i.e., 15-foot spray drift buffer and three runoff mitigation points) are anticipated to reduce off-site transport to the habitats of listed species by 90% or more.

Furthermore, the total overlap metric we use does not fully account for redundancy between use site layers, assumes exposure is occurring in all possible overlapping areas, and does not consider information on past simazine usage (which we expect would only further decrease the likelihood of exposure). For example, for one species in Table 1, the Monterey clover, which occurs completely within the state of California, California specific usage data shows no simazine usage within the range of this species, further decreasing the likelihood of agricultural exposure. Given these additional factors that would further reduce the extent of exposure that is reasonably certain to occur, we have high confidence that, at most, only very small numbers of individuals of each of these species are likely to experience agricultural exposure to simazine.

In addition to agricultural exposure, simazine is registered for use on non-agricultural areas for nurseries and turf, including lawns and golf courses. Based on this individual review of available life history information for each of the species in Table 1, we expect non-agricultural use sites do not provide the species' necessary habitat (e.g., alluvial fans, rocky outcrops), therefore, these species are unlikely to be exposed to non-agricultural uses of simazine.

As we anticipate very small numbers of individuals of the species in Table 1 are likely to be exposed to simazine, we expect the proposed action will result in direct adverse effects (e.g., reduced biomass, growth, or survival) of, at most, a very small number of individuals of these species. We do not expect indirect adverse effects through reductions in pollinators or seed dispersers 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 expected to appreciably reduce 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 species listed in Table 1.

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

The species in Table 2 were grouped together as they occur completely within California, and very little of their ranges have been annually treated with simazine for agricultural and some non-agricultural uses in the past (0.0-1.3%) according to California Department of Pesticide Regulation's Pesticide Use Reporting data (CalPUR). Therefore, 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 2. Species with low exposure informed by low past usage from the California Department of Pesticide Regulation's Pesticide Use Reporting data and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Antioch Dunes evening-primrose	*Oenothera deltoides ssp. howellii*	High	Low	High	1.3	No Jeopardy
Bakersfield cactus	*Opuntia treleasei*	High	Low	High	1.1	No Jeopardy
Beach layia	*Layia carnosa*	High	Low	High	0.0	No Jeopardy
Ben Lomond spineflower	*Chorizanthe pungens var. hartwegiana*	High	Low	High	0.0	No Jeopardy
Ben Lomond wallflower	*Erysimum teretifolium*	High	Low	High	0.0	No Jeopardy
Braunton's milk-vetch	*Astragalus brauntonii*	High	Low	High	0.0	No Jeopardy
Burke's goldfields	*Lasthenia burkei*	High	Low	High	0.1	No Jeopardy
California seablite	*Suaeda californica*	High	Low	High	0.0	No Jeopardy
Chorro Creek bog thistle	*Cirsium fontinale* var. *obispoense*	High	Low	High	0.1	No Jeopardy
Clover (Tidestrom's) lupine	*Lupinus tidestromii*	High	Low	High	0.0	No Jeopardy
Coastal dunes milk-vetch	*Astragalus tener var. titi*	High	Low	High	0.0	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Conejo dudleya	*Dudleya abramsii* ssp. *parva*	High	Low	High	0.2	No Jeopardy
Contra Costa wallflower	*Erysimum capitatum* var. *angustatum*	High	Low	High	1.3	No Jeopardy
Coyote ceanothus	*Ceanothus ferrisae*	High	Low	High	0.0	No Jeopardy
Del Mar manzanita	*Arctostaphylos glandulosa* ssp. *crassifolia*	Medium	Low	High	0.4	No Jeopardy
Encinitas baccharis	*Baccharis vanessae*	Medium	Low	High	0.2	No Jeopardy
Fish Slough milk-vetch	*Astragalus lentiginosus* var. *piscinensis*	High	Low	High	0.0	No Jeopardy
Gaviota tarplant	*Deinandra increscens* ssp. *villosa*	High	Low	High	0.0	No Jeopardy
Gowen cypress	*Cupressus goveniana* ssp. *goveniana*	High	Low	High	0.0	No Jeopardy
Hickman's potentilla	*Potentilla hickmanii*	High	Low	High	0.0	No Jeopardy
Hoffmann's slender-flowered gilia	*Gilia tenuiflora* ssp. *hoffmannii*	High	Low	High	0.0	No Jeopardy
Indian Knob mountainbalm	*Eriodictyon altissimum*	High	Low	High	0.0	No Jeopardy
Ione (incl. Irish Hill) buckwheat	*Eriogonum apricum (*incl. var. *prostratum)*	High	Low	High	0.1	No Jeopardy
Ione manzanita	*Arctostaphylos myrtifolia*	High	Low	High	0.0	No Jeopardy
Island phacelia	*Phacelia insularis* ssp. *insularis*	High	Low	High	0.0	No Jeopardy
Kenwood Marsh checker-mallow	*Sidalcea oregana* ssp. *valida*	High	Low	High	0.1	No Jeopardy
Lake County stonecrop	*Parvisedum leiocarpum*	High	Low	High	0.0	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Large-flowered fiddleneck	*Amsinckia grandiflora*	High	Low	High	0.1	No Jeopardy
Layne's butterweed	*Senecio layneae*	High	Low	High	0.0	No Jeopardy
Loch Lomond coyote thistle	*Eryngium constancei*	Medium	Low	High	0.1	No Jeopardy
Lompoc yerba santa	*Eriodictyon capitatum*	High	Low	High	0.1	No Jeopardy
Lyon's pentachaeta	*Pentachaeta lyonii*	Medium	Low	High	0.4	No Jeopardy
Marcescent dudleya	*Dudleya cymosa* ssp. *marcescens*	High	Low	High	0.2	No Jeopardy
Marin dwarf-flax	*Hesperolinon congestum*	Medium	Low	High	0.0	No Jeopardy
Menzies' wallflower	*Erysimum menziesii*	High	Low	High	0.0	No Jeopardy
Metcalf Canyon jewelflower	*Streptanthus albidus* ssp. *albidus*	High	Low	High	0.0	No Jeopardy
Monterey gilia	*Gilia tenuiflora ssp. arenaria*	Medium	Low	High	0.0	No Jeopardy
Monterey spineflower	*Chorizanthe pungens* var. *pungens*	Medium	Low	High	0.1	No Jeopardy
Morro manzanita	*Arctostaphylos morroensis*	High	Low	High	0.0	No Jeopardy
Nevin's barberry	*Berberis nevinii*	High	Low	High	0.2	No Jeopardy
Nipomo Mesa lupine	*Lupinus nipomensis*	High	Low	High	0.1	No Jeopardy
Orcutt's spineflower	*Chorizanthe orcuttiana*	High	Low	High	0.2	No Jeopardy
Otay mesa-mint	*Pogogyne nudiuscula*	High	Low	High	0.0	No Jeopardy
Palmate-bracted bird's beak	*Cordylanthus palmatus*	High	Low	High	0.6	No Jeopardy
Pine Hill ceanothus	*Ceanothus roderickii*	High	Low	High	0.0	No Jeopardy
Red Hills vervain	*Verbena californica*	High	Low	High	0.0	No Jeopardy
Salt marsh bird's-beak	*Cordylanthus maritimus*	Medium	Low	High	0.1	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
	ssp. *maritimus*					
San Diego ambrosia	*Ambrosia pumila*	High	Low	High	0.8	No Jeopardy
San Diego button-celery	*Eryngium aristulatum* var. *parishii*	High	Low	High	0.2	No Jeopardy
San Francisco lessingia	*Lessingia germanorum (=L.g.* var. *germanorum)*	High	Low	High	0.0	No Jeopardy
San Mateo woolly sunflower	*Eriophyllum latilobum*	Medium	Low	High	0.0	No Jeopardy
Santa Ana River woolly-star	*Eriastrum densifolium* ssp. *sanctorum*	Medium	Low	High	0.0	No Jeopardy
Santa Cruz Island malacothrix	*Malacothrix indecora*	High	Low	High	0.0	No Jeopardy
Santa Monica Mountains dudleyea	*Dudleya cymosa* ssp. *ovatifolia*	High	Low	High	<0.1	No Jeopardy
Santa Rosa Island manzanita	*Arctostaphylos confertiflora*	High	Low	High	0.0	No Jeopardy
Showy Indian clover	*Trifolium amoenum*	High	Low	High	0.1	No Jeopardy
Slender-horned spineflower	*Dodecahema leptoceras*	Medium	Low	High	0.0	No Jeopardy
Soft bird's-beak	*Cordylanthus mollis* ssp. *mollis*	High	Low	High	0.1	No Jeopardy
Soft-leaved paintbrush	*Castilleja mollis*	High	Low	High	0.0	No Jeopardy
Stebbins' morning-glory	*Calystegia stebbinsii*	High	Low	High	0.0	No Jeopardy
Suisun thistle	*Cirsium hydrophilum* var. *hydrophilum*	High	Low	High	0.0	No Jeopardy
Tiburon paintbrush	*Castilleja affinis* ssp. *neglecta*	High	Low	High	0.0	No Jeopardy
Vail Lake ceanothus	*Ceanothus ophiochilus*	High	Low	High	0.5	No Jeopardy
Vandenberg monkeyflower	*Diplacus vandenbergensis*	High	Low	High	0.1	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Verity's dudleya	*Dudleya verityi*	High	Low	High	0.1	No Jeopardy
Willowy monardella	*Monardella viminea*	High	Low	High	0.2	No Jeopardy
Yreka phlox	*Phlox hirsuta*	High	Low	High	0.0	No Jeopardy

Given that herbicides like simazine are designed to control plants, we assume all listed plant species are sensitive to simazine exposure and no significant difference in the toxicity of simazine among major plant taxa (e.g., dicots, monocots, non-flowering plants) is expected. In general, we anticipate individuals exposed to simazine, from agricultural or non-agricultural use sites, are likely to experience direct adverse effects in the form of reduced biomass and growth, which, in severe cases, would result in mortality of individuals. As such, all species in Table 2 have high toxicity rankings. We do not expect reductions in pollinators and seed dispersers of listed plant species from simazine exposure, and therefore, indirect adverse effects are not likely to occur for these species.

In addition, the species in Table 2 have medium or high vulnerability rankings. While these species may be more vulnerable to adverse effects from pesticides than species with low vulnerability rankings, all species in this group have a low exposure ranking. The low exposure ranking results from the combination of several factors. First, all species in Table 2 occur completely within the state of California and CalPUR usage data compiled between 2013-2022 for simazine indicates low annual usage within the sections where these species' ranges occur. Given that this usage reporting is mandated by the state of California, and that these data are provided regularly at a relatively high spatial resolution (i.e., at the section level, which is per square mile), we have high confidence that only a small percentage of the species' ranges are likely to be exposed to agricultural uses of simazine. Second, the conservation measures already on the label are expected to reduce exposure of the species to spray drift and runoff from agricultural use sites. These measures include restricting use to a maximum windspeed of 10 miles per hour, prohibiting applications during temperature inversions, 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, using ground applications only, and maintaining buffers from waterways. These measures, combined with conservation measures implemented through the Herbicide Strategy (i.e., 15-foot spray drift buffer and three runoff mitigation points) are anticipated to reduce off-site transport to the habitats of listed species by 90% or more.

In addition to agricultural exposure, simazine is registered for use on non-agricultural areas for nurseries and turf, including lawns and golf courses. Based on individual reviews of available life history information for each of the 59 species in Table 2, we expect non-agricultural use sites do not provide the species' necessary habitat (e.g., vernal pools, coastal dunes), therefore, these species are unlikely to be exposed to non-agricultural uses of this herbicide.

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

As we anticipate very small numbers of individuals of the species in Table 2 are likely to be exposed to simazine, we expect the proposed action will result in direct adverse effects (e.g., reduced biomass, growth, or survival) of, at most, a very small number of individuals of these species. We do not expect indirect adverse effects through reductions in pollinators or seed dispersers 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 expected to appreciably reduce 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 species listed 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 because very little of their ranges have been treated annually with herbicides, potentially including simazine, for agriculture in the past according to data from USDA's Census of Agriculture. Therefore, 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 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 Ranking	Toxicity Ranking	% Range Treated (CoA)	Determination
Amargosa niterwort	*Nitrophila mohavensis*	High	Low	High	1.4	No Jeopardy
Arizona cliffrose	*Purshia (=Cowania) subintegra*	High	Low	High	1.2	No Jeopardy
Ash Meadows blazingstar	*Mentzelia leucophylla*	High	Low	High	1.4	No Jeopardy
Ash Meadows gumplant	*Grindelia fraxinipratensis*	High	Low	High	1.4	No Jeopardy
Ash Meadows ivesia	*Ivesia kingii* var. *eremica*	High	Low	High	1.4	No Jeopardy
Ash Meadows sunray	*Enceliopsis nudicaulis* var. *corrugata*	Medium	Low	High	1.4	No Jeopardy
Ash Meadows milk-vetch	*Astragalus phoenix*	Medium	Low	High	1.4	No Jeopardy
Barneby reed-mustard	*Schoenocrambe barnebyi*	High	Low	High	0.6	No Jeopardy
Cochise pincushion cactus	*Coryphantha robbinsorum*	High	Low	High	3.6	No Jeopardy
McDonald's rock-cress	*Arabis macdonaldiana*	Medium	Low	High	1.4	No Jeopardy
Pima pineapple cactus	*Coryphantha scheeri var. robustispina*	High	Low	High	1.8	No Jeopardy
Sacramento Mountains thistle	*Cirsium vinaceum*	High	Low	High	1.1	No Jeopardy
Sacramento prickly poppy	*Argemone pleiacantha* ssp. *pinnatisecta*	High	Low	High	1.1	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	% Range Treated (CoA)	Determination
San Rafael cactus	*Pediocactus despainii*	Medium	Low	High	0.8	No Jeopardy
Shrubby reed-mustard	*Schoenocrambe suffrutescens*	High	Low	High	1.3	No Jeopardy
Telephus spurge	*Euphorbia telephioides*	Medium	Low	High	3.8	No Jeopardy
Texas golden gladecress	*Leavenworthia texana*	High	Low	High	1.0	No Jeopardy
Texas trailing phlox	*Phlox nivalis* ssp. *texensis*	High	Low	High	2.5	No Jeopardy
Tobusch fishhook cactus	*Sclerocactus brevihamatus* ssp. *tobuschii*	Low	Low	High	2.7	No Jeopardy
Uinta Basin hookless cactus	*Sclerocactus wetlandicus*	High	Low	High	2.9	No Jeopardy
White bladderpod	*Physaria pallida*	High	Low	High	1.4	No Jeopardy
Wright fishhook cactus	*Sclerocactus wrightiae*	Medium	Low	High	0.6	No Jeopardy

Given that herbicides like simazine are designed to control plants, we assume all listed plant species are sensitive to simazine exposure and no significant difference in the toxicity of simazine among major plant taxa (e.g., dicots, monocots, non-flowering plants) is expected. In general, we anticipate individuals exposed to simazine, from agricultural or non-agricultural use sites, are likely to experience direct adverse effects in the form of reduced biomass and growth, which, in severe cases, would result in mortality of individuals. As such, all species in Table 3 have high toxicity rankings. We do not expect reductions in pollinators and seed dispersers of listed plant species from simazine exposure, and therefore, indirect adverse effects are not likely to occur for these species.

In addition, most of the species in Table 3 have medium or high vulnerability rankings. While these species may be more vulnerable to adverse effects from pesticides than species with low vulnerability rankings, all species in this group have a low exposure ranking. The low exposure ranking results from the combination of several factors. First, all species in Table 3 have low CoA usage, indicating that very little past herbicide usage occurred on agricultural crops in the counties where these species' ranges occur. Given that this reporting broadly includes all herbicide usage on agriculture, we consider CoA data to be conservative estimates of simazine usage, indicating very small portions of the species' ranges are likely to be treated with simazine. Second, the conservation measures already on the label are expected to reduce exposure of the species to spray drift and runoff from agricultural use sites. These measures include restricting use to a maximum windspeed of 10 miles per hour, prohibiting applications during temperature inversions, 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, using ground applications only, and maintaining buffers from waterways. These measures, combined with conservation measures implemented through the

Herbicide Strategy (i.e., 15-foot spray drift buffer and three runoff mitigation points) are anticipated to reduce off-site transport to the habitats of listed species by 90% or more. Given these factors, we have high confidence that, at most, only very small numbers of individuals of each of these species are likely to experience agricultural exposure to simazine.

In addition to agricultural exposure, simazine is registered for use on non-agricultural areas for nurseries and turf, including lawns and golf courses. Based on individual reviews of available life history information for each of the 20 species in Table 3, we expect non-agricultural use sites do not provide the species' necessary habitat (e.g., canyonlands, desert), therefore, these species are unlikely to be exposed to non-agricultural simazine uses.

As we anticipate very small numbers of individuals of the species in Table 3 are likely to be exposed to simazine, we expect the proposed action will result in direct adverse effects (e.g., reduced biomass, growth, or survival) of, at most, a very small number of individuals of these species. We do not expect indirect adverse effects through reductions in pollinators or seed dispersers 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 expected to appreciably reduce 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 species listed in Table 3.

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

The species in Table 4 were grouped together because we expect low agricultural exposure after incorporating spray drift conservation measures on the simazine label and low likelihood of non-agricultural exposure. These plants were grouped together because they occur in habitats where we expect runoff will not occur (e.g., dry / xeric habitats like sand dunes and desert). 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. Species with low agricultural exposure achieved through spray drift conservation measures and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
Beach jacquemontia	*Jacquemontia reclinata*	High	Low	High	Sand dune (runoff/erosion exposure not expected)	No Jeopardy
Black lace cactus	*Echinocereus reichenbachii var. albertii*	High	Low	High	Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Blowout penstemon	*Penstemon haydenii*	High	Low	High	Sand dune (runoff/erosion exposure not expected)	No Jeopardy
Clay-loving wild buckwheat	*Eriogonum pelinophilum*	High	Low	High	Desert/Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
DeBeque phacelia	*Phacelia submutica*	Medium	Low	High	Desert/Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Dwarf bear-poppy	*Arctomecon humilis*	High	Low	High	Desert/Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Four-petal pawpaw	*Asimina tetramera*	Medium	Low	High	Sand dune (runoff/erosion exposure not expected)	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	**Scientific Name**	**Vulnerability Ranking**	**Agricultural Exposure Ranking**	**Toxicity Ranking**	**Habitat Description**	**Determination**
Gypsum wild-buckwheat	*Eriogonum gypsophilum*	High	Low	High	Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Lakela's mint	*Dicerandra immaculata*	High	Low	High	Sand coastal ridge (runoff/erosion exposure not expected)	No Jeopardy
Lee pincushion cactus	*Coryphantha sneedii var. leei*	High	Low	High	Desert/Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Mesa Verde cactus	*Sclerocactus mesae-verdae*	Medium	Low	High	Desert/Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Pariette cactus	*Sclerocactus brevispinus*	High	Low	High	Desert/Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Pitcher's thistle	*Cirsium pitcheri*	Low	Low	High	Sand dune (runoff/erosion exposure not expected)	No Jeopardy
Robust spineflower	*Chorizanthe robusta* var. *robusta*	Medium	Low	High	Sand dunes (NatureServe, 2015)	No Jeopardy
Sand dune phacelia	*Phacelia argentea*	High	Low	High	Sand dune (runoff/erosion exposure not expected)	No Jeopardy
Seabeach amaranth	*Amaranthus pumilus*	Medium	Low	High	Beach (runoff/erosion exposure not expected)	No Jeopardy
Shivwits milk-vetch	*Astragalus ampullarioides*	High	Low	High	Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Sneed pincushion cactus	*Coryphantha sneedii var. sneedii*	High	Low	High	Desert/Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Star cactus	*Astrophytum asterias*	High	Low	High	Xeric habitat (runoff/erosion exposure not expected)	No Jeopardy
Zapata bladderpod	*Physaria thamnophila*	High	Low	High	Xeric habitat (runoff/erosion	No Jeopardy

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
					exposure not expected)	

Given that herbicides like simazine are designed to control plants, we assume all listed plant species are sensitive to simazine exposure and no significant difference in the toxicity of simazine among major plant taxa (e.g., dicots, monocots, non-flowering plants) is expected. In general, we anticipate individuals exposed to simazine, from agricultural or non-agricultural use sites, are likely to experience direct adverse effects in the form of reduced biomass and growth, which, in severe cases, would result in mortality of individuals. As such, all species in Table 4 have high toxicity rankings. We do not expect reductions in pollinators and seed dispersers of listed plant species from simazine exposure, and therefore, indirect adverse effects are not likely to occur for these species.

In addition, most of the species in Table 4 have medium or high vulnerability rankings. While these species may be more vulnerable to adverse effects from pesticides than species with low vulnerability rankings, all species in this group have a low exposure ranking. The low exposure ranking results from the combination of several factors. First, all species in Table 3 occur in xeric (dry) habitats, such as sand dunes, deserts, or beaches where exposure to simazine through runoff from agricultural use sites is unlikely given the porous nature of the substrate and/or lack of rainfall to create a runoff scenario. Second, the conservation measures already on the label are expected to reduce exposure of the species to spray drift from agricultural use sites. These measures include restricting use to a maximum windspeed of 10 miles per hour, prohibiting applications during temperature inversions, 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, and using ground applications only. These measures, combined with conservation measures implemented through the Herbicide Strategy (i.e., 15-foot spray drift buffer and three runoff mitigation points) are anticipated to reduce off-site transport to the habitats of listed species by 90% or more. Given these factors, we have high confidence that, at most, only very small numbers of individuals of each of these species are likely to experience agricultural exposure to simazine.

In addition to agricultural exposure simazine is registered for use on non-agricultural areas for nurseries and turf, including lawns and golf courses. Based on individual reviews of available life history information for each of the 19 species in Table 4, we expect non-agricultural use sites do not provide the species' necessary habitat (e.g., sand dunes, outcrops), therefore, these species are unlikely to be exposed to non-agricultural uses of this herbicide.

As we anticipate very small numbers of individuals of the species in Table 4 are likely to be exposed to simazine, we expect the proposed action will result in direct adverse effects (e.g., reduced biomass, growth, or survival) of, at most, a very small number of individuals of these species. We do not expect indirect adverse effects through reductions in pollinators or seed dispersers 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 expected to appreciably reduce 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 species listed in Table 4.

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 5, our concern for adverse effects is low. For the species in this table, we expect low agricultural exposure because after incorporating spray drift and runoff conservation measures on the simazine label and from the Herbicide Strategy, we expect off-site transport to be low. We also expect low likelihood of non-agricultural exposure. 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 5. Plant 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	Habitat Description	Determination
Alabama leather flower	*Clematis socialis*	High	Low	High	Terrestrial, palustrine (NatureServe, 2015)	No Jeopardy
American chaffseed	*Schwalbea americana*	Medium	Low	High	Palustrine and terrestrial (NatureServe, 2015)	No Jeopardy
Apalachicola rosemary	*Conradina glabra*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Applegate's milk-vetch	*Astragalus applegatei*	High	Low	High	Terrestrial, wetland, riparian (NatureServe, 2015)	No Jeopardy
Ashy dogweed	*Thymophylla tephroleuca*	High	Low	High	Grasslands (USFWS, 2022a)	No Jeopardy
Beautiful pawpaw	*Deeringothamnus pulchellus*	High	Low	High	Old field, shrubland, savanna, woodland (NatureServe, 2015)	No Jeopardy
Bracted twistflower	*Streptanthus bracteatus*	Medium	Low	High	Primarily in oak-juniper woodlands and associated openings on slopes and in canyon bottoms. (NatureServe, 2015)	No Jeopardy
Bushy whitlow-wort	*Paronychia congesta*	High	Low	High	Shrubland/chaparral (NatureServe, 2015)	No Jeopardy
Chapman rhododendron	*Rhododendron chapmanii*	High	Low	High	Between upland mesic or scrubby flatwoods and floodplain swamps or baygalls; mesic pine flatwoods (USFWS, 2024)	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
Crenulate lead-plant	*Amorpha crenulata*	High	Low	High	Pine rocklands, woodland (NatureServe, 2015)	No Jeopardy
Etonia rosemary	*Conradina etonia*	Medium	Low	High	Scrub, wet prairie, flatwoods, forest (USFWS, 2024)	No Jeopardy
Fassett's locoweed	*Oxytropis campestris* var. *chartacea*	Medium	Low	High	Palustrine (NatureServe, 2015)	No Jeopardy
Furbish lousewort	*Pedicularis furbishiae*	High	Low	High	Palustrine (NatureServe, 2015)	No Jeopardy
Gentian pinkroot	*Spigelia gentianoides*	High	Low	High	Forests, woodlands (NatureServe, 2015)	No Jeopardy
Georgia rockcress	*Arabis georgiana*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Guthrie's (=Pyne's) ground-plum	*Astragalus bibullatus*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Hairy rattleweed	*Baptisia arachnifera*	Medium	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Harperella	*Ptilimnium nodosum*	Medium	Low	High	Riverine, and palustrine (NatureServe, 2015)	No Jeopardy
Houghton's goldenrod	*Solidago houghtonii*	Low	Low	High	Terrestrial and palustrine (NatureServe, 2015)	No Jeopardy
Jesup's milk-vetch	*Astragalus robbinsii* var. *jesupii*	High	Low	High	Riparian and forested wetlands (NatureServe, 2015)	No Jeopardy
Lakeside daisy	*Hymenoxys herbacea*	High	Low	High	Alvar habitat (flat limestone or dolostone bedrock with thin to no soil, few to no tress, and subject to seasonal drought) (USFWS, 2021)	No Jeopardy
Leafy prairie-clover	*Dalea foliosa*	Medium	Low	High	Terrestrial, riverine, palustrine (NatureServe, 2015)	No Jeopardy
Leedy's roseroot	*Rhodiola integrifolia* ssp. *leedyi*	High	Low	High	Cliff ledges and talus slopes (NatureServe, 2015)	No Jeopardy
MacFarlane's four-o'clock	*Mirabilis macfarlanei*	High	Low	High	Grasslands (NatureServe, 2015)	No Jeopardy
Mead's milkweed	*Asclepias meadii*	Medium	Low	High	Grasslands (NatureServe, 2015)	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
Michaux's sumac	*Rhus michauxii*	Medium	Low	High	Woodlands (NatureServe, 2015)	No Jeopardy
Missouri bladderpod	*Physaria filiformis*	Low	Low	High	Glades, barrens, outcrops, prairie, pastures (NatureServe, 2015)	No Jeopardy
Navasota false foxglove	*Agalinis navasotensis*	High	Low	High	Outcrops, prairie, grasslands (USFWS, 2023)	No Jeopardy
Neches River rose-mallow	*Hibiscus dasycalyx*	Medium	Low	High	Swamps, edges of riparian woodlands (NatureServe, 2015)	No Jeopardy
No common name	*Geocarpon minimum*	Low	Low	High	Terrestrial, palustrine (NatureServe, 2015)	No Jeopardy
Peter's Mountain mallow	*Iliamna corei*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Prairie bush-clover	*Lespedeza leptostachya*	Low	Low	High	Grasslands (NatureServe, 2015)	No Jeopardy
Price's potato-bean	*Apios priceana*	Low	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Prostrate milkweed	*Asclepias prostrata*	High	Low	High	Grasslands, shrublands (NatureServe, 2015)	No Jeopardy
Pygmy fringe-tree	*Chionanthus pygmaeus*	High	Low	High	Dry/Xeric hammocks, woodland, transitional habitats (NatureServe, 2015)	No Jeopardy
Rugel's pawpaw	*Deeringothamnus rugelii*	Medium	Low	High	Flatwoods with an open canopy of slash pine or longleaf pine, some disturbed habitats (NatureServe, 2015)	No Jeopardy
Ruth's golden aster	*Pityopsis ruthii*	High	Low	High	Riparian, herbaceous wetlands (NatureServe, 2015)	No Jeopardy
Sandplain gerardia	*Agalinis acuta*	Low	Low	High	Grasslands, shrublands (NatureServe, 2015)	No Jeopardy
Schweinitz's sunflower	*Helianthus schweinitzii*	Medium	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Scrub plum	*Prunus geniculata*	Medium	Low	High	Turkey oak sandhill and evergreen oak-sand pine (NatureServe, 2015)	No Jeopardy
Shale barren rock cress	*Boechera serotina*	Medium	Low	High	Woodlands, bare rock (NatureServe, 2015)	No Jeopardy

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
Short's goldenrod	*Solidago shortii*	High	Low	High	Riparian, herbaceous wetlands (NatureServe, 2015)	No Jeopardy
Showy stickseed	*Hackelia venusta*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Slickspot peppergrass	*Lepidium papilliferum*	Medium	Low	High	Shrubland, chaparral (NatureServe, 2015)	No Jeopardy
Small-anthered bittercress	*Cardamine micranthera*	High	Low	High	Palustrine, terrestrial (NatureServe, 2015)	No Jeopardy
Smooth coneflower	*Echinacea laevigata*	Medium	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
South Llano Springs moss	*Donrichardsia macroneuron*	High	Low	High	Constantly flowing, mineral-rich spring water (USFWS, 2018)	No Jeopardy
Spalding's catchfly	*Silene spaldingii*	Medium	Low	High	Palouse prairie (NatureServe, 2015)	No Jeopardy
Steamboat buckwheat	*Eriogonum ovalifolium var. williamsiae*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Swale paintbrush	*Castilleja ornata*	High	Low	High	Grasslands and temporary palustrine pools (NatureServe, 2015)	No Jeopardy
Texas ayenia	*Ayenia limitaris*	High	Low	High	Riparian, forested wetland (NatureServe, 2015)	No Jeopardy
Texas poppy-mallow	*Callirhoe scabriuscula*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Texas prairie dawn-flower	*Hymenoxys texana*	Medium	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Tiehm's buckwheat	*Eriogonum tiehmii*	High	Low	High	Dry, upland sites (USFWS, 2022b)	No Jeopardy
Umtanum desert buckwheat	*Eriogonum codium*	High	Low	High	Grasslands (NatureServe, 2015)	No Jeopardy
Virginia spiraea	*Spiraea virginiana*	Medium	Low	High	Riverine, Palustrine, and terrestrial (NatureServe, 2015)	No Jeopardy
White Bluffs bladderpod	*Physaria douglasii ssp. tuplashensis*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy

Given that herbicides like simazine are designed to control plants, we assume all listed plant species are sensitive to simazine exposure and no significant difference in the toxicity of simazine among major plant taxa (e.g., dicots, monocots, non-flowering plants) is expected. In general, we anticipate individuals exposed to simazine, from agricultural or non-agricultural use sites, are likely to experience direct adverse effects in the form of reduced biomass and growth, which, in severe cases, would result in mortality of individuals. As such, all species in Table 5 have high toxicity rankings. We do not expect reductions in pollinators and seed dispersers of listed plant species from simazine exposure, and therefore, indirect adverse effects are not likely to occur for these species.

In addition, most of the species in Table 5 have medium or high vulnerability rankings. While these species may be more vulnerable to adverse effects from pesticides than species with low vulnerability rankings, all species in this group have a low exposure ranking. The low exposure ranking results from the combination of several factors. First, the conservation measures already on the label are expected to reduce exposure of the species to spray drift and runoff from agricultural use sites. These measures include restricting use to a maximum windspeed of 10 miles per hour, prohibiting applications during temperature inversions, 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, using ground applications only, and maintaining buffers from waterways. These measures, combined with conservation measures implemented through the Herbicide Strategy (i.e., 15-foot spray drift buffer and three runoff mitigation points) are anticipated to reduce off-site transport to the habitats of listed species by 90% or more.

In addition to agricultural exposure, simazine is registered for use on non-agricultural areas for nurseries and turf, including lawns and golf courses. Based on individual reviews of available life history information for the species in Table 5, we expect non-agricultural use sites of simazine do not provide the species' necessary habitat (e.g., prairies, bluffs, outcrops) for 50 of the 52 species in this table. Therefore, these species are unlikely to occur on or near non-agricultural use sites of simazine and as such we do not expect them to be exposed to simazine from non-agricultural use. Two species may occur on non-agricultural use sites: Michaux's sumac and sandplain gerardia. Michaux's sumac populations occur near (but not on) developed areas that may contain lawns treated with simazine. The sandplain gerardia occurs on several cemetery properties where turf is managed. However, we expect these species will experience low levels of simazine exposure from non-agricultural uses as we anticipate common pesticide use practices and use site characteristics (e.g., use of coarse droplet sizes only, continuous vegetative cover, no till) will greatly reduce the extent of off-site transport of simazine as well as reduce the exposure concentrations for any off-site exposure that does still occur. For the sandplain gerardia, all populations that occur on cemetery lands have conservation agreements in place that ensure management for the continued existence of the species on the property, thus making it unlikely simazine would be used in a manner that would expose the species at these sites (USFWS 2019).

As we anticipate very small numbers of individuals of the species in Table 5 are likely to be exposed to simazine, we expect the proposed action will result in direct adverse effects (e.g., reduced biomass, growth, or survival) of, at most, a very small number of individuals of these species. We do not expect indirect adverse effects through reductions in pollinators or seed dispersers 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 expected to appreciably reduce 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 species listed in Table 5.

References:

NatureServe. 2015. NatureServe Explorer. explorer.natureserve.org [accessed July 15, 2025]

U.S. Fish and Wildlife Service. 2024. Chapman Rhododendron (*Rhododendron chapmanii*) 5-Year Status Review: Summary and Evaluation. Panama City, Florida. 14 pp.

U.S. Fish and wildlife Service. 2023. Species Status Assessment Report for the Navasota False Foxglove. Houston, Texas. 39 pp.

U.S. Fish and Wildlife Service. 2022a. Ashy dogweed (*Thymophylla tephroleuca*) 5-Year Status Review: Summary and Evaluation. Corpus Christi, Texas. 6 pp.

U.S. Fish and wildlife Service. 2022b. Species Status Assessment Report *Eriogonum tiehmii* (Tiehm's buckwheat). Version 2.0. Sacramento, California. 80 pp.

U.S. Fish and Wildlife Service. 2021. Lakeside Daisy (*Tetraneuris herbacea*) 5-Year Status Review: Summary and Evaluation. Columbus, Ohio. 38 pp.

U.S. Fish and wildlife Service. 2019. Sandplain Gerardia (*Agalinis acuta*) 5-year Review: Summary and Evaluation. Cortland, New York. 14 pp.

U.S. Fish and wildlife Service. 2018. Species Status Assessment Report for South Llano Springs Moss. Albuquerque, New Mexico. 69 pp.

Species with Individual Integration and Synthesis Summaries

The species in Table 6 have individual Integration and Synthesis summaries. 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 and reduce the likelihood, magnitude, and frequency of exposure to a level where no more than low levels of adverse effects are likely to occur to plants through this exposure route. While the conservation measures on the label 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 plant 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 6. Species with Individual Integration and Synthesis Summaries

Common Name	Scientific Name	Determination
Kentucky glade cress	*Leavenworthia exigua laciniata*	No Jeopardy
Pallid manzanita	*Arctostaphylos pallida*	No Jeopardy
Presidio clarkia	*Clarkia franciscana*	No Jeopardy
Slender rush-pea	*Hoffmannseggia tenella*	No Jeopardy

Integration and Synthesis Summary: Kentucky glade cress

Scientific Name:	Common Name:	Entity ID:
Leavenworthia exigua laciniata	Kentucky glade cress	7167

Conclusion: No Jeopardy

Species Range

Based on range map dated: 12/28/2023; Wherever found; *States within the range:* KY

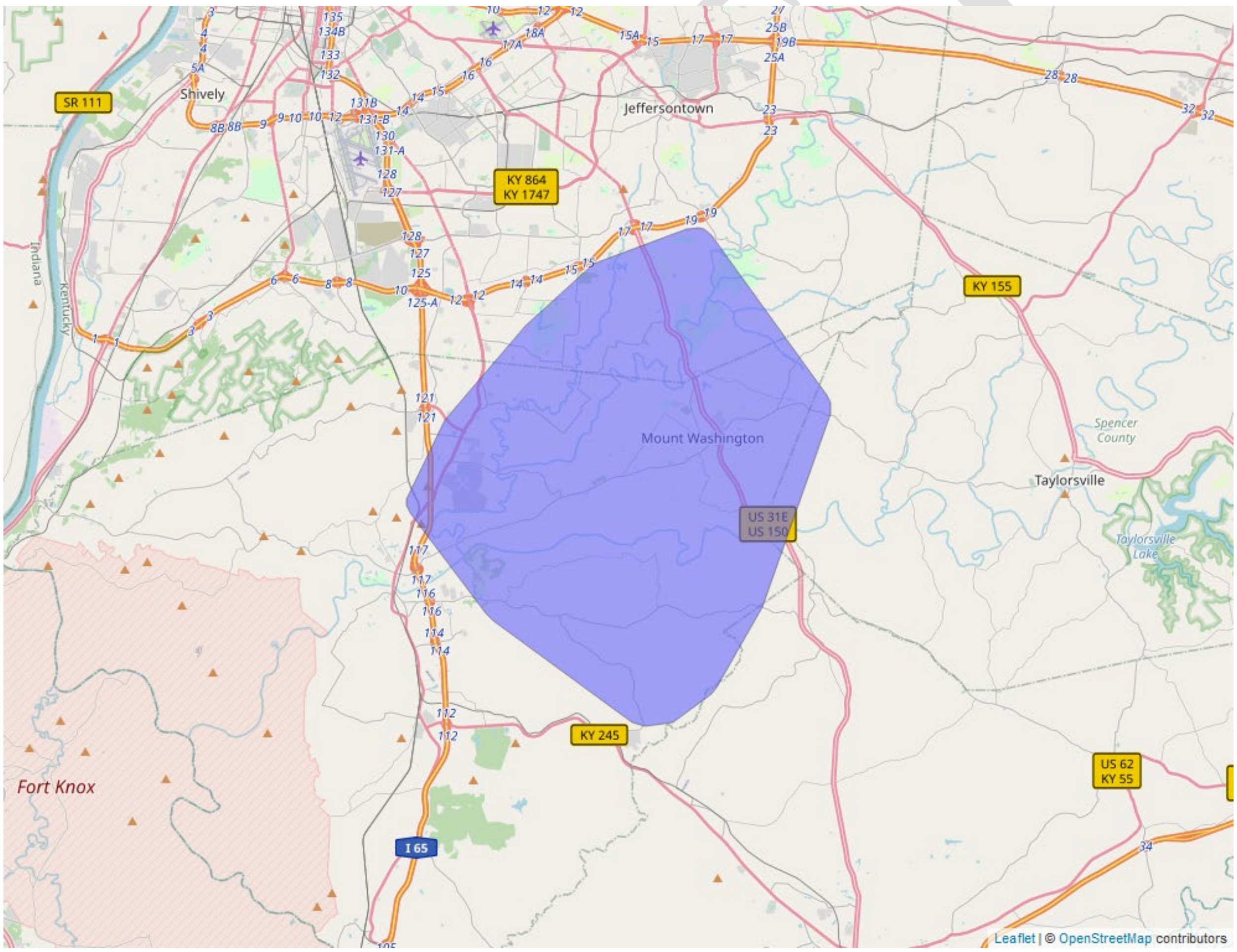

Figure 2. Range map of Kentucky glade cress (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/698.

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

Most recent 5-year review recommendation: No change in Status

Most recently completed 5-year review: 9/3/2020

Listing status: Threatened

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, herbicides

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Kentucky glade cress is a federally threatened, small winter annual in the mustard family (Brassicaceae) endemic to mesic cedar glades in the Inner Bluegrass Region of Kentucky. It is restricted to Bullitt and Jefferson Counties and grows in thin, rocky soils over flat-bedded Ordovician limestone, completing its life cycle during the cool season — germinating in fall, overwintering as a rosette, and flowering in early spring (USFWS 2020, 2022).

As of 2020, there were 48 known extant occurrences of Kentucky glade cress, including 28 populations ranked as high- or moderate-quality and five considered highly resilient (USFWS 2020). The largest population, located on The Nature Conservancy's Eastview Preserve, has documented thousands of individuals during favorable years. Other significant populations occur on Fort Knox and the Jim Beam Brands Company property in Bullitt County. Approximately 34 percent of the species' known populations are protected or managed through conservation agreements (USFWS 2020).

Kentucky glade cress depends on open, seasonally wet glade habitats that are typically saturated in winter and spring, then dry and exposed in summer. The species is intolerant of heavy disturbance, shading, or changes in soil hydrology (USFWS 2022). It can continue to persist for some time in glades that have been converted from their natural conditions to pastures, lawns, and roadsides. Although it has a limited range, it can be locally abundant in high-quality habitat (USFWS 2020, 2022).

Primary threats include habitat loss, fragmentation, and degradation from residential and commercial development, especially in the fast-growing Louisville metropolitan region. This threat includes the application of herbicides, particularly in residential areas (lawns) or rights-of-way prior to seed set (USFWS 2014, 2020). Additional threats include hydrologic alteration (e.g., drainage or compaction), invasion by nonnative species, and cedar encroachment that reduces habitat openness (USFWS 2020). Because of its annual life cycle and short dispersal range, the species is particularly vulnerable to environmental and land-use changes. Conservation efforts focus on habitat management and maintaining glade hydrology through partnerships with private landowners and land trusts (USFWS 2022, 2020).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 7.8% of the species' range overlaps with agricultural use sites and 92.2% 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 [7] 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 Kentucky glade cress.

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	7.4	68.6	76	7.4	68.6	76
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	0.3	26.1	26.5	<0.1	<0.1	<0.1

[7] Total overlap is capped at 100%.

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Other Orchards	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	<0.1	0.6	0.7	<0.1	0.6	0.7
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**7.8**	**92.2**	**100**[7]	**7.4**	**69.2**	**76.6**

Usage

Past usage data indicate that up to 76.6% of the species' range has been treated with simazine annually from agricultural uses, with 7.4% occurring on agricultural fields and 69.2% resulting from off-site transport.

Additional Exposure Considerations

We do not have information to indicate that Kentucky glade cress will occur on agricultural use sites of simazine, and therefore, do not expect on-field exposure for this species.

Exposure from Non-Agricultural Uses

Kentucky glade cress is a winter annual and herbicide application on lawns, rights of way, and roadsides is identified as at threat for this species. Currently, 22 of 61 extant occurrences are in lawns or other landscaped habitats. As such, non-agricultural use of simazine could be a source of exposure for this species. However, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage in residential areas within the range of the Kentucky glade cress to be limited. Furthermore, most areas converted to lawns that have extant or historic Kentucky glade cress records have been seeded with tall fescue (*Schedonorus arundinacea*) a common cool-season grass in Kentucky that will not survive an application of simazine (see *Exposure to Non-Agricultural Uses*, above), thus simazine application in these areas is unlikely (USFWS 2020).

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. Particularly relevant for aquatic species, three runoff mitigation points are also 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

Based on toxicity data available for simazine in plant species, we expect that exposure of individuals that occur on simazine use sites will result in large impacts to growth, which, if severe enough, can result in mortality. While we anticipate simazine use can impact the growth and survival of plant species off-field (exposure through spray drift or runoff), we expect implementation of conservation measures on product labels to reduce the likelihood, magnitude, and frequency of exposure such that we anticipate no more than low level effects to few individuals in these areas.

Indirect Effects

We do not expect that simazine use will result in any indirect adverse effects to individual plants as we do not anticipate simazine is likely to reduce the abundance and availability of the insect pollinator species necessary to support reproduction.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a large percentage of the species' range will be treated with simazine on agricultural fields annually. We do not expect Kentucky glade cress to occur on agricultural fields but could be exposed to simazine through off-site transport. With implementation of conservation measures on product labels, we expect that few individuals will be exposed to simazine via off-site transport and will experience no more than low level of adverse effects to growth and survival.

Kentucky glade cress is known to occur in residential areas, with 22 of 61 extant occurrences in lawns or other landscaped habitats. We expect that exposure from this use would lead to large impacts to growth, which, if severe enough, can result in mortality. Simazine is generally used as a pre-emergent herbicide in spring or fall, so fall applications could coincide with Kentucky glade cress germination and spring applications with the species' flowering period However, we do not expect simazine to be a commonly used herbicide on residential turf, and as such, we expect simazine usage on lawns within the range of the Kentucky glade cress, if any, will be limited.

We conclude the overall risk of adverse effects to the species is low.

Species Conclusion

Kentucky glade cress is a winter annual found in only two counties in Kentucky. It historically occurred in mesic cedar glades, and while many populations now exist in degraded habitats, the species can continue to persist for some time in glades that have been converted to pastures, lawns, and roadsides. The species completes its life cycle during the cool season — germinating in fall, overwintering as a rosette, and flowering in early spring (USFWS 2020, 2022).

After accounting for spray drift and runoff conservation measures on the simazine label, we expect the Kentucky glade cress has the potential to experience appreciable exposure to simazine only if it occurs on a use site. As indicated above, we do not expect the species to occur on agricultural fields. While the Kentucky glade cress does occur on lawns in residential areas, simazine is rarely used on residential turf. In addition, many of the lawns where the glade cress is found are reported to be populated with tall fescue, a cool-season grass to which simazine cannot be applied. As such, we expect very limited exposure, if any, from simazine use on lawns. In addition, we do not anticipate indirect effects from simazine exposure to the insect pollinators this species relies on for reproduction.

Due to incorporation of the label modifications as described in the Conservation Measures section above, rare use of simazine on lawns, and lack of indirect effects to pollinators, we expect exposure and direct adverse effects (i.e., death or reduced growth) for the Kentucky glade cress to be low. 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 Kentucky glade cress. Thus, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of the Kentucky glade cress.

References

U.S. Fish and Wildlife Service. 2022. Final Recovery Plan for the Kentucky Glade Cress (*Leavenworthis exigua var. lacinata*). Frankfort, Kentucky.

U.S. Fish and Wildlife Service. 2020. Species Status Assessment for the Kentucky Glade Cress (*Leavenworthis exigua var. laciniata*). Version 1.0. Atlanta, Georgia.

U.S. Fish and Wildlife Service. 2020. Kentucky glade cress (*Leavenworthia exigua* var. *lacinata*) 5-Year Review: Summary and Evaluation. Frankfort, Kentucky. 13 pp.

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Threatened Species Status for *Leavenworthia exigua var. laciniata* (Kentucky Glade Cress). Federal Register 79(87):25683–25694.

Integration and Synthesis Summary: Pallid manzanita

Scientific Name:	Common Name:	Entity ID:
Arctostaphylos pallida	Pallid manzanita	505

Conclusion: No Jeopardy

Species Range

Based on range map dated: 11/16/2015; Wherever found; *States within the range:* CA

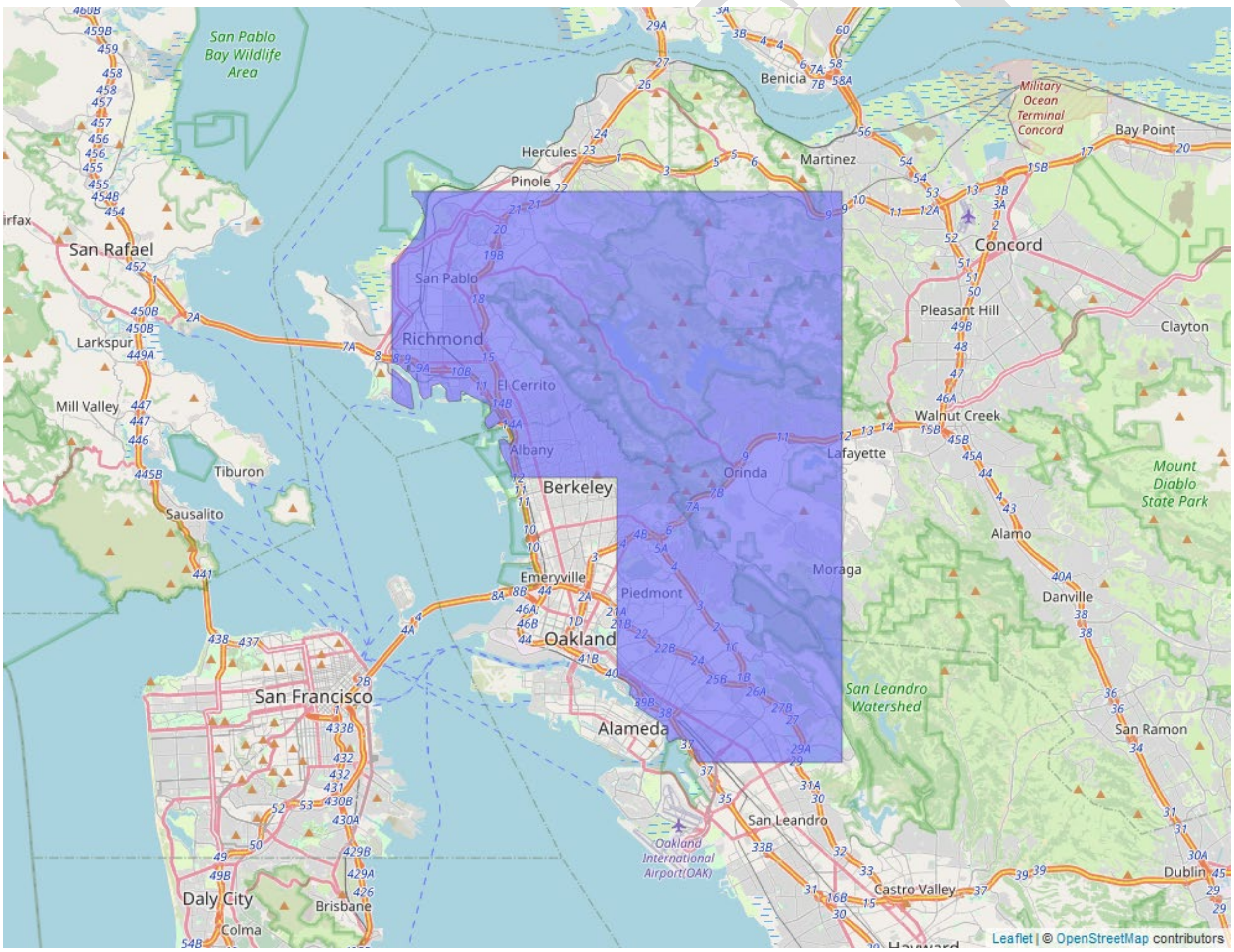

Figure 3. Range map of pallid manzanita (blue polygons). Range map accessed at http://ecos.fws.gov/ecp/species/8292.

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: 8/23/2023

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: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Pallid manzanita occurs in three populations across western Contra Costa and Alameda counties, California. There are 13 documented occurrences of pallid manzanita. They are all extant, naturally occurring populations in two geographic regions: Huckleberry Ridge in Alameda County and Sobrante Ridge in Contra Costa County, California. There are likely dormant seed banks of pallid manzanita across the range of the species, as indicated by the presence of germinated seeds at several sites in Joaquin Miller Park following soil disturbance and/or burning. The largest concentration of pallid manzanita occurs on Huckleberry Ridge, with many stands distributed across connected and adjacent ridge tops. The largest stands by number and size occur along the boundary between East Bay Regional Park District's Huckleberry Botanic Regional Preserve (Preserve) and private properties to the west, primarily on northeast-facing slopes and extending southwest over the top of the ridge into the urban development of Skyline Boulevard. The second-largest concentration of pallid manzanita occurs at Sobrante Ridge in the Preserve's Sobrante Ridge Ecological Preserve. A 2004 survey indicated the population existed within 1.33 acres at Sobrante Ridge. There also exists a small, naturalized population at Tilden Park was planted in the 1930s-1940s and is divided into two stands. One is scattered along the roadside of Wildcat Canyon Road, and the other is along the Selby Trail north of Shasta Road (USFWS 2015, 2023). Estimates from 2023 suggest there are 2,444 mature plants and 133 seedlings distribution-wide. There appear to have been increases across most of the species' occurrences between 2011-2023, partially due to propagation, tree removal, and other habitat management.

Primary threats to pallid manzanita include effects of fire suppression, shading and competition from native and non-native plants, infection by fungal pathogens (*Phytophthora* and potentially *Botryosphaeria*), herbicide spraying, hybridization, and ongoing effects of habitat loss and fragmentation from human development. While herbicide spraying was identified as a threat to the species at the time of listing (1998), it is no longer considered a concern (USFWS 2023).

Many populations show signs of hybridization with other *Arctostaphylos* species and *Phytophthora* infection (USFWS 2023). In addition, pallid manzanita are known to grow on residential lawns (USFWS 2015).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 5.8% of the species' range overlaps with agricultural use sites and 39.3% 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 approximately 45.1% overlap between the species' range and the agricultural footprint of simazine use sites (Table 8).

Table 8. Agricultural use overlap and annual usage data (% Range Treated) for the pallid manzanita.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)
Citrus	<0.1	<0.1	<0.1
Corn	<0.1	1.1	1.1
Grapes	<0.1	1.3	1.3
Other Crops	5.8	25.5	31.3
Other Orchards	<0.1	9.7	9.7
Vegetables and Ground Fruit	<0.1	1.7	1.7
Christmas Trees	0	0	0
Total	**5.8**	**39.3**	**45.1**

Usage

Mandatory reporting data from the state of California indicates that, between 2013-2022, the maximum yearly overlap between the species' range with agricultural and non-agricultural commercial usage was 0.6% for those reporting any pesticide usage and 0.4% for those reporting use of any herbicide (Table 9). There were no reports of simazine usage within the range of the pallid manzanita.

Table 9. Simazine and herbicide usage data for the pallid manzanita from the California Department of Pesticide Regulation Pesticide Use Reporting (CalPUR).

% overlap with all pesticide usage areas	% overlap with all herbicide usage areas	% overlap with simazine usage areas
0.58	0.44	0

Additional Exposure Considerations

We do not expect pallid manzanita to occur on agricultural fields.

Exposure from Non-Agricultural Uses

Pallid manzanita occurs on residential lawns and residential herbicide use is a known threat, particularly for controlling roadside vegetation in the residential development adjacent to Huckleberry Preserve (USFWS 2015). As such, non-agricultural use of simazine could be a source of exposure for this species. However, 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 the pallid manzanita to be limited. In addition, we expect off-site transport from spray drift and runoff from these uses to be minimal.

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. Particularly relevant for aquatic species, three runoff mitigation points are also 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

Based on toxicity data available for simazine in plant species, we expect that exposure of individuals that occur on simazine use sites will result in large impacts to growth, which, if severe enough, can result in mortality. While we anticipate simazine use can impact the growth and survival of plant species off-field (exposure through spray drift or runoff), we expect implementation of conservation measures on product labels to reduce the likelihood, magnitude, and frequency of exposure such that we anticipate no more than low level effects to few individuals in these areas.

Indirect Effects

We do not expect that simazine use will result in any indirect adverse effects to individual plants as we do not anticipate simazine is likely to reduce the abundance and availability of the insect pollinators necessary to support reproduction for the pallid manzanita.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area. However, given that CalPUR data indicate very little overlap (0.4%) between the range and reported usage of herbicides in general and no usage of simazine within the range, we have high confidence that very little simazine, if any, will be used for agricultural and non-agricultural commercial uses. Pallid manzanita is known to occur in and around residential lawns. We expect large impacts to growth, which, if severe enough, can result in mortality for individuals exposed on treated lawns. We expect off-site transport from turf use to be minimal, and as such, do not expect concentrations of simazine to result in adverse effects to individuals exposed off-site. However, we do not expect simazine to be a commonly used herbicide on residential turf, and as such, we expect simazine usage on lawns within the range of the pallid manzanita, if any, will be limited.

Given that few individuals, if any, are expected to be exposed on simazine use sites and the implementation of the conservation measures on product labels, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

Pallid manzanita is an evergreen shrub found in the maritime chaparral of western Contra Costa and Alameda Counties, California. There are 13 extant occurrences in two geographic regions: Huckleberry Ridge in Alameda County and Sobrante Ridge in Contra Costa County. Estimates from 2023 suggest there are 2,444 mature plants and 133 seedlings range-wide. There appear to have been increases across most of the species' occurrences between 2011-2023, partially due to propagation, tree removal, and other habitat management. Pallid manzanita is known to grow on residential lawns, but while herbicide spraying was identified as a threat to the species at the time of listing (1998), it is no longer considered a concern (USFWS 2023).

After accounting for spray drift and runoff conservation measures on the simazine label, we expect the pallid manzanita has the potential to experience appreciable exposure to simazine only if it occurs on a use site. As indicated above, we do not expect the species to occur on agricultural fields. While the pallid manzanita can occur on lawns in residential areas, simazine is rarely used on residential turf, and herbicide spraying in such areas is no longer considered a threat. As such, we expect very limited exposure, if any, from simazine use on lawns. In addition, we do not anticipate indirect effects from simazine exposure to the insect pollinators this species relies on for reproduction.

Due to incorporation of the label modifications as described in the Conservation Measures section above, rare use of simazine on lawns, and lack of indirect effects to pollinators, we expect exposure and direct adverse effects (i.e., death or reduced growth) for the pallid manzanita to be low. 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 registration of simazine, as proposed, is not likely to jeopardize the continued existence of the pallid manzanita.

References

U.S. Fish and Wildlife Service. 2023. 5-Year Review Pallid Manzanita (*Arctostaphylos pallida*). Sacramento, California. 8 pp.

U.S. Fish and Wildlife Service. 2015. Recovery Plan for *Arctostaphylos pallida* (pallid manzanita). Sacramento, California. 49 pp.

Integration and Synthesis Summary: Presidio clarkia

Scientific Name:	Common Name:	Entity ID:
Clarkia franciscana	Presidio clarkia	669

Conclusion: No Jeopardy

Species Range

Based on range map dated: 11/16/2015; Wherever found; *States within the range:* CA

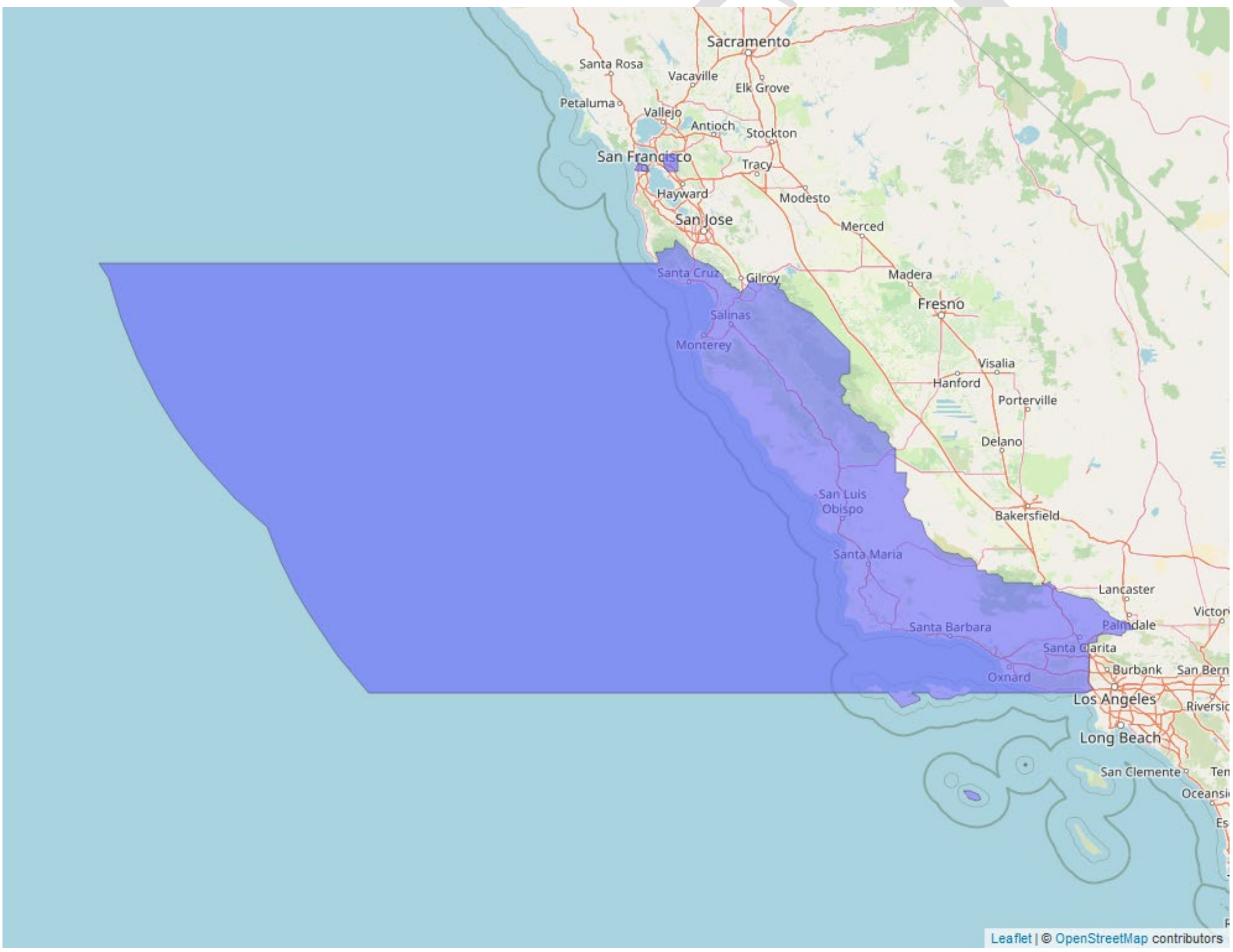

Figure 4. Range map of Presidio clarkia (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/3890.

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: 8/1/2024

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: No

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

Presidio clarkia is a slender, erect annual herb in the evening primrose family (Onagraceae) that is narrowly endemic to serpentine soils in the San Francisco Bay Area. It is found only in two highly urbanized locations: the Presidio of San Francisco and the Oakland Hills in Alameda County. The species grows in grassland and coastal scrub communities and is associated with thin, nutrient-poor serpentine soils. Presidio clarkia is thought to be predominantly self-pollinated, though small sweat bees (halictids) have been observed visiting the flowers and may act as occasional pollinators (USFWS 2024).

As of the most recent 5-year review, five populations are recognized: three in the Presidio (including one established in 2008) and two in the Oakland Hills, which have since been subdivided into 13 subpopulations due to finer-scale mapping. These populations are disjunct and genetically distinct, with very low genetic variability within sites. Most Presidio populations are protected on public lands managed by the National Park Service and Presidio Trust, while in the Oakland Hills, only one subpopulation is on protected public land (Redwood Regional Park) (USFWS 2008, 2024).

Presidio clarkia is threatened by ongoing urban development, habitat fragmentation, invasive plant competition, altered disturbance regimes, and herbivory. In the Oakland Hills, fireprevention mowing, and gopher activity have damaged habitat and extirpated at least one subpopulation. The species' restricted range and dependence on specific soil and disturbance conditions contribute to its vulnerability. However, overall trends suggest some populations are stable or increasing, and conservation efforts, including habitat management and population augmentation, have been implemented (USFWS 2008, 2024).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.6% of the species' range overlaps with agricultural use sites and 40.2% 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 40.8% overlap 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 Presidio clarkia.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)
Citrus	<0.1	<0.1	<0.1
Corn	<0.1	1.9	2
Grapes	<0.1	1.7	1.7
Other Crops	0.3	16.3	16.6
Other Orchards	0.2	20.2	20.4
Vegetables and Ground Fruit	<0.1	1.9	1.9
Christmas Trees	<0.1	<0.1	<0.1
Total	**0.6**	**40.2**	**40.8**

Usage

Mandatory reporting data from the state of California indicates that, between 2013-2022, the maximum yearly overlap between the species' range with agricultural and non-agricultural commercial usage was 0.2% for those reporting any pesticide usage and <0.1% for those reporting use of any herbicide (Table 11). There were no reports of simazine usage within the range of Presidio clarkia.

Table 11. Overlap of usage areas within the range of the Presidio clarkia.

% overlap with all pesticide usage areas	% overlap with all herbicide usage areas	% overlap with simazine usage areas
0.2	<0.1	0

Additional Exposure Considerations

We do not expect Presidio clarkia to occur on agricultural fields.

Exposure from Non-Agricultural Uses

Of the subpopulations of Presidio clarkia that are not on protected lands, some are known to occur in residential and suburban areas where lawns may be present. As such, non-agricultural use of simazine could be a source of exposure for this species. However, 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 Presidio clarkia to be limited. In addition, we expect off-site transport from spray drift and runoff from these uses to be minimal.

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. Particularly relevant for aquatic species, three runoff mitigation points are also 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

Based on toxicity data available for simazine in plant species, we expect that exposure of individuals that occur on simazine use sites will result in large impacts to growth, which, if severe enough, can result in mortality. While we anticipate simazine use can impact the growth and survival of plant species off-field (exposure through spray drift or runoff), we expect the implementation of conservation measures on product labels to reduce the likelihood, magnitude, and frequency of exposure such that we anticipate no more than low level effects to few individuals in these areas.

Indirect Effects

We do not expect that simazine use will result in any indirect adverse effects to individual plants as we do not anticipate simazine is likely to reduce the abundance and availability of the insect pollinator species necessary to support reproduction for the Presidio clarkia.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area. However, given that CalPUR data indicate very little overlap (<0.1%) between the range and reported usage of herbicides in general and no usage of simazine within the range, we have high confidence that very little simazine, if any, will be used for agricultural and non-agricultural commercial uses. For the subpopulations of Presidio clarkia not on protected lands, some have been known to occur in residential and suburban areas where lawns may be present. If exposed on treated lawns in these areas, we expect large impacts to growth, which, if severe enough, can result in mortality. We expect off-site transport from turf use to be minimal, and as such, do not expect concentrations of simazine to result in adverse effects to individuals exposed off-site. However, we do not expect simazine to be a commonly used herbicide on residential turf, and as such, we expect simazine usage on lawns within the range of the Presidio clarkia will be limited.

Given the presence of many individuals on protected lands, and the limited usage of simazine within the range of the Presidio clarkia, we expected few individuals, if any, are expected to be exposed on simazine use sites. Given this low exposure and the implementation of the conservation measures on product labels, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

Presidio clarkia is a slender, erect annual herb that is endemic to serpentine soils in the San Francisco Bay Area. As of the most recent 5-year review, five populations are recognized in a highly urbanized area: three in the Presidio (including one established in 2008) and two in the Oakland Hills (USFWS 2024). While many occurrences of the species are in protected areas, some have been known to occur in urban and suburban areas where lawns are present. Presidio clarkia is threatened by ongoing urban development, habitat fragmentation, invasive plant competition, altered disturbance regimes, and herbivory. However, overall trends suggest some populations are stable or increasing, and conservation efforts, including habitat management and population augmentation, have been implemented (USFWS 2008, 2024).

After accounting for spray drift and runoff conservation measures on the simazine label, we expect the Presidio clarkia has the potential to experience appreciable exposure to simazine only if it occurs on a use site. As indicated above, we do not expect the species to occur on agricultural fields. While the Presidio clarkia does occur in urban and suburban areas where lawns may be present, simazine is rarely used on residential turf, and many occurrences are on protected lands where simazine exposure is unlikely. As such, we expect very limited exposure, if any, from simazine use on lawns. In addition, we do not anticipate indirect effects from simazine exposure to the insect pollinators this species relies on for reproduction.

Due to incorporation of the label modifications as described in the Conservation Measures section above, rare use of simazine on lawns, occurrence of many individuals on protected lands, and lack of indirect effects to pollinators, we expect exposure and direct adverse effects (i.e., death or reduced growth) for the Presidio clarkia to be low. 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 Presidio clarkia. Thus, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of the Presidio clarkia.

References

U.S. Fish and Wildlife Service. 2024. Presidio clarkia (*Clarkia franciscana*) 5-Year Review: Summary and Evaluation. Sacramento, California. pp. 21.

U.S. Fish and Wildlife Service. 2008. Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, Amendment 7 for *Clarkia franciscana*. Sacramento, California. pp. 38.

Integration and Synthesis Summary: Slender rush-pea

Scientific Name:	Common Name:	Entity ID:
Hoffmannseggia tenella	Slender rush-pea	739

Conclusion: No Jeopardy

Species Range

Based on range map dated: 1/27/2018; Wherever found; *States within the range:* TX

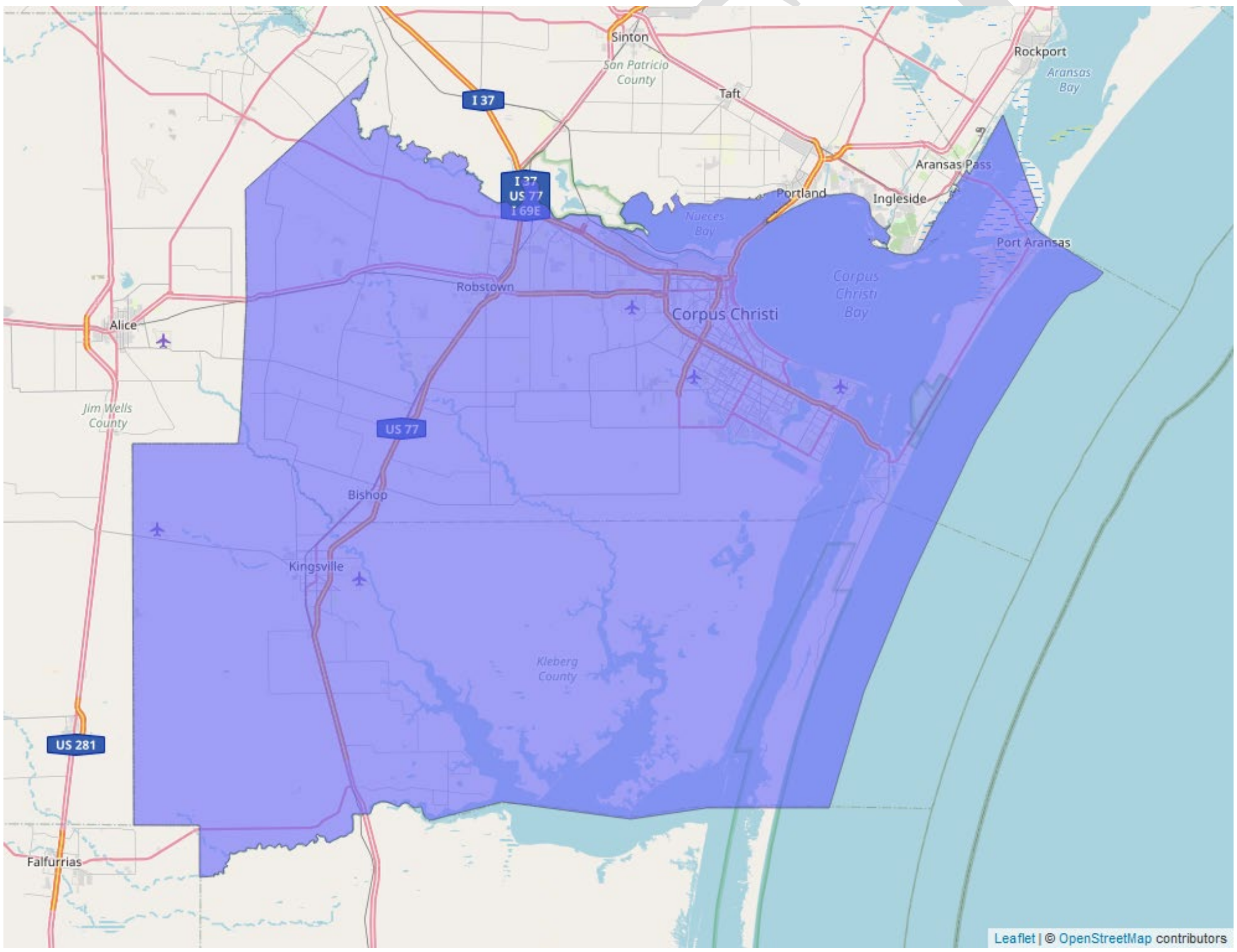

Figure 5. Range map of slender rush-pea (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5298.

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: 8/4/2022

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

Number of populations: Multiple populations (few)

Species trends: Unknown species trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Slender rush-pea is a narrow endemic known from two counties in Texas where it remains on rare patches of undisturbed prairie habitat. It has a high vulnerability based on its endangered status and limited distribution. Row-crop agriculture is prominent within its range and is the main cause of the loss of native short-grass prairie this species relies upon. There are eleven known populations, seven of which are on private land with no protections. Some populations occur on rights of way, roadsides, and developed lands (e.g., cemetery). The populations on private lands are highly threatened by habitat loss and fragmentation from agricultural and residential development, invasive pasture grasses, and localized disturbances such as mowing and road construction (USFWS 2008, 2018, 2022).

Habitat degradation through herbicide use is considered a threat, but only from certain herbicide use types and in certain locations. Use on cropland is not considered a widespread threat as crop fields only occur near a few occurrences (those located in rights-of-way – the highway 77 ROW populations). Herbicides are also used in other environments in which the rush-pea is known, including suburban and urban areas where these chemicals can be applied on lawns, parks, and golf courses (at the Naval Air Station Kingsville golf course). Herbicides are also used to control woody species in rangeland and in bodies of water to control aquatic weeds and have the potential to be used in rangeland throughout the range of rush-pea. Depending on the type of application (hand or broadcast), restricting the effect of the agent can be difficult since both the native grassland species and nonnative grasses share similar physiological and phenological characteristics. Across the two-county area, we lack information on how widespread herbicide damage to the shortgrass prairie ecosystem has been (USFWS 2018).

The 2018 Recovery Plan states effective pollinators of the slender rush-pea have not been observed in the field or in a greenhouse setting. The rush-pea is thought to rely completely on self-pollination as the rate of fruit set is high despite the lack of observed floral visitors, and bagged flowers (i.e., when bags are placed over flowers to isolate them from pollinators) still produced fruit and viable seed (USFWS 2018). The slender rush-pea, like most legumes, likely relies on forcible or gradual dehiscence (ejection of the seeds from seed pods) for seed dispersal.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 7.6% of the species' range overlaps with agricultural use sites and 81.8% 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 approximately 89.3% overlap 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 slender rush-pea.

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	2.4	2.4	<0.1	<0.1	<0.1
Corn	7.1	44	51.1	7.1	44	51.1
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	0.5	32.2	32.7	<0.1	<0.1	<0.1
Other Orchards	<0.1	5.5	5.5	<0.1	5.5	5.5
Vegetables and Ground Fruit	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**7.6**	**81.8**	**89.3**	**7.1**	**49.6**	**56.6**

Usage

Past usage data indicate that up to 56.6% of the species' range has been treated with simazine annually from agricultural uses, with 7.1% occurring on agricultural fields and 49.6% resulting from off-site transport.

Additional Exposure Considerations

We do not expect the slender rush-pea to occur on agricultural fields and know of only a few occurrences that may occur adjacent to fields where exposure could occur from spray drift or runoff.

Non-Agricultural Uses

Where lawn and turf areas are planted with manicured grasses, we would not expect slender rush-pea to occur. If the property occurs in Kleberg or Nueces county and the lawn or grass is simply mowed native grass or a mixture of native and introduced grass, slender rush-pea may be present on the mowed site (Austin Field Office, 2025, pers. comm.). As such, non-agricultural use of simazine could be a source of exposure for this species. However, 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 the slender rush-pea 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. Particularly relevant for aquatic species, three runoff mitigation points are also 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

Based on toxicity data available for simazine in plant species, we expect that exposure of individuals that occur on simazine use sites will result in large impacts to growth, which, if severe enough, can result in mortality. While we anticipate simazine use can impact the growth and survival of plant species off-field (exposure through spray drift or runoff), we expect implementation of conservation measures on product labels to reduce the likelihood, magnitude, and frequency of exposure such that we anticipate no more than low level effects to few individuals in these areas.

Indirect Effects

The slender rush-pea does not rely on biotic pollinators or seed dispersers, and as such, we do not expect that simazine use will result in any indirect adverse effects to individual plants.

Effects of the Action Summary

There is a large extent of overlap between the species' range and the action area, and pesticide usage reporting indicates that a large percentage of the species' range will be treated with simazine on agricultural fields annually. However, we do not expect slender rush-pea to occur on agricultural fields, and few occurrences to occur adjacent to these areas. With implementation of conservation measures on product labels, we expect that few individuals will be exposed to simazine via off-site transport and will experience no more than low level of adverse effects to growth and survival. Slender rush-pea could occur in lawn and turf areas, but only in certain areas of the range, and if the area is limited to native grasses or a mixture of native and introduced grass. We do not expect the slender rush-pea to occur where turf areas are planted with manicured grasses. When individuals are exposed on treated turf, we expect large impacts to growth, which, if severe enough, can result in mortality. However, we do not expect simazine to be a commonly used herbicide on turf, and as such, we expect simazine usage on lawns within the range of the slender rush-pea, if any, will be limited. We expect off-site transport from turf use to be minimal, and as such, do not expect concentrations of simazine to result in adverse effects to individuals exposed off-site.

Given the limited conditions in which we expect the slender rush-pea to occur on turf, and the limited usage of simazine for this use, we expect few individuals, if any, will be exposed on simazine use sites. We conclude the overall risk of adverse effects to the species is low.

Species Conclusion

The slender rush-pea is a narrow endemic known from two counties in Texas where it remains on rare patches of undisturbed prairie habitat. Row-crop agriculture is prominent within its range and is the main cause of the loss of native short-grass prairie this species relies upon. There are eleven known populations, seven of which are on private land with no protections. Some populations occur on rights of way, roadsides, and developed lands (e.g., cemetery). The populations on private lands are highly threatened by habitat loss and fragmentation from agricultural and residential development, invasive pasture grasses, and localized disturbances such as mowing and road construction.

After accounting for spray drift and runoff conservation measures on the simazine label, we expect the slender rush-pea has the potential to experience appreciable exposure to simazine only if it occurs on a use site. As indicated above, we do not expect the species to occur on agricultural fields and rarely adjacent to them. While the slender rush-pea could occur in lawn and turf areas, only in limited areas that retain a mixture of native and introduced grasses and where we anticipate application of simazine would be unlikely. As such, we expect very limited exposure, if any, from simazine use on lawns or turf areas. In addition, we do not anticipate indirect effects from simazine exposure as this species relies on self-fertilization for reproduction.

Due to incorporation of the label modifications as described in the Conservation Measures section above, rare use of simazine on lawns and other turf, and lack of indirect effects, we expect exposure and direct adverse effects (i.e., death or reduced growth) for the slender rush-pea to be low. 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 the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the slender rush-pea.

References

U.S. Fish and Wildlife Service. 2022. Slender rush-pea (*Hoffmannseggia tenella*) 5-Year Review: Summary and Evaluation. Corpus Christi, Texas.

U.S. Fish and Wildlife Service. 2018. Texas Coastal Bend Shortgrass Prairie Multi-Species Recovery Plan: Including Slender Rush-Pea (*Hoffmannseggia tenella*) and South Texas Ambrosia (*Ambrosia cheiranthifolia*). Albuquerque, New Mexico.

C-B2. Dicot and Non-flowering Plants with Low Exposure Achieved Through Conservation Measures on the General Label: Integration and Synthesis Summaries

U.S. Fish and Wildlife Service. 2008. Slender Rush-pea (*Hoffmannseggia tenella*) 5-Year Review: Summary and Evaluation. Corpus Christi, Texas.

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 13, 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. However, these species are highly vulnerable, and while the conservation measures on the label 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 plant 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 13. Species requiring further analysis

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking
Fleshy-fruit gladecress	*Leavenworthia crassa*	High	High	High
Lyrate bladderpod	*Lesquerella lyrata*	High	High	High
Spring Creek bladderpod	*Lesquerella perforata*	High	High	High
Whorled sunflower	*Helianthus verticillatus*	High	High	High