Integration and Synthesis Summary for Plants

Plants in terrestrial habitats occurring near citrus, avocados, and olives

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 all occur in terrestrial habitats, occur near citrus, avocado, and olive use sites associated with higher simazine application rates, and were predicted by EPA to experience similar levels of exposure to 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 that will be added to the product label and conservation measures implemented through Pesticide Use Limitation Areas (PULAs) in EPA's Bulletins Live! Two (including those developed during this consultation through the Herbicide Strategy[1]; see Conservation Measures section below). For species in this group where we determined exposure was medium or high (i.e., based on overlap and/or usage), a higher level of mitigation was necessary (i.e., six runoff points implemented through PULAs) for certain simazine uses (i.e., citrus, avocados, and olives) as the general label allows higher application rates for these uses and the species are anticipated to experience higher levels of runoff exposure in areas where these uses occur.

Through implementation of the conservation measures from the Herbicide Strategy, we anticipate agricultural exposures in the terrestrial habitats where these species occur will be low.

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, particularly through runoff, may result in exposure to listed plant species in areas far from use sites.

[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/

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.

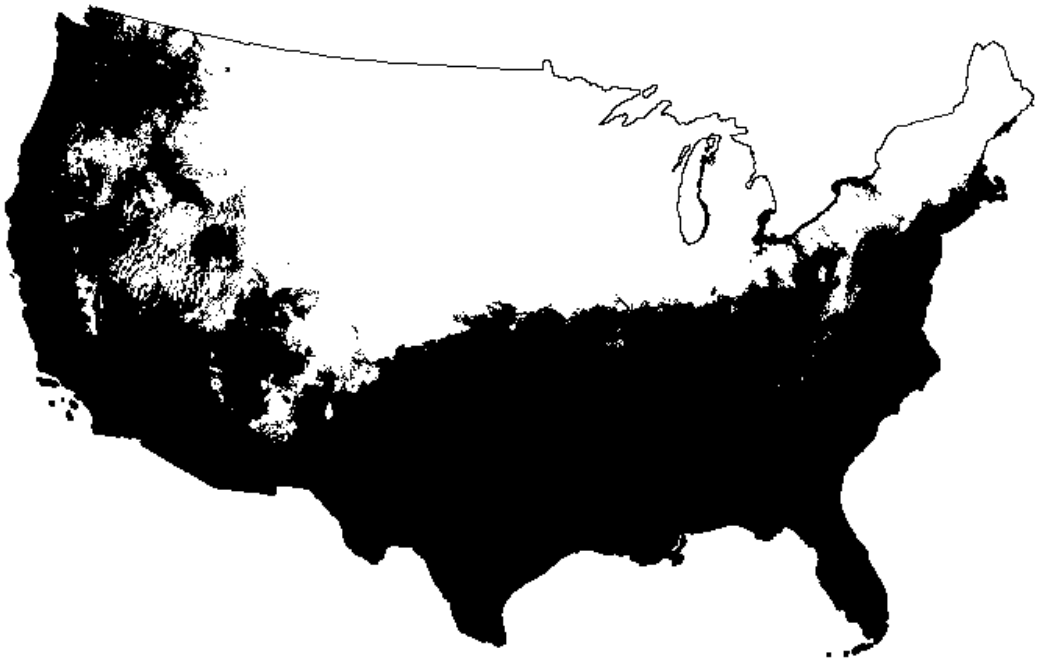

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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 mitigations (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 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

[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.

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 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 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,

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

- 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 three 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 mitigation measures identified on EPA's Mitigation Menu website[6].

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

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

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

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

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).

For some of the plant species in this I&S appendix, EPA identified additional runoff measures are needed for certain uses (i.e., citrus, avocados, and olives), and an additional three points (six points total; i.e., up to 99% reduction) will be required. EPA will communicate where additional runoff mitigation points are needed and for what specific simazine uses through their Bulletins Live! Two online platform, which all applicators are required to check before making pesticide applications. In areas requiring up to six runoff mitigation points total, EPA expects estimated environmental concentrations of simazine will decrease by up to two orders of magnitude (i.e., reduce pesticide loading to one-one hundredth of pre runoff mitigation levels).

Summary of conclusions for plants in terrestrial habitats occurring near citrus, avocados, and olives

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 the 57 plant species in this Appendix.

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 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 1 occur completely within California, and very little of their ranges have been treated with simazine in the past (0.0-2.2%) 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 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.

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Baker's larkspur	*Delphinium bakeri*	High	Low	High	0.3	No Jeopardy
California jewelflower	*Caulanthus californicus*	Medium	Low	High	0.3	No Jeopardy
Clara Hunt's milk-vetch	*Astragalus clarianus*	High	Low	High	0.3	No Jeopardy
Hartweg's golden sunburst	*Pseudobahia bahiifolia*	High	Low	High	0.5	No Jeopardy
Keck's checker-mallow	*Sidalcea keckii*	High	Low	High	0.3	No Jeopardy
Kern mallow	*Eremalche kernensis*	High	Low	High	0.2	No Jeopardy
Pennell's bird's-beak	*Cordylanthus tenuis ssp. capillaris*	High	Low	High	0.9	No Jeopardy
Pismo clarkia	*Clarkia speciosa ssp. immaculata*	High	Low	High	0.4	No Jeopardy
Purple amole	*Chlorogalum purpureum*	Medium	Low	High	0.3	No Jeopardy
San Joaquin adobe sunburst	*Pseudobahia peirsonii*	Medium	Low	High	2.2	No Jeopardy
San Joaquin wooly-threads	*Monolopia (=Lembertia) congdonii*	Medium	Low	High	0.2	No Jeopardy
Santa Cruz tarplant	*Holocarpha macradenia*	High	Low	High	0.0	No Jeopardy
Sonoma spineflower	*Chorizanthe valida*	High	Low	High	0.4	No Jeopardy
Springville clarkia	*Clarkia springvillensis*	High	Low	High	1.5	No Jeopardy

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Yadon's piperia	*Piperia yadonii*	High	Low	High	0.0	No Jeopardy
Yellow larkspur	*Delphinium luteum*	High	Low	High	0.5	No Jeopardy

In our review of the current status of the species and the environmental baseline and cumulative effects for the action area, we determined that the vulnerability rankings of the species in Table 1 are medium or high. These species occur entirely in the state of California in arid areas, woodlands, coastal prairie, and grasslands. Based on their habitat requirements, we do not expect the species in Table 1 to occur on agricultural simazine use sites.

In addition to agricultural exposure, simazine is registered for use on non-agricultural areas for nurseries and turf, including lawns and golf courses. We expect one of the 16 species in Table 1 occurs near non-agricultural use sites where simazine may be used; Yadon's piperia occurs near a golf course (USFWS, 2021). Because CalPUR data include golf course uses and 0% of the species' range has been treated with simazine, we expect low exposure, if any, to the species from this use.

Toxicity is expected to be high for these species, mainly due to expected toxic effects that will occur if the plants are directly exposed to simazine. However, we anticipate very little of the species' ranges will be treated with simazine based on past simazine usage. CalPUR simazine usage data indicate that very little simazine was used within the sections where these species' ranges occurs from 2013-2022. 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 small percentages of the species' ranges are likely to be exposed to agricultural and most non-agricultural uses of simazine. Private residential pesticide use is not required for reporting to CalPUR, but we expect this use is minimal near these species' habitats. 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 summary, while the species in Table 1 have medium or high vulnerability rankings and are likely to experience reduced growth, potentially leading to mortality, if exposed to simazine, we expect them to experience no more than low levels of exposure to simazine based on the low level of agricultural overlap within the species' range and low exposure resulting from non-agricultural uses. Given that we expect exposure is low for all simazine uses across the species' ranges, we have high confidence that the proposed action will result in reduced biomass or growth of, at most, a very small number of individuals of the species in Table 2 after considering conservation measures incorporated into the action. 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 in Table 1.

References:

U.S. Fish and Wildlife Service. 2021. Yadon's piperia (*Piperia yadonii*) 5-Year Review: Summary and Evaluation. Ventura, California. 19 pp.

U.S. Fish and Wildlife Service. 2009. *Piperia yadonii* (Yadon's piperia) 5-Year Review: Summary and Evaluation. Ventura, California. 23 pp.

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

For the species in Table 2, very little of their ranges have been treated with herbicides, potentially including simazine, for agriculture in the past (4.8%) according to data from USDA's Census of Agriculture. 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 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	Exposure Ranking	Toxicity Ranking	% Range Treated (CoA)	Determination
Blodgett's silverbush	*Argythamnia blodgettii*	High	Low	High	4.8	No Jeopardy
Cape Sable thoroughwort	*Chromolaena frustrata*	High	Low	High	4.8	No Jeopardy
Everglades bully	*Sideroxylon reclinatum ssp. austrofloridense*	Low	Low	High	4.8	No Jeopardy
Sand flax	*Linum arenicola*	High	Low	High	4.8	No Jeopardy

In our review of the current status of the species and the environmental baseline and cumulative effects for the action area, we determined that the vulnerability rankings of the species in Table 2 are low or high. All four species are found in pine rocklands, coastal berms, hammocks, and swamps in Florida. They are not known to occur on agricultural or non-agricultural simazine use sites.

Toxicity is expected to be high, mainly due to expected toxic effects that will occur if the plant is directly exposed to simazine. Low CoA usage indicates that very little agricultural herbicide usage occurred in the past in the counties where the species range occurs, which includes areas outside of the protected areas where the species is found. Given that CoA data broadly includes all herbicide usage on agriculture, we consider CoA data to provide a conservative estimate of usage that indicates very little of the species' ranges are likely to be treated with any herbicide, including simazine. 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 to agricultural exposure, the Everglades bully is found near developed areas. Because we expect residential simazine use is very limited and conducted using handheld equipment and

course droplet sizes, we expect very little, if any, off-site transport of simazine from residential areas will expose Everglades bully.

In summary, while some species in Table 2 have high vulnerability rankings and all four are likely to reduced growth that could lead to mortality if exposed to simazine, we do not expect them to be exposed to simazine based on their habitat preferences, known locations, past herbicide usage, and reductions in off-site transport of simazine after incorporating general label conservation measures. Given that we expect exposure is low for all simazine uses across the species' ranges, we have high confidence that the proposed action will result in reduced biomass or growth of, at most, a very small number of individuals of the species in Table 2 after considering conservation measures incorporated into the action. We do not expect indirect adverse effects to 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 in Table 2.

Plants in terrestrial habitats with low agricultural exposure achieved through conservation measures implemented on the general label and in Pesticide Use Limitation Areas for citrus, avocados, and olives and low likelihood of non-agricultural exposure

The species in Table 3 were grouped together because we expect low agricultural exposure after incorporating spray drift and runoff conservation measures on the simazine label and in specific PULAs and low likelihood of non-agricultural exposure. 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 3. Plant species occurring near citrus, avocado, or olive use sites 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	Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
Aboriginal prickly-apple	*Harrisia (=Cereus) aboriginum (=gracilis)*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Avon Park harebells	*Crotalaria avonensis*	High	Low	High	Scrub (USFWS, 1999)	No Jeopardy
Britton's beargrass	*Nolina brittoniana*	High	Low	High	Sandhills (NatureServe, 2015)	No Jeopardy
Carter's mustard	*Warea carteri*	High	Low	High	Shrubby flatwoods, sandhills (USFWS, 1999)	No Jeopardy
Carter's small-flowered flax	*Linum carteri carteri*	High	Low	High	Pine rocklands (USFWS, 2023a)	No Jeopardy
Deltoid spurge	*Chamaesyce deltoidea* ssp. *deltoidea*	High	Low	High	Pine rocklands (USFWS, 1999)	No Jeopardy
Florida bonamia	*Bonamia grandiflora*	Medium	Low	High	Pine highlands and scrub (USFWS, 1999)	No Jeopardy
Florida brickell-bush	*Brickellia mosieri*	High	Low	High	Pine rocklands (USFWS, 2023b)	No Jeopardy
Florida perforate cladonia	*Cladonia perforata*	High	Low	High	Restricted to xeric white sands in sand pine scrub (USFWS, 1999)	No Jeopardy
Florida prairie-clover	*Dalea carthagenensis floridana*	High	Low	High	Pine rockland, rockland hammock, marl prairie, and coastal berm, and in the ecotones between	No Jeopardy

C-B5. All Plants in Terrestrial Habitats: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
					these habitats (USFWS, 2023c)	
Fragrant prickly-apple	*Cereus eriophorus* var. *fragrans*	High	Low	High	Sand pine scrub and coastal hammock (USFWS, 2021)	No Jeopardy
Florida ziziphus	*Ziziphus celata*	High	Low	High	High pine habitat, scrubby flatwoods (USFWS, 1999)	No Jeopardy
Garber's spurge	*Chamaesyce garberi*	High	Low	High	Thin sandy soils, limestone, and oolitic limestone in pine rocklands (USFWS, 1999)	No Jeopardy
Garrett's mint	*Dicerandra christmanii*	High	Low	High	Scrub openings (USFWS, 1999)	No Jeopardy
Highlands scrub hypericum	*Hypericum cumulicola*	High	Low	High	Upland areas with well-drained white sands (USFWS, 1999)	No Jeopardy
Kincaid's lupine	*Lupinus sulphureus* ssp. *kincaidii*	Low	Low	High	Upland prairie between grassland and forest (NatureServe, 2015)	No Jeopardy
Large-fruited sand-verbena	*Abronia macrocarpa*	High	Low	High	Sand dunes, savanna (NatureServe, 2015)	No Jeopardy
Lewton's polygala	*Polygala lewtonii*	Medium	Low	High	Transitional habitats between high pine and turkey oak barrens, scrub (USFWS, 1999)	No Jeopardy
Longspurred mint	*Dicerandra cornutissima*	High	Low	High	Terrestrial (NatureServe, 2015)	No Jeopardy
Okeechobee gourd	*Cucurbita okeechobeensis* ssp. *okeechobeensis*	High	Low	High	Forest edge, swamps, disturbed areas (NatureServe, 2015)	No Jeopardy
Papery whitlow-wort	*Paronychia chartacea*	Low	Low	High	Karst pond edges, scrub, and man-made sandy habitats (USFWS, 1999)	No Jeopardy
Pigeon wings	*Clitoria fragrans*	Medium	Low	High	Scrub, high pinelands (USFWS, 1999)	No Jeopardy
Pineland sandmat	*Chamaesyce deltoidea pinetorum*	High	Low	High	Pine rockland (USFWS, 2023d)	No Jeopardy
Sandlace	*Polygonella myriophylla*	High	Low	High	Scrub, disturbed sites (USFWS, 1999)	No Jeopardy
Scrub blazingstar	*Liatris ohlingerae*	High	Low	High	Rosemary balds and ecotone between balds and scrub (USFWS, 1999)	No Jeopardy

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Habitat Description	Determination
Scrub buckwheat	*Eriogonum longifolium* var. *gnaphalifolium*	Medium	Low	High	Intermediate between scrub and sandhills (USFWS, 1999)	No Jeopardy
Scrub lupine	*Lupinus aridorum*	High	Low	High	Pine rocklands and scrub (USFWS, 1999)	No Jeopardy
Scrub mint	*Dicerandra frutescens*	High	Low	High	Adjacent to or within disturbed areas in scrub and sandhills (USFWS, 1999)	No Jeopardy
Short-leaved rosemary	*Conradina brevifolia*	High	Low	High	Scrub, clearings (USFWS, 1999)	No Jeopardy
Small's milkpea	*Galactia smallii*	High	Low	High	Pine rocklands/rockland hammocks (USFWS, 1999)	No Jeopardy
Snakeroot	*Eryngium cuneifolium*	High	Low	High	Scrub, usually rosemary with bare white sand (USFWS, 1999)	No Jeopardy
Tiny polygala	*Polygala smallii*	High	Low	High	Pine rockland, scrub, high pine, and open coastal spoil (USFWS, 1999)	No Jeopardy
Wide-leaf warea	*Warea amplexifolia*	High	Low	High	High pine, sandhills (USFWS, 1999)	No Jeopardy
Wireweed	*Polygonella basiramia*	High	Low	High	Rosemary scrub (USFWS, 1999)	No Jeopardy

In our review of the current status of the species and the environmental baseline and cumulative effects for the action area, we determined that the vulnerability rankings of the species in Table 3 are low, medium, or high.

EPA's Herbicide Strategy requires a minimum of three runoff mitigation points and a 15-foot spray drift buffer on all agricultural simazine applications, which will reduce estimated environmental concentrations of simazine from agricultural uses by up to 90% (or an order of magnitude) for the species in this group. Applicators must select runoff and erosion control practices from EPA's mitigation menu, which is designed to be flexible while ensuring site-level risk is reduced. These general mitigation measures will both reduce the number of individuals exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to exposed individuals (by reducing estimated exposure concentrations). These species were also included in an additional three-point PULA (i.e., six points total) for citrus, olives, and avocados. We anticipate these additional runoff points will further reduce simazine residues in runoff by another order of magnitude (i.e., up to 99% reduction in simazine runoff residues in total). We expect none of these 15 species occurs on agricultural lands.

In addition to agricultural use, 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 34 species in Table 3, we expect none are unlikely to occur on or near non-agricultural use sites of simazine. Therefore, they are unlikely to be exposed to non-agricultural uses of this herbicide.

When an individual of these plants is exposed to simazine, toxicity is expected to be high, mainly from direct exposure. However, their habitats (e.g., pine rocklands, sandhills, scrub) will be exposed to very low levels of simazine after incorporating conservation measures for both spray drift and runoff as part of the proposed action. We expect exposure is low for all simazine uses across the species' ranges for the species in Table 3, and we have high confidence that, the proposed action will result in reduced biomass or growth of, at most, a very small number of individuals of the species in Table 2 after considering conservation measures incorporated into the action.. We do not expect indirect adverse effects through reductions in pollinators or seed dispersers from simazine exposure.While some adverse effects to exposed individuals can still occur, we anticipate this will be limited to a small number of individuals after incorporating general label conservation measures and a six-point PULA for citrus, avocados, and olives uses.. 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 in Table 3.

References:

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

U.S. Fish and Wildlife Service. 2024. Etonia Rosemary (*Conradina etonia*) 5-Year Status Review: Summary and Evaluation. Gainesville, Florida. 14 pp.

U.S. Fish and Wildlife Service. 2023a. Carter's small-flowered flax (*Linum carteri* var. *carteri*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 16 pp.

U.S. Fish and Wildlife Service. 2023b. 5-Year Status Review Florida brickell-bush (*Brickellia mosieri*). Vero Beach, Florida. 15 pp.

U.S. Fish and Wildlife Service. 2023c. Florida prairie-clover (*Dalea carthagenensis* var. *floridana*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 12 pp.

U.S. Fish and Wildlife Service. 2023d. Pineland sandmat (*Chamaesyce deltoidea* ssp. *pinetorum*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 12 pp.

U.S. Fish and Wildlife Service. 2021. Fragrant prickly-apple (*Cereua eriophorus* var. *fragrans*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 28 pp.

U.S. Fish and Wildlife Service. 1999. South Florida Multi-Species Recovery Plan. Vero Beach, Florida.

Species with Individual Integration and Synthesis Summaries

The species in Table 4 have individual Integration and Synthesis summaries because they have potential exposure not addressed by the Herbicide Strategy (i.e., on-field exposure or exposure from non-agricultural use). For all these species, we expect Herbicide Strategy conservation measures to reduce pesticide loading into aquatic habitats by up to 90% (i.e., one order of magnitude) compared to unmitigated runoff and reduce spray drift from entering species' terrestrial habitats by >95%. We anticipate that this reduction will minimize off-site transport of simazine to a level where no more than low levels of adverse effects are likely to occur to plants through this exposure route. While the 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 4. Species with Individual Integration and Synthesis Summaries

Common Name	Scientific Name	Determination
South Texas ambrosia	*Ambrosia cheiranthifolia*	No Jeopardy
Walker's manioc	*Manihot walkerae*	No Jeopardy

Integration and Synthesis Summary: South Texas ambrosia

Scientific Name:	Common Name:	Entity ID:
Ambrosia cheiranthifolia	South Texas ambrosia	624

Conclusion: No Jeopardy

Species Range

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

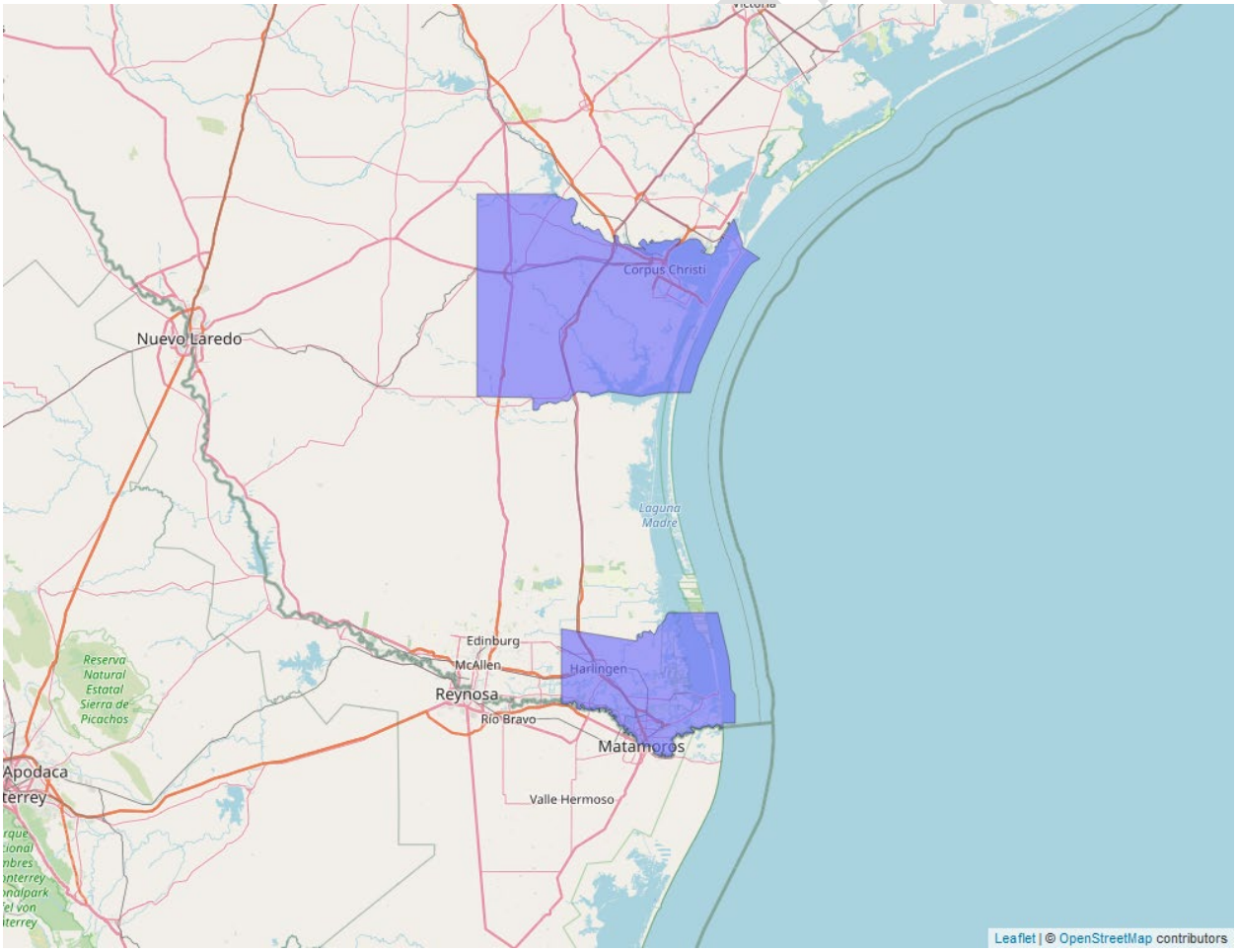

Figure 2. Range map of South Texas ambrosia (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/3331.

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: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

South Texas ambrosia is a perennial, herbaceous plant in the Asteraceae (sunflower) family. Female and male flowers are separate but found on the same plant and bloom in late summer and fall. The inflorescence and floral structure of the Asteraceae family are suited for wind pollination, and ants may serve as pollinators and/or seed dispersers also. However, the species' pollination mechanisms are unknown, and it may rely on insects for pollination. The species relies on rhizomatous growth (i.e., producing underground stems), and single plant may be represented by hundreds of clonal stems. South Texas ambrosia grows at low elevations, typically on well-drained, heavy soils associated with subtropical woodland communities in openings of coastal prairies and savannas. Historically, the species occurred in Cameron, Jim Wells, Kleberg, and Nueces counties in South Texas, and the state of Tamaulipas in Mexico. As of 2021, there were six verifiable extant sites found in scattered, fragmented areas of remaining habitat located in Nueces and Kleberg counties in the Coastal Bend region of Texas; the species' status in Mexico is unknown. South Texas ambrosia occurs in 14 populations, several with subpopulations, in a patchy and scattered distribution across its range, but only six between Nueces and Kleberg counties are believed to be extant. They occur on lands managed by Department of Defense (Naval Air Station Kingsville), a Texas Department of Transportation right of way, city and county parkland, and private lands. Propagation efforts are underway by the San Antonio Botanical Garden (USFWS 2010). Overall species abundance declined between 2018 and the last review in 2022 (USFWS 2022).

Much of the species' habitat has undergone land use change for urban development, agricultural fields, and improved pastures, all of which support non-native grasses that can outcompete native vegetation like South Texas ambrosia. Mowing at certain heights and under regimes that allowed the plant to flower (i.e., monthly intervals) benefitted South Texas ambrosia by reducing competitive pressures from invading non-native grasses. Plowing, paving, and other construction can eliminate this species. Loss of genetic diversity and effects of climate change may also affect the species. Pesticide drift, both herbicides and insecticides, are a known threat to the species from nearby agricultural and urban development. Because pollination mechanism is unknown for the species, insect pollinator loss is noted as an adverse effect of insecticide exposure (USFWS 2010, 2022).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 9.7% of the species' range overlaps with agricultural use sites and 90.3% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[7] between the species' range and the agricultural footprint of simazine use sites (Table 5).

Table 5. Agricultural use overlap and annual usage data (% Range Treated) for the South Texas ambrosia.

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	0.2	10	10.2	<0.1	<0.1	<0.1
Corn	8.4	50.1	58.4	4.8	28.9	33.7
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	0.9	40.6	41.5	<0.1	<0.1	<0.1
Other Orchards	<0.1	7.1	7.1	<0.1	7.1	7.1

[7] Total overlap is capped at 100%.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Vegetables and Ground Fruit	0.3	9.6	9.9	0.2	5	5.2
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**9.7**	**90.3**	**100**[7]	**5**	**41**	**46.1**

Usage

Past usage data indicate that up to 46.1% of the species' range has been treated with simazine annually from agricultural uses, with 5% occurring on agricultural fields and 41% resulting from off-site transport.

Additional Exposure Considerations

Cropland serves as unsuitable habitat and barriers to gene flow, but herbicide exposure from adjacent row crop lands is a known threat to South Texas ambrosia.

Exposure from Non-Agricultural Uses

Herbicide use is a potential threat from a golf course and city and county parks. The species occurs on unplowed, but mowed, railroad and highway rights of way, cemeteries, mowed park fields, and erosional areas along creeks. Urban areas serve as unsuitable habitat and barriers to gene flow. Where lawns/turf areas are planted with manicured grasses, we do not expect this species 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, South Texas ambrosia 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 South Texas ambrosia 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).

In addition to label measures, South Texas ambrosia is in a Pesticide Use Limitation Area (PULA) that requires an additional three runoff mitigation points (i.e., six points total) for all uses of citrus, avocados, and olives. Because the species does not occur near avocados (overlap 0%), of particular importance is citrus and olives. We anticipate these additional runoff points will further reduce simazine residues in runoff by another order of magnitude (i.e., up to 99% reduction in simazine runoff residues in total).

Effects of the Action: Toxicity

Direct Effects

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 agricultural product labels and existing pesticide practices in non-agricultural atrazine use sites to reduce the likelihood, magnitude, and frequency of exposure to a level 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 seed dispersers or to disrupt pollination functions necessary to support reproduction of the South Texas ambrosia.

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. While we do not expect South Texas ambrosia to occur on agricultural fields, herbicide exposure from adjacent row crop lands is a known threat to the species. 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.

South Texas ambrosia 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 South Texas ambrosia 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 South Texas ambrosia, 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 South Texas ambrosia to occur on turf, and the limited usage of simazine for this use, we expected few individuals, if any, are expected to be exposed on simazine use sites. Given this low exposure, implementation of the conservation measures on product labels, and a 6-point PULA for citrus and olive uses, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

South Texas ambrosia is a perennial herb found across six sites in coastal Texas. It grows at low elevations, typically on well-drained, heavy soils associated with subtropical woodland communities in openings of savannas and coastal prairies. It can be found on residential lawns if native vegetation has not been replaced by planted sod. Abundance has continued to decline across the range. It is threatened by non-native plant species, urban and agricultural development, and pesticide drift.

We expect some plants exposed to off-site transport may die or experience reduced growth. Though South Texas ambrosia may occur on non-agricultural use sites, particularly lawns in Kleberg and Nueces counties that have not been planted with introduced grasses, we expect simazine use on turf is limited. The species occurs near agricultural areas and may be exposed through off-site transport, but we expect adverse effects to a small number of individuals after incorporating conservation measures on the label and six-point PULA that will greatly limit off-site transport into this species habitat from citrus and olive uses (~10% combined overlap with the species' range). 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 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 South Texas ambrosia.

References

U.S. Fish and Wildlife Service. 2022. South Texas Ambrosia (*Ambrosia cheiranthifolia*) 5-Year Review: Summary and Evaluation. Corpus Christi, Texas. 7 pp.

U.S. Fish and Wildlife Service. 2010. South Texas Ambrosia (*Ambrosia cheiranthifolia*) 5-Year Review: Summary and Evaluation. Corpus Christi, Texas. 34 pp.

Integration and Synthesis Summary: Walker's manioc

Scientific Name:	Common Name:	Entity ID:
Manihot walkerae	Walker's manioc	763

Conclusion: No Jeopardy

Species Range

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

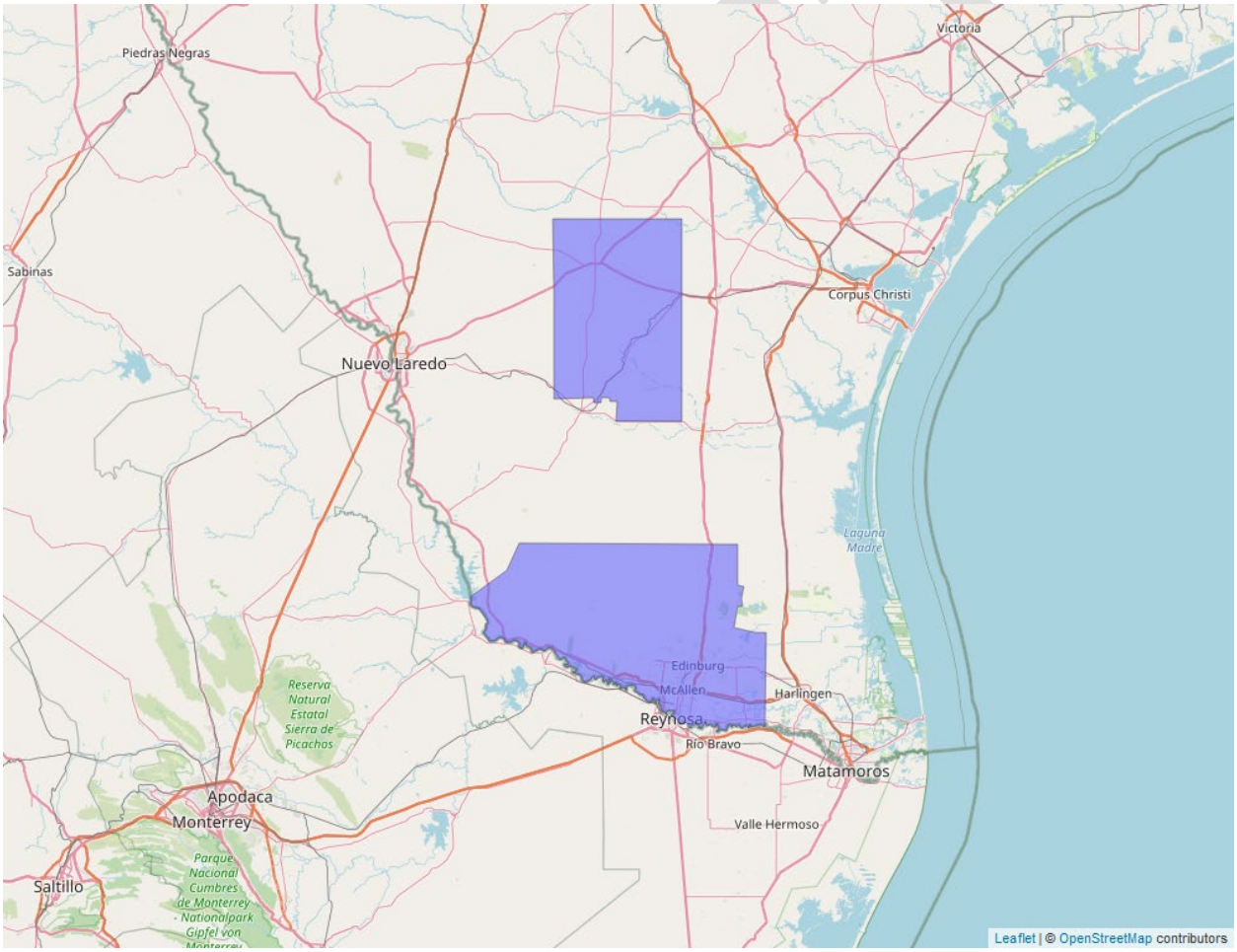

Figure 3. Range map of Walker's manioc (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/1892.

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: 6/4/2009

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: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Walker's manioc is a narrow endemic found in native brush and grassland habitats on shallow calcareous soils over caliche in two counties in the Lower Rio Grande Valley of Texas. There are 11 potentially extant sites in Texas, 24 potentially extant sites in Mexico, and all 35 are believed to operate as a metapopulation. Many areas between surveyed sites have appropriate habitat but have not been surveyed. Each Texas site has between one to approximately 90 individuals and many occur on private lands. Three of the largest sites are on protected areas of Lower Rio Grande Valley National Wildlife Refuge and three private landowners in Mexico have active voluntary conservation agreements (USFWS 2019). Some Walker's manioc plants have been found along roadsides and in rights of way (USFWS 2009). While Walker's manioc can self-fertilize and use tubers for vegetative reproduction, the species relies on insect pollinators to maintain genetic diversity through pollen transport between individual plants. However, the species does not appear to require a rare or specialized pollinator (USFWS 2009, 2019).

Threats include destruction and fragmentation of habitat, non-native grasses, conversion to agriculture, pesticide runoff and drift, caliche surface mining, javelina and feral hog uprooting, and development (e.g., residential, urban, and energy). Walker's manioc reemerged following herbicide application that killed the above-ground portion of the plant (USFWS 2019).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 11.7% of the species' range overlaps with agricultural use sites and 88.3% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[8] between the species' range and the agricultural footprint of simazine use sites (Table 6).

Table 6. Agricultural use overlap and annual usage data (% Range Treated) for the Walker's manioc.

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	1.5	9.5	11	<0.1	<0.1	<0.1
Corn	5.6	36.8	42.4	4.3	28.7	33.1
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	2	29.7	31.8	<0.1	<0.1	<0.1
Other Orchards	<0.1	6.1	6.2	<0.1	6.1	6.2
Vegetables and Ground Fruit	2.6	21.9	24.5	0.1	1.2	1.3
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**11.7**	**88.3**	**100[8]**	**4.5**	**36**	**40.6**

Usage

Past usage data indicate that up to 40.6% of the species' range has been treated with simazine annually from agricultural uses, with 4.5% occurring on agricultural fields and 36% resulting from off-site transport.

[8] Total overlap is capped at 100%.

Additional Exposure Considerations

Walker's manioc was found in a maize field in the Loreto Sand Plain in Tamaulipas, Mexico, in 1994 (Austin Field Office, 2016, pers. comm.). The land cover at this site was originally shrub savanna. It was plowed in the late 1980s, but no herbicides were ever used. The manioc plants were emerging from chopped up pieces of tubers. Based on this scenario, it is possible that manioc could be present in some farmland in southern Texas, however, there are no records of populations growing in cropland in Texas.

Exposure from Non-Agricultural Uses

Walker's manioc is not known to occur on non-agricultural simazine use sites, and we expect off-site transport resulting 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).

In addition to label measures, Walker's manioc is in a Pesticide Use Limitation Area (PULA) that requires an additional three runoff mitigation points (i.e., six points total) for all uses of citrus, avocados, and olives. Because the species does not occur near avocados or olives (overlap 0%), of particular importance is citrus. We anticipate these additional runoff points will further reduce simazine residues in runoff by another order of magnitude (i.e., up to 99% reduction in simazine runoff residues in total).

Effects of the Action: Toxicity

Direct Effects

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 agricultural product labels and existing pesticide practices in non-agricultural atrazine use sites to reduce the likelihood, magnitude, and frequency of exposure to a level 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 insect pollinators necessary to support reproduction for the Walker's manioc.

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 expect simazine concentrations to result in high levels of adverse effects to plants on pesticide use sites. While 11.7% of the range overlaps with agricultural use sites of simazine, we expect simazine applications to occur on-field in just 4.5% of the species' range. This overlap and usage is primarily attributable to corn, for which there is at least one known occurrence of Walker's manioc growing on-field. When exposed on simazine use sites, we expect simazine to result in large impacts to growth, which can lead to mortality. However, given that there are no records of populations growing in cropland in Texas, we expect that few individuals, if any, will experience adverse effects from on-field exposure.

With implementation of conservation measures on product labels and a six-point PULA for citrus uses, we expect that few individuals of Walker's manioc will be exposed to simazine via off-site transport and will experience no more than low level of adverse effects to growth and survival.

As such, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

Walker's manioc is a narrow endemic found in native brush and grassland habitats on shallow calcareous soils over caliche in coastal Texas. A few of the largest populations occur on a National Wildlife Refuge. While most Walker's manioc individuals occur in native shrublands, one individual was found on an agricultural site in Mexico in 1994. There are no known records of Walker's manioc occurring on agricultural lands in Texas or since 1994 in Mexico. Threats to the species include habitat loss, non-native grasses, pesticide runoff and drift, surface mining, and swine uprooting.

We expect Walker's manioc occurrence on agricultural fields is uncommon because the species has never been documented on a crop field in Texas and the observation in Mexico was a plant growing from cut up tubers on the field. We do not expect the species to occur on non-agricultural use sites. In addition, the largest populations of Walker's manioc are on a National Wildlife Refuge where simazine has not been used in the past 10+ years. Therefore, our primary

concern for simazine exposure is through off-site transport from agricultural fields. Even though we expect some plants exposed to off-site transport may die or experience reduced growth, we expect adverse effects to a small number of individuals after incorporating conservation measures on the label and six-point PULA that will greatly limit off-site transport into this species habitat from citrus uses (9.5% overlap with the species' range). 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 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 Walker's manioc.

References

U.S. Fish and Wildlife Service. 2019. Recovery Plan Amendments for Nine Southwest Species. Albuquerque, New Mexico. 14 pp.

U.S. Fish and Wildlife Service. 2009. Walker's Manioc (*Manihot walkerae*) 5-Year Review: Summary and Evaluation. Corpus Christi, Texas. 30 pp.