Integration and Synthesis Summary for Aquatic Snails

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

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

Vulnerability

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

[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.

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 snail species will be exposed to simazine primarily through direct contact in the 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 species in areas far from use sites.

Exposure to Agricultural Uses

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

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

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 on or near non-agricultural simazine use sites (i.e., residential areas where lawns are likely present, golf courses, and nurseries) and the manner in which they may rely on these sites.

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

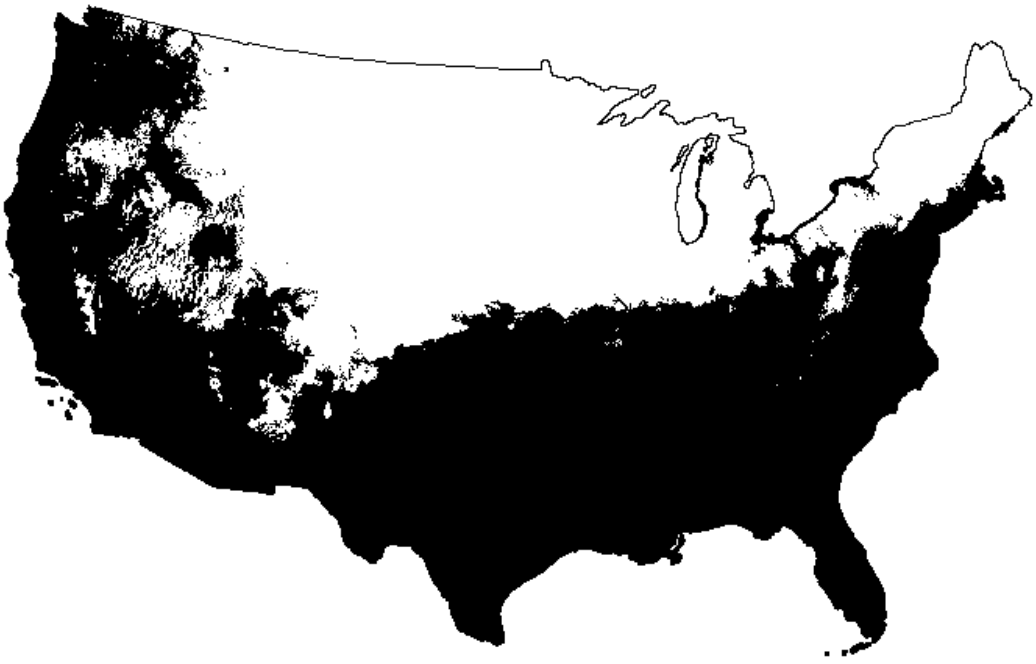

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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

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

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

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 dietary items like plankton or detritus are exposed to simazine and experience adverse effects.

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

We consider in our analysis if EECs exceed the threshold for sublethal effects on reproduction to the snail as simazine data indicate reduced fecundity can occur to aquatic mollusks at EECs that may be observed in concentrations in lower flow or lower volume water bodies within the range for some snails. For some snails in this Opinion, EECs may occur at levels that exceed the aquatic mollusk sublethal LOAEC, but no EECs exceed the mortality threshold for mollusks calculated by the EPA.

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 snails 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 to snails. We determine the agricultural

[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.

toxicity ranking for snails by qualitatively assessing the expected levels of adverse effects (e.g., sublethal effects to the snail).

We also consider effects to dietary resources in our toxicity ranking. Aquatic snails generally consume plant-based and microbial resources (e.g., algae, detritus). We anticipate high levels of mortality to some snail dietary items (e.g., algae) in low flow or low volume waterbodies. We anticipate algae will be impacted by simazine applications but we do not anticipate that it will eliminate all algae within a water body and 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 snails. As such, impacts to reproduction to snails are the primary driver in determining the toxicity ranking for snail species.

Experimental populations, non-essential

We considered the following nonessential experimental population for snails: Anthony's river snail (EXPN Entity IDs 3842 and 9507). We do not provide separate analyses and jeopardy determinations for these populations. Rather, we treat all populations of the species (including populations designated as experimental) as a single listed entity when making jeopardy determinations or for other analyses in a section 7 consultation. An "essential experimental population" is a reintroduced population whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild. However, there are no "essential experimental populations" in this consultation. A "nonessential experimental population" is a reintroduced population whose loss would not be likely to appreciably reduce the likelihood of survival of the species in the wild. By definition, a "nonessential experimental population" is not essential to the continued existence of the species. Therefore, no proposed action impacting a population so designated could lead to a jeopardy determination for the entire species. In cases where our assessment of the listed entity (i.e., the non-experimental population(s) of the species) leads to a "not likely to jeopardize" determination, we generally assume any added effects to the nonessential experimental population will not change these determinations. However, we consider the role of the experimental population in the survival and recovery of the species and consider this information in our jeopardy analyses as appropriate.

Conservation Measures

Herbicide Strategy Conservation Measures

As part of the simazine ESA consultation with the Service, EPA is implementing the final Herbicide Strategy to inform and identify any necessary conservation measures where EPA's analysis indicated there was a risk of population level effects to listed species. The measures identified by EPA, and committed to by the technical registrants, include a standard 15-foot

spray drift buffer and a minimum of three runoff mitigation points[5] necessary in all areas where simazine is used, as well as additional runoff mitigation points for certain simazine uses limited to specific geographic areas.

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

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

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

Based on EPA's analyses, the 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 mussel species through this exposure route.

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

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

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

reduce estimated environmental concentrations of simazine in runoff by up to an order of magnitude (i.e., up to 90% reduction) (i.e., reduce pesticide loading to one-tenth of pre-runoff mitigation levels).

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

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

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

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

Summary of Conclusions for Snail 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 the 22 snail species in this Appendix.

In our analysis below, some species that had the same or very similar rationales for their conclusions were grouped together, to increase efficiency and avoid repetition. Relevant information and data unique to each individual species was considered when assigning species to groups and incorporated into the rationales as appropriate. Species-specific information (e.g., environmental baseline, cumulative effects, status of the species, exposure, and toxicity) was considered for all species, including those species in the grouped analyses, and are presented in full in Appendices B and E. Species with rationales that did not fit in a group, or warranted a separate rationale because of their life history, conservation status, or other information indicated that effects could be different, would have had an individual discussion to provide additional explanation; no snail species warranted individual discussions in this appendix. 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 informed by low overlap with agriculture and low likelihood of non-agricultural exposure

The species in Table 1 are grouped together because they all have low concern of direct and indirect adverse effects due to low exposure as informed by low agricultural overlap between the species' ranges and areas where simazine is registered for use and low likelihood of non-agricultural exposure. While we present some specific information about the species in 1 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 1. Species with low agricultural exposure informed by low overlap with 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
Anthony's riversnail	*Athearnia anthonyi*	High	Low	Low	4.0	No Jeopardy
Cylindrical lioplax (snail)	*Lioplax cyclostomaformis*	High	Low	Low	1.5	No Jeopardy
Flat pebblesnail	*Lepyrium showalteri*	High	Low	Low	0.7	No Jeopardy
Interrupted (=Georgia) rocksnail	*Leptoxis foremani*	High	Low	Low	3.2	No Jeopardy
Lacy elimia (snail)	*Elimia crenatella*	High	Low	Low	4.1	No Jeopardy
Painted rocksnail	*Leptoxis taeniata*	High	Low	Low	2.6	No Jeopardy
Plicate rocksnail	*Leptoxis plicata*	High	Low	Low	0.9	No Jeopardy
Quitobaquito tryonia	*Tryonia quitobaquitae*	High	Low	Low	1.7	No Jeopardy
Rough hornsnail	*Pleurocera foremani*	High	Low	Low	2.3	No Jeopardy
Round rocksnail	*Leptoxis ampla*	Medium	Low	Low	0.8	No Jeopardy
Royal marstonia (snail)	*Marstonia ogmorhaphe*	High	Low	Low	2.0	No Jeopardy
Tulotoma snail	*Tulotoma magnifica*	High	Low	Low	2.7	No Jeopardy
Tumbling Creek cavesnail	*Antrobia culveri*	High	Low	Low	0.1	No Jeopardy

Most species listed in Table 1 have high vulnerability rankings, indicating that they may be especially susceptible to species-level impacts from additional stressors in their environment, such as adverse effects to individuals from simazine exposure. The round rocksnail has a

medium vulnerability based on findings that it is not believed to have lost any known populations since the time of listing; its range has also extended within existing populations, several miles in the Cahaba River and its tributary populations (e.g., Little Cahaba, Shades Creek).

Even though pesticides are a noted threat to some of these species (e.g., Anthony's riversnail) the species in Table 1 have low toxicity rankings because available toxicity data indicate that aquatic snails are not very sensitive to simazine exposure; we do not anticipate mortality at relevant environmental concentrations. Most of these snails occur in waterbodies (i.e., fast-flowing rivers or streams, waters with moderate flow) where we do not anticipate levels of simazine will reach concentrations that will adversely affect them.

For agricultural uses, a required 15-foot buffer and three points of mitigation will reduce simazine spray drift and runoff from entering the aquatic systems where these species are found such that we only expect low level sublethal effects to any exposed individuals. Snails in this grouping are not likely to experience direct adverse effects from runoff or spray drift from non-agricultural uses of simazine as the EECs within their range will not reach levels where we would observe mortality or sublethal effects to snails. In general, aquatic snails feed on a variety of plant-based items such as periphyton, algae, biofilm, and detritus. We anticipate that simazine exposure from both agricultural and non-agricultural sources will cause minor changes to dietary resources and will not affect the snails' abilities to forage. Simazine is not likely to eliminate all aquatic vegetation within a water body, and we expect aquatic plant-based sources will replenish over time in any dynamic aquatic system (e.g., flowing or non-flowing) based on several mesocosm and microcosm studies discussed in the main body of the Opinion.

After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 1.

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

The species in Table 2 are grouped together because we anticipate these species are at low risk of adverse effects from the proposed action as a result of the conservation measures included in the description of the action, including general label changes, and low likelihood of non-agricultural exposure based on practices inherent to nursery, golf course, and residential lawn application methods for simazine to reduce spray drift and runoff. 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 agricultural exposure achieved through spray drift and runoff conservation measures and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
Banbury Springs limpet	*Idaholanx fresti*	High	Low	Low	General label measures	No Jeopardy
Bliss Rapids snail	*Taylorconcha serpenticola*	High	Low	Low	General label measures	No Jeopardy
Magnificent ramshorn	*Planorbella magnifica*	High	Low	Low	General label measures	No Jeopardy
Snake River physa snail	*Physella natricina*	High	Low	Low	General label measures	No Jeopardy
Armored snail	*Marstonia pachyta*	High	Low	Low	General label measures	No Jeopardy
Koster's springsnail	*Juturnia kosteri*	High	Low	Low	General label measures	No Jeopardy
Pecos assiminea snail	*Assiminea pecos*	High	Low	Low	General label measures	No Jeopardy
Roswell springsnail	*Pyrgulopsis roswellensis*	High	Low	Low	General label measures	No Jeopardy
Slender campeloma	*Campeloma decampi*	High	Low	Low	General label measures	No Jeopardy

All species in this group have high vulnerability rankings, reflecting their limited distributions, small or declining populations, and known sensitivity to environmental stressors. These species have low toxicity rankings, and low exposure rankings after incorporating conservation measures from spray drift and runoff conservation measures. Although modeled overlap between species' ranges and simazine use sites is medium or high for species in this group, the required conservation measures are expected to reduce the likelihood, magnitude, and frequency of exposure to a level we expect no more than low level direct or indirect effects.

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.

For non-agricultural uses, there are several practices in turf grass management for golf courses and residential lawn application practices that offer runoff and spray drift mitigation points already inherent in the methods by which these applications are made. For example, for golf course management, a practice of no-tilling and continuous cover minimizes runoff such that mitigation points would be recognized for such and lead to a two-order of magnitude reduction in the concentrations of simazine in aquatic habitats where these snails are found. Additional practices for residential lawns and golf courses using a coarse droplet size further reduce spray drift from entering the aquatic habitats where these snails are found as well. All of these species have <0.1% overlap with nurseries thus we do not have concern for simazine exposure from this use within the range of these snail species.

These species occur in waterbodies that are small or have low flow, where we expect pesticides may concentrate over time. The combined effect of spray drift buffers and runoff controls is expected to prevent exceedance of toxicity thresholds for agricultural uses. As such, it is unlikely simazine will impact the periphyton, algae, spatterdock, biofilm on decaying spatterdock, or water molds on which these snails feed as well. There are no concerns from non-agricultural uses of simazine as EECs likely within the range of these snails will be below levels where adverse effects (i.e., mortality or sublethal) would be expected for the snails as well as the dietary items on which they feed.

Thus, given the implementation of the conservation measures, the low toxicity rankings of species in this group, and the expectation that any exposure will occur at low and environmentally non-consequential levels, we anticipate that adverse effects, if they occur, will be limited to a small number of individuals for the species in Table 2. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 2.