Integration and Synthesis Summary for Fish

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

Most of these species have low exposure to simazine due to the factors described in the tables or individual rationales below, in combination with reductions in simazine spray drift and runoff resulting from implementation of conservation measures added to the product label (including those developed during this consultation through the Herbicide Strategy[1]; see Conservation Measures section below). We anticipate that these measures will reduce exposure from agricultural uses to a level where no more than low level adverse effects are anticipated for many listed fish species.

Vulnerability

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

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

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

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

vulnerability summary from the Status of the Species accounts (Appendix B), overarching *Environmental Baseline* section of the 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 fish species will be exposed to simazine primarily through direct contact in water. 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 fish species in areas far from agricultural and non-agricultural use sites.

Exposure to Agricultural Uses

Simazine has several registered agricultural uses (see Appendix 1-4 of EPA's Biological Evaluation) in the conterminous United States. 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), 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, dietary needs, dispersal behavior), and existing protections or conservation actions (e.g., existing label measures, conservation measures from the action agency). Instead of using the species' range, the EPA uses the HUC-12 watersheds that contain the species range to calculate the extent of overlap and past simazine usage. Given that we typically do not anticipate the specific waterbodies required for fully aquatic listed species occur directly in simazine use sites and that off-site exposure is inherently included when overlap and

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

usage are calculated at a watershed scale, we use the watershed overlap and usage data to characterize potential exposure to agricultural uses of simazine.

Species with greater than 10% overlap between their range and simazine agricultural 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 coterminous 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 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.

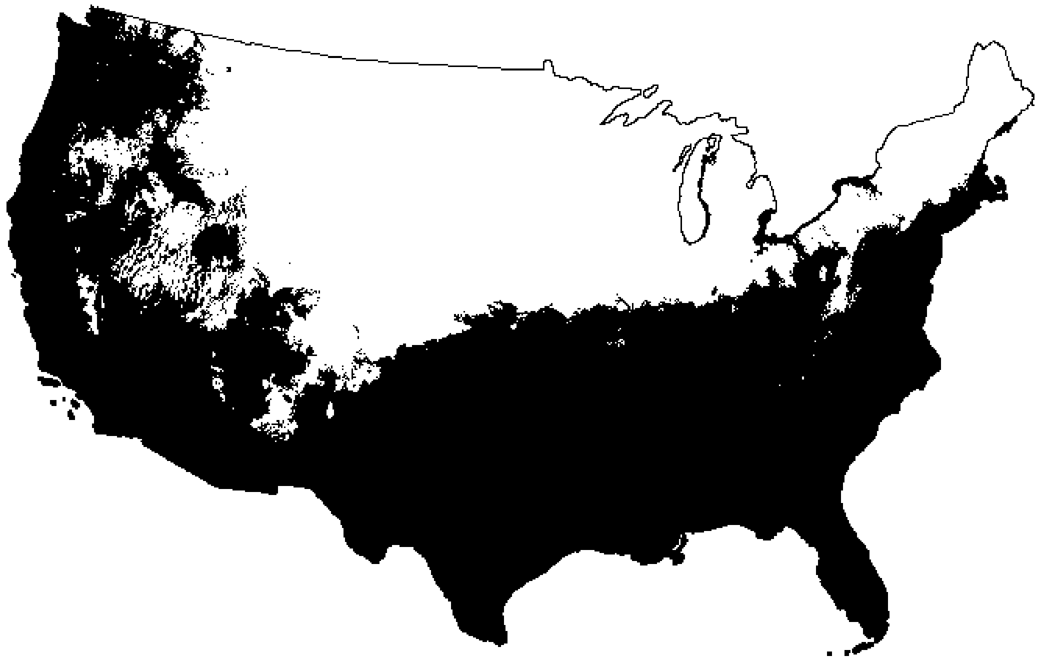

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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 run-off mitigations (i.e., equivalent to 6 points on EPA's mitigation menu), and we considered them in our assessment.

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

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 likely to experience when the organisms they rely on, such as those that act as food sources, are exposed to simazine and experience adverse effects.

[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.

We consider estimated concentrations of simazine on the landscape or within the environment and effects reported in available toxicity studies to determine the level of direct and indirect adverse effects likely to occur to fish. Because mortality from simazine exposure at estimated environmental concentrations to fish is not anticipated (see section *Effects to Fish and Aquatic-phase Amphibians* in the main body of the Opinion), we focus our assessment on sublethal effects to fish, and indirect effects to the fish from effects to fish prey (e.g., other fish, aquatic invertebrates) and plant related food resources.

We consider in our analysis if EECs exceed the threshold for sublethal effects on growth to the fish or reproductive effects to the aquatic invertebrate fish prey. Data indicate reduced growth can occur to fish at EECs that may be observed in concentrations in lower flow or lower volume water bodies within the range for some fishes. We consider the NOAEC a conservative threshold for qualitatively estimating anticipated sublethal effects to listed fishes.

Because mortality from simazine exposure at estimated environmental concentrations to fish is not anticipated (see section *Effects to Fish and Aquatic-phase Amphibians* in the main body of the Opinion), we focus our assessment on sublethal effects to fish, and indirect effects to the fish from effects to fish prey (e.g., other fish, aquatic invertebrates) and plant related food resources. Concentrations of simazine can vary greatly among different regions and aquatic habitat types. Where simazine enters smaller streams or static waters (e.g., low flow/low volume waterbodies) from runoff or spray drift, we generally anticipate high levels of sublethal effects to individual fish where exposure occurs. In larger waterbodies (e.g., where concentrations may be lower due to dilution or other factors as described in the *Effects of the Action* section of the Biological Opinion), we expect lower levels of sublethal effects fish. We determine the agricultural toxicity ranking for fish by qualitatively assessing the expected levels of adverse effects (i.e., sublethal effects to the fish).

Fishes can consume other fish, amphibians, arthropod prey such as aquatic insects, and plant-based and microbial resources (e.g., algae, detritus). We expect some impacts to fish or aquatic amphibian prey, and we anticipate some effects to aquatic arthropod prey but not to the extent it will reduce the listed fish species' ability to forage as simazine exposure is not expected to eliminate these prey items completely in the aquatic habitats where they are found. We anticipate some fish dietary items (e.g., phytoplankton, algae) in low flow or low volume waterbodies will be impacted by simazine applications but we do not anticipate that it will eliminate all algae or phytoplankton within a water body and that these resources will replenish over time in any dynamic aquatic system (flowing or non-flowing) based on several mesocosm and microcosm studies discussed in the main body of the Opinion. We don't expect impacts to detritus from simazine exposure. Therefore, we do not anticipate significant reductions in plant-base food availability for fish. As such, impacts to growth to fish are the primary driver in determining the toxicity ranking for listed fish species.

Experimental populations, non-essential

We considered the following experimental, non-essential populations for fish species in this section of the consultation: The boulder darter (Entity ID 8921), bull trout (Entity ID 10037), Colorado pikeminnow (Entity ID 2142), duskytail darter (Entity ID 9502, 6503), Rio Grande silvery minnow (Entity ID 10052), slender chub (Entity ID 9504), smoky madtom (Entity ID 5981), spotfin chub (Entity IDs 1934, 9061 and 9505), Topeka shiner (Entity ID 10910), yellowfin madtom (Entity IDs 2956, 4496, 9506), and woundfin (Entity ID 2599).

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

Conservation Measures

Herbicide Strategy Conservation Measures

As part of the simazine ESA consultation with the Service, EPA is implementing the final Herbicide Strategy to inform and identify any necessary mitigations 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

---

[5] Ecological Mitigation Support Document to Support Endangered Species Strategies. Access at: https://www.epa.gov/system/files/documents/2025-04/ecological-mitigation-support-document-v.2-.pdf

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[5]. These documents are provided in Appendix A-1.

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

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

Based on EPA's analyses, the Service anticipates that the required spray drift conservation measures described above (from the current label and implemented through the Herbicide Strategy) will sufficiently reduce 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 fish 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]. The menu provides a suite of options, including relief points for certain field characteristics and likelihood for pesticide transport.

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

- Product must not be mixed or loaded within 50 feet of intermittent streams and rivers, natural or impounded lakes and reservoirs.
- Product must not be applied within 66 feet of points where agricultural field (nurseries, Christmas tree plantings, and turf grasses for sod farms) surface water runoff enters perennial or intermittent streams and rivers or within 200 feet of natural or impounded lakes and reservoirs. If this product is applied to highly erodible land, the 66-foot buffer

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

or setback from runoff entry points must be planted to crop or seeded with grass or other suitable crop.

- Do not apply within 66 feet of standpipes in tile-outletted terraced fields.
    - Apply this product to the entire tile-outletted terraced field under a no-till practice only when a high crop residue management practice is practiced. High crop residue management is described as a crop management practice where little, or no crop residue is removed from the field during and after crop harvest.

We expect implementation of the runoff and erosion reduction measures as required, to minimize off-site transport of simazine to habitats of listed species. EPA's analyses indicated that the general label requirement of three runoff mitigation points will reduce estimated environmental concentrations of simazine in runoff by up to an order of magnitude (i.e., up to 90% reduction, in other words reduce pesticide loading to one-tenth of pre-runoff mitigation levels). In cases where EPA has identified additional runoff measures are needed, additional points (up to three additional points, 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[7], 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).

We anticipate this level of mitigation will protect listed fish species by reducing the number of individuals exposed (by reducing the extent of off-site transport of simazine residues) and reducing the level of direct and indirect adverse effects that will occur to exposed individuals (by reducing estimated exposure concentrations).

Summary of Conclusions for Fish Species

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the registration of simazine, as proposed, is not likely to jeopardize the continued existence of at least 97 of the 115 fish species in this Appendix. For the remaining 18 fish in this appendix, we plan to continue coordination with EPA and the technical registrants to further assess these species.

In our analysis, 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

[7] Bulletins Live! Two website: https://www.epa.gov/endangered-species/bulletins-live-two-view-bulletins

species, including those species in the grouped analyses, and are presented in full in Appendices B and E. This approach allowed us to streamline our discussion in this Opinion by avoiding repeating our findings when species in the respective groupings would be expected to be affected similarly. The use of these groupings, therefore, does not mean that our evaluation failed to evaluate each individual species. On the contrary, our detailed process for each species-specific analysis remained the same, including for species for which we summarized our findings in tables below.

Species proposed for delisting

The following species is recommended for delisting (Table 1).

Table 1. Fish species recommended for delisting.

Scientific Name	Common Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Change in status	Determination
Etheostoma sellare	Maryland darter	High	High	Low	Recommend delisting due to extinction	No Jeopardy

The 2021 5-Year Review for the Maryland darter recommended delisting the species due to extinction. Available information indicates this species is no longer extant in the wild, and there are no captive individuals. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Maryland darter.

Species with low exposure informed by low overlap with the agricultural uses in the action area and low likelihood of non-agricultural exposure

The species in Table 2 are grouped together as they all have low concern of direct and indirect adverse effects due to low exposure as informed by low overlap between the species' range and areas where simazine is registered for use. While we present some specific information about the species in Table 2 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 2. Species with low exposure informed by low overlap with the agricultural uses in the action area and low likelihood of non-agricultural exposure

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Total Agricultural Action Area Overlap (% Range)	Determination
Alabama sturgeon	*Scaphirhynchus suttkusi*	High	Low	High	2.7	No Jeopardy
Atlantic salmon	*Salmo salar*	Medium	Low	High	1.1	No Jeopardy
Gulf sturgeon	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	Medium	Low	High	0.7	No Jeopardy
Bayou darter	*Etheostoma rubrum*	High	Low	High	3.4	No Jeopardy
Beautiful shiner	*Cyprinella formosa*	Medium	Low	High	0.4	No Jeopardy
Blackside dace	*Phoxinus cumberlandensis*	Medium	Low	High	1.2	No Jeopardy
Blue shiner	*Cyprinella caerulea*	High	Low	High	2.2	No Jeopardy
Bonytail	*Gila elegans*	High	Low	Low	1.8	No Jeopardy
Bull Trout	*Salvelinus confluentus*	Medium	Low	High	3.2	No Jeopardy
Cahaba shiner	*Notropis cahabae*	High	Low	High	1.1	No Jeopardy
Candy darter	*Etheostoma osburni*	High	Low	High	0.3	No Jeopardy
Cherokee darter	*Etheostoma scotti*	Medium	Low	High	0.6	No Jeopardy
Chihuahua chub	*Gila nigrescens*	High	Low	High	3.7	No Jeopardy
Chucky Madtom	*Noturus crypticus*	High	Low	High	3.2	No Jeopardy
Clear Creek gambusia	*Gambusia heterochir*	High	Low	High	0.6	No Jeopardy
Colorado pikeminnow	*Ptychocheilus lucius*	Medium	Low	High	1.4	No Jeopardy
Comanche Springs pupfish	*Cyprinodon elegans*	High	Low	High	0.9	No Jeopardy
Conasauga logperch	*Percina jenkinsi*	High	Low	High	2.2	No Jeopardy

Appendix C-A5. Fish: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Total Agricultural Action Area Overlap (% Range)	Determination
Cui-ui	*Chasmistes cujus*	High	Low	High	0.1	No Jeopardy
Devils River minnow	*Dionda diaboli*	High	Low	High	1.1	No Jeopardy
Duskytail darter	*Etheostoma percnurum*	High	Low	Low	0.4	No Jeopardy
Etowah darter	*Etheostoma etowahae*	High	Low	High	0.8	No Jeopardy
Fountain darter	*Etheostoma fonticola*	High	Low	High	4.4	No Jeopardy
Frecklebelly madtom	*Noturus munitus*	Medium	Low	High	1.4	No Jeopardy
Gila chub	*Gila intermedia*	High	Low	High	1.5	No Jeopardy
Gila trout	*Oncorhynchus gilae*	Medium	Low	High	0.9	No Jeopardy
Goldline darter	*Percina aurolineata*	Medium	Low	High	1.4	No Jeopardy
Greenback Cutthroat trout	*Oncorhynchus clarkii stomias*	High	Low	High	0.6	No Jeopardy
Independence Valley speckled dace	*Rhinichthys osculus lethoporus*	High	Low	High	<0.1	No Jeopardy
Kentucky arrow darter	*Etheostoma spilotum*	High	Low	High	0.2	No Jeopardy
Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*	Medium	Low	High	0.3	No Jeopardy
Laurel dace	*Chrosomus saylori*	High	Low	High	2.1	No Jeopardy
Leon Springs pupfish	*Cyprinodon bovinus*	High	Low	High	1.1	No Jeopardy
Leopard darter	*Percina pantherina*	High	Low	Low	0.2	No Jeopardy
Little Colorado spinedace	*Lepidomeda vittata*	High	Low	High	<0.1	No Jeopardy
Lost River sucker	*Deltistes luxatus*	High	Low	High	2.2	No Jeopardy
Mexican blindcat (catfish)	*Prietella phreatophila*	High	Low	High	0.1	No Jeopardy
Moapa dace	*Moapa coriacea*	Medium	Low	High	<0.1	No Jeopardy
Mohave tui chub	*Gila bicolor ssp. mohavensis*	High	Low	High	0.2	No Jeopardy
Niangua darter	*Etheostoma nianguae*	High	Low	High	2.0	No Jeopardy
Owens Tui chub	*Gila bicolor ssp. snyderi*	High	Low	High	<0.1	No Jeopardy
Ozark cavefish	*Amblyopsis rosae*	Medium	Low	High	3.0	No Jeopardy
Pahrump poolfish	*Empetrichthys latos*	High	Low	High	0.1	No Jeopardy

Appendix C-A5. Fish: Integration and Synthesis Summaries

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Total Agricultural Action Area Overlap (% Range)	Determination
Pecos bluntnose shiner	*Notropis simus pecosensis*	Medium	Low	Low	3.9	No Jeopardy
Pecos gambusia	*Gambusia nobilis*	Medium	Low	High	2.9	No Jeopardy
Pygmy sculpin	*Cottus paulus (=pygmaeus)*	High	Low	High	1.8	No Jeopardy
Razorback sucker	*Xyrauchen texanus*	Medium	Low	High	1.6	No Jeopardy
Rio Grande silvery minnow	*Hybognathus amarus*	High	Low	Low	0.9	No Jeopardy
Rush darter	*Etheostoma phytophilum*	High	Low	High	2.6	No Jeopardy
Santa Ana sucker	*Catostomus santaanae*	High	Low	High	0.6	No Jeopardy
Sharpnose shiner	*Notropis oxyrhynchus*	High	Low	Low	3.0	No Jeopardy
Shortnose sucker	*Chasmistes brevirostris*	High	Low	High	2.2	No Jeopardy
Sickle darter	*Percina williamsi*	High	Low	High	1.1	No Jeopardy
Slender chub	*Erimystax cahni*	High	Low	Low	0.8	No Jeopardy
Smalleye shiner	*Notropis buccula*	High	Low	Low	3.0	No Jeopardy
Smoky madtom	*Noturus baileyi*	High	Low	High	0.5	No Jeopardy
Sonora chub	*Gila ditaenia*	Medium	Low	High	<0.1	No Jeopardy
Unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	High	Low	High	1.0	No Jeopardy
Vermilion darter	*Etheostoma chermocki*	High	Low	High	0.5	No Jeopardy
Virgin River chub	*Gila seminuda (=robusta)*	High	Low	High	0.3	No Jeopardy
Watercress darter	*Etheostoma nuchale*	High	Low	High	0.3	No Jeopardy
White sturgeon	*Acipenser transmontanus*	High	Low	High	2.3	No Jeopardy
White River springfish	*Crenichthys baileyi baileyi*	High	Low	Medium	0.1	No Jeopardy
Woundfin	*Plagopterus argentissimus*	High	Low	High	0.4	No Jeopardy
Yellowcheek darter	*Etheostoma moorei*	High	Low	High	<0.1	No Jeopardy
Yellowfin madtom	*Noturus flavipinnis*	Medium	Low	High	0.6	No Jeopardy
Bluemask darter	*Etheostoma akatulo*	Medium	Low	High	3.1	No Jeopardy
Diamond darter	*Crystallaria cincotta*	High	Low	High	0.1	No Jeopardy

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Total Agricultural Action Area Overlap (% Range)	Determination
White River spinedace	*Lepidomeda albivallis*	High	Low	High	0.1	No Jeopardy
Desert dace	*Eremichthys acros*	Medium	Low	Low	0.1	No Jeopardy
Railroad Valley springfish	*Crenichthys nevadae*	Medium	Low	Low	0.1	No Jeopardy
Zuni bluehead sucker	*Catostomus discobolus yarrowi*	High	Low	Low	<0.1	No Jeopardy

The species listed in Table 2 have a range of vulnerability rankings. Species like the Alabama sturgeon, blue shiner, leopard darter, and vermillion darter have high vulnerability rankings due to a number of factors, such as small or restricted population distributions, declining population trends, and/or low population numbers. Additionally, these species have pesticides noted as a specific threat to individuals. As such, we anticipate these species may be more susceptible to adverse effects (direct and indirect) that occur to individuals as a result of simazine exposure. Other species, like the Owens tui chub and Virgin River chub, may not have pesticides listed as a specific threat, but still have high vulnerability rankings, indicating that the species may still be susceptible to adverse effects (direct and indirect) to individuals from simazine exposure. Species like the Colorado pikeminnow, gila trout, and yellowfin madtom, have medium vulnerability rankings, indicating that, while they may still be susceptible to adverse effects to individuals resulting from simazine exposure, may be somewhat more robust to population level effects due to factors like a wider species distribution, larger population numbers, or stable or increasing population trends.

All the species in Table 2 have low total overlap with registered agricultural use sites of simazine, indicating that only a small number of individuals, at most, are likely to experience any exposure to simazine. Given the conservative nature of total overlap (e.g., does not consider information on past simazine usage, does not fully account for redundancy between crop use sites, assumes exposure is occurring in all possible areas at the same time), we have high confidence that these species will experience low levels of exposure from agricultural uses. We anticipate the inclusion of usage data would further reduce the extent and likelihood of exposure to individuals of these species.

The Zuni bluehead sucker, Sonora chub, and the Little Colorado spinedace's ranges have very little overlap with agricultural simazine use sites (i.e., < 0.1% overlap), indicating that very few if any individuals are likely to be exposed to simazine from these uses. Thus, while these species have a high vulnerability ranking and would experience high levels of adverse effects if exposed, we anticipate no individuals will experience any mortality or adverse effects to growth.

While we expect that some of these species may occur near non-agricultural use sites, we anticipate no more than a small number of individuals of each species will be exposed to simazine from non-agricultural uses. Of the species listed in Table 2, we expect that the yellowfin madtom and Cherokee darter, among others, may co-occur within watersheds with developed, and open-spaced developed use sites and may be exposed to simazine runoff or spray drift through these uses. However, for all non-agricultural turf uses, triazines are not used on cool season grasses because the grass will die after exposure, but triazines are used on warm season grasses (i.e., the deep south and southeastern parts of CONUS) from the warm season hardiness zone north into the warm-cool transition zone, so any of these fish species located in outside of these areas would not be exposed to simazine from these non-agricultural uses (e.g., Railroad Valley springfish, Lost River sucker, greenback cutthroat trout). In addition, for golf course turf uses, simazine is 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. 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 6 points on EPA's mitigation menu), and we considered them in our assessment as limits to the amount of runoff that may enter nearby aquatic habitats where these fishes may be found. Finally, all species in this grouping have EECs from non-agricultural uses within their range that are well below the sublethal threshold where we would observe any adverse effects (direct or indirect) to these fish.

Nearly all species in this group have a low toxicity ranking as we anticipate estimated environmental concentrations of simazine within their habitats will be low, and as such, result in only low levels of sublethal adverse effects to any exposed individuals. None of these species will be exposed to estimated environmental concentrations (for agricultural or non-agricultural uses of simazine) that exceed the threshold for fish mortality.

While sublethal effects may occur at the high end of exposure estimates, we do not anticipate more than low levels of sublethal impacts to these species as we anticipate typical exposures will be below levels where toxicity studies have observed sublethal adverse effects to fish or their prey species. We expect some impacts to fish or aquatic amphibian prey, and we anticipate some effects to aquatic arthropod prey but not to the extent it will reduce the listed fish species' ability to forage as simazine exposure is not expected to eliminate these prey items completely in the aquatic habitats where they are found. We anticipate some fish dietary items (e.g., phytoplankton, algae) in low flow or low volume waterbodies will be impacted by simazine applications but we do not anticipate that it will eliminate all algae or phytoplankton within a water body and that these resources will replenish over time in any dynamic aquatic system (flowing or non-flowing) based on several mesocosm and microcosm studies discussed in the main body of the Opinion. We don't expect impacts to detritus from simazine exposure.

In summary, we expect all these species are likely to experience no more than low levels of exposure to simazine based on the low level of total overlap of the species' ranges and agricultural simazine use sites. We also expect non-agricultural exposure is low. While pesticides are noted as a threat to some of the fish species in this group, and while some species may experience sublethal direct effects (e.g., reduced growth) and indirect effects (e.g., loss of prey items), we expect these adverse effects will be limited to only a small number of individuals. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species listed in Table 2.

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

The species in Table 3 are grouped together because they all occur completely within California and very little of their ranges have been treated with simazine in the past according to the California Department of Pesticide Regulation Pesticide Use Reporting (CalPUR) data. While we present some specific information about the species in Table 3 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 3. Species with low 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
Clear Lake hitch	*Lavinia exilicauda chi*	High	Low	Low	0.1	No Jeopardy
Delta smelt	*Hypomesus transpacificus*	High	Low	Low	0.7	No Jeopardy
Longfin smelt	*Spirinchus thaleichthys*	High	Low	Low	0.1	No Jeopardy
Santa Ana speckled dace	*Rhinichthys gabrielino*	High	Low	Low	<0.1	No Jeopardy
Tidewater goby	*Eucyclogobius newberryi*	Low	Low	Low	0.1	No Jeopardy

The Delta smelt, longfin smelt, and Santa Ana speckled dace have high vulnerability rankings. The tidewater goby has a low vulnerability ranking. Delta smelt and longfin smelt each only have a single population experiencing declining trends while the tidewater goby has multiple populations within unknown populations trends. The Santa Ana speckled dace's four extant populations are small, declining, and distributed across the headwaters of four isolated river systems, but most exist within federal lands[8] (primarily on lands owned by USFS, see Table 6-2 in USFWS 2024) where pesticides are not anticipated to be a threat for this species. Pesticides are a noted threat to both the delta smelt and the longfin smelt. While there is a high extent of overlap between the Delta smelt and longfin smelt species' ranges and registered agricultural use

[8] Simazine use on federal lands is anticipated to be low given the limited and regulated uses. For example, simazine use is primarily on agricultural lands, Christmas tree farms and golf courses (see Appendix 1-4 of the BE), which are generally limited or nonexistent on federal lands.

sites, with 41.3% and 29.2%[9] total overlap for the Delta smelt and longfin smelt, respectively, available data from the California Department of Pesticide Regulations' California Pesticide Usage Report (CalPUR) indicate very little simazine usage has occurred within the two species' ranges. From 2013-2022, up to just 0.7% and 0.6% of both the Delta smelt and longfin smelt's ranges, respectively have been treated with simazine annually, indicating that only a small number of individuals are likely to experience any exposure (Table 3). There is a low extent of overlap with agricultural uses of simazine in the tidewater goby range (2.5%) and from 2013-2022, 0.1% of the tidewater goby's range has been treated with simazine annually, indicating that only a small number of individuals are likely to experience any exposure for this species as well (Table 2). While CalPUR data include all agricultural usage, it is also inclusive of certain non-agricultural uses, such as those performed by professional commercial applicators. Given that this usage data is mandated by the state of California and that these data are provided regularly at a relatively high spatial resolution (i.e., at the section level, which is per square mile), we have high confidence that only a small percent of the species' ranges is likely to be exposed to simazine.

Additionally, all three species have a low toxicity ranking, as we anticipate only low levels of simazine are likely to accumulate within the habitats of the tidewater goby, Delta smelt, and longfin smelt. Maximum estimated environmental concentrations of simazine from non-agricultural uses within the ranges of these three species will not exceed 1.6 µg/L[10]. This maximum exposure is lower than the sublethal NOAEC and is below levels where available toxicity studies have observed any mortality in fish species. Sublethal effects (e.g., reduced growth) will not occur at these exposure estimates, thus we do not anticipate sublethal effects are likely.

While these species are vulnerable to adverse effects (primarily direct effects to growth), we anticipate only a small number of individuals are likely to experience any exposure to agricultural or non-agricultural uses of simazine, and exposed individuals are not likely to die or experience adverse sublethal effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species in Table 3 in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of these fish species in the wild.

---

[9] Overlap values are provided from EPA's overlap analysis to determine overlap of likely simazine exposure to listed species, as described in Appendix 1-7 in the BE.

[10] Source: Appendix 3-1 in the EPA's BE. The EECs in these I&S summaries are also adjusted based on EPA's Herbicide Strategy that show a reduction in the estimated environmental concentrations of simazine in runoff by up to an order of magnitude (i.e., up to 90% reduction, in other words reduce pesticide loading to one-tenth of pre-runoff mitigation levels).

References

U.S. Fish and Wildlife Service. 2024. Draft Species Status Assessment for Santa Ana Speckled Dace. Sacramento, California. x + 91pp.

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

The species in Table 4 were grouped together because very little of their ranges have been treated with simazine in the past according to data from USDA's Census of Agriculture. Our concern for adverse effects (direct or indirect) is low. While we present some specific information about the species below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 4. Species with low agricultural exposure informed by low past usage of all herbicides from the USDA's Census of Agriculture (CoA) and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	% Range Treated (CoA)	Determination
Big Spring spinedace	*Lepidomeda mollispinis pratensis*	High	Low	Medium	4.1	No Jeopardy
Clover Valley speckled dace	*Rhinichthys osculus oligoporus*	High	Low	Medium	0.6	No Jeopardy
Cumberland darter	*Etheostoma susanae*	High	Low	Low	3	No Jeopardy
Gila topminnow (incl. Yaqui)	*Poeciliopsis occidentalis*	Medium	Low	Medium	2.5	No Jeopardy
Hiko White River springfish	*Crenichthys baileyi grandis*	High	Low	Medium	0.7	No Jeopardy
Humpback chub	*Gila cypha*	Medium	Low	Medium	1.8	No Jeopardy
Loach minnow	*Tiaroga cobitis*	High	Low	Medium	1.6	No Jeopardy
Owens pupfish	*Cyprinodon radiosus*	High	Low	Medium	0.8	No Jeopardy
Pahranagat roundtail chub	*Gila robusta jordani*	High	Low	Medium	2.5	No Jeopardy
Spikedace	*Meda fulgida*	High	Low	Medium	1.6	No Jeopardy

All the species in Table 4 have either a medium or high vulnerability ranking. Species like the loach minnow and spikedace have high vulnerability rankings as they have a restricted distribution and have pesticides noted as a threat. We anticipate these species may be more susceptible to impacts to individuals resulting from exposure to simazine. Species like the Gila topminnow (incl. Yaqui), and humpback chub have a medium vulnerability ranking. While these species may be more robust in general to adverse effects than high vulnerability species, we anticipate these species may still be susceptible to direct adverse effects to growth from simazine exposure from agricultural uses.

Despite the medium to high vulnerability of these species, we anticipate only a small number of individuals are likely to experience any exposure to agricultural uses of simazine as the USDA Census of Agriculture (CoA) indicates very little herbicide usage (of any active ingredient) occurred within the agricultural crops in the past in the counties where these species' ranges occur. Given that this reporting broadly includes all herbicide usage, we consider CoA data to be conservative estimates of simazine usage that indicates very little of the species' ranges are likely to be treated. As such, we anticipate no more than a small number of individuals are likely to be exposed to simazine through agricultural uses.

While we expect that some of these species may occur near non-agricultural use sites, we anticipate no more than a small number of individuals of each species will be exposed to simazine from non-agricultural uses. Of the species listed in Table 4, we expect all of them may co-occur within watersheds with developed, and open-spaced developed use sites and may be exposed to simazine runoff or spray drift through these uses. However, for all non-agricultural turf uses, triazines are not used on cool season grasses because they will die after exposure, but triazines are used on warm season grasses (i.e., the deep south and southeastern parts of CONUS) from the warm season hardiness zone north into the warm-cool transition zone. The Big Spring spinedace, Clover Valley speckled dace, Pahranagat roundtail chub, and Owens pupfish, are not located in areas of CONUS where warm season grasses grow and thus would not likely be exposed to simazine from this use. In addition, for golf course turf uses, simazine is 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. 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 6 points on EPA's mitigation menu), and we considered them in our assessment as limits to the amount of runoff that may enter nearby aquatic habitats where these fishes may be found. Finally, all species in this grouping have EECs from non-agricultural uses within their range that are well below the sublethal threshold where we would observe any adverse effects to these fish. Further, all species in this grouping have < 0.1 % overlap with nurseries indicating very low exposure to simazine from this non-agricultural use. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of these species to be limited.

While maximum estimated environmental concentrations of simazine may cause sublethal adverse effects (e.g., reduced growth) to all species in Table 4, we anticipate these high level exposures will only occur on occasion and that typical exposure concentrations are likely to be lower than levels where toxicity studies have observed sublethal effects in fish, resulting in only low levels of sublethal adverse effects to these species. Therefore, we expect low levels of sublethal adverse effects (i.e., reduced growth) to a small number of individuals of these species.

In summary, while sublethal adverse effects (primarily direct effects to growth) may occur to all species in Table 4, we expect these adverse effects will be limited to only a small portion of individuals as available CoA usage data indicate only low levels of simazine usage are likely to occur within these species' ranges. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species in Table 4 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 4.

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

The species in Table 5 were grouped together because we expect low agricultural exposure after incorporating spray drift and runoff conservation measures on the simazine label, including species-specific Pesticide Use Limitation Areas, and low likelihood of non-agricultural exposure. We expect off-site transport to be low, and the risk for adverse effects (direct or indirect) 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 5. Species with low agricultural exposure with mitigation from spray drift and runoff conservation measures and low likelihood of non-agricultural exposure

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
Alabama cavefish	*Speoplatyrhinus poulsoni*	High	Low	Low	General label measures	No Jeopardy
Boulder darter	*Etheostoma wapiti*	High	Low	Low	General label measures	No Jeopardy
Neosho madtom	*Noturus placidus*	High	Low	Low	General label measures	No Jeopardy
Trispot darter	*Etheostoma trisella*	High	Low	Low	General label measures + 6 points for all uses (with 1 exception)	No Jeopardy
Amber darter	*Percina antesella*	High	Low	Low	General label measures	No Jeopardy
Coal darter	*Percina brevicauda*	High	Low	Low	General label measures	No Jeopardy
Pearl darter	*Percina aurora*	High	Low	Low	General label measures	No Jeopardy
Spotfin Chub	*Erimonax monachus*	High	Low	Low	General label measures	No Jeopardy
Waccamaw silverside	*Menidia extensa*	High	Low	High	General label measures	No Jeopardy

The species in Table 5 are grouped together because we expect the mitigation measures included in the proposed action—including those required under EPA's Herbicide Strategy—to sufficiently reduce simazine transport to aquatic habitats such that no more than low levels of adverse effects (direct or indirect) are anticipated. All species in this group have high vulnerability rankings, reflecting their limited distributions, small or declining populations, and known sensitivity to environmental stressors. These conservation 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).

For all species in this group, EPA's Herbicide Strategy requires a minimum of three runoff mitigation points and implementation of a 15-foot spray drift buffer on all agricultural simazine applications. 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 measures are anticipated to reduce pesticide loading into aquatic habitats by up to 90% (one order of magnitude) compared to unmitigated runoff.

Although modeled overlap between species' ranges and simazine agricultural use sites is moderate to high for many species in this group, the conservation measures are expected to reduce the likelihood, magnitude, and frequency of exposure to a level where we expect no more than low levels of direct and indirect adverse effects to individuals will occur. For species that may occur in smaller, low-flow waterbodies where pesticide concentrations could be higher, the combined effect of drift buffers and runoff controls is expected to prevent exceedance of toxicity thresholds for both mortality and sublethal effects.

The trispot darter requires an additional three points for runoff mitigation (for a total of six points) based on concentrations of simazine within the aquatic habitats where they are found exceeding the sublethal threshold for all uses of simazine except strawberries within the Vegetables and Ground Fruit UDL. The conservation measures already present on the label include three points for runoff mitigation as well as a 15-foot buffer to reduce spray drift are sufficient to mitigate the effects from simazine exposure within their range from this use. The trispot darter is found in two different types of habitats depending on the time of year. Approximately from April to October, the species inhabits its non-breeding habitat which consists of small to medium river margins and lower reaches of tributaries with slower velocities (estimated to be 0.7 - 1 foot/second, 0.2 - 0.3 m/second) and is associated with detritus, logs, and stands of water willow though vegetation and detritus have not been found to be essential. In late fall this migratory species shifts its habitat preference and movement toward spawning areas begins. The fish move from approximately late November or early December to late April to breeding sites defined as intermittent to partially intermittent seepage areas and ditches with little to no flow; shallow depths (12 inches, 30 cm or less; USFWS 2017). Thus, the trispot darter relies on low velocity shallow areas for most of its lifecycle, in particular during the breeding season, therefore the need for additional mitigation runoff points is essential to the survival of this species.

Of the species listed in Table 5 we expect that all of them may co-occur within watersheds with developed, and open-spaced developed use sites and may be exposed to simazine runoff or spray drift through these uses. However, for all species in Table 5, all EECs from developed and open-space developed uses are well below the concentration of simazine where we would observe any sublethal effects (e.g., reduced growth). In addition, non-agricultural turf uses, triazines are not used on cool season grasses because they will die after exposure, but triazines are used on warm season grasses (i.e., the deep south and southeastern parts of CONUS) from the warm season hardiness zone north into the warm-cool transition zone. Some of these fish species are located in the warm season or warm season transition hardiness zone (e.g., Waccamaw silverside, Alabama cavefish, pearl darter) thus could be exposed to simazine from these non-agricultural uses.

However, for golf course turf uses, simazine is 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. 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 6 points on EPA's mitigation menu), and we considered them in our assessment as limits to the amount of runoff that may enter nearby aquatic habitats where these fishes may be found. Furthermore, given our knowledge of simazine application to turf and nursery areas (see *Exposure to Non-Agricultural Uses*, above), we expect simazine usage within the range of these species to be limited.

Given the implementation of the conservation measures, the low exposure rankings of all species in this group based on conservation measures incorporated into the action, and the expectation that any exposure will occur at low and environmentally non-consequential levels, we anticipate that adverse effects (primarily direct effects to growth), if they occur, will be limited to a small number of individuals. 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 likelihood of survival and recovery of the species in Table 5 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 5.

References

U.S. Fish and Wildlife Service. 2017.Species Status Assessment for the Trispot Darter (*Etheostoma trisella*) Version 1.0, July 2017. U.S. Fish and Wildlife Service, Region 4, Atlanta, Georgia.

Species requiring further analysis

In our draft Biological Opinion, we focused our analyses on 1) species with low expected exposure to simazine (due to low overlap, usage, or conservation measures adopted prior to consultation), and 2) species with more than low levels of exposure that benefited from conservation measures identified through the Herbicide Strategy that aimed to reduce off-site transport of simazine (i.e., listed plants and listed animals that depend on plant resources). For the species in Table 6, we identified the need for further coordination. We expect Herbicide Strategy mitigations to reduce pesticide loading into aquatic habitats by up to 90% (i.e., one order of magnitude) compared to unmitigated runoff. While the conservation measures are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues in low-flow or low-volume habitats could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to these species. We intend to continue coordinating with EPA and simazine registrants between the release of this draft Opinion and the transmission of the final Opinion to gain information regarding the exposure and effects of each species to simazine. As such, we have not yet made determinations for these species.

Table 6. Fish needing further analysis.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking
Arkansas River shiner	*Notropis girardi*	High	Medium	High
Barrens topminnow	*Fundulus julisia*	High	High	High
Cape Fear shiner	*Notropis mekistocholas*	High	Medium	High
Carolina madtom	*Noturus furiosus*	High	Medium	High
Desert pupfish	*Cyprinodon macularius*	High	Medium	High
Grotto sculpin	*Cottus specus*	High	High	High
June sucker	*Chasmistes liorus*	Medium	Medium	High
Palezone shiner	*Notropis albizonatus*	High	Medium	High
Pallid sturgeon	*Scaphirhynchus albus*	Medium	High	High
Peppered chub	*Macrhybopsis tetranema*	High	Medium	High
Relict darter	*Etheostoma chienense*	Medium	High	High
Slackwater darter	*Etheostoma boschungi*	High	Medium	High
Spring pygmy sunfish	*Elassoma alabamae*	Medium	High	High
Toothless blindcat	*Trogloglanis pattersoni*	High	Medium	High
Topeka shiner	*Notropis topeka (=tristis)*	Medium	High	High
Widemouth blindcat	*Satan eurystomus*	High	Medium	High
Yaqui catfish	*Ictalurus pricei*	High	Medium	High
Yaqui chub	*Gila purpurea*	Medium	Medium	High