Integration and Synthesis Summary for Plants

Plants in Flowing Wetland Habitats with Risk of Exposure from Sugarcane and Sweetcorn

This Integration and Synthesis Summary includes our jeopardy analysis for listed 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 our rankings (high, medium, low) for vulnerability, exposure, and toxicity. Data and information used to determine individual species' rankings include environmental baselines, cumulative effects, exposure information, and expected toxic effects for all species, and a template worksheet to show how rankings were assessed and combined 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., flowing wetlands) and were predicted by EPA to be exposed to similar concentrations of atrazine from registered uses, including sugarcane or sweetcorn. Most of these species have low exposure to atrazine due to the factors described in the tables or individual rationales below, in combination with reductions in atrazine 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]) and conservation measures that will be implemented through Pesticide Use Limitation Areas (PULAs) in EPA's Bulletins Live! Two (see Conservation Measures section below). The species in this Appendix need species-specific conservation measures (i.e., six runoff points total, implemented through PULAs) for certain atrazine uses (i.e., sugarcane and sweetcorn) 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.

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 atrazine primarily through direct contact, either as a result of exposure to pesticide applications on-site or in off-site areas through off-field transport via spray drift or runoff. Atrazine is moderately mobile in water and is relatively persistent in the environment relative to other pesticides, indicating that off-site transport, particularly through runoff, may result in exposure to listed species in areas far from use sites.

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[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

Atrazine has several registered agricultural uses (see Appendix 1-4 of EPA's Biological Evaluation) in the coterminous United States. We characterize the expected level of exposure using overlaps between the species' ranges and agricultural areas where atrazine is registered for use (i.e., overlap data; including a 305-m off-site transport area adjacent to use sites), past atrazine usage data (when available; the amount and location where atrazine has been used in the past), any species-specific considerations such as life history information (e.g., habitat 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 agricultural atrazine 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% overlap are assigned a low overlap score. In addition to range overlaps with atrazine use sites, we considered past atrazine usage data within a species' range to determine how much of a species' range we expect to be treated with 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 atrazine each year are assigned a high usage score. Species that have a medium portion of their range (5-10%) treated with atrazine each year are assigned a medium usage score, and species where data indicate a low portion of their range (<5%) is treated with atrazine each year are assigned a low usage score.

We determine the overall 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 overall exposure ranking the same score (e.g., if both overlap and usage is high, the overall 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 overall 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 overall exposure ranking of medium. For species where there are additional exposure considerations, we adjust the overall exposure ranking to reflect this additional information, as appropriate.

Agricultural uses of atrazine include labeled uses for corn, vegetables and ground fruit (i.e., sweet corn), sod, orchards (i.e., guava and macadamia nut), other grains (including sugarcane and sorghum), and fallow fields only within the coterminous United States.

Exposure to Non-Agricultural Uses

In addition to agricultural uses, atrazine is registered for use on non-agricultural turf, including residential lawns and golf course turf. 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 atrazine in a qualitative manner, considering the life history of species, methods of application, atrazine 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 atrazine use sites (i.e., residential areas where lawns or golf courses are likely present) 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 atrazine. 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 atrazine 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 atrazine will not be used on turf and no exposure will occur from this use.

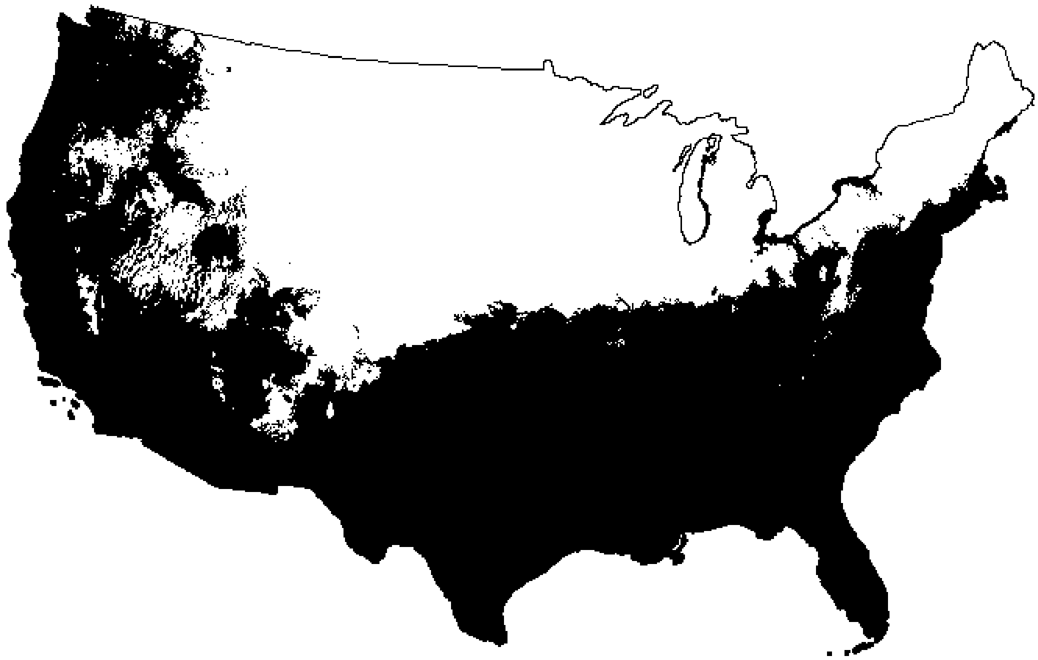

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

Particularly for residential and commercial turf uses, qualitative usage information obtained by EPA from the National Association of Landscape Professionals (NALP) indicate that atrazine is no longer commonly used on residential or commercial turf due to preferential use of newer herbicides. If atrazine 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 atrazine 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 lbs. AI./A spray). 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 run-off mitigations (i.e., equivalent to six points on EPA's mitigation menu), and we considered them in our assessment.

For most species in this Appendix, we anticipate that non-agricultural uses will not meaningfully add to the overall level of anticipated exposure considered in our analysis of agricultural uses. Due to runoff and spray drift considerations described above, off-site exposure is not expected to result in effects to most species in this Appendix. In addition, we expect most listed species' habitat requirements preclude them from occupying non-agricultural use sites where atrazine may be used. For species whose habitat is known or presumed to occur in non-agricultural use sites of atrazine, we consider, individually and qualitatively, the extent and manner of non-agricultural atrazine 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 atrazine.

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 atrazine 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 atrazine and experience adverse effects.

Given that herbicides like atrazine are designed to control plants, we assume listed plant species are sensitive to atrazine exposure. In general, we anticipate individuals exposed to atrazine 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 atrazine, 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 atrazine for each listed species to determine the anticipated level of adverse effects atrazine. In contrast, available toxicity data indicate that animal species, including potential pollinators and seed dispersers of listed plant species, are not likely to experience mortality from atrazine exposure, suggesting that indirect adverse effects are not likely to occur to listed plant species.

Conservation Measures

The technical registrants have previously agreed to substantial conservation measures that were incorporated into EPA's 2021 BE. These conservation measures include the following:

- Prohibit use in Hawaii, Alaska, and the Territories,
- Prohibit use on roadsides, shelterbelts, Conservation Reserve Program (CRP) land, conifers (including Christmas tree plantings), timber and forestry, and miscanthus and other perennial bioenergy crops,
- Prohibit application via mechanically pressurized handguns to macadamia nuts, sweet corn, and guava,
- Restrict "fallow" uses on all labels to the following scenarios and geographies only:
    - Wheat-corn-fallow and wheat-fallow-wheat in CO, KS, ND, NE, SD, and WY,
    - Wheat-sorghum-fallow in AR, CO, GA, IL, KS, LA, MS, MO, NE, NM, NC, OK, SD, and TX
- Reduce the single maximum application rate of turf, granular formulations to 2.0 lbs. AI/A, and reduce the single maximum application rate of turf, sprays to 1.0 lb. AI/A,
- Restrict applications made by backpack-spray to landscape turf to spot treatments only,
- Restrict applicators from applying atrazine products to the same sorghum acre,
- Require all applications to use coarse or coarser droplet sizes,
- Require an in-field downwind buffer of 15-ft for all ground applications (from the edge of all streams and rivers as well as the high-tide line for all estuarine/marine environments, and from threatened and endangered species critical habitat and/or species locations)
- Prohibit all ground applications when wind speeds exceed 10 miles per hour at the application site,
- For ground boom applications, only apply with the release height recommended by the manufacturer, but no more than 4-ft above the ground or crop canopy,

- Require an in-field downwind buffer of 150-ft for all aerial applications (from the edge of all streams and rivers as well as the high-tide line for all estuarine/marine environments, and from threatened and endangered species critical habitat and/or species locations),
- If the windspeed is 10 miles per hour or less, applicators must use ½ swath displacement upwind at the downwind edge of the field. When the windspeed is between 11-15 miles per hour, applicators must use ¾ swath displacement upwind at the downwind edge of the field,
- If the windspeed is greater than 10 mph, the boom length must be 65% or less of the wingspan for fixed wing aircraft and 75% or less of the rotor diameter for helicopters. Otherwise, the boom length must be 75% or less of the wingspan for fixed-wing aircraft and 90% or less of the rotor diameter for helicopters,
- Prohibit all aerial applications when wind speeds exceed 15 miles per hour at the application site,
- Restrict aerial applications from releasing spray at a height greater than 10-ft above the ground or vegetative canopy unless a greater application height is necessary for pilot safety,
- Prohibit aerial applications of non-liquid formulations,
- Prohibit all applications during temperature inversions.

While these conservation measures are impactful and contribute to reducing the level of exposure and adverse effects to listed species, EPA and the Service anticipate substantial risk of adverse effects to many listed species remain after incorporating these measures into the proposed action.

Herbicide Strategy Conservation Measures

As part of the atrazine 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 170-foot wind-directional spray drift buffer for aerial applications[5] (not in addition to the buffers the technical registrants committed to previously), and
- a minimum of three runoff mitigation points[6] necessary in all areas where atrazine is used, as well as additional runoff mitigation points (i.e., six points total) for certain

[5] Note: The 170-foot aerial buffer replaces the 150-foot aerial buffer agreed to before implementation of the Herbicide Strategy.

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

atrazine uses limited to certain geographic areas when required to protect specific listed species.

In addition to the conservation measures identified through EPA's Herbicide Strategy, in the course of this consultation the technical registrants have also committed to additional measures for specific registered uses of atrazine to reduce exposure to listed species, including:

- Reduce the maximum annual application rate for field corn from 2.5 lbs. AI/A to 2.0 lbs. AI/A,
- For sweet corn uses, adopt one of the following:
    - Do not apply atrazine to sweet corn from August 15th to November 1st; when applied during other times of the year, use as a pre-emergent up to 2.0 lbs ai/acre.
    - With no timing restrictions for use, use as pre-emergent up to 1.25 lbs ai/acre followed by post-emergent 0.75 lbs ai/acre.
- Restrict "corn" in wheat-corn-fallow rotations to "field corn" meaning "wheat-field corn-fallow rotations",
- Off-label all uses in California except for Imperial County, and
- Add the restriction "Do not apply atrazine products during rain or when soils are saturated or above field capacity" to all formulations.

The spray drift buffers will be placed on the general label and will apply to all uses of atrazine. 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.

Based on EPA's analyses, the required spray drift conservation measures described above (from the current label, those from implementation of the Herbicide Strategy, and additional measures committed to through consultation for specific registered atrazine uses) will reduce spray drift from entering species' habitats by >95%. The Service anticipates that this reduction will minimize off-site transport of atrazine from spray drift to a level where no more than low levels of effects are likely to occur to most listed plants.

As stated above, 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 conservation measures identified on EPA's Mitigation Menu website[7]. The menu provides a suite of options, including relief points for certain field characteristics and likelihood for pesticide transport.

We expect implementation of the required runoff and erosion reduction measures to minimize off-site transport of atrazine 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 atrazine in runoff by up to an order of magnitude (i.e., up to 90% reduction, in other words reduce pesticide loading to one-tenth of pre-runoff mitigation levels).

In cases where EPA has identified additional runoff measures are needed, additional points (up to six points total) will be required. EPA will communicate where additional runoff mitigation points are needed and for what specific atrazine 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 atrazine will decrease by up to two orders of magnitude (i.e., reduce pesticide loading to one-one hundredth of pre runoff mitigation levels; 99% reduction).

For all the species in this document, we expect that the runoff and mitigation measures will reduce exposure concentrations to within one order of magnitude of the exposure level where 95% of plant species are not likely to experience measurable adverse effects. 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 atrazine residues) and reducing the level of adverse effects that will occur to exposed individuals (by reducing estimated exposure concentrations).

Summary of Conclusions for Flowing Wetland Habitats with Risk of Exposure from Sugarcane and Sweetcorn

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of atrazine with conservation measures, and the cumulative effects, it is the Service's biological opinion that the registration of atrazine, as proposed, is not likely to jeopardize the continued existence of the 14 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

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

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 agricultural exposure achieved through conservation measures and low likelihood of non-agricultural exposure

For the species in Table 1, we expect they will have low exposure after incorporating general label measures (e.g., measures already on the label, three runoff points and a ground and aerial buffers determined through implementation of the Herbicide Strategy, and rate reductions and other restrictions for particular registered uses) and six-point PULAs for sugarcane and sweet corn uses accessed through EPA's Bulletins Live! Two. Therefore, we expect adverse effects to be 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 agricultural exposure achieved through conservation measures and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
Fassett's locoweed	*Oxytropis campestris* var. *chartacea*	Medium	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Furbish lousewort	*Pedicularis furbishiae*	High	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Harperella	*Ptilimnium nodosum*	Medium	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Houghton's goldenrod	*Solidago houghtonii*	Low	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Kral's water-plantain	*Sagittaria secundifolia*	Medium	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Michigan monkey-flower	*Mimulus michiganensis*	High	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Navasota ladies-tresses	*Spiranthes parksii*	High	Low	High	General label measures +	No Jeopardy

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Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
					PULA sweet corn and sugarcane	
Neches River rose-mallow	*Hibiscus dasycalyx*	Medium	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Small-anthered bittercress	*Cardamine micranthera*	High	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
South Llano Springs moss	*Donrichardsia macroneuron*	High	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Texas wild-rice	*Zizania texana*	High	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
Virginia spiraea	*Spiraea virginiana*	Medium	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy
White fringeless orchid	*Platanthera integrilabia*	Medium	Low	High	General label measures + PULA sweet corn and sugarcane	No Jeopardy

The species in Table 1 have low to high vulnerabilities. Specifically, pesticides are a noted threat to the Fassett's locoweed.

The species in Table 1 have high toxicity because herbicides like atrazine are designed to control plants. Therefore, we assume all listed plant species are sensitive to atrazine exposure and no significant difference in the toxicity of atrazine among major plant taxa (e.g., dicots, monocots, non-flowering plants) is expected. In general, we anticipate individuals exposed to atrazine, 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 death. We do not expect reductions in pollinators and seed dispersers of listed plant species from atrazine exposure, and therefore, indirect adverse effects are not likely to occur for these species.

We anticipate the species in this group are not likely to occur in agricultural atrazine use sites. We expect the general label measures for agricultural uses described above (e.g., reduced application rates, 15-foot spray drift buffer for ground application, 170-foot spray drift buffer for aerial applications, and three runoff mitigation points) will reduce off-field exposures by an order of magnitude (i.e., a 90% reduction). In addition, the species in Table 1 are included in a six-point PULA for all sugarcane and sweet corn uses. The PULA will reduce off-field atrazine residues by two orders of magnitude (i.e., a 99% reduction), which will ensure no more than low levels of direct and indirect adverse effects to individuals of this species will occur.

In addition to agricultural exposure, none of the species in Table 1 occur on non-agricultural atrazine use sites (i.e., turf) because non-agricultural use sites do not provide the species' necessary habitat (e.g., streams, bogs, lakes). In addition, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see *Exposure to Non-Agricultural Uses*, above), we expect atrazine usage within the ranges of these species to be limited. In addition, if applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses. Therefore, we expect atrazine exposure from non-agricultural uses to be low for these species.

In summary, with implementation of conservation measures on product labels and a six-point PULA for sweet corn and sugarcane uses, we expect that few individuals will be exposed to atrazine via off-site transport from agricultural or non-agricultural areas. Therefore, 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 atrazine exposure. We determine the overall risk of adverse effects to these species is low. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label and specific conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the registration of atrazine, as proposed, is not likely to jeopardize the continued existence of the species in Table 1.

References:

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

U.S. Fish and Wildlife Service. 2021. Species status assessment report for *Platanthera integrilabia* (white fringeless orchid), Version 1.0. Atlanta, Georgia. 112 pp.

U.S. Fish and Wildlife Service. 2020a. Kral's Water-Plantain (*Sagittaria secundifolia*) 5-Year Review: Summary and Evaluation. Daphne, Alabama. 16 pp.

U.S. Fish and Wildlife Service. 2020b. Navasota ladies'-tresses (*Spiranthes parksii*) 5-Year Review: Summary and Evaluation. Houston, Texas. 18 pp.

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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 2 has an individual Integration and Synthesis summary. 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 atrazine 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 atrazine 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. It may occur on atrazine 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 2. Species with Individual Integration and Synthesis Summaries

Common Name	Scientific Name	Determination
Slender rush-pea	*Hoffmannseggia tenella*	No Jeopardy

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: 01-27-2018; Wherever found; *States within the range:* TX

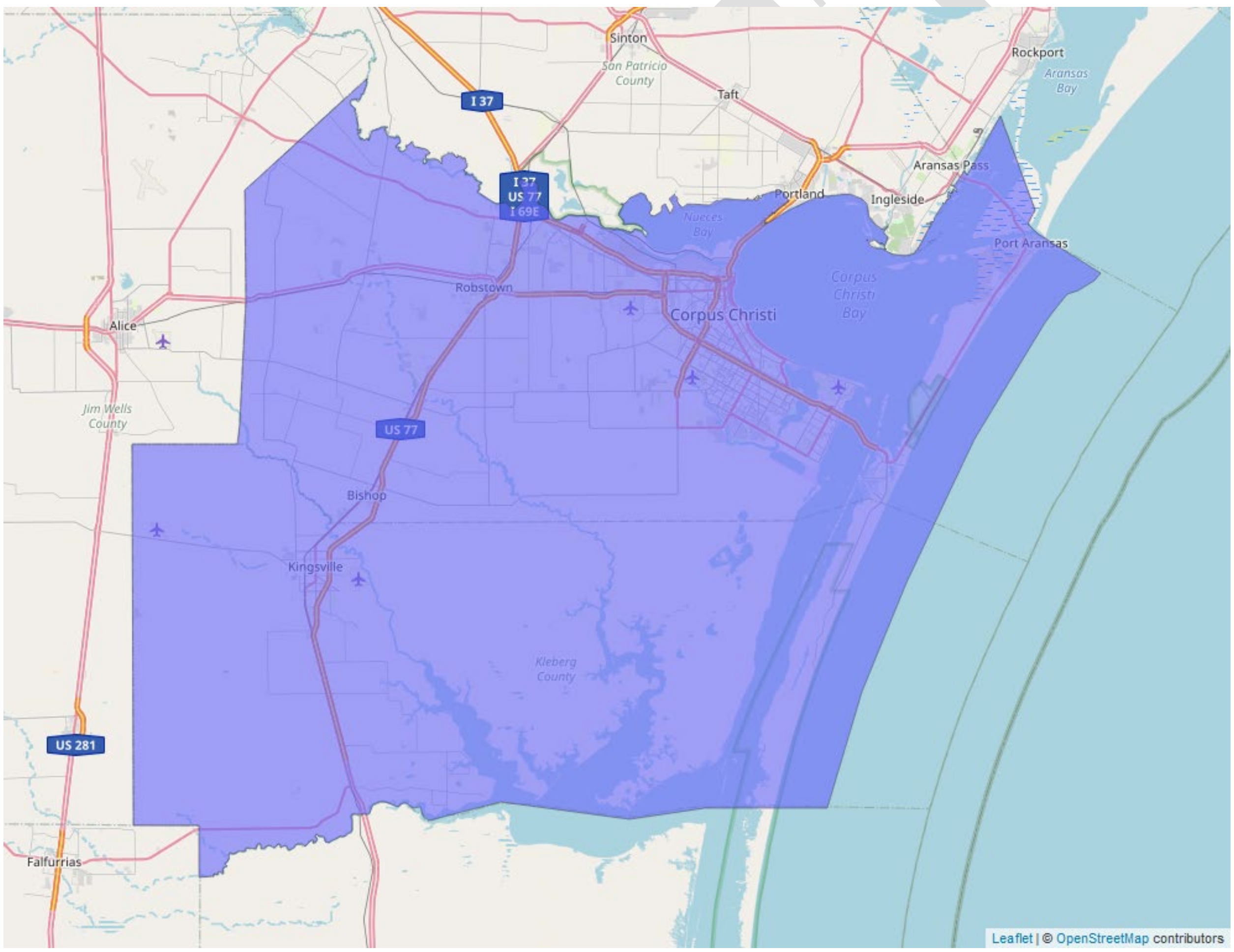

Figure 2. Range map of slender rush-pea (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5298.

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 39.2% of the species' range overlaps with agricultural use sites and 100% of the species' range[8] 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 atrazine use sites (Table 3).

Table 3. 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
Corn	7.1	44	51.1	7.1	44	51.1
Vegetables and Ground Fruit (Sweet Corn)	0	0	0	0	0	0
Other Grains (Sorghum & Sugarcane)	31.4	38.5	69.9	31.4	38.5	69.9

[8] 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
Other Orchards (Guava & Macadamia Nut)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops (Wheat-Corn-Fallow)	0	0	0	0	0	0
Other Crops (Wheat-Sorghum-Fallow)	0.5	32.2	32.7	0.5	32.2	32.7
Other Crops (Wheat-Fallow-Wheat)	0	0	0	0	0	0
Other Crops (Sod)	0.2	14.3	14.5	0.2	14.3	14.5
Total	**39.2**	**100[8]**	**100[8]**	**39.2**	**100[8]**	**100[8]**

Usage

Past usage data indicate that up to 100% of the species' range[8] has been treated with or exposed to atrazine annually from agricultural uses with 39.2% occurring on agricultural fields and up to 100% resulting from off-field transport[8].

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 atrazine could be a source of exposure for this species. However, given our knowledge of atrazine application to turf areas (see *Exposure to Non-Agricultural Uses*, above), we expect atrazine usage within the range of the slender rush-pea to be limited.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all agricultural uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications. Additionally, product labels require three runoff mitigation points for all agricultural uses, which will reduce atrazine concentrations in runoff. We expect these measures will reduce the concentration of atrazine entering species' habitats by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff).

In addition to label measures, slender rush-pea 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 sugarcane and sweet corn. We anticipate these additional runoff points will further reduce atrazine residues in runoff by another order of magnitude (i.e., up to 99% reduction in atrazine runoff residues in total).

Effects of the Action: Toxicity

Direct Effects

Based on toxicity data available for atrazine in plant species, we expect that exposure of individuals that occur on atrazine use sites will result in large impacts to growth, which, if severe enough, can result in mortality. While we anticipate atrazine 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

The slender rush-pea does not rely on biotic pollinators or seed dispersers, and as such, we do not expect that atrazine 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 atrazine 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 atrazine 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 atrazine to be a commonly used herbicide on turf, and as such, we expect atrazine 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 atrazine 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 atrazine for this use, we expect few individuals, if any, will be exposed on atrazine 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 atrazine label and a PULA (six points total) for sweet corn and sugarcane uses, we expect the slender rush-pea has the potential to experience appreciable exposure to atrazine 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 atrazine would be unlikely. As such, we expect very limited exposure, if any, from atrazine use on lawns or turf areas. In addition, we do not anticipate indirect effects from atrazine 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 atrazine on lawns and other turf, and lack of indirect effects, we expect exposure and direct effects (e.g., reduced growth or death) for the slender rush-pea to occur to a small number of individuals over the duration of the proposed action. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the general and species-specific 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 slender rush-pea. Thus, it is our biological opinion that the registration of atrazine, as proposed, 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.