Critical Habitat Determinations and Rationales

Introduction

Destruction or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species (50 CFR 402.02). The conservation value of the critical habitat for a species is based on physical and biological features (PBFs) that the species needs for life processes and successful reproduction that are essential to the conservation of endangered and threatened species and that may need special management or protection. While there are general PBFs that serve as the basis for all critical habitat designations, many critical habitat rules (obtained through our ECOS[1] repository) list specific PBFs related to the habitat needs of the species. In this assessment, when critical habitat rules did not list specific PBFs (primarily older critical habitat rules), we reviewed available information about the species' biology and habitat requirements to determine if features essential to the conservation value of the critical habitat for the species would be affected by the proposed action. We also reviewed other sections of the critical habitat rules, such as descriptions of special management considerations or protection and the application of the destruction or adverse modification standards for section 7(a)(2) consultations, to determine if these sections included information relevant to the effects of the Action on critical habitat. The effects to the critical habitat and its PBFs are related to, but are not always the same as, effects to the species, and the species does not have to be present for adverse effects to the critical habitat to occur. Our analysis considers whether the critical habitat's PBFs will be affected in a manner that is likely to appreciably diminish the value of the critical habitat as a whole for the conservation of a listed species.

Methodology

We assessed whether the registration of simazine is likely to appreciably reduce the conservation value of designated critical habitat. Critical habitat designation rules have included a variety of terms, such as "physical or biological features" (PBFs), "primary constituent elements" (PCEs), or "essential features" to characterize the key components of critical habitat essential for the conservation of the listed species. Our analytical approach is the same regardless of whether the original critical habitat designation identified PCEs, PBFs or essential features. For those reasons, in this Opinion, we broadly use the term PBFs when referring to the key components of critical habitat that are described as essential for the conservation of the listed species in critical habitat designations as a standardized way to cover all features described by these terms.

We used information related to the PBFs to categorize the critical habitats and frame our critical habitat effects analyses. We identified five types of PBFs (as currently understood and available) that would be susceptible to the effects of simazine, specifically, those related to: (1) water quality, (2) host plants, (3) required plant assemblages, (4) general plant functions, and (5)

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

animals (other than insects). These types of PBFs and why we selected them are described in more detail in the "Critical Habitat Approach to the Assessment" section of the Opinion and are collectively referred to herein as the "relevant PBFs." Insect-related PBFs were not identified as relevant to the proposed action because they are not likely to experience mortality from simazine exposure, and thus insect-related PBFs are not likely to be affected by the proposed action. Other types of animals that function as prey, host fish (for mussels), or seed dispersers were found to be relevant PBFs. We reviewed each critical habitat rule to determine if PBFs related to one or more of the relevant factors is listed or discussed, and identified comparable habitat features, where applicable, for those critical habitats with rules that do not include specific PBFs. We then categorized designated critical habitats into two groups:

- Critical habitats that have specified PBFs, but none of the five relevant types of PBFs that we anticipate would be affected by simazine (e.g., PBFs that are not water quality, host plants, plant assemblages, plant functions, or animals (other than insects) required to support the species).
- Critical habitats that have relevant types of PBFs (whether explicitly outlined or inferred and assigned by our review of the critical habitat designation) that we anticipate would be affected by simazine.

In cases where there were no relevant PBFs, we could not link the consequences of the proposed action to the PBFs of the critical habitat, including elements of the habitat that require special management considerations or protection and considerations when applying the adverse modification standard. Thus, based on the rationale that none of the features essential to the conservation value of the critical habitat for the species would be affected by the proposed action, we determined that the proposed action is not likely to destroy or adversely modify critical habitats that fell into this category.

In cases where we identified relevant PBFs that we anticipate would be affected by simazine, we continued our assessment of the consequences of the proposed action by evaluating the extent to which the critical habitat will be exposed to simazine, the degree of anticipated adverse effects to the PBF(s), and anticipated effects on the critical habitat as a whole.

Exposure to Agricultural Uses of Simazine

Simazine has several registered agricultural uses (see Appendix 1-4 of EPA's Biological Evaluation). We characterize the expected level of exposure from agricultural uses of simazine using overlap data (including on- and off-field overlap), past usage data, including EPA's State Use and Usage Matrix (SUUM), USDA's Census of Agriculture (CoA), and the California Department of Pesticide Regulation's Pesticide Use Report (CalPUR), and any species-specific considerations such as life history information (e.g., habitat preferences, dispersal behavior) and existing protections or conservation actions. Critical habitats with greater than 10% total overlap with agricultural simazine use sites and off-site transport areas are assigned a high overlap score, critical habitats with 5-10% overlap are assigned a medium overlap score, and critical habitats with less than 5% total overlap are assigned a low overlap score. In addition to overlaps with simazine agricultural use sites, we considered past usage within critical habitat (as informed by the SUUM) to determine the proportion of critical habitat we expect to be treated with simazine each year of the proposed action. For critical habitats occurring in California, we replace the SUUM usage data with CalPUR data as this data is spatially specific and likely a more accurate description of potential agricultural exposure. Critical habitats that usage data indicate will have a large portion of their range (>10%) treated with simazine each year are assigned a high usage score. Critical habitats that will have a medium proportion (5-10%) treated with simazine each year are assigned a medium usage score, and critical habitats that data indicate will have a low proportion (<5%) treated with simazine each year are assigned a low usage score.

Agricultural uses of simazine include labeled uses for corn, vegetables and ground fruit, other crops, citrus, Christmas trees, and other orchards only within the conterminous United States.

Exposure to Non-agricultural Uses of Simazine

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. Data provided by EPA indicate low to high levels of overlap between critical habitats 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 critical habitats and 0%-0.7% of critical habitats when nurseries are buffered out to 305 meters (to account for potential off-site exposure). For critical habitats 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 critical habitat to all non-agricultural uses of simazine in a qualitative manner, considering whether factors such as the life history of species suggest that non-agricultural use sites may act as high quality or highly desirable areas that would support the conservation and recovery of the species. To facilitate this analysis, for every critical habitat in this Appendix, we reviewed species' documents (e.g., 5-year reviews, recovery plans, listing rules) to determine if the critical habitat PBFs 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 the species may rely on these sites within designated or proposed critical habitat.

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.

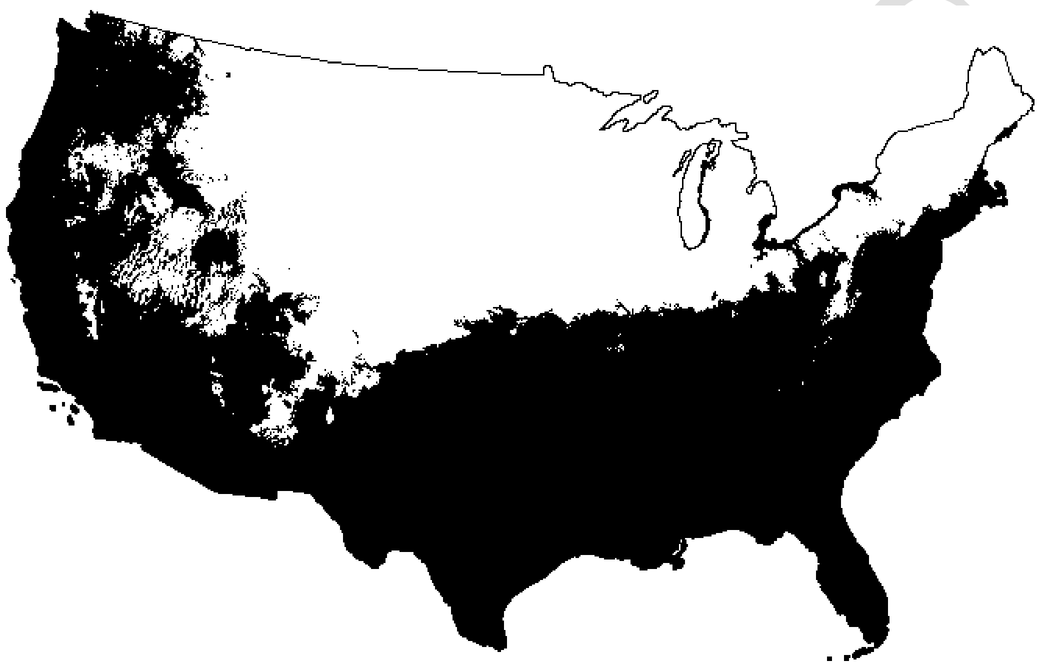

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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 critical habitats, we generally anticipate that non-agricultural use sites occurring within critical habitat units do not represent fully functional critical habitat and these areas are not contributing to the overall conservation and recovery of the species, suggesting that simazine use in these areas will not meaningfully add to the overall level of anticipated exposure considered in our analysis of agricultural uses. Briefly, we expect most listed species' habitat requirements precludes them from occupying or occurring near non-agricultural use sites where simazine may be used, indicating that non-agricultural areas are generally not likely to contain many (if any) of the PBFs required to support the conservation and recovery of listed species. For critical habitats known or presumed to occur in or adjacent to non-agricultural use sites of simazine, we consider, individually and qualitatively, the extent and manner of non-agricultural simazine usage within the critical habitat to determine the expected level of adverse effects from non-agricultural exposure of simazine.

References:

GCSAA (Golf Course Superintendents Association of America). 2025. Personal communication with USFWS HQ staff.

USDA. 2004. Comparing warm-season and cool-season grasses for erosion control, water quality, and wildlife habitat. Natural Resources Conservation Service, U.S. Department of Agriculture. 5 pp.

USDA. 2023. Plant Hardiness Zone Map. Agricultural Research Service, U.S. Department of Agriculture. Accessed from https://planthardiness.ars.usda.gov/ on August 20, 2025.

Toxicity

We characterize the expected adverse effects to critical habitats based on the anticipated level of adverse effects to PBFs. Our analysis of toxicity assumes critical habitats 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. We consider estimated concentrations of simazine on the landscape or within the environment and effects reported in available toxicity studies of various taxa of organisms to determine the level of adverse effect to relevant PBFs. We also include any additional considerations regarding a listed species' life history that provides additional context to the specific parameters that PBFs need to meet to maintain their function (e.g., how sensitive a listed species is to simazine may influence the level of adverse effect to a water quality PBF relative to another species).

Additional Considerations

The general framework for our critical habitat analysis is largely similar to our analysis for listed species. However, the nature of critical habitat results in some inherent differences and notable trends we think are worth bringing to the readers' attention. While overlap and usage metrics are derived using the same data sources as for species ranges, we tend to see higher levels of overlap and usage, which is likely a result of the small size of designated critical habitat units relative to the species range. For instance, we observed that the percent critical habitat likely to be treated each year is the same as the total overlap for critical habitats where we used SUUM data to characterize past levels of usage. This is in contrast to results seen in our analysis of listed species where the past level of usage typically indicates that a portion of the range smaller than the total overlap is likely to be treated each year.

Similar to the analyses for listed species, for critical habitats designated for aquatic species, rather than using the designated critical habitat units, the EPA uses the HUC-12 watersheds that contain the designated critical habitat units 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 (e.g., fish, bivalves) occur directly in simazine use sites and that off-site exposure is inherently included when overlap and usage are calculated at a watershed scale, we use the watershed overlap and usage data to characterize potential exposure to agricultural uses of simazine.

Conservation Measures

Herbicide Strategy Conservation Measures

As part of the simazine ESA consultation with the Service, EPA is implementing the final Herbicide Strategy[2] to inform and identify any necessary mitigations where EPA's analysis indicated there was a risk of population level effects to listed species. While these measures were put in place to protect listed species, we anticipate any measures that apply to the species will also be protective of their critical habitats and thus also incorporate them into our critical habitat analyses whenever relevant. 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

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

mitigation points[3] 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[3]. These documents are provided in Appendix A-1.

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

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

Based on EPA's analyses, the required spray drift conservation measures described above (from the current label and implemented through the Herbicide Strategy) will reduce spray drift from entering species' critical habitats by >95%. The Service anticipates that this reduction will minimize off-site transport of simazine from spray drift to a point where no more than low levels of adverse effects are likely to occur to most relevant PBFs through this exposure route.

Additionally, all agricultural labels will include a requirement for applicators to achieve 3 points of runoff mitigation, as described in the Herbicide Strategy, for all agricultural uses. EPA's Herbicide Strategy provides applicators with various options to reduce runoff and erosion and assigns points to each option based on its effectiveness. Applicators must implement sufficient mitigation points to meet the label requirement. Applicators can achieve the required points using the mitigation measures identified on EPA's Mitigation Menu website[4]. 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:

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

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

- 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 into the critical habitats of listed species. EPA's analyses indicate that the general label requirement of 3 runoff mitigation points will reduce estimated environmental concentrations of simazine in runoff by up to an order of magnitude (i.e., up to 90% reduction, in other words reduce pesticide loading to one-tenth of pre-runoff mitigation levels).

For all critical habitats in this document, we expect the spray drift and runoff measures, including the 3 runoff points and 15-foot spray drift buffers required under the Herbicide Strategy, will reduce off-site exposure concentrations to within one order of magnitude of the exposure level where 95% of plant species are not likely to experience measurable adverse effects. We anticipate this level of mitigation will protect critical habitat by reducing the extent of area exposed (by reducing the extent of off-site transport of simazine residues) and reducing the level of adverse effects that will occur to critical habitat PBFs (by reducing estimated exposure concentrations in off-site areas). In most cases, we anticipate this reduction in off-site exposure will result in no more than low levels of adverse effects to plant-based PBFs. Animal-based PBFs will also be protected by this level of mitigation because plants are the most sensitive taxonomic group, and all other animal taxa are less sensitive to simazine exposure than plants thus any mitigations focused on protecting plants from simazine will be protective of animal taxonomic groups also.

In cases where EPA has identified additional runoff measures are needed, additional points (up to 3, i.e., up to 99% reduction) will be required. EPA will communicate where additional runoff mitigation points are needed and for what specific simazine uses through their Bulletins Live! Two online platform, which all applicators are required to check before making pesticide applications. In areas requiring up to 6 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).

Conclusion

To determine the overall adverse effect of the proposed action to designated critical habitat, we assessed the anticipated adverse effects to each relevant PBF alongside exposure to determine both the overall adverse effect of simazine exposure and the footprint of the anticipated adverse effect across the entire critical habitat.

In our analysis below, critical habitats that had the same or very similar rationales for their conclusion were grouped together to increase efficiency and avoid repetition. Relevant information and data unique to each individual species and critical habitat was considered when assigning critical habitats to groups and incorporated into the rationales as appropriate. Species- and critical habitat-specific information (e.g., environmental baseline, cumulative effects, status of the species, exposure, and toxicity) for all critical habitats, including those in the grouped analyses, are included in Appendices B and E. Critical habitats with rationales that did not fit in a group, or warranted a separate rationale, have an individual discussion. To be clear, we conducted a critical habitat-specific analysis for each critical habitat as part of this formal consultation (considering the status of the critical habitat, environmental baseline, cumulative effects, and effects of the action, for each critical habitat, as explained further in Appendices B and E); our process and analysis for each critical habitat remained the same, regardless of the format of the discussion presented below (i.e., a grouped or individual discussion).

Critical Habitats with No Relevant PBFs

Our review found no relevant PBFs for the designated and proposed critical habitats listed in Table 1. Given that there is no link between simazine exposure and adverse effects to critical habitat function as defined by the relevant PBFs, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species and is not likely to result in the destruction or adverse modification to the critical habitats listed in Table 1.

Table 1. Summary of critical habitats with no relevant physical and biological features (PBFs) listed in their critical habitat designation.

Taxa	Common Name	Scientific Name	Determination
Fish	Niangua darter	*Etheostoma nianguae*	No Destruction or Adverse Modification
Fish	White sturgeon	*Acipenser transmontanus*	No Destruction or Adverse Modification
Mammals	Indiana bat	*Myotis sodalis*	No Destruction or Adverse Modification
Mammals	Virginia big-eared bat	*Corynorhinus (=Plecotus) townsendii virginianus*	No Destruction or Adverse Modification
Plants	Amargosa niterwort	*Nitrophila mohavensis*	No Destruction or Adverse Modification
Plants	Arizona eryngo	*Eryngium sparganophyllum*	No Destruction or Adverse Modification
Plants	Lyon's pentachaeta	*Pentachaeta lyonii*	No Destruction or Adverse Modification
Plants	Pecos (=puzzle, =paradox) sunflower	*Helianthus paradoxus*	No Destruction or Adverse Modification
Plants	White Bluffs bladderpod	*Physaria douglasii ssp. tuplashensis*	No Destruction or Adverse Modification

Critical Habitats with Low Exposure (informed by low overlap with agriculture and low anticipated exposure from non-agricultural uses)

The critical habitats in Table 2 have a low extent of overlap between designated critical habitat and agricultural uses of simazine. Given the conservative nature of our estimate 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 critical habitats will experience low levels of exposure from agricultural uses. We discuss any anticipated effects to relevant PBFs within these small portions of the critical habitats and from non-agricultural uses below.

Table 2. Critical habitats that have a low total overlap with agricultural uses of simazine.

Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% critical habitat)	Determination
Amphibians	Austin blind salamander	*Eurycea waterlooensis*	0.1	No Destruction or Adverse Modification
Amphibians	Black warrior (=Sipsey Fork) waterdog	*Necturus alabamensis*	1.4	No Destruction or Adverse Modification
Amphibians	Georgetown salamander	*Eurycea naufragia*	1.0	No Destruction or Adverse Modification
Amphibians	Jollyville Plateau salamander	*Eurycea tonkawae*	0.6	No Destruction or Adverse Modification
Amphibians	San Marcos salamander	*Eurycea nana*	1.0	No Destruction or Adverse Modification
Amphibians	Salado salamander	*Eurycea chisholmensis*	4.7	No Destruction or Adverse Modification
Amphibians	Sierra Nevada Yellow-legged frog	*Rana sierrae*	4.1	No Destruction or Adverse Modification
Birds	Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Birds	Mississippi sandhill crane	*Antigone canadensis pulla*	3.5	No Destruction or Adverse Modification
Bivalves	Alabama moccasinshell	*Medionidus acutissimus*	2.4	No Destruction or Adverse Modification
Bivalves	Appalachian elktoe	*Alasmidonta raveneliana*	1.2	No Destruction or Adverse Modification
Bivalves	Balcones spike	*Fusconaia iheringi*	3.6	No Destruction or Adverse Modification
Bivalves	Canoe Creek Clubshell	*Pleurobema athearni*	2.0	No Destruction or Adverse Modification
Bivalves	Coosa moccasinshell	*Medionidus parvulus*	2.6	No Destruction or Adverse Modification
Bivalves	Cumberland elktoe	*Alasmidonta atropurpurea*	0.5	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% critical habitat)	Determination
Bivalves	Cumberlandian combshell	*Epioblasma brevidens*	2.5	No Destruction or Adverse Modification
Bivalves	Dark pigtoe	*Pleurobema furvum*	0.8	No Destruction or Adverse Modification
Bivalves	False spike	*Fusconaia mitchelli*	2.4	No Destruction or Adverse Modification
Bivalves	Finelined pocketbook	*Hamiota altilis*	2.2	No Destruction or Adverse Modification
Bivalves	Fluted kidneyshell	*Ptychobranchus subtentus*	3.6	No Destruction or Adverse Modification
Bivalves	Georgia pigtoe	*Pleurobema hanleyianum*	3.2	No Destruction or Adverse Modification
Bivalves	Guadalupe fatmucket	*Lampsilis bergmanni*	0.5	No Destruction or Adverse Modification
Bivalves	Guadalupe Orb	*Cyclonaias necki*	2.2	No Destruction or Adverse Modification
Bivalves	Louisiana pigtoe	*Pleurobema riddellii*	0.6	No Destruction or Adverse Modification
Bivalves	Mexican fawnsfoot	*Truncilla cognata*	0.9	No Destruction or Adverse Modification
Bivalves	Narrow pigtoe	*Fusconaia escambia*	2.6	No Destruction or Adverse Modification
Bivalves	Orangenacre mucket	*Hamiota perovalis*	2.3	No Destruction or Adverse Modification
Bivalves	Ouachita fanshell	*Cyprogenia sp. cf. aberti*	0.5	No Destruction or Adverse Modification
Bivalves	Oyster mussel	*Epioblasma capsaeformis*	2.5	No Destruction or Adverse Modification
Bivalves	Purple bean	*Villosa perpurpurea*	0.4	No Destruction or Adverse Modification
Bivalves	Rough rabbitsfoot	*Quadrula cylindrica strigillata*	0.4	No Destruction or Adverse Modification
Bivalves	Slabside Pearlymussel	*Pleuronaia dolabelloides*	4.7	No Destruction or Adverse Modification
Bivalves	Southern clubshell	*Pleurobema decisum*	2.8	No Destruction or Adverse Modification
Bivalves	Southern pigtoe	*Pleurobema georgianum*	2.6	No Destruction or Adverse Modification
Bivalves	Texas fatmucket	*Lampsilis bracteate*	1.0	No Destruction or Adverse Modification
Bivalves	Texas fawnsfoot	*Truncilla macrodon*	3.9	No Destruction or Adverse Modification
Bivalves	Texas heelsplitter	*Potamilus amphichaenus*	2.3	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% critical habitat)	Determination
Bivalves	Texas hornshell	*Popenaias popeii*	1.1	No Destruction or Adverse Modification
Bivalves	Texas pimpleback	*Cyclonaias petrina*	2.8	No Destruction or Adverse Modification
Bivalves	Triangular Kidneyshell	*Ptychobranchus greenii*	1.9	No Destruction or Adverse Modification
Crustaceans	Big Creek crayfish	*Faxonius peruncus*	1.0	No Destruction or Adverse Modification
Crustaceans	Guyandotte River crayfish	*Cambarus veteranus*	0.0	No Destruction or Adverse Modification
Crustaceans	Kentucky cave shrimp	*Palaemonias ganteri*	2.1	No Destruction or Adverse Modification
Crustaceans	Panama City crayfish	*Procambarus econfinae*	0.3	No Destruction or Adverse Modification
Crustaceans	Peck's cave amphipod	*Stygobromus (=Stygonectes) pecki*	1.3	No Destruction or Adverse Modification
Crustaceans	St. Francis River crayfish	*Faxonius quadruncus*	1.1	No Destruction or Adverse Modification
Fish	Alabama sturgeon	*Scaphirhynchus suttkusi*	2.8	No Destruction or Adverse Modification
Fish	Atlantic salmon	*Salmo salar*	1.9	No Destruction or Adverse Modification
Fish	Atlantic sturgeon (Gulf subspecies)	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	0.2	No Destruction or Adverse Modification
Fish	Big Spring spinedace	*Lepidomeda mollispinis pratensis*	0.7	No Destruction or Adverse Modification
Fish	Bonytail	*Gila elegans*	0.1	No Destruction or Adverse Modification
Fish	Bull trout	*Salvelinus confluentus*	3.5	No Destruction or Adverse Modification
Fish	Candy darter	*Etheostoma osburni*	0.7	No Destruction or Adverse Modification
Fish	Cape Fear shiner	*Notropis mekistocholas*	2.2	No Destruction or Adverse Modification
Fish	Colorado pikeminnow	*Ptychocheilus lucius*	1.8	No Destruction or Adverse Modification
Fish	Cumberland darter	*Etheostoma susanae*	0.1	No Destruction or Adverse Modification
Fish	Devils River minnow	*Dionda diaboli*	0.5	No Destruction or Adverse Modification
Fish	Fountain darter	*Etheostoma fonticola*	0.9	No Destruction or Adverse Modification
Fish	Frecklebelly madtom	*Noturus munitus*	2.1	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% critical habitat)	Determination
Fish	Gila chub	*Gila intermedia*	0.1	No Destruction or Adverse Modification
Fish	Hiko White River springfish	*Crenichthys baileyi grandis*	0.3	No Destruction or Adverse Modification
Fish	Humpback chub	*Gila cypha*	0.1	No Destruction or Adverse Modification
Fish	June sucker	*Chasmistes liorus*	0.4	No Destruction or Adverse Modification
Fish	Kentucky arrow darter	*Etheostoma spilotum*	0.1	No Destruction or Adverse Modification
Fish	Laurel dace	*Chrosomus saylori*	0.8	No Destruction or Adverse Modification
Fish	Leon Springs pupfish	*Cyprinodon bovinus*	0.4	No Destruction or Adverse Modification
Fish	Loach minnow	*Tiaroga cobitis*	0.2	No Destruction or Adverse Modification
Fish	Lost River sucker	*Deltistes luxatus*	1.5	No Destruction or Adverse Modification
Fish	Owens Tui chub	*Gila bicolor ssp. snyderi*	0.1	No Destruction or Adverse Modification
Fish	Pearl darter	*Percina aurora*	0.6	No Destruction or Adverse Modification
Fish	Peppered chub	*Macrhybopsis tetranema*	2.9	No Destruction or Adverse Modification
Fish	Razorback sucker	*Xyrauchen texanus*	2.0	No Destruction or Adverse Modification
Fish	Rush darter	*Etheostoma phytophilum*	2.9	No Destruction or Adverse Modification
Fish	Santa Ana sucker	*Catostomus santaanae*	0.6	No Destruction or Adverse Modification
Fish	Shortnose sucker	*Chasmistes brevirostris*	1.2	No Destruction or Adverse Modification
Fish	Sickle darter	*Percina williamsi*	1.8	No Destruction or Adverse Modification
Fish	Sonora chub	*Gila ditaenia*	0.0	No Destruction or Adverse Modification
Fish	Spikedace	*Meda fulgida*	0.2	No Destruction or Adverse Modification
Fish	Spotfin chub	*Erimonax monachus*	0.7	No Destruction or Adverse Modification
Fish	Tidewater goby	*Eucyclogobius newberryi*	4.9	No Destruction or Adverse Modification
Fish	Trispot darter	*Etheostoma trisella*	4.1	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% critical habitat)	Determination
Fish	Vermilion darter	*Etheostoma chermocki*	0.2	No Destruction or Adverse Modification
Fish	Virgin River chub	*Gila seminuda (=robusta)*	0.4	No Destruction or Adverse Modification
Fish	Warner sucker	*Catostomus warnerensis*	0.4	No Destruction or Adverse Modification
Fish	White River spinedace	*Lepidomeda albivallis*	2.1	No Destruction or Adverse Modification
Fish	Woundfin	*Plagopterus argentissimus*	0.4	No Destruction or Adverse Modification
Fish	Yellowcheek darter	*Etheostoma moorei*	0.0	No Destruction or Adverse Modification
Fish	Yellowfin madtom	*Noturus flavipinnis*	0.7	No Destruction or Adverse Modification
Insects	Comal Springs dryopid beetle	*Stygoparnus comalensis*	1.0	No Destruction or Adverse Modification
Insects	Comal Springs riffle beetle	*Heterelmis comalensis*	1.4	No Destruction or Adverse Modification
Insects	Palos Verdes blue butterfly	*Glaucopsyche lygdamus palosverdesensis*	0.0	No Destruction or Adverse Modification
Mammals	Gray wolf (MN Population)	*Canis lupus*	3.8	No Destruction or Adverse Modification
Mammals	Penasco least chipmunk	*Tamias minimus atristriatus*	0.0	No Destruction or Adverse Modification
Plants	Acuña cactus	*Echinomastus erectocentrus var. acunensis*	0.0	No Destruction or Adverse Modification
Plants	Big Pine partridge pea	*Chamaecrista lineata keyensis*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Plants	Blodgett's silverbush	*Argythamnia blodgettii*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Plants	DeBeque phacelia	*Phacelia submutica*	3.1	No Destruction or Adverse Modification
Plants	Everglades bully	*Sideroxylon reclinatum ssp. austrofloridense*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Plants	Florida prairie-clover	*Dalea carthagenensis floridana*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Plants	Kneeland Prairie penny-cress	*Thlaspi californicum*	0.0	No Destruction or Adverse Modification
Plants	Malheur wire-lettuce	*Stephanomeria malheurensis*	0.0	No Destruction or Adverse Modification

Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% critical habitat)	Determination
Plants	Munz's onion	*Allium munzii*	0.0	No Destruction or Adverse Modification
Plants	Pineland sandmat	*Chamaesyce deltoidea pinetorum*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Plants	Sand flax	*Linum arenicola*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Plants	Wedge spurge	*Chamaesyce deltoidea serpyllum*	No shapefile – qualitative assessment	No Destruction or Adverse Modification
Reptiles	American crocodile	*Crocodylus acutus*	2.2	No Destruction or Adverse Modification
Snails	Chupadera springsnail	*Pyrgulopsis chupaderae*	0.1	No Destruction or Adverse Modification
Snails	Interrupted (=Georgia) Rocksnail	*Leptoxis foremani*	4.2	No Destruction or Adverse Modification
Snails	Koster's springsnail	*Juturnia kosteri*	2.0	No Destruction or Adverse Modification
Snails	Magnificent ramshorn	*Planorbella magnifica*	2.6	No Destruction or Adverse Modification
Snails	Pecos assiminea snail	*Assiminea pecos*	1.3	No Destruction or Adverse Modification
Snails	Roswell springsnail	*Pyrgulopsis roswellensis*	2.0	No Destruction or Adverse Modification
Snails	Tumbling Creek cavesnail	*Antrobia culveri*	0.1	No Destruction or Adverse Modification

The critical habitats in this group have low total overlap with agricultural use sites. For those critical habitats that did not have a shapefile available, we used information from critical habitat rules to assess the extent to which they are expected to overlap with agricultural use sites, which was estimated to be low (i.e., likely less than 5% overlap). In the limited areas where we anticipate usage for agricultural uses will occur for the critical habitats in Table 2, EPA's Herbicide Strategy requires general label measures for all agricultural simazine applications that are expected to reduce estimated environmental concentrations of simazine from off-site transport into species' critical habitats by up to 90% (or an order of magnitude) for runoff and by over 95% from spray drift (see "Conservation Measures" section above). We anticipate these measures will both reduce the extent of critical habitat area exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to critical habitat PBFs when exposure occurs (by reducing estimated exposure concentrations) in off-site areas.

In addition to agricultural uses of simazine, critical habitat can experience additional exposure to simazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., nurseries and turf (residential or commercial)). Critical habitats in Table 52 may include developed or open space developed use sites. However, many of these critical habitats include aquatic habitats that are not use sites, and terrestrial habitats have been altered on simazine use sites such that these areas are generally less likely to contain or produce critical habitat PBFs. Therefore, exposure is anticipated primarily in off-site areas from spray drift or runoff. Based on standard practices used for turf applications (e.g., no till practices, continuous cover), we expect runoff of simazine to be limited from these uses, and generally result in simazine concentrations below the level where we anticipate adverse effects to the relevant PBFs (i.e., those related to water quality, plants, and animals). In addition, based on the small footprint of nurseries with critical habitats (see "Exposure to Non-agricultural Uses of Simazine" above), we expect exposure of these critical habitats from nursery uses of simazine to be low. Given our broad understanding of simazine use sites, usage, and general information on non-agricultural use practices, we anticipate any critical habitat areas (listed in Table 2) that occur on or near developed or open space developed use sites of simazine are not likely to experience more than low levels of exposure to simazine.

Anticipated effects to relevant PBFs for the critical habitats in Table 2 are discussed below.

Water Quality as a PBF:

Most of the animal critical habitats in Table 2 list water quality-related PBFs of the critical habitat, representing all taxa groups except birds and mammals. All of the critical habitats designated for listed snail and bivalve species (mollusks), and two of the critical habitats for listed insect species (i.e., the Comal Springs dryopid beetle and Comid Springs riffle beetle), include a water quality PBF. Available toxicity data for mollusks and insects exposed to triazines indicate that individuals are not likely to experience any mortality and no more than low levels of adverse effects to reproduction of mussels (if any) from exposures to levels estimated to occur from agricultural simazine use. We do not anticipate any adverse effects will occur from exposure to levels estimated to occur from non-agricultural uses. Thus, we expect critical habitats for mollusks and insects will experience low levels of adverse effects to the water quality PBF (see also the discussion of host species for mussels under animals as PBFs for this group below).

The critical habitats designated for crustaceans, amphibians, fish, and reptiles in Table 2 include habitats with a variety of flow and volume conditions; we expect high levels of water quality impairment only in areas of exposed critical habitat where flow or volume are low. We anticipate adverse effects to water quality will be restricted in area because overlap data indicate that only a small portion (0.1-4.9%; all except three critical habitats range from 0.1-3.5%) of these critical habitats is likely to overlap with simazine agricultural use sites and off-site areas that may be exposed from spray drift or runoff, and we do not expect critical habitat with simazine usage for agricultural uses would exceed that area over the project duration. The three species with agricultural overlaps higher than 3.5% that require water quality as a PBF are the Sierra Nevada yellow-legged frog (4.1%), tidewater goby (4.9%), and trispot darter (4.1%). The Sierra Nevada yellow-legged frog and trispot darter use a variety of aquatic habitats in which to complete their life cycles, ranging from marshes and ponds (frog) and seepage areas and ditches (darter) where flow and/or volume are likely to be low, to streams and rivers (frog and darter) where flow and volume are likely to be higher. Since we only anticipate adverse effects to water quality in those areas of low flow or volume, which make up only a portion of the already low overlapping critical habitat areas, this further increases our confidence that only a very small portion of critical habitat and its corresponding water quality PBF will be adversely affected by simazine exposure from agricultural uses. The tidewater goby is a coastal species that inhabits lagoons, estuaries, and tidal habitats where we generally expect flow and/or volume to be high such that water quality impairment is anticipated to be low in the small overlapping portion of the range. Additionally, with the conservation measures that are in place for agricultural uses and limited exposure anticipated from non-agricultural use sites, we have high confidence that very little, if any, of the critical habitats with water quality PBFs are likely to experience more than low levels of water quality impairment.

Host Plants, Plant Assemblages or Plant Functions as PBFs:

Critical habitat for the Palos Verdes blue butterfly has a host plant PBF. This critical habitat has no overlap with agricultural use sites, although it overlaps with developed and open space developed non-agricultural use sites. However, the critical habitat is entirely within the state of California where CalPUR data indicates no herbicides have been used in Palos Verdes blue butterfly critical habitat areas in recent years for agricultural uses and certain non-agricultural uses, such as those performed by professional commercial applicators. While these data do not capture all non-agricultural usage, such as residential applications by consumers, qualitative usage information from the NALP indicate that simazine is no longer commonly used on residential or commercial turf. Given the lack of expected usage in the critical habitat, our broad understanding of simazine usage, and general information on non-agricultural use practices, we expect limited exposure from these uses of simazine such that adverse effects to host plant PBFs in Palos Verdes blue butterfly critical habitat are expected to be low.

Nearly all critical habitats include plant functions or plant assemblages as a PBF. Given that herbicides like simazine are designed to control plants, we assume most plants are sensitive to simazine exposure. In general, we anticipate simazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation. However, we expect simazine exposure will be negligible or very low based on the low overlap with the critical habitats in Table 2 and agricultural use sites (0.0-4.9%) for simazine. Additionally, we expect terrestrial habitats have been altered on simazine use sites such that these areas are generally less likely to contain or produce critical habitat PBFs, and with the conservation measures that are in place and limited exposure anticipated from non-agricultural use sites, we have high confidence that very little, if any, of the critical habitats are likely to experience more than low levels of impairment to plant-related PBFs. In small areas where exposure may occur, we expect changes to plant PBFs will be localized, and we do not expect more than minimal adverse effects to the structure or functionality of the plant-based PBFs of the critical habitat from simazine exposure.

Animals as PBFs:

The Leon Springs pupfish, fountain darter, San Marcos salamander, Georgetown Salamander, Black warrior (=Sipsey Fork) Waterdog, Mississippi sandhill crane, bull trout, and American crocodile critical habitats include animal PBFs due to various types of amphibian, bird, bivalve, crustacean, fish, mammal, reptile and snail prey items that vary by species. Available toxicity data on bivalves and snails exposed to triazines indicate that individuals are not likely to experience any mortality and no more than low levels of adverse effects to reproduction (if any) from exposures to levels estimated to occur from agricultural simazine use. We do not anticipate any adverse effects will occur from exposure to levels estimated to occur from non-agricultural uses. As such, we do not anticipate more than low levels of adverse effects to bivalve or snail prey items.

We expect terrestrial vertebrate prey species (e.g., mammals, birds, reptiles, and terrestrial phase amphibians) will accumulate the highest concentrations of simazine through dietary exposure, with individuals that forage extensively directly on simazine use sites accumulating higher concentrations than those that only forage in off-site areas. Based on available toxicity data in mammals and birds (which we use as surrogate data for reptiles and terrestrial phase amphibians), we expect individual prey that forage extensively on simazine use sites will experience high levels of sublethal effects, including adverse effects to reproduction and growth. In contrast, individual prey that primarily forage in off-site areas will only accumulate low levels of simazine and are not likely to experience more than low levels of sublethal adverse effects to growth and reproduction (if any). In general, we do not anticipate most prey species will extensively forage directly in simazine use sites and expect simazine use will not result in more than low levels of adverse effects to individual prey or the availability of terrestrial vertebrate species that may be required as critical habitat PBFs.

Available toxicity data indicate that aquatic-phase amphibians, crustaceans, and fish are likely to experience high levels of sublethal effects (e.g., reduced growth, reduced reproduction) with simazine exposure, but they are not expected to die even at high concentrations. We anticipate these adverse effects will be limited to areas of low flow or low volume, as we expect large waterbodies or areas with high flow will not accumulate more than low levels of simazine from agricultural uses and will not result in adverse effects to individuals. We do not anticipate any adverse effects will occur to individuals exposed to simazine from non-agricultural uses as estimated exposure concentrations from these uses are much lower. With effects limited to agricultural areas and low flow and low volume waterbodies, and with the low agricultural use site overlaps and mitigation measures in place to reduce exposure and adverse effects, we anticipate low level losses of aquatic prey in a small portion of the critical habitat.

Critical habitats for all of the listed mussels require animal PBFs as they rely on host fish for glochidia (larval mussel) attachment to complete their life cycle. Available toxicity data on fish exposed to simazine indicate that no host fish that the species rely on will die or have altered reproductive output, but will likely experience sublethal adverse effects to growth, particularly when exposed to simazine from agricultural uses. However, we anticipate these adverse effects to host fish growth will only occur in areas of low flow as areas of high flow will accumulate lower levels of simazine that are not likely to result in any adverse effects to host fish growth. All of these species use both low and high flow waterbodies or only high flow waterbodies, with the exception of the Texas fatmucket and Texas fawnsfoot which rely on only low flow waterbodies. We do not anticipate any adverse effects will occur to fish exposed to simazine from non-agricultural uses as estimated exposure concentrations from these uses are much lower. Most of the mussels in this group are host fish generalists (i.e., they use a variety of host fish). Exceptions are the Appalachian elktoe, Balcones spike, Coosa moccasinshell, and false spike (these species are considered to be host fish specialists, requiring one or two specific types of host fish), and host fish are unknown for the Georgia pigtoe, Guadalupe fatmucket (this species is believed to be similar to the Texas fatmucket and use sunfish or bass as its host fish), Mexican fawnsfoot, and narrow pigtoe (based on other *Truncilla* species, this species is likely to be a specialist that relies on the freshwater drum (*Aplodinotus grunniens*)). However, all of the known host fish species that are PBFs of the critical habitats for the mussel species in this group are likely common. Thus, we anticipate that there will be sufficient host species remaining in the mussel critical habitats even if exposed host species individuals experience some sublethal effects to growth. Additionally, we expect most individual host fish that experience sublethal effects will still be able to function as hosts (i.e., glochidia could still attach to individuals), and these effects are anticipated only in critical habitat areas overlapping with agricultural uses (ranging from 0.5% to 4.7% of the critical habitats).

After incorporating conservation measures outlined above in the “Conservation Measures” section, we expect estimated exposure concentrations in the critical habitat for these bivalves to be low, limiting adverse effects to host fish to only areas of critical habitat where low flow or low water volume result in higher exposure concentrations from agricultural uses only. Even for mussels that are host fish specialists, we anticipate that there will likely be sufficient host fish remaining even if exposed individuals experience some sublethal effects to growth, and we expect most fish that experience sublethal effects will still be able to function as hosts (i.e., glochidia could still attach to individuals). As such, we anticipate no more than low adverse effects to the host fish PBFs for the critical habitats in Table 2.

Critical habitat for the Acuña cactus includes animal PBFs because birds and mammals (as well as insects, which are not a relevant PBF) function as seed dispersers for the species. However, this species does not overlap with agricultural use sites. Additionally, we expect habitat for the species has been altered on simazine non-agricultural use sites such that these areas are generally less likely to contain or produce critical habitat PBFs, and with the conservation measures that are in place (see the “Conservation Measures” section above) and limited exposure anticipated from non-agricultural use sites, we have high confidence that there will be no more than low levels of adverse effects to animal-related PBF and birds and mammals will remain available to function as seed dispersers.

Group Conclusion

In summary, all the critical habitats listed in Table 2 have low exposure as these critical habitats have low overlap with agricultural use sites of simazine. EPA's Herbicide Strategy requires general label measures for all agricultural simazine applications that are expected to minimize simazine exposure in off-site areas. While these critical habitats can also be exposed through non-agricultural uses of simazine, we do not anticipate most non-agricultural use sites are likely to support PBFs and exposure from these areas will be limited. Where exposure occurs, we anticipate a range of adverse effects will occur to the different PBFs of the critical habitats, as discussed below.

We expect critical habitats for mollusks will experience low levels of adverse effects to water quality-related PBFs. For crustacean, amphibian, and fish critical habitats, we only anticipate some adverse effects to water quality in those areas of low flow or volume, which make up only a portion of the already low overlapping critical habitat areas. We expect adverse effects to plant-based PBFs to be localized, and we do not expect more than minimal adverse effects to host plants or the structure or functionality of the plant-based PBFs of the critical habitat from simazine exposure. For animal PBFs, we do not anticipate more than low level adverse effects to bivalve, snail, and terrestrial vertebrate prey and seed dispersers. Aquatic-phase amphibians, crustaceans, and fish as prey or host fish for mussels are likely to experience sublethal effects (e.g., reduced growth, reduced reproduction) with simazine exposure, but we expect these adverse effects will be limited to low flow or low volume habitats exposed to simazine from agricultural uses only. We anticipate there will be some adverse effects to prey and host fish, but that sufficient numbers will remain even if exposed individuals experience some sublethal effects.

In conclusion, with the conservation measures that are in place for agricultural uses and limited exposure anticipated from any use sites, we have high confidence that very little of the critical habitat areas are likely to be exposed, and any exposures that do occur are likely to be limited to small areas and result in no more than minor and temporary adverse effects to critical habitat PBFs. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species and is not likely to result in the destruction or adverse modification of the designated critical habitats for the species listed in Table 2.

Critical Habitats with Low Exposure (informed by low past usage from the California Department of Pesticide Regulation Pesticide Use Reporting data and low anticipated exposure from non-agricultural uses)

The critical habitats in Table 3 are grouped together because they all occur entirely within the state of California and have a low level of past agricultural simazine usage as informed by the California Pesticide Use Report (CalPUR), which includes 10 years of data (2013-2022). Growers and commercial pesticide applicators in California are required to report pesticide usage to the state, which summarizes this data at a section level (see the *Usage Analysis* section in the main Opinion for more details). While CalPUR data include all agricultural usage, it is also inclusive of certain non-agricultural uses, such as those performed by professional commercial applicators. While these data no not capture all non-agricultural usage, such as residential applications by consumers, given our broad understanding of simazine usage, general information on non-agricultural use practices, we expect limited exposure from these uses of simazine.

Given that this data is spatially specific to the critical habitats within California and usage reporting for most uses is mandatory, we have high confidence that the past simazine usage patterns reported in this dataset are accurate and critical habitats with low levels of reported usage are not likely to experience more than low levels of exposure to agricultural (and some non-agricultural) uses of simazine. We discuss any anticipated effects to relevant PBFs within the portions of critical habitats that are likely to be exposed to agricultural or non-agricultural uses of simazine below. In cases where there is a small sample size of growers reporting simazine usage in the sections containing critical habitats, we pulled those critical habitats out of the grouped rationale and provide a more thorough analysis in the section with individual determinations and rationales below to determine if our assumptions of low exposure are maintained or if additional analyses are needed.

Table 3. Critical habitats with low exposure informed by low past simazine usage from the California Department of Pesticide Regulation Pesticide Use Reporting (CalPUR) data and low likelihood of non-agricultural exposure.

Taxa	Common Name	Scientific Name	% Critical Habitat Treated Annually (CalPUR data)	Determination
Amphibians	Arroyo (=arroyo southwestern) toad	*Anaxyrus californicus*	0.7	No Destruction or Adverse Modification
Amphibians	California red-legged frog	*Rana draytonii*	0.0	No Destruction or Adverse Modification
Amphibians	California tiger salamander (Central CA DPS)	*Ambystoma californiense*	0.3	No Destruction or Adverse Modification
Amphibians	California tiger salamander (Santa Barbara DPS)	*Ambystoma californiense*	0.7	No Destruction or Adverse Modification

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Taxa	**Common Name**	**Scientific Name**	**% Critical Habitat Treated Annually (CalPUR data)**	**Determination**
Amphibians	California tiger salamander (Sonoma DPS)	*Ambystoma californiense*	0.7	No Destruction or Adverse Modification
Amphibians	Foothill yellow-legged frog (Central Coast Range DPS)	*Rana boylii*	0.0	No Destruction or Adverse Modification
Amphibians	Foothill yellow-legged frog (Coast Range DPS)	*Rana boylii*	0.0	No Destruction or Adverse Modification
Amphibians	Foothill yellow-legged frog (North Feather River DPS)	*Rana boylii*	0.0	No Destruction or Adverse Modification
Amphibians	Foothill yellow-legged frog (Sierra Nevada DPS)	*Rana boylii*	0.0	No Destruction or Adverse Modification
Amphibians	Kern Canyon slender salamander	*Batrachoseps simatus*	0.0	No Destruction or Adverse Modification
Amphibians	Mountain yellow-legged frog (southern DPS)	*Rana muscosa*	0.0	No Destruction or Adverse Modification
Amphibians	Relictual slender salamander	*Batrachoseps relictus*	0.0	No Destruction or Adverse Modification
Birds	Least Bell's vireo	*Vireo bellii pusillus*	1.1	No Destruction or Adverse Modification
Crustaceans	Conservancy fairy shrimp	*Branchinecta conservatio*	0.4	No Destruction or Adverse Modification
Crustaceans	Longhorn fairy shrimp	*Branchinecta longiantenna*	0.0	No Destruction or Adverse Modification
Crustaceans	San Diego fairy shrimp	*Branchinecta sandiegonensis*	0	No Destruction or Adverse Modification
Crustaceans	Vernal pool fairy shrimp	*Branchinecta lynchi*	1.0	No Destruction or Adverse Modification
Crustaceans	Vernal pool tadpole shrimp	*Lepidurus packardi*	0.6	No Destruction or Adverse Modification
Insects	Bay checkerspot butterfly	*Euphydryas editha bayensis*	0.0	No Destruction or Adverse Modification
Insects	Casey's June beetle	*Dinacoma caseyi*	0.0	No Destruction or Adverse Modification
Insects	Delta green ground beetle	*Elaphrus viridis*	0.0	No Destruction or Adverse Modification
Insects	Hermes copper butterfly	*Lycaena hermes*	0.0	No Destruction or Adverse Modification
Insects	Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	0.0	No Destruction or Adverse Modification
Insects	Zayante band-winged grasshopper	*Trimerotropis infantilis*	0.0	No Destruction or Adverse Modification

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Taxa	**Common Name**	**Scientific Name**	**% Critical Habitat Treated Annually (CalPUR data)**	**Determination**
Mammals	Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	0.0	No Destruction or Adverse Modification
Mammals	San Bernardino Merriam's kangaroo rat	*Dipodomys merriami parvus*	0.1	No Destruction or Adverse Modification
Plants	Butte County meadowfoam	*Limnanthes floccosa ssp. californica*	1.3	No Destruction or Adverse Modification
Plants	Contra Costa goldfields	*Lasthenia conjugens*	0.1	No Destruction or Adverse Modification
Plants	Fleshy owl's-clover	*Castilleja campestris ssp. succulenta*	1.0	No Destruction or Adverse Modification
Plants	Gaviota tarplant	*Deinandra increscens ssp. villosa*	0	No Destruction or Adverse Modification
Plants	Greene’s tructoria	*Tuctoria greenei*	1.2	No Destruction or Adverse Modification
Plants	Hoover's spurge	*Chamaesyce hooveri*	3.9	No Destruction or Adverse Modification
Plants	Keck's checker-mallow	*Sidalcea keckii*	0.0	No Destruction or Adverse Modification
Plants	La Graciosa thistle	*Cirsium loncholepis*	0.4	No Destruction or Adverse Modification
Plants	Lompoc yerba santa	*Eriodictyon capitatum*	0.0	No Destruction or Adverse Modification
Plants	Monterey spineflower	*Chorizanthe pungens var. pungens*	0.0	No Destruction or Adverse Modification
Plants	Otay tarplant	*Deinandra (=Hemizonia) conjugens*	0.0	No Destruction or Adverse Modification
Plants	Purple amole	*Chlorogalum purpureum*	0.0	No Destruction or Adverse Modification
Plants	Robust spineflower	*Chorizanthe robusta var. robusta*	0.0	No Destruction or Adverse Modification
Plants	Sacramento Orcutt grass	*Orcuttia viscida*	0.9	No Destruction or Adverse Modification
Plants	San Diego ambrosia	*Ambrosia pumila*	1.4	No Destruction or Adverse Modification
Plants	San Joaquin Valley Orcutt grass	*Orcuttia inaequalis*	0.8	No Destruction or Adverse Modification
Plants	Santa Cruz tarplant	*Holocarpha macradenia*	0.0	No Destruction or Adverse Modification
Plants	Soft bird's-beak	*Cordylanthus mollis* ssp. *mollis*	0.0	No Destruction or Adverse Modification
Plants	Solano grass	*Tuctoria mucronata*	0.0	No Destruction or Adverse Modification
Plants	Spreading navarretia	*Navarretia fossalis*	0.0	No Destruction or Adverse Modification

Taxa	Common Name	Scientific Name	% Critical Habitat Treated Annually (CalPUR data)	Determination
Plants	Suisun thistle	*Cirsium hydrophilum var. hydrophilum*	0.0	No Destruction or Adverse Modification
Plants	Thread-leaved brodiaea	*Brodiaea filifolia*	0.2	No Destruction or Adverse Modification
Plants	Vandenberg monkeyflower	*Diplacus vandenbergensis*	0.0	No Destruction or Adverse Modification
Plants	Willowy monardella	*Monardella viminea*	0.0	No Destruction or Adverse Modification
Plants	Yadon's piperia	*Piperia yadonii*	0.0	No Destruction or Adverse Modification
Plants	Yellow larkspur	*Delphinium luteum*	0.0	No Destruction or Adverse Modification
Reptiles	Alameda whipsnake (=striped racer)	*Masticophis lateralis euryxanthus*	0.0	No Destruction or Adverse Modification
Reptiles	Coachella Valley fringe-toed lizard	*Uma inornata*	0.0	No Destruction or Adverse Modification
Snails	Morro shoulderband (=Banded dune) snail	*Helminthoglypta walkeriana*	0.0	No Destruction or Adverse Modification

In the limited areas where we anticipate usage for agricultural uses will occur for the critical habitats in Table 3, EPA's Herbicide Strategy requires general label measures for all agricultural simazine applications that are expected to reduce estimated environmental concentrations of simazine from off-site transport into species' critical habitats by up to 90% (or an order of magnitude) for runoff and by over 95% from spray drift (see "Conservation Measures" section above). We anticipate these measures will both reduce the extent of critical habitat area exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to critical habitat PBFs when exposure occurs (by reducing estimated exposure concentrations) in off-site areas.

In addition to agricultural uses of simazine, critical habitat can experience additional exposure to simazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., nurseries and turf (residential or commercial)). The CalPUR data described above is inclusive of certain non-agricultural uses, such as those performed by professional commercial applicators. While these data do not capture all non-agricultural usage, such as residential applications by consumers, given our broad understanding of simazine usage, general information on non-agricultural use practices, and existing conservation measures, we expect limited exposure from private residential uses of simazine. In addition, turf (residential and commercial) and nurseries are not likely to contain or produce many of the PBF requirements for the species' critical habitats. Based on standard practices used for turf applications (e.g., no till practices, continuous cover), we expect runoff of simazine to be limited from these uses, and generally result in simazine concentrations below the level where we anticipate adverse effects to PBFs. Based on the small footprint of nurseries (see "Exposure to Non-agricultural Uses of Simazine" above), we expect exposure of these critical habitats to nursery uses of simazine to be low. Given the CalPUR data indicating low simazine usage, our broad understanding of simazine usage of residential use sites, and general information on non-agricultural use practices, we expect low exposure from non-agricultural uses of simazine for the critical habitats in Table 3.

Anticipated effects to relevant PBFs for the critical habitats in Table 3 are discussed below.

Water Quality as a PBF:

There are thirteen critical habitats in Table 3 that list essential critical habitat features related to water quality: Buena Vista Lake ornate shrew, Arroyo toad, California red-legged frog, California tiger salamander (Central CA DPS), California tiger salamander (Santa Barbara DPS), California tiger salamander (Sonoma DPS), mountain yellow-legged frog (southern DPS), conservancy fairy shrimp, longhorn fairy shrimp, San Diego fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp.

Available toxicity data indicate that mammals are likely to experience high levels of sublethal effects (i.e., reduced growth, reduced reproduction) only if they primarily forage on simazine use sites; we do not expect mammals to die from simazine exposure or accumulate levels of simazine that would result in any direct adverse effects for individuals that are only exposed off-site (i.e., in areas only exposed to simazine through spray drift of runoff). As aquatic habitats are not use sites and foraging would only occur in off-site areas, we do not anticipate adverse effects to the water quality PBF for mammals. Available toxicity data indicate that aquatic-phase amphibians and crustaceans are likely to experience high levels of sublethal effects (i.e., reduced growth, reduced reproduction) with simazine exposure, but they are not expected to die even at high concentrations. The critical habitats designated for amphibians and crustaceans in Table 3 include habitats with a variety of flow and volume conditions; we expect high levels of water quality impairment only in areas of exposed critical habitat where flow or volume are low. We anticipate adverse effects to water quality will be restricted in area because CalPUR data indicate that only a small portion (0.0-1.0%) of any of the critical habitats with water quality PBFs is likely to be treated with simazine for agricultural and certain non-agricultural uses each year and we expect low off-site exposure, particularly with the mitigation in place for agricultural uses, low likelihood of transport of simazine from non-agricultural use sites, and any effects limited to low flow and low volume habitats. We have high confidence that very little of the critical habitats are likely to experience levels of water quality impairment (i.e., to the water quality PBF) where would expect adverse sublethal effects to amphibians and crustaceans from exposure or any effects to mammals.

Host Plants, Plant Assemblages, or Plant Functions as PBFs:

Critical habitats for three insects (i.e., valley elderberry longhorn beetle, Bay checkerspot butterfly, Hermes copper butterfly) include host plants as PBFs. These critical habitats are entirely within the state of California where CalPUR data indicates no herbicides have been used in critical habitat areas in recent years for agricultural uses and certain non-agricultural uses, such as those performed by professional commercial applicators. While these data no not capture all non-agricultural usage, such as residential applications by consumers, qualitative usage information from the NALP indicate that simazine is no longer commonly used on residential or commercial turf. Given the lack of expected usage in the critical habitat, our broad understanding of simazine usage, and general information on non-agricultural use practices, we expect limited exposure from these uses of simazine such that any adverse effects to host plant PBFs in valley elderberry longhorn beetle, Bay checkerspot butterfly, and Hermes copper butterfly critical habitats are likely to be low (i.e., small numbers of affected plants) and limited to very small areas within the critical habitats, if any.

Nearly all of the critical habitats in Table 3 include plant functions or plant assemblages as a PBF. Given that herbicides like simazine are designed to control plants, we assume most plants are sensitive to simazine exposure. In general, we anticipate simazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation. However, we expect simazine exposure will be negligible or very low based on low past usage on agricultural and certain non-agricultural use sites in these critical habitats (0.0-3.9%) and low anticipated off-site exposure, particularly with the mitigation in place for agricultural uses, and low likelihood of transport of simazine from non-agricultural use sites. In small areas where exposure may occur, we expect changes to plant-based PBFs will be minor such that we do not expect changes to the functionality of the critical habitat from simazine exposure.

Animals as PBFs:

Critical habitat for the Buea Vista Lake ornate shrew requires the animal PBF due to species requirement for snail prey items. Available toxicity data on snails exposed to triazines indicate that individuals are not likely to experience any mortality and no more than low levels of adverse effects to reproduction (if any) from exposures to levels estimated to occur from agricultural simazine use. We do not anticipate any adverse effects will occur from exposure to levels estimated to occur from non-agricultural uses. As such, we do not anticipate more than low adverse effects to snail prey items.

Critical habitats for the Monterey spineflower and robust spineflower include animals as PBFs because birds and mammals provide some of the seed dispersal functions for these species. We expect terrestrial vertebrates will accumulate the highest concentrations of simazine through dietary exposure, with individuals that forage extensively directly on simazine use sites accumulating higher concentrations than those that only forage in off-site areas. Based on available toxicity data in mammals and birds, we expect individuals that forage extensively on simazine use sites will experience high levels of sublethal effects, including adverse effects to reproduction and growth. In contrast, individual prey that primarily forage in off-site areas will only accumulate low levels of simazine and are not likely to experience more than low levels of sublethal adverse effects to growth and reproduction (if any). In general, we do not anticipate most individuals serving as seed dispersers in the critical habitats for these plant species will extensively forage directly in simazine use sites. Additionally, CalPUR data indicates simazine has not been used on agricultural and certain non-agricultural use sites overlapping with the critical habitats for these species in recent years. Thus, we do not expect exposure to simazine will result in more than low levels of adverse effects, if any, to the availability of terrestrial vertebrate species required as critical habitat PBFs for the two spineflower species.

Group Conclusion

In summary, all of the critical habitats listed in Table 3 occur entirely within the state of California and have a low level of past agricultural simazine usage as informed by the California Pesticide Use Report (CalPUR). CalPUR data includes all agricultural usage as well as certain non-agricultural uses, such as those performed by professional commercial applicators. While these data do not capture all non-agricultural usage, such as residential applications by consumers, given our broad understanding of simazine usage and general information on non-agricultural use practices, we expect limited exposure from these uses of simazine.

Where exposed, we anticipate a range of adverse effects will occur to the different PBFs of the critical habitats. We do not expect adverse effects to the water quality PBF for mammals, and very little of the critical habitats for amphibians and crustaceans will be exposed at concentrations where there would be adverse effects to the water quality PBF (i.e., impairments that would lead to adverse effects to individuals). We do not expect any adverse effects to host plant PBFs due to the lack of simazine usage in the critical habitats that require host plant PBFs. Any adverse effects to PBFs related to plant functions or plant assemblages are expected to be minor and localized. We do not anticipate more than low level adverse effects to the animal PBFs, which are related to prey availability and seed dispersal.

In conclusion, we anticipate any adverse effects to the PBFs of the critical habitats in Table 3 will be limited to a very small area and will not cause more than minor adverse effects to the overall critical habitat. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species and is not likely to result in the destruction or adverse modification of the designated critical habitats for the species listed in Table 3.

Critical Habitats with Low Exposure (informed by low past herbicide usage from the Census of Agriculture data and low anticipated exposure from non-agricultural uses)

The critical habitats in Table 4 have a low level of past agricultural herbicide usage as informed by the United States Department of Agriculture's (USDA) Census of Agriculture (CoA). The CoA provides, among other data, information on past pesticide usage. Pesticide usage data is reported at a county level and provides usage information for pesticides within a certain class (e.g., all herbicides, all insecticides). Given that this data is spatially specific to the counties that overlap with critical habitat and includes past usage of other herbicides (i.e., not just simazine), we have high confidence that this data represents a conservative upper bound estimate of past simazine usage within the species' critical habitat. As such, low levels of herbicide usage in the past is a likely indication of potentially low levels of simazine usage throughout the duration of the proposed action. We discuss any anticipated effects to relevant PBFs within the portions of critical habitats that are likely to be exposed to agricultural or non-agricultural uses of simazine below.

Table 4. Critical habitats with low exposure informed by low past usage from the Census of Agriculture (CoA) all herbicide usage data and low anticipated non-agricultural exposure.

Taxa	Common Name	Scientific Name	% Critical Habitat Treated (CoA)	Determination
Amphibians	Oregon spotted frog	*Rana pretiosa*	4.2	No Destruction or Adverse Modification
Insects	Island marble Butterfly	*Euchloe ausonides insulanus*	2.4	No Destruction or Adverse Modification
Plants	Cushenbury milk-vetch	*Astragalus albens*	3.1	No Destruction or Adverse Modification
Reptiles	Narrow-headed gartersnake	*Thamnophis rufipunctatus*	4.0	No Destruction or Adverse Modification

In the limited areas where we anticipate usage for agricultural uses will occur for the critical habitats in Table 4, EPA's Herbicide Strategy requires general label measures for all agricultural simazine applications that are expected to reduce estimated environmental concentrations of simazine from off-site transport into species' critical habitats by up to 90% (or an order of magnitude) for runoff and by over 95% from spray drift (see "Conservation Measures" section above). We anticipate these measures will both reduce the extent of critical habitat area exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to critical habitat PBFs when exposure occurs (by reducing estimated exposure concentrations) in off-site areas.

In addition to agricultural uses of simazine, critical habitat can experience additional exposure to simazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., nurseries and turf (residential or commercial)). Critical habitats in Table 5 may include developed or open space developed use sites. However, these use sites are not likely to contain or produce many of the PBF requirements for the species' critical habitats. Additionally, qualitative usage information from the NALP indicates that simazine is no longer commonly used on residential or commercial turf. Based on standard practices used for turf applications (e.g., no till practices, continuous cover), we expect off-site transport of simazine to be unlikely from these uses. In addition, based on the small footprint of nurseries (see "Exposure to Non-agricultural Uses of Simazine" above), we expect exposure of these critical habitats to nursery uses of simazine to be low. Given our broad understanding of simazine use sites, usage, and general information on non-agricultural use practices, we expect limited exposure from non-agricultural uses of simazine. Thus, we do not anticipate any critical habitat units that occur on or near non-agricultural use sites are likely to experience more than low levels of exposure of the PBFs to simazine.

Anticipated effects to relevant PBFs for the critical habitats in Table 4 are discussed below.

Water Quality as a PBF:

Critical habitat for the Oregon spotted frog and narrow-headed gartersnake include water quality PBFs. The critical habitat designated for the Oregon spotted frog includes low flow waterbodies and critical habitat designated for the narrow-headed gartersnake includes both low and high low waterbodies. Available toxicity data in amphibians indicate estimated environmental concentrations of simazine in small, low volume aquatic areas within critical habitats exposed to simazine are likely to be high enough to cause sublethal adverse effects to growth and reproduction, but not cause any mortality of individuals. Thus, we anticipate simazine use will result in moderate adverse effects to the water quality PBF for the Oregon spotted frog. Based on available toxicity data in birds (which we use as surrogate for reptiles), we do not anticipate estimated environmental concentrations of simazine within aquatic areas of critical habitat will cause mortality or more than low levels of sublethal adverse effects (e.g., reduced growth or reproduction) to the narrow-headed gartersnake. We anticipate any adverse effects to the water quality PBFs for these critical habitats will be limited to small areas because of the low portion of these critical habitats that are likely to be treated with any herbicide for agricultural uses over the project duration, including simazine (4.0 - 4.2%) and conservation measures that are in place (see "Conservation Measures" section above). We also anticipate exposure from non-agricultural uses will be low, as discussed in this section above. Thus, we have high confidence that very little of the critical habitats is likely to experience levels of water quality impairment (i.e., to the water quality PBFs) where would expect adverse sublethal effects to the Oregon spotted frog or the narrow-headed garternsake.

Host Plants, Plant Assemblages, or Plant Functions as PBFs:

The critical habitat for the Island marble butterfly includes a host plant PBF, and all of the critical habitats for the species in Table 4 include plant assemblage and plant function PBFs. Given that herbicides like simazine are designed to control plants, we assume most plants are sensitive to simazine exposure. In general, we anticipate simazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation. However, we expect simazine exposure will be low based on the low level of past usage of any herbicide (including, but not limited to simazine) in the critical habitats for these species (2.4 - 4.2%) from agricultural uses and conservation measures that are in place (see "Conservation Measures" section above). We also anticipate exposure from non-agricultural uses will be low, as discussed in this section above. In small areas where exposure may occur, we expect changes to plant-based PBFs will be localized, and we do not expect changes to the functionality of the critical habitat as a whole from simazine exposure.

Animals as PBFs:

The animal PBF is relevant to critical habitat for the narrow-headed gartersnake due to species requirements for amphibian and fish prey items. We expect terrestrial vertebrate prey species (e.g., amphibians) will accumulate the highest concentrations of simazine through dietary exposure, with individuals that forage extensively directly on simazine use sites accumulating higher concentrations than those that only forage in off-site areas. Based on available toxicity data in mammals and birds (which we use as surrogate data for terrestrial phase amphibians), we expect individual prey that forage extensively on simazine use sites will experience high levels of sublethal effects, including adverse effects to reproduction and growth. In contrast, individual prey that primarily forage in off-site areas will only accumulate low levels of simazine and are not likely to experience more than low levels of sublethal adverse effects to growth and reproduction (if any). In general, we do not anticipate most prey species will extensively forage directly in simazine use sites and expect simazine use will not result in more than low levels of adverse effects to the availability of terrestrial vertebrate species that may be required as part of the animal PBFs for this critical habitat.

Available toxicity data indicate that aquatic-phase amphibians and fish are likely to experience high levels of sublethal effects (e.g., reduced growth) with simazine exposure, but they are not expected to die even at high concentrations. We anticipate these adverse effects will be limited to areas of low flow or low volume, as we expect large waterbodies or areas with high flow will not accumulate more than low levels of simazine from agricultural uses and will not result in adverse effects to individuals. We do not anticipate any adverse effects will occur to individuals exposed to simazine from non-agricultural uses as estimated exposure concentrations from these uses are much lower. With effects limited to agricultural areas and low flow and low volume waterbodies, and with the low agricultural use site overlaps and mitigation measures in place to reduce exposure and adverse effects, we anticipate low level losses of aquatic prey in a small portion of the critical habitat.

Group Conclusion

In summary, CoA data indicates there has been a low level of past usage of any herbicide (including, but not limited to simazine) in the critical habitats in Table 4 from agricultural uses, and low off-site exposure is anticipated from agricultural uses with the conservation measures that are in place. We also anticipate exposure on non-agricultural use sites will be low, and there is a low likelihood of transport of simazine from non-agricultural use sites.

We expect there will be some adverse effects to the water quality PBF that lead to sublethal adverse effects to listed species in aquatic areas of critical habitat, particularly in low flow and low volume habitats where water quality is degraded by high concentrations of simazine. However, we expect very little of the critical habitats with water quality PBFs are likely to experience levels of water quality impairment where would expect adverse sublethal effects to the species that rely on them. We also expect exposed plants to die or experience sublethal effects (i.e., reduced growth or reproduction), which could result in changes to critical habitats for species that rely on plants for hosts, forage, cover, shelter, or other habitat requirements. However, we expect simazine exposure of the critical habitat will be low. In small areas where exposure occurs, we expect adverse effects to plant-based PBFs will be localized, will only adversely affect a few sensitive plant species, and we do not expect changes to the functionality of plant-based PBFs of critical habitat from simazine exposure. For the one critical habitat requiring animal PBFs, we expect adverse effects to prey growth and reproduction, which will be limited to agricultural areas and low flow and low volume waterbodies. With the low agricultural use site overlaps and mitigation measures in place to reduce exposure and adverse effects, we anticipate low level sublethal effects to aquatic prey in a small portion of the critical habitat.

In conclusion, even though some critical habitats in this group will experience adverse effects to water quality, plant-based, or animal PBFs, we anticipate these adverse effects will be limited to very small areas and will not cause more than minor adverse effects to the overall critical habitat. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species and is not likely to result in the destruction or adverse modification of the designated critical habitats for the species listed in Table 3.

Critical Habitats with Low Agricultural Exposure Achieved Through Conservation Measures and Low Anticipated Exposure from Non-agricultural Uses

The critical habitats in Table 5 were grouped together because we expect low agricultural exposure after incorporating spray drift and runoff conservation measures on the simazine label and low likelihood of non-agricultural exposure. We expect off-site transport and adverse effects to be low. We discuss any anticipated effects to relevant PBFs within the portions of critical habitats that are likely to be exposed to agricultural or non-agricultural uses of simazine below.

Table 5. Critical habitats with low exposure achieved through conservation measures included in the description of the action.

Taxa	Common Name	Scientific Name	Conservation measures	Determination
Amphibians	Dusky gopher frog	*Rana sevosa*	General label measures + 6 points for all uses (except strawberries, WA mixed greens, and CA peaches and nectarines)	No Destruction or Adverse Modification
Amphibians	Frosted flatwoods salamander	*Ambystoma cingulatum*	General label measures + 6 points for all uses (except strawberries, WA mixed greens, and CA peaches and nectarines)	No Destruction or Adverse Modification
Amphibians	Houston toad	*Bufo houstonensis*	General label measures + 6 points for all uses (except strawberries, WA mixed greens, and CA peaches and nectarines)	No Destruction or Adverse Modification
Amphibians	Reticulated flatwoods salamander	*Ambystoma bishopi*	General label measures + 6 points for all uses (except strawberries, WA mixed greens, and CA peaches and nectarines)	No Destruction or Adverse Modification
Birds	Greater sage-grouse	*Centrocercus urophasianus*	General label measures	No Destruction or Adverse Modification
Birds	Piping plover (Atlantic Coast and Great Plains DPS)	*Charadrius melodus*	General label measures	No Destruction or Adverse Modification
Birds	Piping plover (Great Lakes DPS)	*Charadrius melodus*	General label measures	No Destruction or Adverse Modification
Birds	Streaked horned lark	*Eremophila alpestris strigata*	General label measures	No Destruction or Adverse Modification
Birds	Whooping crane	*Grus americana*	General label measures	No Destruction or Adverse Modification
Birds	Yellow-billed cuckoo	*Coccyzus americanus*	General label measures	No Destruction or Adverse Modification
Bivalves	Atlantic pigtoe	*Fusconaia masoni*	General label measures	No Destruction or Adverse Modification
Bivalves	Choctaw bean	*Obovaria choctawensis*	General label measures	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Conservation measures	Determination
Bivalves	Green floater	*Lasmigona subviridis*	General label measures	No Destruction or Adverse Modification
Bivalves	Longsolid	*Fusconaia subrotunda*	General label measures	No Destruction or Adverse Modification
Bivalves	Rabbitsfoot	*Quadrula cylindrica cylindrica*	General label measures	No Destruction or Adverse Modification
Bivalves	Rayed Bean	*Villosa fabalis*	General label measures	No Destruction or Adverse Modification
Bivalves	Round hickorynut	*Obovaria subrotunda*	General label measures	No Destruction or Adverse Modification
Bivalves	Salamander mussel	*Simpsonaias ambigua*	General label measures	No Destruction or Adverse Modification
Bivalves	Sheepnose Mussel	*Plethobasus cyphyus*	General label measures	No Destruction or Adverse Modification
Bivalves	Snuffbox mussel	*Epioblasma triquetra*	General label measures	No Destruction or Adverse Modification
Bivalves	Southern elktoe	*Alasmidonta triangulate*	General label measures	No Destruction or Adverse Modification
Bivalves	Spectaclecase (mussel)	*Cumberlandia monodonta*	General label measures	No Destruction or Adverse Modification
Bivalves	Western fanshell	*Cyprogenia aberti*	General label measures	No Destruction or Adverse Modification
Crustaceans	Brawleys Fork crayfish	*Cambarus williami*	General label measures	No Destruction or Adverse Modification
Crustaceans	Noel's amphipod	*Gammarus desperatus*	General label measures	No Destruction or Adverse Modification
Fish	Amber darter	*Percina antesella*	General label measures	No Destruction or Adverse Modification
Fish	Conasauga logperch	*Percina jenkinsi*	General label measures	No Destruction or Adverse Modification
Insects	Dakota skipper	*Hesperia dacotae*	General label measures	No Destruction or Adverse Modification
Insects	Florida leafwing butterfly	*Anaea troglodyta floridalis*	General label measures + 6 pts for FL citrus only	No Destruction or Adverse Modification
Insects	Hine's emerald dragonfly	*Somatochlora hineana*	General label measures + 6 points for all uses (except strawberries, WA mixed greens, and CA peaches and nectarines)	No Destruction or Adverse Modification
Insects	Taylor's (=whulge) checkerspot	*Euphydryas editha taylori*	General label measures	No Destruction or Adverse Modification
Mammals	Florida bonneted bat	*Eumops floridanus*	General label measures + 6 pts for FL citrus only	No Destruction or Adverse Modification
Mammals	Preble's meadow jumping mouse	*Zapus hudsonius preblei*	General label measures	No Destruction or Adverse Modification
Mammals	Texas kangaroo rat	*Dipodomys elator*	General label measures	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Conservation measures	Determination
Plants	Aboriginal prickly-apple	*Harrisia (=Cereus) aboriginum (=gracilis)*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Baker's larkspur	*Delphinium bakeri*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Bracted twistflower	*Streptanthus bracteatus*	General label measures	No Destruction or Adverse Modification
Plants	Carter's small-flowered flax	*Linum carteri carteri*	General label measures + 6 pts for citrus, avocados, olives	No Destruction or Adverse Modification
Plants	Colusa grass	*Neostapfia colusana*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Cook's lomatium	*Lomatium cookii*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Florida brickell-bush	*Brickellia mosieri*	General label measures + 6 pts for citrus, avocados, olives	No Destruction or Adverse Modification
Plants	Florida semaphore cactus	*Consolea corallicola*	General label measures	No Destruction or Adverse Modification
Plants	Georgia rockcress	*Arabis georgiana*	General label measures	No Destruction or Adverse Modification
Plants	Golden sedge	*Carex lutea*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Hairy Orcutt grass	*Orcuttia pilosa*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Huachuca water-umbel	*Lilaeopsis schaffneriana var. recurva*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Kincaid's lupine	*Lupinus sulphureus ssp. kincaidii*	General label measures	No Destruction or Adverse Modification
Plants	Large-flowered woolly meadowfoam	*Limnanthes pumila ssp. grandiflora*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Neches River rose-mallow	*Hibiscus dasycalyx*	General label measures	No Destruction or Adverse Modification
Plants	Sand dune phacelia	*Phacelia argentea*	General label measures	No Destruction or Adverse Modification
Plants	Slender Orcutt grass	*Orcuttia tenuis*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Slickspot peppergrass	*Lepidium papilliferum*	General label measures	No Destruction or Adverse Modification
Plants	Texas wild-rice	*Zizania texana*	General label measures	No Destruction or Adverse Modification
Plants	Whorled sunflower	*Helianthus verticillatus*	General label measures	No Destruction or Adverse Modification
Plants	Willamette daisy	*Erigeron decumbens*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Conservation measures	Determination
Plants	Wright's marsh thistle	*Cirsium wrightii*	General label measures + 6 pts for all uses	No Destruction or Adverse Modification
Plants	Zapata bladderpod	*Physaria thamnophila*	General label measures	No Destruction or Adverse Modification
Reptiles	Florida Keys mole skink	*Plestiodon egregius egregius*	General label measures	No Destruction or Adverse Modification

Through consultation with EPA and the registrant, we have used EPA's Herbicide Strategy to identify general label measures for all agricultural simazine applications that are expected to reduce estimated environmental concentrations of simazine from off-site transport into species' critical habitats by up to 90% (or an order of magnitude) for runoff and by over 95% from spray drift (see "Conservation Measures" section above). We anticipate these measures will both reduce the extent of area exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to critical habitat PBFs when exposure occurs (by reducing estimated exposure concentrations) in off-site areas. In cases where EPA has identified additional runoff measures are needed to further reduce offsite transport, we agreed that an additional 3 points (6 points total; i.e., up to 99% reduction) will be required for some or all uses. In areas requiring up to 6 runoff mitigation points, EPA expects estimated environmental concentrations of simazine will decrease by up to two orders of magnitude (i.e., reducing pesticide loading to one-one hundredth of pre-runoff mitigation levels). We anticipate these measures will both reduce the extent of area exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to critical habitat PBFs when exposure occurs (by reducing estimated exposure concentrations) in off-site areas.

In addition to agricultural uses of simazine, critical habitat can experience additional exposure to simazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., nurseries and turf (residential or commercial)). The critical habitat boundaries in Table 5 may include developed or open space developed use sites. However, turf (residential and commercial) and nurseries are not likely to contain or produce many of the PBF requirements for the species' critical habitats. Additionally, qualitative usage information from the NALP indicates that simazine is no longer commonly used on residential or commercial turf. Based on standard practices used for turf applications (e.g., no till practices, continuous cover), we expect off-site transport of simazine to be limited from these uses, and generally result in simazine concentrations below the level where we anticipate adverse effects to PBFs. We also anticipate low overlap of other critical habitats with nursery uses (see "Exposure to Non-agricultural Uses of Simazine" above). Therefore, we expect very little, if any simazine exposure from nurseries uses for the critical habitats in Table 5. An exception iscritical habitat for the Brawleys Fork crayfish, which includes areas in Warren County, Tennessee where there is known to be a high concentration of nurseries. However, we do not expect simazine EECs in runoff from these nurseries to rise to the level where we would see sublethal (or lethal) effects to the Brawleys Fork crayfish. Given our broad understanding of simazine use sites, usage, and general information on non-agricultural use practices, we expect limited exposure from non-agricultural uses of simazine. Thus, we do not anticipate any critical habitat units that occur on or near non-agricultural use sites are likely to experience more than low levels of exposure of the PBFs to simazine.

Anticipated effects to relevant PBFs for the critical habitats in Table 5 are discussed below.

Water Quality as a PBF:

The following critical habitats in Table 5 list essential critical habitat features related to water quality: dusky gopher frog, frosted flatwoods salamander, Houston toad, reticulated flatwoods salamander, Brawleys Fork crayfish, Noel's amphipod, piping plover (Entire population, except Great Lakes), amber darter, Conasauga logperch, Hine's emerald dragonfly, and all of the mussels in this group. Available toxicity data indicate that fish are likely to experience high levels of sublethal effects (i.e., reduced growth) and aquatic amphibians, aquatic-phase amphibians, aquatic insects, and crustaceans are likely to experience high levels of sublethal effects (i.e., reduced growth, reduced reproduction) with simazine exposure from agricultural uses, but they are not expected to die even at high concentrations. Available toxicity data on mussels exposed to triazines indicate that individuals are not likely to experience any mortality and no more than low levels of adverse effects to reproduction (if any) from exposures to levels estimated to occur from agricultural simazine use (see also the discussion of host species for mussels under animals as PBFs for this group below). We do not anticipate any adverse effects will occur to fish, amphibians, insects, crustaceans, or mussels from exposure to levels estimated to occur from non-agricultural uses. Based on available toxicity data for birds, which we also used as a surrogate for terrestrial amphibians, we do not expect mortality or sublethal effects from simazine exposure to terrestrial amphibians.

The critical habitats designated for the species in Table 5 include habitats with a variety of flow and volume conditions. We expect high levels of water quality impairment from agricultural uses only in areas of exposed critical habitat where flow or volume are low. However, after incorporating conservation measures outlined in Table 5 for each critical habitat, we expect the extent of estimated exposure and estimated exposure concentrations to be low, with limited adverse effects to water quality PBFs when exposure occurs in these off-site areas such any adverse effects to the species would be low.

Animals as PBFs:

Animal PBFs are relevant to critical habitat for the whooping crane due to species requirements for mammal, snail, bivalve, crustacean, bird, amphibian, reptile, and fish prey items and to the Brawleys Fork crayfish due to prey requirements that include fish. We expect terrestrial vertebrate prey species (e.g., mammals, birds, reptiles, and terrestrial phase amphibians) will accumulate the highest concentrations of simazine through dietary exposure, with individuals that forage extensively directly on simazine use sites accumulating higher concentrations than those that only forage in off-site areas. Based on available toxicity data in mammals and birds (which we use as surrogate data for reptiles and terrestrial phase amphibians), we expect individual prey that forage extensively on simazine use sites will experience high levels of sublethal effects, including adverse effects to reproduction and growth. In contrast, individual prey that primarily forage in off-site areas will only accumulate low levels of simazine and are not likely to experience more than low levels of sublethal adverse effects to growth and reproduction (if any). In general, we do not anticipate most terrestrial prey species will extensively forage directly in simazine use sites and expect simazine use will not result in more than low levels of adverse effects to the availability of terrestrial vertebrate species that may be required as part of the animal PBFs for these critical habitats. Available toxicity data indicate that aquatic-phase amphibians, crustaceans, and fish are likely to experience high levels of sublethal effects (e.g., reduced growth, reduced reproduction) with simazine exposure, but they are not expected to die, even at high concentrations. We anticipate these adverse effects will be limited to areas of low flow or low volume, as we expect large waterbodies or areas with high flow will not accumulate more than low levels of simazine from agricultural uses and will not result in adverse effects to individuals. We do not anticipate any adverse effects will occur to individuals of aquatic prey exposed to simazine from non-agricultural uses as estimated exposure concentrations from these uses are much lower. With effects limited to exposure on use sites for terrestrial prey and low flow and low volume waterbodies for aquatic prey, the mitigation measures in place to reduce exposure and adverse effects in off-site areas from agricultural uses, and the low likelihood of transport of simazine from non-agricultural use sites, we anticipate low level adverse effects to prey-based PBFs for these critical habitats.

Critical habitats for the mussel species in Table 5 require animal PBFs as they rely on host species for glochidia (larval mussel) attachment to complete their life cycle. All mussels in this group rely on host fish, except the salamander mussel which relies on the mudpuppy salamander as a host. We consider the effects to the host species similarly regardless of whether the mussel has a fish host or an amphibian host because we evaluate the toxicity to fish species and amphibian species as hosts using a similar toxicity endpoint. Available toxicity data on fish and amphibians exposed to simazine indicate that no host species will die or have altered reproductive output, but will likely experience sublethal adverse effects to growth, particularly when exposed to simazine from agricultural uses. While the critical habitats in this group have a high level of overlap with use sites and surrounding spray drift and runoff areas, we anticipate these adverse effects to growth will only occur in areas of low flow as areas of high flow will accumulate lower levels of simazine that are not likely to result in any adverse effects to host species growth. We do not anticipate non-agricultural uses of simazine will cause any adverse effects to host species growth or reproduction as estimated environmental concentrations of simazine resulting from non-agricultural uses are below levels where any adverse effects to animals have been observed in available toxicity studies. All of the mussel species in this group use both low and high flow waterbodies or only high flow waterbodies, with the exception of the green floater, which relies on only low flow waterbodies. Animal PBFs for two of the critical habitats (i.e., for the Kentucky creekshell and spectaclecase) require one or two specific host fish (we consider these species to be host fish specialists), with the others using a wider variety of host fish (i.e. host fish generalists), a salamander (i.e., for the salamander mussel), or host species are unknown (i.e., for the Choctaw bean). Information indicates the host fish known to be required by the mussel species in Table 5 are common, with the exception the spectaclecase which relies on both a common and a more rare host fish. Thus, we anticipate that there will likely be sufficient host fish remaining in the bivalve critical habitats even if exposed host fish individuals experience some sublethal effects to growth. Additionally, we expect most fish that experience sublethal effects will still be able to function as hosts (i.e., glochidia could still attach to individuals). In summary, despite higher levels of overlap between these critical habitats and the action area, we generally expect conservation measures in place for agricultural uses and the low likelihood of transport of simazine from non-agricultural use sites will result in low exposure to critical habitat. Furthermore, we expect any adverse effects to fish hosts will be limited to low flow and low volume areas within critical habitat (with no more than low levels of adverse effects in high flow areas), further limiting adverse effects to host fish PBFs in the overall critical habitat. As such, we anticipate no more than low level adverse effects to the host fish PBFs for the critical habitats in Table 5.

Host Plants, Plant Assemblages, or Plant Functions as PBFs:

Critical habitats for three insects (i.e., Dakota skipper, Florida leafwing butterfly, Taylor's checkerspot) include host plants as a PBF. In addition, all critical habitats include plant functions or plant assemblages as a PBF, with the exception of critical habitats for mussels other than the green floater which requires plankton and detritus for food resources. Given that herbicides like simazine are designed to control plants, we assume most plants are sensitive to simazine exposure. In general, we anticipate simazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation. However, after incorporating conservation measures outlined in Table 5 for each critical habitat, including additional measures as needed to minimize exposure and effects to critical habitats for specific species, we expect estimated exposure concentrations from agricultural uses to be low. We also anticipate exposure from non-agricultural uses will be low, as discussed in this section above. Thus, we anticipate effects to plant-based PBFs will be localized and limited such that we do not expect changes to the functionality of the critical habitat from simazine exposure.

Group Conclusion

In summary, we expect the critical habitats listed in Table 5 to have low exposure after incorporating spray drift and runoff conservation measures on the simazine label for agricultural uses (including additional measures as needed for specific species and their critical habitats) and low anticipated non-agricultural exposure. We anticipate a range of adverse effects will occur to the different PBFs of the critical habitats listed above in Table 5. For those that require water quality PBFs, we expect high levels of water quality impairment only in areas of exposed critical habitat where flow or volume are low. However, after incorporating the conservation measures outlined in Table 5 for each critical habitat, we expect estimated exposure concentrations to be low, limiting adverse effects to water quality PBFs when exposure occurs.

Some of the critical habitats require animal PBFs for prey and host species. We expect sublethal effects to growth and reproduction for terrestrial vertebrate individuals that primarily forage on use sites, and we anticipate similar sublethal effects for aquatic prey and host species exposed to simazine from agricultural uses in low flow or low volume aquatic portions of the critical habitats. However, we anticipate low level adverse effects to prey-based PBFs for these critical habitats. We also anticipate that there will be sufficient host fish and salamanders remaining in the bivalve critical habitats even if exposed host individuals experience sublethal effects to growth, and we expect most fish and salamanders that experience sublethal effects will still be able to function as hosts (i.e., glochidia could still attach to individuals). With effects limited to exposure on use sites for terrestrial prey and low flow and low volume waterbodies for aquatic prey and host species, along with the mitigation measures in place to reduce exposure and adverse effects in off-site areas from agricultural uses and the low likelihood of transport of simazine from non-agricultural use sites, we anticipate low level adverse effects to animal PBFs for the critical habitats in Table 5.

Many of the critical habitats in this group require plant-based PBFs. While we anticipate simazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation, after incorporating conservation measures outlined in Table 5 for each critical habitat, and considering that simazine use sites have typically been altered such that these areas are generally less likely to contain the required plant PBFs, and the low likelihood of transport of simazine from non-agricultural use sites, we expect estimated exposure concentrations to be low, limiting adverse effects to plant-based PBFs to low levels of adverse effects.

In conclusion, while we anticipate adverse effects to the PBFs for the critical habitats in this group, we anticipate these adverse effects will not cause more than minor adverse effects to the overall critical habitats. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species and is not likely to result in the destruction or adverse modification of the designated critical habitats for the species listed in Table 5.

Critical Habitats with Individual Integration and Synthesis Summaries

The critical habitats in Table 6 has an individual Integration and Synthesis summaries. For all these critical habitats, expect the Herbicide Strategy conservation measures will reduce pesticide loading into habitats adjacent to agricultural use sites by up to 90% (i.e., by one order of magnitude) from runoff and by up to 95% from spray drift. We anticipate that this reduction will minimize off-site transport of simazine and reduce the likelihood, magnitude, and frequency of exposure to a level where no more than low levels of adverse effects are likely to occur to listed plants through this exposure route. We expect this reduction in exposure will similarly result in no more than low levels of adverse effects to most other PBF categories relevant to each critical habitat. While the conservation measures on the label are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to PBFs. Information about the PBFs of the critical habitats and anticipated exposure and toxicity to those PBFs from simazine is provided in the summaries below. Additional information about the species and their critical habitats can be found in the Status of the Species and Critical Habitat accounts in Appendix B.

Table 6. Critical habitats with Individual Integration and Synthesis summaries.

Taxa	Common Name	Scientific Name	Determination
Amphibians	Neuse River waterdog	*Necturus lewisi*	No Destruction or Adverse Modification
Bivalves	Kentucky creekshell	*Villosa ortmanni*	No Destruction or Adverse Modification
Fish	Diamond darter	*Crystallaria Cincotta*	No Destruction or Adverse Modification
Fish	Maryland darter	*Etheostoma sellare*	No Destruction or Adverse Modification
Insects	Rusty patched bumble bee	*Rusty patched bumble bee*	No Destruction or Adverse Modification
Mammals	New Mexico meadow jumping mouse	*Zapus hudsonius luteus*	No Destruction or Adverse Modification
Mammals	Olympia pocket gopher	*Thomomys mazama pugetensis*	No Destruction or Adverse Modification
Mammals	Tenino pocket gopher	*Thomomys mazama tumuli*	No Destruction or Adverse Modification
Mammals	Yelm pocket gopher	*Thomomys mazama yelmensis*	No Destruction or Adverse Modification
Plants	Kentucky glade cress	*Leavenworthia exigua laciniata*	No Destruction or Adverse Modification
Plants	Prostrate milkweed	*Asclepias prostrata*	No Destruction or Adverse Modification
Reptiles	Northern Mexican gartersnake	*Thamnophis eques megalops*	No Destruction or Adverse Modification

Taxa	Common Name	Scientific Name	Determination
Reptiles	Plymouth redbelly turtle = Plymouth redbelly cooter	*Pseudemys rubriventris bangsi*	No Destruction or Adverse Modification

Amphibians

Neuse River waterdog (*Necturus lewisi*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

- Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of native aquatic fauna (such as stable riffle-run-pool habitats that provide flow refuges consisting of silt- free gravel, small cobble, coarse sand, and leaf litter substrates) as well as abundant cover and burrows used for nesting.
- Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain instream habitats where the species is found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the waterdog's habitat, food availability, and ample oxygenated flow for spawning and nesting habitat.
- Water quality (including, but not limited to, conductivity, hardness, turbidity, temperature, pH, ammonia, heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.
- Invertebrate and fish prey items, which are typically hellgrammites, crayfish, mayflies, earthworms, snails, beetles, centipedes, slugs, and small fish.

The features essential to the conservation of the Neuse River waterdog may require special management considerations or protections to reduce the following threats: (1) Urbanization of the landscape, including (but not limited to) land conversion for urban and commercial use, infrastructure (roads, bridges, utilities), and urban water uses (water supply reservoirs, wastewater treatment, etc.); (2) nutrient pollution and sedimentation from agricultural activities that impact water quantity and quality; (3) significant alteration of water quality; (4) improper forest management or clearcuts in riparian areas; (5) culvert and pipe installation that create barriers to movement; (6) impacts from invasive species; (7) changes and shifts in seasonal precipitation patterns as a result of climate change; and (8) other watershed and floodplain disturbances that release sediments or nutrients into the water.

Effects of the Action

Overlap and Usage

For critical habitats designated for aquatic species, rather than using the designated critical habitat units, the EPA uses the HUC-12 watersheds that contain the designated critical habitat units to calculate the extent of agricultural use site overlap and past simazine usage from agricultural uses. Given this expansion of area considered for agricultural use site overlap and usage, we only use the on-field overlap and usage data to characterize potential exposure as we anticipate this HUC-12 scale analysis already incorporates potential exposures resulting from off-site transport via spray drift and runoff. As such, we do not extend overlap metrics off-field like we do for terrestrial species as this extension of overlap would be redundant.

There is a high extent of overlap between agricultural use sites (and their associated off-site transport areas) and the critical habitat (20.8% total overlap) (Table 7). There is a moderate level of past simazine usage (up to 7.8% critical habitat treated annually), suggesting that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action. Additionally, we anticipate any non-agricultural uses within the watersheds containing the species' critical habitat will further contribute to the overall exposure of critical habitat.

Table 7. Overlap and past usage data for agricultural use sites in the critical habitat of the Neuse River waterdog.

% Total Overlap with Agricultural Uses	% Total CH Treated Annually for Agricultural Uses
20.8	7.8

Anticipated Effects to PBFs

Based on the PBFs listed above, we anticipate simazine will adversely affect water quality and animal prey as relevant PBFs necessary for critical habitat to support the Neuse River waterdog (Table 8).

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental modeling, we expect maximum estimated environmental concentrations likely to occur in exposed areas of critical habitat can reach up to 167.4 µg/L in its aquatic habitats adjacent to use sites agricultural use sites and up to 3.12 µg/L in aquatic habitats adjacent to non-agricultural use sites.

Available toxicity data indicate that estimated environmental concentrations of simazine from non-agricultural uses will not cause any direct adverse effects to the Neuse River waterdog. In contrast, estimated environmental concentrations of simazine from agricultural uses will not cause any mortality but will cause sublethal adverse effects to growth in the Neuse River waterdog. However, maximum exposure concentrations are associated with simazine use on orchard crops, and based on EPA's overlap data, there is very little presence of orchard crops within the Neuse River waterdog's watershed containing the species' critical habitat (orchards occur in 0.05% of the watershed). Thus, we expect the maximum exposure reported above is an overestimate of exposure concentrations and that agricultural simazine use will likely result in much lower levels of exposure that will not cause more than low levels of sublethal adverse effects to amphibians, such as the Neuse River waterdog. As such, we anticipate only low levels of adverse effects to the water quality PBF.

The Neuse River waterdog relies on animals as its prey, including gastropods, annelids, and small fish. Available toxicity data indicate that mollusks and annelids are not likely to experience any mortality or sublethal adverse effects, even at maximum estimated environmental concentrations of simazine. In contrast, simazine exposure is anticipated to cause sublethal adverse effects to fish prey, likely in the form of reduced growth. Estimated environmental concentrations of simazine are not high enough to cause more than low levels of adverse effects to fish growth. As such, we do not anticipate there will be significant effects to the availability or abundance of any of its prey, although low level effects to growth are expected for exposed fish prey within critical habitat. As such, we anticipate there will be no more than low levels of adverse effects to the animal PBF.

Table 8. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	yes	low flow/low volume waterbodies, high flow/high volume waterbodies	Low
Host Plant	no	--	--
Plant Assemblage	no	--	--
Plant Function	no	--	--
Animals	yes	presence of small fish, gastropods, annelids, arthropods as prey	Low

Rationale for Conclusion

There is a high extent of overlap between critical habitat and agricultural use areas and a moderate portion of the critical habitat anticipated to be exposed from annual simazine agricultural usage annually, with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas over the project duration and from non-agricultural uses. We identified water quality and animals as prey as relevant PBFs of the critical habitat.

We do not anticipate exposure to simazine from non-agricultural uses will cause any direct adverse effects to the Neuse River waterdog, but we expect sublethal adverse effects to growth from exposure to simazine from agricultural uses. However, maximum exposure concentrations are associated with simazine use on orchard crops, and based on EPA's overlap data, there is very little presence of orchard crops within the critical habitat based on the Neuse River waterdog's watershed (orchards occur in 0.05% of the watershed). As such, we anticipate only low levels of effects to water quality in a very small portion of the critical habitat.

The Neuse River waterdog relies on animals as its prey, including gastropods, annelids, and small fish. Available toxicity data indicate that mollusks and annelids are not likely to experience any mortality or sublethal adverse effects, even at maximum estimated environmental concentrations of simazine. In contrast, simazine exposure is likely to sublethal adverse effects to fish prey, likely in the form of reduced growth. Estimated environmental concentrations of simazine are not high enough to cause more than low levels of adverse effects to fish growth, and mortality is not anticipated. As such, we do not anticipate there will be any significant reductions in the availability or abundance of fish prey within critical habitat, although some may experience reductions in growth. We do not expect other types of prey to be affected.

After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Neuse River waterdog.

References

U. S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Threatened Species Status with Section 4(d) Rule for Neuse River Waterdog, Endangered Species Status for Carolina Madtom, and Designations of Critical Habitat. Final Rule. Federal Register 86: 30688-30751.

Bivalves (Mussels)

Kentucky creekshell (*Villosa ortmanni*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

1) Water quantity and quality necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages, including (but not limited to): water conditions in the stream that are cool; are well-oxygenated with no evidence of excessive sediments or suspended solids, salinity, ammonia, nutrients, pesticides, or herbicides; and have a stream flow and pattern consistent with natural flow regimes. Spring-influenced river sections are important habitat types for this species as most Kentucky creekshell populations are associated with this habitat type, and this is also the preferred habitat type for the host fish, the banded sculpin.
2) Suitable substrates and connected instream habitats characterized by geomorphically stable stream channels and banks (i.e., channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) and stable riffle-run-pool habitats that provide flow refuges consisting of predominantly silt-free, stable coarse sand, gravel, and cobble substrates.
3) Adequate food availability for Kentucky creekshell including (but not limited to): suspended phytoplankton, zooplankton, rotifers, protozoans, detritus, and dissolved organic matter from the water column or sediments.
4) Habitat conditions that support the presence and abundance of banded sculpin, the host fish necessary for Kentucky creekshell recruitment, as well as the actual presence and abundance of the banded sculpin in the habitat.
5) Connected instream habitats without barriers such as dams and perched or undersized culverts to provide suitable lotic rather than lentic habitat; access to quality habitat for multiple life stages of Kentucky creekshell; access for host fish movement, which in turn, may influence Kentucky creekshell distribution and provide genetic exchange for both species and recolonization of Kentucky creekshell.
6) Appropriate abundance, density, and distribution of mussel beds (aggregations of freshwater mussels) such that local stochastic events do not necessarily eliminate the bed(s), allowing the mussel beds and the overall local population within a stream reach to recover from any single event and for resilient populations.

The critical habitat proposed rule (see *Special Management Considerations or Protection*) states that features essential to the conservation of the Kentucky creekshell may require special management considerations or protections to reduce threats that include “significant alteration of water quality and nutrient pollution from a variety of activities, such as urban development, mining, and agricultural activities." The proposed rule (see *Summary of Biological Status and Threats*) also states, "The Kentucky creekshell requires host fish to complete its life cycle. Kentucky creekshell use the banded sculpin as a host fish (Haag and Cicerello 2016, p. 261); it is the only sculpin known to occur in the Kentucky creekshell range. The Kentucky creekshell requires sufficient host fish numbers to provide nutrition to and dispersal of glochidia. The presence of life history requirements for the banded sculpin influence Kentucky creekshell viability through host fish contribution to mussel recruitment. Suitable habitat for the banded sculpin is characterized as spring-fed and spring-influenced streams with riffle and pool areas with gravel and rubble substrate, adjacent riparian cover, and sufficient food items, including macroinvertebrates and small fish such as darters. The banded sculpin is susceptible to effects from habitat fragmentation due to its small size and lower ability to swim the distance between suitable habitat patches compared to larger fishes (Etnier and Starnes 1993, p. 387). Additionally, even small vertical drops (2–3 inches) created by culverts can be a significant barrier to the banded sculpin's upstream movement. Being a benthic species, the banded sculpin is particularly sensitive to silt and sedimentation (Greenberg and Holtzman 1987, entire)." The banded sculpin (*Cottus carolinae*) is described as an obligate host fish in the proposed rule.

Effects of the Action

<u>Overlap and Usage</u>

The critical habitat for the Kentucky creekshell was proposed in September 2024 and the critical habitat shapefile was not available when EPA ran their overlap analysis. As such, we assess the potential exposure to the species' critical habitat qualitatively. A visual inspection of the proposed critical habitat areas using satellite imagery indicates that potential agricultural and non-agricultural use sites are likely to occur in close proximity to the species' critical habitat. As such, we anticipate the Kentucky creekshell's critical habitat is likely to be exposed to simazine.

<u>Anticipated Effects to PBFs</u>

Based on the PBFs listed above, we anticipate simazine will adversely affect water quality as well as host fish that are necessary for critical habitat to support the Kentucky creekshell (Table 9).

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental modeling, we expect maximum estimated environmental concentrations likely to occur in exposed areas of critical habitat can reach up to 119.6 µg/L in its aquatic habitats adjacent to use sites agricultural use sites and up to 3.41 µg/L in aquatic habitats adjacent to non-agricultural use sites.

Available toxicity data on mollusks exposed to triazines indicate that individuals are not likely to experience any mortality and no more than low levels of adverse effects to growth (if any) from exposures to levels estimated to occur from agricultural simazine use. We do not anticipate any adverse effects will occur from exposure to levels estimated to occur from non-agricultural uses. As such, we do not anticipate more than low adverse effects, if any, to the water quality PBF as the presence of simazine is not likely to prevent individuals from occupying critical habitat.

Available toxicity data on fish exposed to simazine indicate that no host fish that the species relies on will die but will likely experience sublethal adverse effects to growth and reproduction, particularly when exposed to simazine from agricultural uses. However, we anticipate these adverse effects to host fish growth and reproduction will only occur in areas of low flow as areas of high flow will accumulate lower levels of simazine that are not likely to result in any adverse effects to host fish growth or reproduction. Furthermore, the Kentucky creekshell is a host specialist on sculpins. The only sculpin known to occur in the Kentucky creekshell range is the banded sculpin (*Cottus carolinae*). The banded sculpin is found throughout the Mississippi river basin and common in spring-fed and upland streams of Kentucky, ranging from the lower Cumberland River drainage eastward to the Kentucky River drainage (USFWS 2024b), indicating that there will likely be sufficient host fish remaining even if exposed individuals experience some sublethal effects to growth or reproduction. We do not anticipate non-agricultural uses of simazine will cause any adverse effects to host fish growth or reproduction. As such, we anticipate no more than low adverse effects to the animal PBF for host fish.

Table 9. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	yes	low flow, high flow	Low
Host Plant	no	--	--
Plant Assemblage	no	--	--
Plant Function	no	--	--
Animals	yes	host fish	Low

Rationale for Conclusion

While we expect there is overlap between critical habitat and agricultural and non-agricultural use sites and there will be agricultural and non-agricultural simazine usage within the critical habitat, we do not anticipate more than low levels of adverse effects to relevant critical habitat PBFs, which are those related to water quality and host fish. Available toxicity data on mussels exposed to triazines indicate that individuals are not likely to experience any mortality or more than low levels of adverse effects to growth (if any) from exposures to levels estimated to occur from agricultural simazine use. We do not anticipate any adverse effects will occur to mussels from exposure to levels estimated to occur from non-agricultural uses. As such, we do not anticipate more than low adverse effects, if any, to the water quality PBF for the Kentucky clubshell. Critical habitat for this species also includes a host fish PBF, as individuals rely on host fish for glochidia (larval mussel) attachment to complete their life cycle. Available toxicity data on fish exposed to simazine indicate that no host fish that the species relies on will die, but will likely experience sublethal adverse effects to growth and reproduction, particularly when exposed to simazine from agricultural uses. However, we anticipate these sublethal adverse effects to host fish will only occur in areas of low flow, as areas of high flow will accumulate lower levels of simazine that are not likely to result in any adverse effects to host fish growth or reproduction. While the Kentucky creekshell is a host specialist that relies on the banded sculpin as a PBF of the critical habitat, information about the sculpin indicates these fish are common in the range of the mussel. Additionally, we expect most individual host fish that experience sublethal effects will still be able to function as hosts (i.e., glochidia could still attach to individuals). Thus, we anticipate there will be host fish remaining in the critical habitat even if host fish individuals experience sublethal effects to growth or reproduction, which we anticipate will occur only from exposures in low flow habitats associated with agricultural uses. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Kentucky clubshell.

References

U.S. Fish and Wildlife Service. 2024a. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Kentucky Creekshell and Designation of Critical Habitat. Proposed Rule. Federal Register 89: 76196-76233.

U.S. Fish and Wildlife Service. 2024b. Kentucky Creekshell (*Leounio ortmanni*) Species Status Assessment, Version 1.0. Atlanta, Georgia. 63 pp.

Fish

Diamond darter (*Crystallaria cincotta*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

- A series of connected riffle-pool complexes with moderate velocities in moderate- to large-sized (fourth- to eighth-order), geomorphically stable streams within the Ohio River watershed.
- Stable, undisturbed sand and gravel stream substrates that are relatively free of and not embedded with silts and clays.
- An instream flow regime (magnitude, frequency, duration, and seasonality of discharge over time) that is relatively unimpeded by impoundment or diversions such that there is minimal departure from a natural hydrograph.
- Adequate water quality characterized by seasonally moderated temperatures, high dissolved oxygen levels, and moderate pH, and low levels of pollutants and siltation. Adequate water quality is defined as the quality necessary for normal behavior, growth, and viability of all life stages of the diamond darter.
- A prey base of other fish larvae and benthic invertebrates including midge, caddisfly, and mayfly larvae.

<u>Overlap and Usage</u>

For critical habitats designated for aquatic species, rather than using the designated critical habitat units, the EPA uses the HUC-12 watersheds that contain the designated critical habitat units to calculate the extent of agricultural use site overlap and past simazine usage from agricultural uses. Given this expansion of area considered for agricultural use site overlap and usage, we only use the on-field overlap and usage data to characterize potential exposure as we anticipate this HUC-12 scale analysis already incorporates potential exposures resulting from off-site transport via spray drift and runoff. As such, we do not extend overlap metrics off-field like we do for terrestrial species as this extension of overlap would be redundant.

There is a high extent of overlap between agricultural use sites (and their associated off-site transport areas) and the critical habitat (10.3% total overlap) (Table 10). There is a moderate level of past simazine usage (up to 8.5% critical habitat treated annually), with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas (up to 10.3%) over the project duration, suggesting that a moderate to high portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action. Additionally, we anticipate any non-agricultural uses within the watersheds containing the species' critical habitat will further contribute to the overall exposure of critical habitat.

Table 10. Overlap and past usage data for agricultural use sites in the critical habitat of the diamond darter.

% Total Overlap with Agricultural Uses	% Total CH Treated Annually for Agricultural Uses
10.3	8.5

Anticipated Effects to PBFs

Based on the PBFs listed above, we anticipate simazine will adversely affect water quality and animals (i.e., aquatic invertebrates as prey), which are relevant PBFs necessary for critical habitat to support the diamond darter (Table 11).

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental modeling, we expect maximum estimated environmental concentrations likely to occur in exposed areas of critical habitat can reach up to 86.8 µg/L in its aquatic habitats adjacent to use sites agricultural use sites and up to 3.41 µg/L in aquatic habitats adjacent to non-agricultural use sites.

Available toxicity data indicate that estimated environmental concentrations of simazine from non-agricultural uses will not cause any direct adverse effects to the diamond darter. In contrast, estimated environmental concentrations of simazine from agricultural uses will not cause any mortality but will cause low levels of sublethal adverse effects to growth in the diamond darter. As such, we anticipate only low levels of adverse effects to the water quality PBF.

The diamond darter relies on animals, specifically fish larvae and aquatic invertebrates as its prey, including midge, caddisfly, and mayfly larvae. Insect prey are not a relevant PBF as we do not anticipate adverse effects will occur form exposure. Likewise, larval fish prey will not die with exposure to simazine at estimated environmental concentrations but may experience low levels of sublethal adverse effects to growth. We anticipate these adverse effects will be limited to areas of low flow or low volume, as we expect large waterbodies or areas with high flow will not accumulate more than low levels of simazine from agricultural uses and will not result in adverse effects to individuals. We do not anticipate any adverse effects will occur to individual prey items exposed to simazine from non-agricultural uses as estimated exposure concentrations from these uses are much lower. With effects limited to agricultural areas and low flow and low volume waterbodies, the varied diet of this species that includes insects which will not be affected by simazine exposure, and with the conservation measures in place to reduce exposure and adverse effects, we anticipate low level losses of aquatic prey in the critical habitat. As such, we anticipate there will be no more than low levels of adverse effects to the animal PBF.

Table 11. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	yes	low flow/low volume waterbodies, high flow/high volume waterbodies	Low
Host Plant	no	--	--
Plant Assemblage	no	--	--
Plant Function	no	--	--
Animals	yes	presence of fish larvae (and benthic invertebrates including midge, caddisfly, and mayfly larvae, which are not relevant PBFs)	Low

Rationale for Conclusion

There is a high extent of overlap between critical habitat and the agricultural use areas and a moderate level of anticipated simazine agricultural usage over the project duration based on past annual usage data, with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas (up to 10.3%) and exposure from non-agricultural uses over the project duration. We identified water quality and animals as prey as relevant PBFs of the critical habitat.

While exposure is anticipated in a moderate to high portion of the critical habitat, we anticipate there adverse effects to the water quality PBF and animal PBF related to prey will be low. We do not expect simazine exposure from non-agricultural uses will cause any direct adverse effects to the diamond darter or its fish larvae prey. Exposure from agricultural uses is not likely to cause mortality, but will likely cause low levels of sublethal adverse effects to growth in the diamond darter. Similarly, fish larvae prey are also likely to experience low levels of sublethal effects (e.g., reduced growth) with simazine agricultural exposure, and are not expected to die even at high estimated exposure concentrations. We anticipate adverse effects to the water quality and prey-based PBFs will be limited to areas of low flow or low volume from agricultural uses. This species primarily relies on moderate- to large-sized streams where simazine concentrations are expected to be low. With the species' primary use of high flow streams where adverse effects are not anticipated, sublethal effects limited to agricultural areas and low flow and low volume waterbodies, the conservation measures in place to reduce exposure and adverse effects, and the variety of prey items used by the diamond darter that includes insects that are not likely to be adversely affected, we anticipate water quality and prey abundance will remain sufficient in all but a small portion of the critical habitat with low flows exposed to agricultural uses of simazine.

After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species.

Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the diamond darter.

References

U.S. Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Diamond Darter (*Crystallaria cincotta*). Final Rule. Federal Register 78: 52363-52387.

Maryland darter (*Etheostoma sellare*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

- Continuity und sufficiency of stream flow. Like most fishes, this one could not be expected to survive removal of all water from its habitat for more than a few minutes.
- Permanence of riffle habitat. Like many other darters, this one shows evidence of permanent residence in the shallower, swifter segments of streams. Both reproduction and ultimately survival can reasonably be predicted to be adversely affected if the population is forced by low water into stagnant or even still pools for prolonged periods. This constraint probably holds for most organisms that are the darter's natural food.
- Pollution sensitivity. Coupled with most darters' preference for swift water is a high oxygen requirement, making darters among the first fishes to show respiratory stress and failure with any reduction of oxygen availability. Selective mortality of darters in habitats subjected to various other kinds of pollution is also documented.
- Presence and quality of cover. Darters inhabiting riffles are known to use crevices among stones, smaller pebbles, vegetation or trapped wood flotsam both for cover from their predators and for spawning and egg protection. They have been noted to disappear from riffles when silt deposition eliminated such crevices. Darter eggs have been shown to be particularly vulnerable to smothering by silt, so that even less siltation can normally be tolerated during the spawning season.

Maryland darters feed primarily on small riffle insects, snails, and invertebrates. As stated in the critical habitat rule (see *Critical Habitat* section), "darters [are] among the first fishes to show respiratory stress and failure with any reduction of oxygen availability" and "selective mortality of darters in habitats subjected to various other kinds of pollution is also documented."

Effects of the Action

Overlap and Usage

For critical habitats designated for aquatic species, rather than using the designated critical habitat units, the EPA uses the HUC-12 watersheds that contain the designated critical habitat units to calculate the extent of agricultural use site overlap and past simazine usage from agricultural uses. Given this expansion of area considered for agricultural use site overlap and usage, we only use the on-field overlap and usage data to characterize potential exposure as we anticipate this HUC-12 scale analysis already incorporates potential exposures resulting from off-site transport via spray drift and runoff. As such, we do not extend overlap metrics off-field like we do for terrestrial species as this extension of overlap would be redundant.

There is a high extent of overlap between agricultural use sites (and their associated off-site transport areas) and the critical habitat (15.5% total overlap) (Table 12). There is a high level of past simazine usage (up to 14.5% critical habitat treated annually), suggesting that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action. Additionally, we anticipate any non-agricultural uses within the watersheds containing the species' critical habitat will further contribute to the overall exposure of critical habitat.

Table 12. Overlap and past usage data for agricultural use sites in the critical habitat of the Maryland darter.

% Total Overlap with Agricultural Uses	% Total CH Treated Annually for Agricultural Uses
15.5	14.5

Anticipated Effects to PBFs

Based on the PBFs listed above, we anticipate simazine will adversely affect water quality as well as plant assemblages and plant functions, which are relevant PBFs necessary for critical habitat to support the Maryland darter (Table 13).

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental modeling, we expect maximum estimated environmental concentrations likely to occur in exposed areas of critical habitat can reach up to 114.6 µg/L in its aquatic habitats adjacent to use sites agricultural use sites and up to 3.54 µg/L in aquatic habitats adjacent to non-agricultural use sites.

Available toxicity data on fish exposed to simazine indicate that individuals are not likely to experience any mortality but are likely to experience sublethal adverse effects (e.g., reduced growth and reproduction) from exposures to levels expected to occur from agricultural simazine use. However, we anticipate these adverse effects will be limited to areas of low flow. We expect areas of high flow will not accumulate more than low levels of simazine from agricultural uses and will not result in any water quality impairments that cause adverse effects to individuals. We do not anticipate any adverse effects will occur to individuals exposed to simazine from non-agricultural uses as estimated exposure concentrations from these uses are much lower. Thus, we anticipate simazine use will result in moderate adverse effects to the water quality PBF as only some uses and only some parts of the species' critical habitat will have reduced water quality that would adversely affect the species.

The Maryland darter requires aquatic and wetland plants as well as nonliving plant matter assemblages for shelter from predators as well as substrate for their eggs. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to plant assemblage and plant function PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat. These measures will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect conservation measures will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect this effect to sensitive species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as cover and general habitat for individuals within exposed areas of critical habitat. As such, we anticipate no more than low levels of adverse effects to the plant assemblage and plant function PBFs required to support the Maryland darter.

Table 13. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	yes	low flow, high flow	Moderate
Host Plant	no	--	--
Plant Assemblage	yes	aquatic or wetland plants; nonliving plant matter	Low
Plant Function	yes	plants as cover; plants as general habitat features	Low
Animals	no	--	--

Rationale for Conclusion

There is a high extent of overlap between critical habitat and the agricultural use areas and a high level of anticipated simazine agricultural usage over the project duration based on past annual usage data, with a larger portion of the critical habitat likely to be exposed from non-agricultural uses. We anticipate there will be moderate adverse effects to the water quality PBF and low adverse effects to the plant assemblage and plant function PBFs of the critical habitat. Available toxicity data on fish exposed to simazine indicate that individuals are not likely to experience any mortality, but are likely to experience sublethal adverse effects (e.g., reduced growth and reproduction) from exposures to levels expected to occur from agricultural simazine usage in areas with low flow. Areas of high flow and exposure from non-agricultural uses are not expected to result in water quality impairments that cause adverse effects to individuals. Thus, we anticipate simazine use will result in adverse effects to water quality from exposures in low flow areas from agricultural uses. While this species is sensitive to pollutants, it uses shallower, but swifter segments of streams where concentrations of simazine may be lower and less likely to cause more than low levels of effects to water quality that would cause sublethal effects to exposed individuals.

Maryland darter critical habitat also requires plant assemblages and plant functions to provide cover as protection from predators and for spawning and egg protection. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to plant assemblage and plant function PBFs is likely. However, we expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect these adverse effects will significantly change the overall plant assemblages or plant functions within exposed areas of critical habitat. As such, we anticipate no more than low levels of adverse effects to the plant-based PBFs required to support the Maryland darter.

While adverse effects to the water quality PBF could adversely affect portions of the critical habitat for the Maryland darter from exposures that lead to sublethal adverse effects (e.g., reduced growth and reproduction) to individuals, these exposures are expected to be limited to areas with low flow exposed to simazine from agricultural uses only. Further, while this species is sensitive to pollutants, it tends to use shallower, but swifter segments of streams where concentrations of simazine are expected to be lower and cause no more than low levels of adverse effects to water quality that would cause sublethal effects to exposed individuals. Additionally, 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 adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Maryland darter.

References

U.S. Fish and Wildlife Service. 1984. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Endangered Maryland Darter. Final Rule. Federal Register 49: 34228-34232.

Insects

Rusty patched bumble bee (*Bombus affinis*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

- For overwintering, upland forest interior habitat containing leaf litter and without dense understory vegetation.
- For nesting, upland forest edge interface between forested and non- forested natural habitats that extends approximately 30 meters into the forest.
- For nesting, abandoned rodent burrows, other mammal burrows, existing cavities with ample cover, or similar existing cavities at the soil surface or below to 4 feet underground.
- For nesting and overwintering, well-drained, loose soils sheltered from the elements.
- For foraging, diverse, abundant, native floral resources for the entire active flight season.

The proposed rule (see *Special Management Considerations or Protection*) states that the features essential to the conservation of this species may require special management considerations or protection to reduce stressors that are anticipated to degrade the physical or biological features. Activities listed include habitat management (e.g., prescribed burns, herbicide use) and pesticide applications (e.g., rodenticides that may reduce rodents and therefore potential nesting areas). Sources of these stressors include, but are not limited to, agricultural, municipal, and residential land uses. The proposed rule (see *Criteria Used To Identify Critical Habitat*) also states that the decline of the rusty patched bumble bee is unknown, but evidence suggests a synergistic interaction between an introduced pathogen and exposure to pesticides (specifically, insecticides and fungicides). Only areas that are at least 0.6 mi (1 km) away from large-scale and intensive agricultural areas that rely on pesticides, or use a variety of managed bees for pollination, or both, are proposed critical habitat areas. This distance is used to buffer areas from the potential adverse effects of managed bees and pesticides that may be used in large-scale agriculture. The proposed critical habitat overlaps a great deal of developed areas, such as lands covered by buildings, pavement, and other structures. These structures are not designated as critical habitat themselves because such structures lack the physical or biological features necessary for the rusty patched bumble bee. However, the physical or biological features for rusty patched bumble are interspersed throughout the developed lands at such a scale that they cannot be mapped.

Effects of the Action

Overlap and Usage

The critical habitat for the rusty patched bumble bee was proposed in November 2024 and the critical habitat shapefile was not available when EPA ran their overlap analysis. As such, we assess the potential exposure to the species' critical habitat qualitatively. A visual inspection of the proposed critical habitat areas using satellite imagery indicates that potential agricultural and non-agricultural use sites are likely to occur in close proximity to the species' critical habitat. As such, we anticipate the rusty patched bumble bee's critical habitat is likely to be exposed to simazine.

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental fate modeling, we anticipate simazine residues in terrestrial habitats occurring adjacent to agricultural use sites (after incorporating the mandatory label spray drift and runoff measures) will range from 0.0011-0.099 lbs/acre in areas off-field. Simazine residues in terrestrial habitat occurring adjacent to non-agricultural use sites will range from 0.00047-0.0013 lbs/acre (Table 14).

The rusty patched bumble bee requires upland forest edges interfacing between forested and non-forested natural habitats for nesting, and diverse, abundant, native floral resources for the entire active flight season for foraging, indicating that relevant PBFs for the species include plant assemblage and plant function PBFs. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to plant-based PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of simazine will greatly minimize adverse effects to plants in areas of critical habitat adjacent to use sites. Similarly, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the exposure concentration of simazine in areas of critical habitat adjacent to these non-agricultural use sites. Additionally, only areas that are at least 0.6 mi (1 km) away from large-scale and intensive agricultural areas that rely on pesticides are proposed critical habitat areas. Therefore, we anticipate little, if any, adverse effects to plant-based PBFs on agricultural use sites. In areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural factors will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect effects to sensitive plant species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function for nesting sites or to support native floral resources for foraging. As such, we anticipate no more than low levels of adverse effects to the plant assemblage and plant function PBFs required to support the rusty patch bumble bee.

Table 14. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
Plant Assemblage	yes	upland forest edges interfacing between forested and non-forested natural habitats	Low
Plant Function	yes	forage and nesting	Low
Animals	no	--	--

Rationale for Conclusion

While we expect there is overlap between critical habitat and agricultural and non-agricultural uses that will expose proposed critical habitat areas, we do not anticipate there will be more than low levels of adverse effects to plant assemblage and plant function PBFs of the critical habitat. While simazine exposure can cause adverse effects to plant growth and survival, we expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. Additionally, only areas that are at least 0.6 mi (1 km) away from large-scale and intensive agricultural areas that rely on pesticides are proposed critical habitat areas. Therefore, we do not anticipate there will be more than low levels of adverse effects, if any, to plant-based PBFs on agricultural use sites. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine, we do not expect these adverse effects will significantly change the overall plant assemblages or plant functions within exposed areas of critical habitat as this species is a generalist that does not rely on one or just a few particular plant species for its habitat requirements or foraging. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species.

Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the rusty patched bumble bee.

References

U.S. Fish and Wildlife Service. 2024. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Rusty Patched Bumble Bee. Proposed Rule. Federal Register 89: 93245-93272.

Mammals

New Mexico meadow jumping mouse (*Zapus hudsonius luteus*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

1) Riparian communities along rivers and streams, springs and wetlands, or canals and ditches that contain: (A) Persistent emergent herbaceous wetlands especially characterized by presence of primarily forbs and sedges (*Carex spp*. or *Schoenoplectus pungens*); or (B) Scrub-shrub riparian areas that are dominated by willows (*Salix spp*.) or alders (*Alnus spp*.) with an understory of primarily forbs and sedges; and
2) Flowing water that provides saturated soils throughout the New Mexico meadow jumping mouse's active season that supports tall (average stubble height of herbaceous vegetation of at least 61 centimeters (24 inches)) and dense herbaceous riparian vegetation composed primarily of sedges (*Carex spp*. or *Schoenoplectus pungens*) and forbs, including, but not limited to, one or more of the following associated species: Spikerush (*Eleocharis macrostachya*), beaked sedge (*Carex rostrata*), rushes (*Juncus spp*. and *Scirpus spp*.), and numerous species of grasses such as bluegrass (*Poa spp*.), slender wheatgrass (*Elymus trachycaulus*), brome (*Bromus spp*.), foxtail barley (*Hordeum jubatum*), or Japanese brome (*Bromus japonicas*), and forbs such as water hemlock (*Circuta douglasii*), field mint (*Mentha arvense*), asters (*Aster spp*.), or cutleaf coneflower (*Rudbeckia laciniata*); and
3) Sufficient areas of 9 to 24 kilometers (5.6 to 15 miles) along a stream, ditch, or canal that contain suitable or restorable habitat to support movements of individual New Mexico meadow jumping mice; and
4) Adjacent floodplain and upland areas extending approximately 100 meters (330 feet) outward from the boundary between the active water channel and the floodplain (as defined by the bankfull stage of streams) or from the top edge of the ditch or canal.

These PBFs focus on habitat type and structure. The PBF section of the Final Rule discusses the reliance of the jumping mouse on tall and dense vegetation as described in the PBFs above, and states, "[t]his vegetation is an important resource need for the jumping mouse because it provides vital food sources (insects and seeds), as well as the structural material for building day nests that are used for shelter from predators. It is imperative that the jumping mouse have rich abundant food sources during the summer so that it can accumulate sufficient fat reserves to survive the long hibernation period because the subspecies does not cache food for the winter."

Effects of the Action

Overlap and Usage

Our review of the species' PBF requirements indicate that agricultural use sites, as well as residential turf, golf courses, and nurseries are not likely to contain or produce many of the PBF requirements for the species. As such, we primarily focus our analysis of adverse effects to critical habitat in adjacent off-site areas. There is a high extent of critical habitat likely to be exposed by spray drift or runoff (45.3% off-field overlap) (Table 15) and a high level of past simazine usage (up to 28.4% off-field critical habitat exposed annually) from agricultural uses. This suggests that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action. We anticipate any non-agricultural uses in the species' critical habitat will further contribute to the overall exposure of critical habitat.

Table 15. Overlap and past usage data for the New Mexico meadow jumping mouse's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually for Agricultural Uses
0.8	45.3	46.1	0.5	28.4	28.9

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental fate modeling, we anticipate simazine residues in terrestrial habitats occurring adjacent to agricultural use sites (after incorporating the mandatory label spray drift and runoff measures) will range from 0.0011-0.099 lbs/acre in areas off-field. Simazine residues in terrestrial habitat occurring adjacent to non-agricultural use sites will range from 0.00047-0.0013 lbs/acre.

Within its critical habitat, the New Mexico meadow jumping mouse requires riparian communities along rivers and streams, springs and wetlands, or canals and ditches or scrub-shrub riparian areas that contain a wide array of plant species, including herbaceous forbs, tall grasses, sedges, and rushes, and woody plant species to provide food, shelter, and dispersal areas (Table 16). As such, we expect that relevant PBFs for the species include plant assemblage and plant function PBFs. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to all relevant PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of simazine will greatly minimize adverse effects to plants in the flowing wetland and riparian areas necessary for critical habitat. Similarly, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the exposure concentration of simazine in the flowing wetlands and riparian areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural factors will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural factors will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect this effect to sensitive species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, cover, and general habitat for individuals in areas adjacent to agricultural and non-agricultural use sites. As such, we anticipate no more than low levels of adverse effects to the plant assemblage and plant function PBFs required to support the New Mexico meadow jumping mouse.

Table 16. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
Plant Assemblage	yes	aquatic or wetland plants; trees or shrubs; herbaceous cover; grasses, sedges, or rushes	Low
Plant Function	yes	plants as forage; plants to support prey; plants as cover; plants as general habitat features	Low
Animals	no	--	--

Rationale for Conclusion

There is a high extent of overlap between critical habitat and the agricultural use areas and a high portion of the critical habitat anticipated to be exposed from annual simazine agricultural usage annually, with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas over the project duration and from non-agricultural uses. The New Mexico meadow jumping mouse requires riparian communities along rivers and streams, springs and wetlands, or canals and ditches or scrub-shrub riparian areas that contain a wide array of plant species, including herbaceous forbs, tall grasses, sedges, and rushes, and woody plant species to provide food, shelter, and dispersal areas. As such, relevant PBFs for the critical habitat include plant assemblage and plant function PBFs.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to plant assemblage and plant function PBFs is likely. However, we expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect these adverse effects will significantly change the overall plant assemblages or plant functions within exposed areas of critical habitat. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the New Mexico meadow jumping mouse.

References

U. S. Fish and Wildlife Service. 2016. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the New Mexico Meadow Jumping Mouse. Final Rule. Federal Register 81:14264-14325.

Olympia pocket gopher (*Thomomys mazama pugetensis*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

1) Friable, loamy, and deep soils, some with relatively greater content of sand, gravel, or silt, all generally on slopes less than 15 percent in the following soil series or soil series complex: (A) Alderwood; (B) Cagey; (C) Everett; (D) Godfrey; (E) Indianola; (F) Kapowsin; (G) McKenna; (H) Nisqually; (I) Norma; (J) Spana; (K) Spanaway; (L) Spanaway-Nisqually complex; and (M) Yelm.

2) Areas equal to or larger than 50 ac (20 ha) in size that provide for breeding, foraging, and dispersal activities, found in the soil series listed in paragraph (2)(i) of this entry that have: (A) Less than 10 percent woody vegetation cover; (B) Vegetative cover suitable for foraging by gophers. Pocket gophers' diets include a wide variety of plant material, including leafy vegetation, succulent roots, shoots, tubers, and grasses. Forbs and grasses that Mazama pocket gophers eat are known to include, but are not limited to: *Achillea millefolium* (common yarrow), *Agoseris spp*. (agoseris), *Cirsium spp*. (thistle), *Bromus spp*. (brome), *Camassia spp*. (camas), *Collomia linearis* (tiny trumpet), *Epilobium spp*. (several willowherb spp.), *Eriophyllum lanatum* (woolly sunflower), *Gayophytum diffusum* (groundsmoke), *Hypochaeris radicata* (hairy cat's ear), *Lathyrus spp*. (peavine), *Lupinus spp*. (lupine), *Microsteris gracilis* (slender phlox), *Penstemon spp*. (penstemon), *Perideridia gairdneri* (Gairdner's yampah), *Phacelia heterophylla* (varileaf phacelia), *Polygonum douglasii* (knotweed), *Potentilla spp*. (cinquefoil), *Pteridium aquilinum* (bracken fern), *Taraxacum officinale* (common dandelion), *Trifolium spp*. (clover), and *Viola spp*. (violet); and
3) Few, if any, barriers to dispersal. Barriers to dispersal may include, but are not limited to, forest edges, roads (paved and unpaved), abrupt elevation changes, Scot's broom thickets, highly cultivated lawns, inhospitable soil types or substrates, development and buildings, slopes greater than 35 percent, and open water.

Effects of the Action

<u>Overlap and Usage</u>

Our review of the species' PBF requirements indicate that non-agricultural use sites, such as residential turf, golf courses, and nurseries, are not likely to contain or produce many of the PBF requirements for the species. As such, we primarily focus our analysis of adverse effects to critical habitat in areas adjacent to these use sites. However, the Olympia pocket gopher is known to occur on and forage in agricultural areas, indicating that agricultural use sites may contain the necessary PBFs to support the species. As such, we include both on-field and adjacent off-field areas in our critical habitat assessment for this species. There is a high level of overlap between agricultural use sites and their associated spray drift and runoff areas (61.6% total overlap with critical habitat) and a high level of past simazine usage (up to 57.6% of critical habitat exposed annually) from agricultural uses (Table 17). This suggests that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action. We anticipate any non-agricultural uses in the species' critical habitat will further contribute to the overall exposure of critical habitat, but that exposure will primarily occur in off-site areas where PBFs of the critical habitat are likely to be more prevalent.

Table 17. Overlap and past usage data for the Olympia pocket gopher's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually for Agricultural Uses
0.4	61.2	61.6	0.4	57.2	57.6

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental fate modeling, we anticipate simazine residues in terrestrial habitats occurring adjacent to agricultural use sites (after incorporating the mandatory label spray drift and runoff measures) will range from 0.0011-0.099 lbs/acre in areas off-field. Simazine residues in terrestrial habitat occurring adjacent to non-agricultural use sites will range from 0.00047-0.0013 lbs/acre (Table 18).

Within its critical habitat, the Olympia pocket gopher requires prairie habitat that contains woody vegetation for cover and a wide range of plant material for foraging, including leafy vegetation, succulent roots, shoots, tubers, and grasses from a wide variety of species. As such, we expect that relevant PBFs for the species include plant assemblage and plant function PBFs. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to all three PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of simazine will greatly minimize adverse effects to plants in critical habitat. Similarly, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the exposure concentration of simazine in the areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural factors will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural factors will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect this effect to sensitive species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, cover, and general habitat for individuals in areas adjacent to agricultural and non-agricultural use sites.

Required conservation measures are not likely to significantly reduce the amount of simazine applied to agricultural use sites, indicating that areas of critical habitat to coincide with agricultural use sites will be exposed to high levels of simazine, which is likely to result in high levels of adverse effects to plant assemblages and their functions on agricultural use sites. However, given that very little of the species' critical habitat is located directly on agricultural use sites (0.4% on-field overlap), we anticipate this effect to plant assemblages and their functions will not represent more than a low level of adverse effect to the overall critical habitat.

Table 18. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
Plant Assemblage	yes	terrestrial or riparian plants; herbaceous cover; grasses, sedges, or rushes	Low
Plant Function	yes	plants as forage; plants as cover; plants as general habitat features	Low
Animals	no	--	--

Rationale for Conclusion

There is a high extent of overlap between critical habitat and the agricultural use areas and a high level of anticipated simazine agricultural usage based on past usage data, with additional overlap from non-agricultural use sites and anticipated usage on those sites. The Olympia pocket gopher requires prairie habitat that contains woody vegetation for cover and a wide range of plant material for foraging, including leafy vegetation, succulent roots, shoots, tubers, and grasses from a wide variety of species. As such, relevant PBFs of the critical habitat for the species include plant assemblage and plant function PBFs.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to plant assemblage and plant function PBFs is likely. We expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in off-site areas. However, conservation measures are not likely to reduce the high levels of simazine exposure on use sites, leading to greater adverse affects to plants in areas overlapping with use sites. Given that a low portion of critical habitat overlaps with agricultural use sites (0.4% on-field overlap), and there is likely additional overlap with non-agricultural use sites and low levels of exposure may occur in off-site areas, we anticipate adverse effects to plants will cause some effects to the plant assemblage and plant function PBFs in a low to moderate portion of the critical habitat. However, we do not anticipate exposure in these use sites will significantly change the plant communities there, as use sites have been altered from their natural conditions and are no longer likely support many of the PBFs of the critical habitat, and only low level adverse effects to plants are expected in off-site areas. Thus, while we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect these adverse effects will significantly change the overall plant assemblages or plant functions within exposed areas of critical habitat. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Olympia pocket gopher.

References

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Mazama Pocket Gophers. Final Rule. Federal Register 79: 19711-19757.

Tenino pocket gopher (*Thomomys mazama tumuli*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

1) Friable, loamy, and deep soils, some with relatively greater content of sand, gravel, or silt, all generally on slopes less than 15 percent in the following soil series or soil series complex: (A) Alderwood; (B) Cagey; (C) Everett; (D) Godfrey; (E) Indianola; (F) Kapowsin; (G) McKenna; (H) Nisqually; (I) Norma; (J) Spana; (K) Spanaway; (L) Spanaway-Nisqually complex; and (M) Yelm.
2) Areas equal to or larger than 50 ac (20 ha) in size that provide for breeding, foraging, and dispersal activities, found in the soil series listed in paragraph (2)(i) of this entry that have: (A) Less than 10 percent woody vegetation cover; (B) Vegetative cover suitable for foraging by gophers. Pocket gophers' diets include a wide variety of plant material, including leafy vegetation, succulent roots, shoots, tubers, and grasses. Forbs and grasses that Mazama pocket gophers eat are known to include, but are not limited to: *Achillea millefolium* (common yarrow), *Agoseris spp*. (agoseris), *Cirsium spp*. (thistle), *Bromus spp*. (brome), *Camassia spp*. (camas), *Collomia linearis* (tiny trumpet), *Epilobium spp*. (several willowherb spp.), *Eriophyllum lanatum* (woolly sunflower), *Gayophytum diffusum* (groundsmoke), *Hypochaeris radicata* (hairy cat's ear), *Lathyrus spp*. (peavine), *Lupinus spp*. (lupine), *Microsteris gracilis* (slender phlox), *Penstemon spp*. (penstemon), *Perideridia gairdneri* (Gairdner's yampah), *Phacelia heterophylla* (varileaf phacelia), *Polygonum douglasii* (knotweed), *Potentilla spp*. (cinquefoil), *Pteridium aquilinum* (bracken fern), *Taraxacum officinale* (common dandelion), *Trifolium spp*. (clover), and *Viola spp*. (violet); and

3) Few, if any, barriers to dispersal. Barriers to dispersal may include, but are not limited to, forest edges, roads (paved and unpaved), abrupt elevation changes, Scot's broom thickets, highly cultivated lawns, inhospitable soil types or substrates, development and buildings, slopes greater than 35 percent, and open water.

Effects of the Action

Overlap and Usage

Our review of the species' PBF requirements indicate that non-agricultural use sites, such as residential turf, golf courses, and nurseries, are not likely to contain or produce many of the PBF requirements for the species. As such, we primarily focus our analysis of adverse effects to critical habitat in areas adjacent to these use sites. However, the Tenino pocket gopher is known to occur on and forage in agricultural areas, indicating that agricultural use sites may contain the necessary PBFs to support the species. As such, we include both on-field and adjacent off-field areas in our critical habitat assessment for this species. There is a high level of overlap between agricultural use sites and their associated spray drift and runoff areas (100% total overlap with critical habitat) and a high level of past simazine usage (up to 100% of critical habitat exposed annually) from agricultural uses (Table 19). This suggests that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action. We anticipate any non-agricultural uses in the species' critical habitat will further contribute to the overall exposure of critical habitat, but that exposure will primarily occur in off-site areas where PBFs of the critical habitat are likely to be more prevalent.

Table 19. Overlap and past usage data for agricultural use sites in the Tenino pocket gopher's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually for Agricultural Uses
3.4	96.6	100.0	3.4	96.6	100.0

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental fate modeling, we anticipate simazine residues in terrestrial habitats occurring adjacent to agricultural use sites (after incorporating the mandatory label spray drift and runoff measures) will range from 0.0011-0.099 lbs/acre in areas off-field. Simazine residues in terrestrial habitat occurring adjacent to non-agricultural use sites will range from 0.00047-0.0013 lbs/acre.

Within its critical habitat, the Tenino pocket gopher requires prairie habitat that contains woody vegetation for cover and a wide range of plant material for foraging, including leafy vegetation, succulent roots, shoots, tubers, and grasses from a wide variety of species (Table 20). As such, we expect that relevant PBFs for the species include plant assemblage and plant function PBFs. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to all three PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of simazine will greatly minimize adverse effects to plants in the within critical habitat. Similarly, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the exposure concentration of simazine in areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural factors will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural factors will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect this effect to sensitive species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, cover, and general habitat for individuals in areas adjacent to agricultural and non-agricultural use sites.

Required conservation measures are not likely to significantly reduce the amount of simazine applied to agricultural use sites, indicating that areas of critical habitat to coincide with agricultural use sites will be exposed to high levels of simazine, which is likely to result in high levels of adverse effects to plant assemblages and their functions on agricultural use sites. However, given that very little of the species' critical habitat is located directly on agricultural use sites (3.4% on-field overlap), we anticipate this effect to plant assemblages and their functions will not represent more than a low level of adverse effect to the overall critical habitat.

Table 20. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
Plant Assemblage	yes	terrestrial or riparian plants; herbaceous cover; grasses, sedges, or rushes	Low
Plant Function	yes	plants as forage; plants as cover; plants as general habitat features	Low
Animals	no	--	--

Rationale for Conclusion

There is a high extent of overlap between critical habitat and the agricultural use areas and a high level of anticipated simazine agricultural usage based on past usage data, with additional overlap from non-agricultural use sites and anticipated usage on those sites. The Tenino pocket gopher requires prairie habitat that contains woody vegetation for cover and a wide range of plant material for foraging, including leafy vegetation, succulent roots, shoots, tubers, and grasses from a wide variety of species. As such, relevant PBFs of the critical habitat for the species include plant assemblage and plant function PBFs.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to plant assemblage and plant function PBFs is likely. We expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in off-site areas. However, conservation measures are not likely to reduce the high levels of simazine exposure on use sites, leading to greater adverse affects to plants in areas overlapping with use sites. Given that a low portion of critical habitat overlaps with agricultural use sites (3.4% on-field overlap), and there is likely additional overlap with non-agricultural use sites and low levels of exposure may occur in off-site areas, we anticipate adverse effects to plants will cause some adverse effects to the plant assemblage and plant function PBFs in a low to moderate portion of the critical habitat. However, we do not anticipate exposure in these use sites will significantly change the plant communities there, as use sites have been altered from their natural conditions and are no longer likely support many of the PBFs of the critical habitat, and only low level adverse effects to plants are expected in off-site areas. Thus, while we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect these adverse effects will significantly change the overall plant assemblages or plant functions within exposed areas of critical habitat. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Tenino pocket gopher.

References

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Mazama Pocket Gophers. Final Rule. Federal Register 79: 19711-19757.

Yelm pocket gopher (*Thomomys mazama yelmensis*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

1) Friable, loamy, and deep soils, some with relatively greater content of sand, gravel, or silt, all generally on slopes less than 15 percent in the following soil series or soil series complex: (A) Alderwood; (B) Cagey; (C) Everett; (D) Godfrey; (E) Indianola; (F) Kapowsin; (G) McKenna; (H) Nisqually; (I) Norma; (J) Spana; (K) Spanaway; (L) Spanaway-Nisqually complex; and (M) Yelm.
2) Areas equal to or larger than 50 ac (20 ha) in size that provide for breeding, foraging, and dispersal activities, found in the soil series listed in paragraph (2)(i) of this entry that have: (A) Less than 10 percent woody vegetation cover; (B) Vegetative cover suitable for foraging by gophers. Pocket gophers' diets include a wide variety of plant material, including leafy vegetation, succulent roots, shoots, tubers, and grasses. Forbs and grasses that Mazama pocket gophers eat are known to include, but are not limited to: *Achillea millefolium* (common yarrow), *Agoseris spp*. (agoseris), *Cirsium spp*. (thistle), *Bromus spp*. (brome), *Camassia spp*. (camas), *Collomia linearis* (tiny trumpet), *Epilobium spp*. (several willowherb spp.), *Eriophyllum lanatum* (woolly sunflower), *Gayophytum diffusum* (groundsmoke), *Hypochaeris radicata* (hairy cat's ear), *Lathyrus spp*. (peavine), *Lupinus spp*. (lupine), *Microsteris gracilis* (slender phlox), *Penstemon spp*. (penstemon), *Perideridia gairdneri* (Gairdner's yampah), *Phacelia heterophylla* (varileaf phacelia), *Polygonum douglasii* (knotweed), *Potentilla spp*. (cinquefoil), *Pteridium aquilinum* (bracken fern), *Taraxacum officinale* (common dandelion), *Trifolium spp*. (clover), and *Viola spp*. (violet); and
3) Few, if any, barriers to dispersal. Barriers to dispersal may include, but are not limited to, forest edges, roads (paved and unpaved), abrupt elevation changes, Scot's broom thickets, highly cultivated lawns, inhospitable soil types or substrates, development and buildings, slopes greater than 35 percent, and open water.

Effects of the Action

<u>Overlap and Usage</u>

Our review of the species' PBF requirements indicate that non-agricultural use sites, such as residential turf, golf courses, and nurseries, are not likely to contain or produce many of the PBF requirements for the species. As such, we primarily focus our analysis of adverse effects to critical habitat in areas adjacent to these use sites. However, the Yelm pocket gopher is known to occur on and forage in agricultural areas, indicating that agricultural use sites may contain the necessary PBFs to support the species. As such, we include both on-field and adjacent off-field areas in our critical habitat assessment for this species. There is a high level of overlap between agricultural use sites and their associated spray drift and runoff areas (100% total overlap with critical habitat) and a high level of past simazine usage (up to 100% of critical habitat exposed annually) from agricultural uses (Table 21). This suggests that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action. We anticipate any non-agricultural uses in the species' critical habitat will further contribute to the overall exposure of critical habitat, but that exposure will primarily occur in off-site areas where PBFs of the critical habitat are likely to be more prevalent.

Table 21. Overlap and past usage data for the Yelm pocket gopher's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually for Agricultural Uses
8.8	91.8	100.0	8.8	91.8	100.0

<u>Anticipated Effects to PBFs</u>

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental fate modeling, we anticipate simazine residues in terrestrial habitats occurring adjacent to agricultural use sites (after incorporating the mandatory label spray drift and runoff measures) will range from 0.0011-0.099 lbs/acre in areas off-field. Simazine residues in terrestrial habitat occurring adjacent to non-agricultural use sites will range from 0.00047-0.0013 lbs/acre.

Within its critical habitat, the Yelm pocket gopher requires prairie habitat that contains woody vegetation for cover and a wide range of plant material for foraging, including leafy vegetation, succulent roots, shoots, tubers, and grasses from a wide variety of species (Table 22). As such, we expect that relevant PBFs for the species include plant assemblage and plant function PBFs. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to all three PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of simazine will greatly minimize adverse effects to plants in the within critical habitat. Similarly, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the exposure concentration of simazine in areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural factors will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural factors will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival. While we anticipate individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect this effect to sensitive species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, cover, and general habitat for individuals in areas adjacent to agricultural and non-agricultural use sites.

Required conservation measures are not likely to significantly reduce the amount of simazine applied to agricultural use sites, indicating that areas of critical habitat to coincide with agricultural use sites will be exposed to high levels of simazine, which is likely to result in high levels of adverse effects to plant assemblages and their functions on agricultural use sites. Given that a significant portion of critical habitat overlaps with agricultural use sites (8.8% on-field overlap), we anticipate this effect to plant assemblages and their functions represents a moderate adverse effect to the plant assemblage and plant function PBFs.

Table 22. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
Plant Assemblage	yes	terrestrial or riparian plants; herbaceous cover; grasses, sedges, or rushes	Moderate
Plant Function	yes	plants as forage; plants as cover; plants as general habitat features	Moderate
Animals	no	--	--

Rationale for Conclusion

There is a high extent of overlap between critical habitat and the agricultural use areas and a high level of anticipated simazine agricultural usage based on past usage data, with additional overlap from non-agricultural use sites and anticipated usage on those sites. The Yelm pocket gopher requires prairie habitat that contains woody vegetation for cover and a wide range of plant material for foraging, including leafy vegetation, succulent roots, shoots, tubers, and grasses from a wide variety of species. As such, relevant PBFs of the critical habitat for the species include plant assemblage and plant function PBFs.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to plant assemblage and plant function PBFs is likely. We expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in off-site areas. However, conservation measures are not likely to reduce the high levels of simazine exposure on use sites, leading to greater adverse effects to plants in areas overlapping with use sites. Given that a moderate portion of critical habitat overlaps with agricultural use sites (8.8% on-field overlap), and there is likely additional overlap with non-agricultural use sites and low levels of exposure may occur in off-site areas, we anticipate adverse effects to plants will cause some effects to the plant assemblage and plant function PBFs in a moderate to high portion of the critical habitat. However, we do not anticipate exposure in use sites will significantly change the plant communities there, as use sites have been altered from their natural conditions and are no longer likely support many of the PBFs of the critical habitat, and only low level adverse effects to plants are expected in off-site areas. Thus, while we anticipate individuals of sensitive plant species will be adversely affected by exposure to simazine residues, we do not expect these effects will significantly change the overall plant assemblages or plant functions within exposed areas of critical habitat. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Yelm pocket gopher.

References

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Mazama Pocket Gophers. Final Rule. Federal Register 79: 19711-19757.

Plants

Prostrate milkweed (*Asclepias prostrata*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features::

1) Well-drained sandy soil overlying strata of sandstone or indurated caliche
2) High soil gypsum concentration
3) Open savannas and grasslands of the Tamaulipan shrubland ecological region
4) Vegetation composition that includes abundant, diverse pollen and nectar plants and healthy populations of native bee and wasp species
5) Less than 20 percent cover of Pennisetum ciliare (buffelgrass)

The final rule states that occupied areas were designated as critical habitat that contain the PBFs that are essential to the conservation of the species and that may require special management considerations or protection (*see* Special Management Considerations or Protection). Activities described in the final rule that we may consider likely to destroy or adversely modify critical habitat (*see* Application of the "Adverse Modification" Standard) include, "Actions that would degrade or destroy native plant communities. Such activities could include, but are not limited to, building roads, clearing land for oil and gas exploration or other purposes, introducing and encouraging the spread of nonnative species (i.e., buffelgrass), and conducting border security operations. However, above-ground cutting or thinning of woody plants and prescribed burning are recommended management practices for conservation of prostrate milkweed and other native grasses and forbs, and would not destroy or adversely modify critical habitats."

Effects of the Action

<u>Overlap and Usage</u>

Our review of the species' PBF requirements indicate that non-agricultural use sites, including residential turf, golf courses, and nurseries, are not likely to contain or produce many of the PBF requirements for the species. In contrast, available information about the species show that individuals can occur on actively-cultivated agricultural areas, including corn fields. As such, we primarily focus our analysis of adverse effects to critical habitat to agricultural use sites and their associated off-site transport areas as well as areas adjacent to non-agricultural use sites. There is a high extent of overlap between critical habitat and agricultural use sites and their off-site transport areas (56.6% off-field overlap) (Table 23) and a high level of past agricultural simazine usage (up to 21.3% critical habitat exposed annually) from agricultural uses over the duration of the proposed action. We anticipate any non-agricultural uses in the species' critical habitat will further contribute to the overall exposure of critical habitat.

Table 23. Overlap and past usage data for the prostrate milkweed's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually for Agricultural Uses
0.1	56.5	56.6	0.0	21.3	21.3

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. We anticipate exposure levels to critical habitat areas located in use sites will be at labeled application rates, which can range from 1-4 lbs/acre. Based on EPA's environmental fate modeling, we anticipate simazine residues in terrestrial habitats occurring adjacent to agricultural use sites (after incorporating the mandatory label spray drift and runoff measures) will range from 0.0011-0.099 lbs/acre in areas off-field. Simazine residues in terrestrial habitat occurring adjacent to non-agricultural use sites will range from 0.00047-0.0013 lbs/acre.

Within its critical habitat, the prostrate milkweed requires open savannas and grasslands communities and vegetation composition that includes abundant, diverse pollen and nectar plants and healthy populations of native bee and wasp species (Table 24). As such, we anticipate the relevant PBF for this critical habitat is the plant assemblage PBF. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to the plant assemblage PBF is likely. However, we anticipate mandatory conservation measures required for agricultural uses (including a 15-ft spray drift buffer and three runoff mitigation points), as well as known standard pesticide application practices in non-agricultural use sites (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage), will greatly minimize adverse effects to plants in most areas within critical habitat that are adjacent to use sites. These measures will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect these mitigation measures and protective standard practices will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in the open savannas and grassland habitats the species requires.

In contrast, simazine residues on agricultural use sites are much higher and likely to cause high levels of adverse effects to the growth and survival of many species that make up the necessary plant communities outlined in the critical habitat PBF. As such, we anticipate a high level of adverse effects is likely in areas of critical habitat that occur on agricultural use sites. However, we anticipate this will be limited to only a small portion of critical habitat as only 0.1% of the species' critical habitat occurs directly on agricultural use sites. We anticipate a similar high level of effects to plants on non-agricultural use sites, although we expect low overlap with these areas as they have been altered from their natural conditions and are not likely to support the plant assemblage PBFs to have become designated critical habitat. Thus, while these areas will experience high levels of adverse effects from simazine use, we do not anticipate this will result in high levels of adverse effects to the overall critical habitat, which is primarily located in areas adjacent to use sites (where required conservation measures are more protective of critical habitat). As such, the overall adverse effects to the plant assemblage PBF is low.

Table 24. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
Plant Assemblage	yes	terrestrial plants, herbaceous cover, and grasses in open savannas and grasslands and for vegetation composition that includes abundant, diverse pollen and nectar plants	Low
Plant Function	no	--	--
Animals	no	--	--

Rationale for Conclusion

There is a high extent of overlap between critical habitat and agricultural use areas and a high portion of the critical habitat anticipated to be exposed from annual simazine agricultural usage annually, with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas over the project duration and from non-agricultural uses. The prostrate milkweed requires open savannas and grasslands and vegetation composition that includes abundant, diverse pollen and nectar plants. As such, plant assemblage is a relevant PBF of the critical habitat.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to the plant assemblage PBF is likely. However, we expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in off-site areas. Simazine residues on agricultural use sites are much higher and likely to cause high levels of adverse effects to the growth and survival of many species that make up the necessary plant communities outlined in the critical habitat PBF. As such, we anticipate a high level of adverse effects is likely in areas of critical habitat that occur on agricultural use sites. However, we anticipate this will be limited to only a very small portion of critical habitat as only 0.1% of the species' critical habitat occurs directly on agricultural use sites. There may be additional overlap with non-agricultural use sites where exposures are also expected to have a high level of adverse effects to plants, although we anticipate very low overlap of these use sites with critical habitat as they do not likely support the PBFs that would have been needed for critical habitat designation. Thus, while we expect high levels of adverse effects to plants on use sites from simazine usage, we do not anticipate simazine will result in more than low levels of adverse effects to the overall critical habitat, which is primarily located in off-site areas where exposures and effects to plant communities are expected to be low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the prostrate milkweed.

References

U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Prostrate Milkweed and Designation of Critical Habitat. Federal Register 88: 12572-12602.

Kentucky glade cress (*Leavenworthia exigua laciniata*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

1) Cedar glades and gladelike areas within the range of *L. exigua var. laciniata* that include: (A) Areas of rock outcrop, gravel, flagstone of Silurian dolomite or dolomitic limestone, and/or shallow (1 to 5 centimeters (0.393 to 1.97 inches)), calcareous soils; (B) Intact cyclic hydrologic regime involving saturation and/or inundation of the area in winter and early spring, then drying quickly in the summer; (C) Full or nearly full sunlight; and (D) An undisturbed seed bank.
2) Vegetated land around glades and gladelike areas that extends up and down slope and ends at natural (e.g., stream, topographic contours) or manmade breaks (e.g., roads).

In the Application of the 'Adverse Modification' Standard section of the Final Rule, activities that may affect critical habitat include, "Actions within or near critical habitat that would remove or alter vegetation and allow erosion, sedimentation, shading, or the introduction or expansion of invasive species. Such activities could include, but are not limited to: Land clearing; silviculture; fertilizer, herbicide, or insecticide applications; development; road maintenance, widening, or construction; and utility line construction or maintenance. These activities could alter habitat conditions to the point of eliminating the site conditions required for growth, reproduction, and/or expansion of *L. exigua* var. *laciniata*." Threats to those features that define primary constituent elements for *L. exigua var. laciniata* include residential and commercial development on private land and incompatible agricultural or grazing practices. Management activities that could address these threats include avoiding cedar glades (or suitable gladelike habitats) when planning the location of buildings, lawns, roads (including horse or ORV trails), or utilities; avoiding lawn grass or tree plantings near glades; and habitat management, such as brush removal, prescribed fire, and/or eradication of lawn grasses to maintain an intact native glade vegetation community.

Effects of the Action

<u>Overlap and Usage</u>

Our review of the species' PBF requirements indicate that agricultural use sites, as well as residential turf, golf courses, and nurseries are not likely to contain or produce many of the PBF requirements for the species. As such, we primarily focus our analysis of adverse effects to critical habitat in adjacent off-site areas. There is a high extent of critical habitat likely to be exposed by spray drift or runoff (90.1% off-field overlap) and a high level of past simazine usage (up to 75.8% off-field critical habitat exposed annually) from agricultural uses (Table 25). Additionally, available information of the species' distribution indicates that a significant portion of the species' extant occurrences are found in lawns and other landscaped habitats that could be considered non-agricultural simazine use sites. Based on this information of known occurrence in non-agricultural use sites, as well as the high overlap and past usage in areas adjacent to agricultural use sites, we anticipate there will be a large portion of critical habitat likely to be exposed over the duration of the proposed action.

Table 25. Overlap and past usage data for the Kentucky glade cress's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually for Agricultural Uses
3.2	90.1	93.3	3.1	75.8	78.9

<u>Anticipated Effects to PBFs</u>

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. We anticipate exposure levels to critical habitat areas located in use sites will be at labeled application rates, which can range from 2-4 lbs/acre for turf use sites the species is known to occur on. Based on EPA's environmental fate modeling, we anticipate simazine residues in terrestrial habitats occurring adjacent to agricultural use sites (after incorporating the mandatory label spray drift and runoff measures) will range from 0.0011-0.099 lbs/acre in areas off-field. Simazine residues in terrestrial habitat occurring adjacent to non-agricultural use sites will range from 0.00047-0.0013 lbs/acre.

Within its critical habitat, the Kentucky glade cress requires cedar glades and glade-like areas with vegetated land around them and an undisturbed seedbank, in addition to abiotic features like rocky outcrops and certain substrates (Table 26). As such, we anticipate the plant assemblage PBF is a relevant PBF necessary for critical habitat to support the species. Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to the plant assemblage PBF is likely. However, we anticipate mandatory conservation measures required for agricultural uses (including a 15-ft spray drift buffer and three runoff mitigation points), as well as known standard pesticide application practices in non-agricultural use sites (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage), will greatly minimize adverse effects to plants in most areas within critical habitat that are adjacent to use sites. These measures will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine.

In contrast, simazine residues on non-agricultural use sites are much higher and could potentially cause high levels of adverse effects to the growth and survival of many plants that make up the necessary plant communities outlined in the critical habitat PBF (e.g., cedar glade species, undisturbed seed bank). As such, we anticipate there could be a high level of adverse effects in areas of critical habitat that occur on turf use sites. While we do not have detailed overlap information regarding turf use sites, given that 22 of 61 extant occurrences are located in lawns and other landscaped areas, we anticipate exposure of critical habitat on non-agricultural use sites could be significant when considering non-agricultural uses. As such, we anticipate an overall high level of potential adverse effects to the plant assemblage PBF. However, given our knowledge of simazine application to turf and nursery areas, we expect simazine usage in residential areas within the range of the Kentucky glade cress to be limited. Furthermore, most areas converted to lawns that have extant or historic Kentucky glade cress records have been seeded with tall fescue (*Schedonorus arundinacea*) a common cool-season grass in Kentucky that will not survive an application of simazine (see Exposure to Non-Agricultural Uses of Simazine, above), thus while potential adverse effects to the plant assemblage PBF is high, simazine application in these areas is unlikely (USFWS 2020).

Table 26. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Plant Assemblage	yes	terrestrial or riparian plants; trees or shrubs; herbaceous cover; grasses, sedges, or rushes	High
Plant Function	no	--	--
Animals	no	--	--

Rationale for Conclusion

There is a high extent of overlap between critical habitat and agricultural use areas and a high portion of the critical habitat anticipated to be exposed from annual simazine agricultural usage annually, with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas over the project duration and from non-agricultural uses. The Kentucky glade cress requires cedar glades and gladelike areas, and vegetated land around them. As such, plant assemblage is a relevant PBF of the critical habitat.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to the plant assemblage PBF is likely. We expect the conservation measures for agricultural uses of simazine, in addition to standard pesticide usage practices and environmental conditions of non-agricultural uses, will greatly minimize adverse effects to plants within critical habitat by both reducing the extent of off-site transport and reducing exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in off-site areas. Simazine residues on agricultural use sites are much higher and likely to cause high levels of adverse effects to the growth and survival of many species that make up the necessary plant communities outlined in the critical habitat PBF. As such, we anticipate a high level of adverse effects is likely in areas of critical habitat that occur on agricultural use sites. However, we anticipate this will be limited to only a very small portion of critical habitat as only 0.1% of the species' critical habitat occurs directly on agricultural use sites. In contrast, we expect there may be overlap with non-agricultural use sites, where exposures are also expected to have higher adverse effects to plants, and the species is known to occur on turf use sites such as lawns and other landscaped areas. Notwithstanding this information about the species, turf use sites are not likely support the plant assemblage PBFs specified in the critical habitat designation. In addition, most areas converted to lawns that have extant or historic Kentucky glade cress records have been seeded with tall fescue, which is a common cool-season grass that will not survive an application of simazine, so simazine applications in these areas are unlikely. Thus, while we expect high levels of adverse effects to plants on use sites from simazine usage, we do not anticipate simazine will result in more than low levels of effects to the plant assemblage PBF, which is primarily expected to be located in off-site areas where exposures and affects to plant communities are expected to be low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Kentucky glade cress.

References

USFWS. 2020. Species Status Assessment for the Kentucky Glade Cress (*Leavenworthis exigua var. laciniata*). Version 1.0. Atlanta, Georgia.

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for *Leavenworthia exigua* var. *laciniata* (Kentucky Glade Cress). Final Rule. Federal Register 79: 25689-25707.

Reptiles

Plymouth redbelly turtle = Plymouth redbelly cooter (*Pseudemys rubriventris bangsi*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

The final critical habitat designation did not list specific PBFs for the species' critical habitat. Based on the 2021 Species Status Assessment, northern red-bellied cooters in Massachusetts spend most of their time in aquatic habitats, primarily coastal plain ponds, river systems, cranberry bogs, and other wetlands. They rely on aquatic habitats for foraging, basking, and overwintering, and require nearby upland habitats for nesting and dispersal to other aquatic habitat. Rivers that northern red-bellied cooters are known to inhabit in Massachusetts are large, slow moving, and winding, and many of the ponds within the designated critical habitat area are large water bodies. We presume that the Plymouth redbelly turtle's PBFs are as follows:

1) Aquatic habitats for foraging, basking, and overwintering, which include features such as:
    - Dense or abundant vegetation
    - Logs, rocks, rafts, or vegetative mats for basking
2) Upland habitats for nesting and dispersal to other aquatic habitat, such as:
    - Unforested areas with well drained soils in proximity to aquatic habitat
    - Areas with enough solar exposure to meet temperature needs for egg development
    - Dispersal areas containing a combination of forested and wetland habitats that adequately link suitable aquatic and nesting habitat
3) Aquatic vegetation (such as milfoil) as food resources, along with aquatic prey such as snails, fish, amphibians (e.g., tadpoles), crustaceans (e.g., crayfish).

Observed nesting habitats include a variety of natural and developed areas, including clearings, borrow pits, and roadsides associated with cranberry bog operations, open pitch pine woodland, gravel causeways, residential yards and gardens, and natural shoreline habitat. Major threats to the continued existence of this species is the adverse modification of the water quality and levels of the ponds on which it depends. Because this species uses wetlands adjacent to the ponds, the draining of wetlands within the critical habitat could adversely affect the species. Chemical changes to water quality that reduces or eliminates vegetation or aquatic prey items is listed as a threat that may adversely modify critical habitat in the Final Rule. The Final Rule states "[t]his species has an extremely limited range and is highly susceptible to changes in its habitat." The Final Rule also states "[w]ith regard to the Plymouth redbellied turtle, a major threat to the continued existence of this species is the adverse modification of the water quality and levels of the ponds on which it depends. Any significant … reduction in water quality which would reduce or eliminate vegetation and aquatic prey items of this turtle could adversely modify critical habitat since aquatic vegetation serves as both food and shelter to the turtle." Designated habitat includes a reservoir and several large ponds. The final rule also states, "this species uses wetlands adjacent to the ponds."

Effects of the Action

Overlap and Usage

Our review of the species' PBF requirements indicate that agricultural use sites are not likely to contain or produce many of the PBF requirements for the species. As such, we primarily focus our analysis of adverse effects to critical habitat in adjacent off-site areas. There is a high extent of critical habitat likely to be exposed by spray drift or runoff (93.2% off-field overlap) and a high level of past simazine usage (up to 74% off-field critical habitat exposed annually) from agricultural uses (Table 27). This suggests that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action.

Table 27. Overlap and past usage data for the Plymouth redbelly turtle's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually from Agricultural Uses
6.8	93.2	100.0	3.9	74	77.9

We anticipate non-agricultural uses may also occur in the species' critical habitat. Our review of the species' PBF requirements indicate that residential turf, golf courses, and nurseries are not likely to contain or produce many of the PBF requirements for the species. Additionally, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the exposure concentration of simazine in areas of critical habitat adjacent to these non-agricultural use sites. As such, we do not anticipate non-agricultural uses of simazine will meaningfully add to the overall exposure resulting from agricultural uses.

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental fate modeling, we anticipate simazine residues will range from 0.0011-0.099 lbs/acre in terrestrial habitat adjacent to agricultural use sites and from 0.00047-0.0013 lbs/acre in terrestrial habitat adjacent to non-agricultural use sites. We anticipate residues in semiaquatic areas like wetlands adjacent to use sites will accumulate higher levels of simazine, ranging from 0.00891-0.155 lbs/acre near agricultural use sites and 0.00094-0.00554 lbs/are near non-agricultural use sites.

Within its critical habitat, the Plymouth redbelly turtle requires densely vegetated aquatic habitats for foraging (e.g., milfoil), basking, and overwintering; vegetated upland habitat for dispersal and nesting; high water quality with low levels of pollutants; and prey availability. As such, we expect that relevant PBFs for the species include water quality, plant assemblage, plant function, and animal PBFs (Table 28).

Based on available toxicity data in birds (which we use as surrogate for reptiles), we do not anticipate estimated environmental concentrations of simazine in food resources within aquatic areas of critical habitat will cause direct adverse effects, including mortality or sublethal adverse effects (e.g., reduced growth or reproduction), to the Plymouth redbelly turtle. We expect reptiles will accumulate the highest concentrations of simazine through dietary exposure, with individuals that forage extensively directly on simazine use sites accumulating higher concentrations than those that forage in off-site areas, such as the aquatic habitats that require the water quality PBF. The Plymouth redbelly turtle forages in off-site areas on aquatic prey. Low off-site exposure is anticipated from agricultural uses with the conservation measures that are in place. We also anticipate exposure on non-agricultural use sites will be low due to the low likelihood of transport of simazine from non-agricultural use sites. While we do not anticipate direct effects to the turtle associated with simazine exposure in aquatic habitats, the need for water quality to support PBFs related to prey items and vegetation is included in discussions about those PBFs below.

The Plymouth redbelly turtle uses aquatic prey such as snails, fish, amphibians (e.g., tadpoles), and crustaceans (e.g., crayfish). Available toxicity data indicate that aquatic-phase amphibians, crustaceans, and fish are likely to experience high levels of sublethal effects (e.g., reduced growth, reduced reproduction) with simazine exposure, but they are not expected to die even at high concentrations. We anticipate these adverse effects will be limited to areas of low flow or low volume, as we expect large waterbodies or areas with high flow will not accumulate more than low levels of simazine from agricultural uses and will not result in adverse effects to individuals. Available toxicity data on snails exposed to triazines indicate that individuals are not likely to experience any mortality and no more than low levels of adverse effects to reproduction (if any) from exposures to levels estimated to occur from agricultural simazine use. We do not anticipate any adverse effects will occur from exposure of any prey items to levels of simazine estimated to occur from non-agricultural uses. We expect effects to prey will be limited to those exposed from agricultural uses only in low flow and low volume waterbodies. This species uses low flow and low volume habitats, and has a high overlap with off-site areas likely to be exposed from agricultural uses. As such, we anticipate simazine usage will result in moderate levels of adverse effects to the animal (prey) PBFs.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to the plant assemblage and plant function PBFs are likely. However, we anticipate mandatory conservation measures required for agricultural uses (including a 15-ft spray drift buffer and three runoff mitigation points), as well as known standard pesticide application practices in non-agricultural use sites (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage), will greatly minimize adverse effects to plants in most areas within critical habitat. These measures will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect these conservation measures and protective standard practices will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in terrestrial upland habitats as well as flowing wetland areas. In contrast, simazine residues in non-flowing wetlands may still reach levels that can cause measurable adverse effects to growth and survival of sensitive plant species. While we anticipate individuals of sensitive plant species will be adversely affected by exposure to simazine residues, we do not expect these effects to sensitive species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, or as nesting, dispersal, and basking habitat for individuals, as the Plymouth redbelly turtle is not highly dependent on any single sensitive plant species for habitat or food resources. Furthermore, given that individuals can use other less sensitive resources, such as invertebrate prey and abiotic features like woody debris or rocks for basking or shelter, we anticipate individuals occupying critical habitat will still have available habitat and food resources even if sensitive plant species are adversely affected by simazine use. As such, we determine the overall adverse effects to plant assemblage and plant function PBFs will be low.

Table 28. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	yes	low flow, low volume, high flow, large volume	Low
Host Plant	no	--	--
Plant Assemblage	yes	aquatic or wetland plants; terrestrial or riparian plants; trees or shrubs; herbaceous cover; grasses, sedges, or rushes; nonliving plant matter	Low
Plant Function	yes	plants as forage; plants to support prey; plants as cover; plants as general habitat features	Low
Animals	yes	snails, fish, amphibians (e.g., tadpoles), and crustaceans (e.g., crayfish)	Moderate

Rationale for Conclusion

There is a high extent of overlap between critical habitat and agricultural use areas and a high portion of the critical habitat anticipated to be exposed from annual simazine agricultural usage annually, with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas over the project duration and from non-agricultural uses. The Plymouth redbelly turtle requires densely vegetated aquatic habitats for foraging (e.g., milfoil), basking, and overwintering; vegetated upland habitat for dispersal and nesting; high water quality with low levels of pollutants; and prey availability. As such, relevant PBFs identified for critical habitat include water quality, plant assemblage, plant function, and animal PBFs.

We do not anticipate estimated environmental concentrations of simazine within aquatic areas of critical habitat will cause direct effects, including mortality or sublethal adverse effects (e.g., reduced growth or reproduction), to the Plymouth redbelly turtle, although aquatic prey such as fish, amphibians (e.g., tadpoles), and crustaceans (e.g., crayfish) are likely to experience high levels of sublethal effects (e.g., reduced growth, reduced reproduction) with simazine exposure in areas of low flow or low volume exposed to simazine from agricultural uses. Snail prey are not likely to experience any mortality and no more than low levels of adverse effects to reproduction (if any) from exposures to levels estimated to occur in aquatic habitats, including those with low flow or low volume. We do not anticipate any adverse effects will occur from exposure of any prey items to levels estimated to occur from non-agricultural uses, and we do not expect any prey items to die even at the highest anticipated concentrations of simazine.

While the Plymouth turtle uses low flow and low volume habitats and has a high overlap with off-site areas likely to be exposed from agricultural uses, many of the aquatic habitats used by the species are in high flow or high volume areas where adverse effects to water quality and prey are not anticipated. Additionally, we anticipate mandatory conservation measures required for agricultural uses (including a 15-ft spray drift buffer and three runoff mitigation points), as well as known standard pesticide application practices in non-agricultural use sites (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage), will reduce the extent of critical habitat area exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to critical habitat PBFs when exposure occurs (by reducing estimated exposure concentrations) in off-site areas. Similarly, while simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, the same conservation measures and practices are expected to greatly reduce exposure in off-site areas to levels that will cause no more than low levels of adverse effects to plant growth and survival in terrestrial upland habitats as well as in most aquatic habitats (higher adverse effects to plants are expected in non-flowing wetlands). While we anticipate individuals of sensitive plant species will still likely be adversely affected by exposure to simazine, we do not expect these affects will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, or as nesting, dispersal, and basking habitat for individuals. The Plymouth redbelly turtle uses a variety of plant species for habitat and food resources, and has a diet consisting of a variety of plants and animal prey. Furthermore, given that individual turtles can use other less sensitive resources for food and cover, such as invertebrate prey or abiotic features like woody debris or rocks for basking or shelter, and direct mortality is not anticipated for any exposed prey, we anticipate critical habitat will still have the necessary habitat features, food resources, and sufficient water quality (i.e., the required PBFs), even if some sensitive plants and prey species are affected by simazine use.

After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the Plymouth redbelly turtle.

References

U. S. Fish and Wildlife Service. 1980. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Plymouth Red-Bellied Turtle. Final Rule. Federal Register 45:21828-21833.

U.S. Fish and Wildlife Service. 2021. Species Status Assessment Report for the Massachusetts Population of the Northern Red-bellied Cooter (*Pseudemys rubriventris*), Version 1.0. November 2021. Northeast Region, Hadley, MA. 100 pp.

Northern Mexican gartersnake (*Thamnophis eques megalops*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

(1) Perennial or spatially intermittent streams that provide both aquatic and terrestrial habitat that allows for immigration, emigration, and maintenance of population connectivity of northern Mexican gartersnakes and contain: (A) Slow-moving water (walking speed) with in-stream pools, off-channel pools, and backwater habitat; (B) Organic and natural inorganic structural features (e.g., boulders, dense aquatic and wetland vegetation, leaf litter, logs, and debris jams) within the stream channel for thermoregulation, shelter, foraging opportunities, and protection from predators; (C) Terrestrial habitat adjacent to the stream channel that includes riparian vegetation, small mammal burrows, boulder fields, rock crevices, and downed woody debris for thermoregulation, shelter, foraging opportunities, brumation, and protection from predators; and (D) Water quality that meets or exceeds applicable State surface water quality standards.

(2) Hydrologic processes that maintain aquatic and terrestrial habitat through: (A) A natural flow regime that allows for periodic flooding, or if flows are modified or regulated, a flow regime that allows for the movement of water, sediment, nutrients, and debris through the stream network; and (B) Physical hydrologic and geomorphic connection between a stream channel and its adjacent riparian areas.

(3) A combination of amphibians, fishes, small mammals, lizards, and invertebrate species such that prey availability occurs across seasons and years.
(4) An absence of nonnative fish species of the families Centrarchidae and Ictaluridae, American bullfrogs (*Lithobates catesbeianus*), and/or crayfish (*Orconectes virilis*, *Procambarus clarki*, etc.), or occurrence of these nonnative species at low enough levels such that recruitment of northern Mexican gartersnakes is not inhibited and maintenance of viable prey populations is still occurring.
(5) Elevations from 130 to 8,497 feet (40 to 2,590 meters).
(6) Lentic wetlands including off-channel springs, cienegas, and natural and constructed ponds (small earthen impoundment) with: (A) Organic and natural inorganic structural features (e.g., boulders, dense aquatic and wetland vegetation, leaf litter, logs, and debris jams) within the ordinary high water mark for thermoregulation, shelter, foraging opportunities, brumation, and protection from predators; (B) Riparian habitat adjacent to ordinary high water mark that includes riparian vegetation, small mammal burrows, boulder fields, rock crevices, and downed woody debris for thermoregulation, shelter, foraging opportunities, and protection from predators; and (C) Water quality that meets or exceeds applicable State surface water quality standards.
(7) Ephemeral channels that connect perennial or spatially intermittent perennial streams to lentic wetlands in southern Arizona where water resources are limited.

In the Final Rule (*see* Application of the 'Adverse Modification' Standard), activities that may affect critical habitat include "Actions that would alter water chemistry beyond the tolerance limits of a gartersnake prey base. Such activities could include, but are not limited to: Release of chemicals, biological pollutants, or effluents into the surface water or into connected groundwater at a point source or by dispersed release (non-point source); aerial deposition of known toxicants, such as mercury, that are positively correlated to regional exceedances of water quality standards for these toxicants; livestock grazing that results in waters heavily polluted by feces; runoff from agricultural fields; roadside use of salts; aerial pesticide overspray; runoff from mine tailings or other mining activities; and ash flow and fire retardants from fires and fire suppression. These actions could adversely affect the ability of the habitat to support survival and reproduction of gartersnake prey species."

Effects of the Action

<u>Overlap and Usage</u>

Our review of the species' PBF requirements indicate that agricultural use sites, as well as residential turf, golf courses, and nurseries are not likely to contain or produce many of the PBF requirements for the species. As such, we primarily focus our analysis of adverse effects to critical habitat in adjacent off-site areas. There is a high extent of critical habitat likely to be exposed by spray drift or runoff (70.7% off-field overlap) and a high level of past simazine usage (up to 47% off-field critical habitat exposed annually) from agricultural uses (Table 29). This suggests that a large portion of the critical habitat is likely to be exposed from agricultural uses over the duration of the proposed action.

Table 29. Overlap and past usage data for the Northern Mexican gartersnake's critical habitat.

% On-field Overlap	% Off-field Overlap	% Total Overlap with Agricultural Uses	% On-field CH Treated Annually	% Off-field CH Treated Annually	% Total CH Treated Annually for Agricultural Uses
1.4	70.7	72.1	0.8	47	47.8

We anticipate non-agricultural uses may also occur in the species' critical habitat. Our review of the species' PBF requirements indicate that residential turf, golf courses, and nurseries are not likely to contain or produce many of the PBF requirements for the species. Additionally, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the exposure concentration of simazine in areas of critical habitat adjacent to these non-agricultural use sites. As such, we do not anticipate non-agricultural uses of simazine will meaningfully add to the overall exposure resulting from agricultural uses.

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats 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. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below. Based on EPA's environmental fate modeling, we anticipate simazine residues will range from 0.0011-0.099 lbs/acre in terrestrial habitat adjacent to agricultural use sites and from 0.00047-0.0013 lbs/acre in terrestrial habitat adjacent to non-agricultural use sites. We anticipate residues in semiaquatic areas like wetlands adjacent to use sites will accumulate higher levels of simazine, ranging from 0.00891-0.155 lbs/acre near agricultural use sites and 0.00094-0.00554 lbs/are near non-agricultural use sites.

Within its critical habitat, the northern Mexican gartersnake requires both aquatic habitat containing moving water, organic and natural inorganic structural features (e.g., boulders, dense aquatic and wetland vegetation, leaf litter, logs, and debris jams), terrestrial habitat adjacent to the stream channel that includes riparian vegetation, small mammal burrows, boulder fields, rock crevices, and downed woody debris, high water quality, and prey availability. As such, we expect that relevant PBFs for the species include water quality, plant assemblage, plant function, and animal PBFs (Table 30).

Based on available toxicity data in birds (which we use as surrogate for reptiles), we do not anticipate estimated environmental concentrations of simazine of food resources within aquatic areas of critical habitat will cause direct effects, including mortality or f sublethal adverse effects (e.g., reduced growth or reproduction) to the Northern Mexican gartersnake. We expect reptiles will accumulate the highest concentrations of simazine through dietary exposure, with individuals that forage extensively directly on simazine use sites accumulating higher concentrations than those that forage in off-site areas, such as the aquatic habitats that require the water quality PBF. Low off-site exposure is anticipated in off-site areas from agricultural and non-agricultural uses with the conservation measures that are in place and the low likelihood of transport of simazine from non-agricultural use sites. Therefore, we do not anticipate direct effects to water quality PBF required for the gartersnake from simazine exposure in aquatic habitats. The need for water quality to support PBFs related to prey items and vegetation is included in discussions about those PBFs below.

The northern Mexican gartersnake uses a combination of amphibians, fishes, small mammals, lizards, and invertebrate prey species and requires prey availability across seasons and years. Available toxicity data indicate that aquatic-phase amphibians, crustaceans, and fish are likely to experience high levels of sublethal effects (e.g., reduced growth, reduced reproduction) with simazine exposure, but they are not expected to die even at high concentrations. We anticipate these adverse effects will be limited to areas of low flow or low volume for aquatic prey, as we expect large waterbodies or areas with high flow will not accumulate more than low levels of simazine from agricultural uses and will not result in adverse effects to individuals of prey from these taxa groups. We expect terrestrial vertebrate prey species (e.g., mammals, reptiles, and terrestrial phase amphibians) will accumulate the highest concentrations of simazine through dietary exposure, with individuals that forage extensively directly on simazine use sites accumulating higher concentrations than those that only forage in off-site areas. Based on available toxicity data in mammals and birds (which we use as surrogate data for reptiles and terrestrial phase amphibians), we expect individual prey that forage extensively on simazine use sites will experience high levels of sublethal effects, including adverse effects to reproduction and growth. In contrast, individual prey that primarily forage in off-site areas will only accumulate low levels of simazine and are not likely to experience more than low levels of sublethal adverse effects to growth and reproduction (if any). In general, we do not anticipate most terrestrial vertebrate prey species will extensively forage directly in simazine use sites, and use sites are not anticipated to be primary foraging areas for the gartersnake. Based on sublethal effects to growth and reproduction of prey foraging primarily on use sites or low volume and low flow habitats exposed to simazine, we expect simazine use will result in moderate levels of adverse effects to the animal (prey) PBFs.

Simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from simazine residues to the plant assemblage and plant function PBFs are likely. However, we anticipate mandatory conservation measures required for agricultural uses (including a 15-ft spray drift buffer and three runoff mitigation points), as well as known standard pesticide application practices in non-agricultural use sites (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage), will greatly minimize adverse effects to plants within the species' critical habitat. These measures will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to simazine. Additionally, in areas that are still exposed, we expect these conservation measures and protective standard practices will greatly reduce exposure concentrations of simazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in terrestrial, riparian, and flowing wetland habitats like those described by the critical habitat PBFs above. While we anticipate some individuals of sensitive plant species will still be adversely affected by exposure to simazine residues, we do not expect this effect to sensitive species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as shelter, foraging areas to support the gartersnake's prey, and cover from predators. Furthermore, given that individuals can use abiotic features like woody debris, rocks, and mammal burrows shelter and cover, and can consume a wide range of animal prey, we anticipate individuals occupying critical habitat will still have available habitat and food resources even if sensitive plant species are adversely affected by simazine use. As such, we determine the overall adverse effects to plant assemblage and plant function PBFs will be low.

Table 30. Summary of relevant physical and biological features (PBFs), feature characteristics, and potential adverse effects to each PBF.

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Potential Adverse Effects to PBF
Water Quality	yes	low flow, high flow, low volume, large volume	Low
Host Plant	no	--	--
Plant Assemblage	yes	aquatic or wetland plants; terrestrial or riparian plants; trees or shrubs; herbaceous cover; grasses, sedges, or rushes; nonliving plant matter	Low
Plant Function	yes	plants to support prey; plants as cover; plants as general habitat features	Low
Animals	yes	mammal, amphibian, reptile, and fish prey	Moderate

Rationale for Conclusion

There is a high extent of overlap between critical habitat and agricultural use areas and a high portion of the critical habitat anticipated to be exposed from annual simazine agricultural usage annually, with a larger portion of the critical habitat likely to be exposed due to variations in use sites where annual usage may occur within overlapping agricultural areas over the project duration and from non-agricultural uses. The northern Mexican gartersnake requires both aquatic habitat containing moving water, organic and natural inorganic structural features (e.g., boulders, dense aquatic and wetland vegetation, leaf litter, logs, and debris jams), terrestrial habitat adjacent to the stream channel that includes riparian vegetation, small mammal burrows, boulder fields, rock crevices, and downed woody debris, high water quality, and prey availability. As such, we expect that relevant PBFs for the species include water quality, plant assemblage, plant function, and animal PBFs.

We do not anticipate estimated environmental concentrations of simazine within aquatic areas of critical habitat will cause direct effects, including mortality or sublethal adverse effects (e.g., reduced growth or reproduction), to the northern Mexican gartersnake, although we expect prey are likely to experience high levels of sublethal effects (e.g., reduced growth, reduced reproduction) with simazine exposure in areas of low flow or low volume exposed to simazine from agricultural uses or for terrestrial vertebrate prey that forage extensively on simazine use sites. Individual prey items that primarily forage in off-site areas are not likely to experience more than low levels of sublethal adverse effects to growth and reproduction (if any). No prey items are expected to die from exposure. We expect the gartersnake will primarily forage in riparian and aquatic habitats, which are off-site areas. We anticipate conservation measures required for agricultural uses as well as known standard pesticide application practices in non-agricultural use sites will reduce the extent of critical habitat area exposed (by reducing the extent of off-site transport of simazine residues) and reduce the level of adverse effects that will occur to prey PBFs when exposure occurs (by reducing estimated exposure concentrations) in off-site areas. Similarly, while simazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, the same conservation measures and practices are expected to greatly reduce exposure in off-site areas to levels that will cause no more than low levels of adverse effects to plant growth and survival in terrestrial upland habitats as well as in most aquatic habitats. While we anticipate individuals of sensitive plant species will still likely be adversely affected by exposure to simazine, we do not expect these effects will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, or as nesting, dispersal, and basking habitat for individuals. The northern Mexican gartersnake uses a variety of plant species for its habitat needs features. Furthermore, we anticipate critical habitat will still have sufficient habitat features, food resources, and water quality (i.e., the required PBFs), even if there is some loss of sensitive plants, sublethal effects to individual prey species, and reductions in water quality in low flow and low volume habitats from simazine uses, given that gartersnakes can use other less sensitive resources for food and cover, they feed on a variety of different types of prey and use abiotic features like woody debris or rocks for basking or shelter, and direct mortality is not anticipated for any exposed prey.

After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the critical habitat, we have determined that the proposed action will not appreciably diminish the value of critical habitat as a whole for the conservation of the species. Therefore, we have determined the proposed action is not likely to result in the destruction or adverse modification of the designated critical habitat for the northern Mexican gartersnake.

References

U. S. Fish and Wildlife Service. 2021. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Northern Mexican Gartersnake. Final Rule. Federal Register 86: 22518-22580.

Critical Habitats Requiring Further Analysis

In our draft Biological Opinion, we focused our analyses on 1) critical habitats with low expected exposure to simazine (due to low overlap, usage, or conservation measures adopted prior to consultation), and 2) critical habitats 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 critical habitats in Table 31, we identified the need for further coordination. We expect Herbicide Strategy conservation measures to reduce pesticide loading into aquatic habitats by up to 90% (i.e., one order of magnitude) compared to unmitigated runoff, and reduce spray drift from entering species' terrestrial habitats by >95%. While the conservation measures are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues on use sites and in aquatic habitats could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to PBFs. 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 critical habitat to simazine. As such, we have not yet made determinations for these critical habitats.

Table 31. Critical habitats that require further analysis.

Taxa	Common Name	Scientific Name
Amphibians	Chiricahua leopard frog	*Rana chiricahuensis*
Bivalves	Yellow lance	*Elliptio lanceolata*
Crustaceans	Black Creek crayfish	*Procambarus pictus*
Crustaceans	Slenderclaw crayfish	*Cambarus cracens*
Fish	Arkansas River shiner	*Notropis Girardi*
Fish	Barrens topminnow	*Fundulus julisia*
Fish	Slackwater darter	*Etheostoma boschungi*
Fish	Spring pygmy sunfish	*Elassoma alabamae*
Fish	Topeka shiner	*Notropis topeka (=tristis)*
Insects	Bartram's hairstreak butterfly	*Strymon acis bartrami*
Insects	Fender's blue butterfly	*Icaricia icarioides fenderi*
Insects	Poweshiek skipperling	*Oarisma poweshiek*
Plant	Fleshy-fruit gladecress	*Leavenworthia crassa*