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 atrazine 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 atrazine, 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 atrazine 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 atrazine (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 atrazine.

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 atrazine, we continued our assessment of the consequences of the proposed action by evaluating the extent to which the critical habitat will be exposed to atrazine, 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 Atrazine

Atrazine has several registered agricultural uses (see Appendix 1-4 of EPA's Biological Evaluation) in the coterminous United States. We characterize the expected level of exposure using overlaps between the species' ranges and agricultural areas where atrazine is registered for use (i.e., overlap data; including a 305-m off-site transport area adjacent to use sites), past atrazine usage data (when available; the amount and location where atrazine has been used in the past), any species-specific considerations such as life history information (e.g., habitat preferences), and existing protections or conservation actions (e.g., existing label measures, conservation measures from the action agency). Critical habitats with greater than 10% total overlap with agricultural atrazine 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 atrazine 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 atrazine 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 atrazine each year are assigned a high usage score. Critical habitats that will have a medium proportion (5-10%) treated with atrazine each year are assigned a medium usage score, and critical habitats that data indicate will have a low proportion (<5%) treated with atrazine each year are assigned a low usage score.

We determine the overall exposure ranking by qualitatively considering both the total overlap and total usage, as well as any additional exposure considerations that might modify the level of exposure likely to occur. When overlap and usage scores are the same, we assign the overall exposure ranking the same score (e.g., if both overlap and usage is high, the overall exposure ranking is high). In cases where overlap is high and usage is medium or when overlap is medium and usage is low, we use the overlap score as the overall exposure ranking to maintain conservative exposure assumptions. As usage is a subset of overlap, the overlap score will always be greater than the usage score. In cases where overlap is high, but usage is low, we anticipate a moderate portion of the range may be treated over the duration of the proposed action even if only a small portion of the range is treated in any given year (particularly if the areas treated occur in different locations each year), leading to an overall exposure ranking of medium. For species where there are additional exposure considerations, we adjust the overall exposure ranking to reflect this additional information, as appropriate.

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

Exposure to Non-agricultural Uses of Atrazine

In addition to agricultural uses, atrazine is registered for use on non-agricultural turf, including residential lawns and golf course turf. UDLs for non-agricultural uses sites that represent turf tend to be less defined than those for agricultural UDLs and are less likely to accurately represent the actual footprint of these use sites on the landscape. As such, we assess exposure of critical habitats to all non-agricultural uses of atrazine in a qualitative manner, considering the life history of species, methods of application, atrazine usage, and any existing conservation measures to reduce drift and runoff or otherwise limit exposure to species. To facilitate this analysis, for every species in this Appendix, we reviewed species' documents (e.g., Status of the Species (Appendix B), 5-year reviews, Species Status Assessments, recovery plans, listing rules) to determine if non-agricultural atrazine use sites (i.e., residential areas where lawns or golf courses are likely present) could function as critical habitat for an individual species.

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

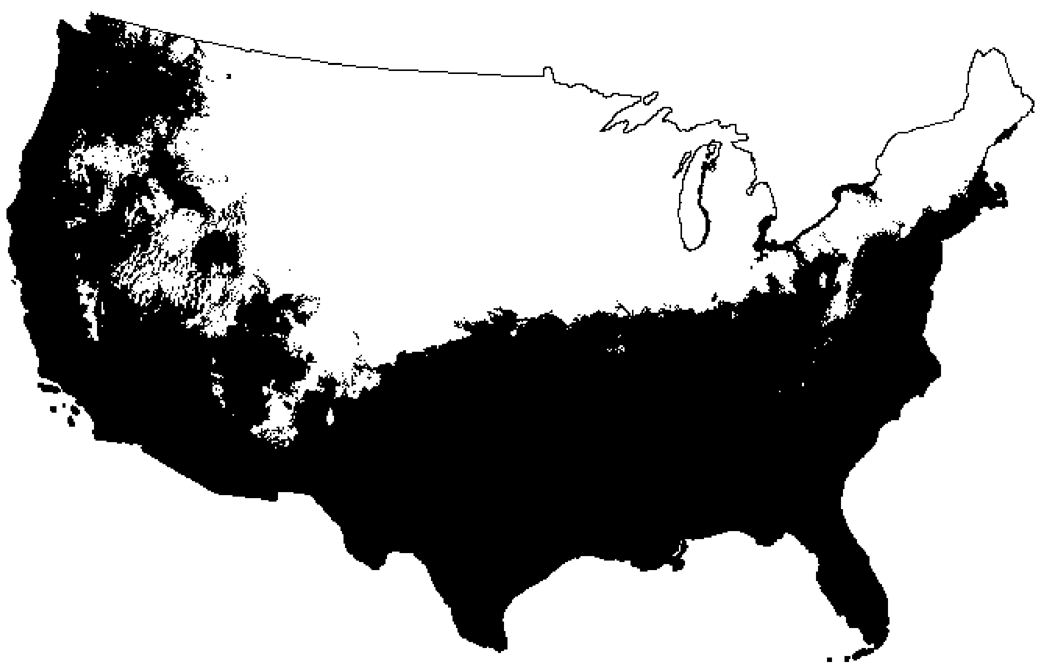

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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

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

For most 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 atrazine 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 atrazine 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 atrazine, we consider, individually and qualitatively, the extent and manner of non-agricultural atrazine usage within the critical habitat to determine the expected level of adverse effects from non-agricultural exposure of atrazine.

References:

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

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

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

Toxicity

We characterize the expected 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 atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. We consider estimated concentrations of atrazine 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 atrazine 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 atrazine usage. Given that we typically do not anticipate the specific waterbodies required for fully aquatic listed species (e.g., fish, bivalves) occur directly in atrazine 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 atrazine.

Conservation Measures

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

- Prohibit use in Hawaii, Alaska, and the Territories,
- Prohibit use on roadsides, shelterbelts, Conservation Reserve Program (CRP) land, conifers (including Christmas tree plantings), timber and forestry, and miscanthus and other perennial bioenergy crops,
- Prohibit application via mechanically pressurized handguns to macadamia nuts, sweet corn, and guava,
- Restrict "fallow" uses on all labels to the following scenarios and geographies only:
  - Wheat-corn-fallow and wheat-fallow-wheat in CO, KS, ND, NE, SD, and WY,
  - Wheat-sorghum-fallow in AR, CO, GA, IL, KS, LA, MS, MO, NE, NM, NC, OK, SD, and TX
- Reduce the single maximum application rate of turf, granular formulations to 2.0 lbs. AI/A, and reduce the single maximum application rate of turf, sprays to 1.0 lb. AI/A,
- Restrict applications made by backpack-spray to landscape turf to spot treatments only,
- Restrict applicators from applying atrazine products to the same sorghum acre,
- Require all applications to use coarse or coarser droplet sizes,
- Require an in-field downwind buffer of 15-ft for all ground applications (from the edge of all streams and rivers as well as the high-tide line for all estuarine/marine environments, and from threatened and endangered species critical habitat and/or species locations)
- Prohibit all ground applications when wind speeds exceed 10 miles per hour at the application site,
- For ground boom applications, only apply with the release height recommended by the manufacturer, but no more than 4-ft above the ground or crop canopy,
- Require an in-field downwind buffer of 150-ft for all aerial applications (from the edge of all streams and rivers as well as the high-tide line for all estuarine/marine environments, and from threatened and endangered species critical habitat and/or species locations),
- If the windspeed is 10 miles per hour or less, applicators must use ½ swath displacement upwind at the downwind edge of the field. When the windspeed is between 11-15 miles per hour, applicators must use ¾ swath displacement upwind at the downwind edge of the field,
- If the windspeed is greater than 10 mph, the boom length must be 65% or less of the wingspan for fixed wing aircraft and 75% or less of the rotor diameter for helicopters. Otherwise, the boom length must be 75% or less of the wingspan for fixed-wing aircraft and 90% or less of the rotor diameter for helicopters,
- Prohibit all aerial applications when wind speeds exceed 15 miles per hour at the application site,

- Restrict aerial applications from releasing spray at a height greater than 10-ft above the ground or vegetative canopy unless a greater application height is necessary for pilot safety,
- Prohibit aerial applications of non-liquid formulations,
- Prohibit all applications during temperature inversions.

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

Herbicide Strategy Conservation Measures

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

- a standard 170-foot wind-directional spray drift buffer for aerial applications[2] (not in addition to the buffers the technical registrants committed to previously), and
- a minimum of three runoff mitigation points[3] necessary in all areas where atrazine is used, as well as additional runoff mitigation points (i.e., six points total) for certain atrazine uses limited to certain geographic areas when required to protect specific listed species.

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

- Reduce the maximum annual application rate for field corn from 2.5 lbs. AI/A to 2.0 lbs. AI/A,
- For sweet corn uses, adopt one of the following:
    - Do not apply atrazine to sweet corn from August 15th to November 1st; when applied during other times of the year, use as a pre-emergent up to 2.0 lbs ai/acre.
    - With no timing restrictions for use, use as pre-emergent up to 1.25 lbs ai/acre followed by post-emergent 0.75 lbs ai/acre.
- Restrict "corn" in wheat-corn-fallow rotations to "field corn" meaning "wheat-field corn-fallow rotations",

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

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

- Off-label all uses in California except for Imperial County, and
- Add the restriction “Do not apply atrazine products during rain or when soils are saturated or above field capacity” to all formulations.

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

Based on EPA’s analyses, the required spray drift conservation measures described above (from the current label and implemented through the Herbicide Strategy) will reduce spray drift from entering critical habitats located in adjacent areas by >95%. The Service anticipates that this reduction will minimize off-site transport of atrazine from spray drift to a level where no more than low levels of effects are likely to occur to most critical habitat PBFs.

As stated above, all agricultural labels will include a requirement for applicators to achieve three points of runoff mitigation, as described in the Herbicide Strategy, for all agricultural uses. EPA’s Herbicide Strategy provides applicators with various options to reduce runoff and erosion and assigns points to each option based on its effectiveness. Applicators must implement sufficient mitigation points to meet the label requirement. Applicators can achieve the required points using the conservation measures identified on EPA’s Mitigation Menu website[4]. The menu provides a suite of options, including relief points for certain field characteristics and likelihood for pesticide transport.

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

While the general mitigation measures on the label will greatly reduce atrazine exposure to all critical habitats, EPA identified the need for additional mitigations to further reduce the risk of adverse effects to many critical habitats. For those critical habitats where EPA identified high levels of residual risk, EPA is requiring an additional three runoff mitigation points (for a total of six points) for all registered agricultural uses (including corn, macadamia nuts, guava, sweet corn, sod, sugarcane, sorghum, and fallow) within specific areas identified as important for each species (including any proposed or designated critical habitats). EPA will communicate where these additional runoff mitigations are needed using their Bulletins Live! Two online platform,

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

which all applicators are required to check before making pesticide applications. In areas requiring six points of runoff mitigation, EPA expects estimated environmental concentrations of atrazine will decrease by up to two orders of magnitude (i.e., reduce pesticide concentrations in runoff by 99% of pre-mitigated 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 atrazine 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 atrazine exposure and impacts to critical habitat function as defined by the relevant PBFs, we determine that the proposed action will not cause destruction or adverse modification to the critical habitats listed in Table 1.

Table 1. Critical habitats with no relevant physical or biological features (PBFs) listed in their critical habitat designations.

Taxa	Common Name	Scientific Name	Determination
Mammals	Indiana bat	*Myotis sodalis*	No Destruction or Adverse Modification
Mammals	Virginia big-eared bat	*Corynorhinus (=Plecotus) townsendii virginianus*	No Destruction or Adverse Modification
Plant-Dicot	Amargosa niterwort	*Nitrophila mohavensis*	No Destruction or Adverse Modification
Plant-Dicot	Arizona eryngo	*Eryngium sparganophyllum*	No Destruction or Adverse Modification
Plant-Dicot	Clay-Loving wild buckwheat	*Eriogonum pelinophilum*	No Destruction or Adverse Modification
Plant-Dicot	Pecos (=puzzle, =paradox) sunflower	*Helianthus paradoxus*	No Destruction or Adverse Modification
Plant-Dicot	Shivwits milk-vetch	*Astragalus ampullarioides*	No Destruction or Adverse Modification
Plant-Dicot	Texas golden Gladecress	*Leavenworthia texana*	No Destruction or Adverse Modification
Plant-Dicot	White Bluffs bladderpod	*Physaria douglasii ssp. tuplashensis*	No Destruction or Adverse Modification
Plant-Dicot	\`Ahinahina	*Argyroxiphium sandwicense ssp. macrocephalum*	No Destruction or Adverse Modification
Plant-Dicot	\`Akoko	*Euphorbia celastroides var. kaenana*	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 atrazine. Given the conservative nature of our estimate of total overlap (e.g., does not consider information on past atrazine 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 atrazine.

Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% range)	Determination
Amphibians	Austin blind salamander	*Eurycea waterlooensis*	0.2	No Destruction or Adverse Modification
Amphibians	Georgetown salamander	*Eurycea naufragia*	2.6	No Destruction or Adverse Modification
Amphibians	Jollyville Plateau salamander	*Eurycea tonkawae*	1.2	No Destruction or Adverse Modification
Amphibians	San Marcos salamander	*Eurycea nana*	1.6	No Destruction or Adverse Modification
Amphibians	Sierra Nevada Yellow-legged Frog	*Rana sierrae*	1.3	No Destruction or Adverse Modification
Birds	Cactus ferruginous pygmy-owl	*Glaucidium brasilianum cactorum*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Birds	Greater sage-grouse	*Centrocercus urophasianus*	1.2	No Destruction or Adverse Modification
Birds	Mississippi sandhill crane	*Antigone canadensis pulla*	3.5	No Destruction or Adverse Modification
Crustaceans	Big Creek Crayfish	*Faxonius peruncus*	1.2	No Destruction or Adverse Modification
Crustaceans	Big Sandy crayfish	*Cambarus callainus*	<0.1	No Destruction or Adverse Modification
Crustaceans	Guyandotte River crayfish	*Cambarus veteranus*	<0.1	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*	3.3	No Destruction or Adverse Modification
Crustaceans	St. Francis River Crayfish	*Faxonius quadruncus*	1.3	No Destruction or Adverse Modification
Fish	Alabama sturgeon	*Scaphirhynchus suttkusi*	2.4	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% range)	Determination
Fish	Atlantic salmon	*Salmo salar*	1.8	No Destruction or Adverse Modification
Fish	Atlantic sturgeon (Gulf subspecies)	*Acipenser oxyrinchus (=oxyrhynchus) desotoi*	0.1	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*	1.5	No Destruction or Adverse Modification
Fish	Candy darter	*Etheostoma osburni*	0.8	No Destruction or Adverse Modification
Fish	Cape Fear shiner	*Notropis mekistocholas*	2.3	No Destruction or Adverse Modification
Fish	Chucky madtom	*Noturus crypticus*	3.0	No Destruction or Adverse Modification
Fish	Colorado pikeminnow	*Ptychocheilus lucius*	1.9	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*	1.5	No Destruction or Adverse Modification
Fish	Frecklebelly madtom	*Noturus munitus*	2.1	No Destruction or Adverse Modification
Fish	Gila chub	*Gila intermedia*	0.0	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	Leopard darter	*Percina pantherina*	<0.1	No Destruction or Adverse Modification
Fish	Loach minnow	*Tiaroga cobitis*	0.2	No Destruction or Adverse Modification
Fish	Lost River sucker	*Deltistes luxatus*	0.5	No Destruction or Adverse Modification

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Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% range)	Determination
Fish	Niangua darter	*Etheostoma nianguae*	1.2	No Destruction or Adverse Modification
Fish	Owens Tui Chub	*Gila bicolor ssp. snyderi*	0.0	No Destruction or Adverse Modification
Fish	Pearl darter	*Percina aurora*	0.6	No Destruction or Adverse Modification
Fish	Razorback sucker	*Xyrauchen texanus*	1.5	No Destruction or Adverse Modification
Fish	Rio Grande Silvery Minnow	*Hybognathus amarus*	1.0	No Destruction or Adverse Modification
Fish	Rush Darter	*Etheostoma phytophilum*	2.0	No Destruction or Adverse Modification
Fish	Shortnose Sucker	*Chasmistes brevirostris*	0.4	No Destruction or Adverse Modification
Fish	Sickle darter	*Percina williamsi*	1. 8	No Destruction or Adverse Modification
Fish	Slender chub	*Erimystax cahni*	0.5	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*	3.9	No Destruction or Adverse Modification
Fish	Vermilion darter	*Etheostoma chermocki*	0.2	No Destruction or Adverse Modification
Fish	Virgin River Chub	*Gila seminuda (=robusta)*	0.3	No Destruction or Adverse Modification
Fish	Warner sucker	*Catostomus warnerensis*	0.0	No Destruction or Adverse Modification
Fish	White River spinedace	*Lepidomeda albivallis*	0.1	No Destruction or Adverse Modification
Fish	White sturgeon	*Acipenser transmontanus*	1.4	No Destruction or Adverse Modification
Fish	Woundfin	*Plagopterus argentissimus*	0.3	No Destruction or Adverse Modification
Fish	Yellowcheek Darter	*Etheostoma moorei*	<0.1	No Destruction or Adverse Modification
Fish	Yellowfin madtom	*Noturus flavipinnis*	0.6	No Destruction or Adverse Modification
Insects	Comal Springs dryopid beetle	*Stygoparnus comalensis*	2.5	No Destruction or Adverse Modification
Insects	Comal Springs riffle beetle	*Heterelmis comalensis*	3.2	No Destruction or Adverse Modification

Appendix D-A1. Animal and Plants Critical Habitat Determinations and Rationales

Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% range)	Determination
Mammals	Penasco least chipmunk	*Tamias minimus atristriatus*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Mammals	West Indian Manatee	*Trichechus manatus*	<0.1	No Destruction or Adverse Modification
Mollusk-Clams	Balcones spike	*Fusconaia iheringi*	0.9	No Destruction or Adverse Modification
Mollusk-Clams	Choctaw bean	*Obovaria choctawensis*	4.6	No Destruction or Adverse Modification
Mollusk-Clams	False spike	*Fusconaia mitchelli*	1.9	No Destruction or Adverse Modification
Mollusk-Clams	Georgia pigtoe	*Pleurobema hanleyianum*	3.2	No Destruction or Adverse Modification
Mollusk-Clams	Guadalupe Fatmucket	*Lampsilis bergmanni*	0.4	No Destruction or Adverse Modification
Mollusk-Clams	Louisiana Pigtoe	*Pleurobema riddellii*	0.6	No Destruction or Adverse Modification
Mollusk-Clams	Mexican fawnsfoot	*Truncilla cognata*	1.2	No Destruction or Adverse Modification
Mollusk-Clams	Narrow pigtoe	*Fusconaia escambia*	1.9	No Destruction or Adverse Modification
Mollusk-Clams	Ouachita fanshell	*Cyprogenia sp. cf. aberti*	0.5	No Destruction or Adverse Modification
Mollusk-Clams	Purple bean	*Villosa perpurpurea*	0.4	No Destruction or Adverse Modification
Mollusk-Clams	Rough rabbitsfoot	*Quadrula cylindrica strigillata*	0.4	No Destruction or Adverse Modification
Mollusk-Clams	Texas hornshell	*Popenaias popeii*	1.0	No Destruction or Adverse Modification
Mollusk-Clams	Texas fatmucket	*Lampsilis bracteata*	2.4	No Destruction or Adverse Modification
Mollusk-Clams	Texas fawnsfoot	*Truncilla macrodon*	1.3	No Destruction or Adverse Modification
Mollusk-Clams	Texas heelsplitter	*Potamilus amphichaenus*	2.9	No Destruction or Adverse Modification
Mollusk-Snails	Chupadera springsnail	*Pyrgulopsis chupaderae*	0.1	No Destruction or Adverse Modification
Mollusk-Snails	Koster's springsnail	*Juturnia kosteri*	2.2	No Destruction or Adverse Modification
Mollusk-Snails	Magnificent ramshorn	*Planorbella magnifica*	3.5	No Destruction or Adverse Modification
Mollusk-Snails	Pecos assiminea snail	*Assiminea pecos*	1.3	No Destruction or Adverse Modification
Mollusk-Snails	Roswell springsnail	*Pyrgulopsis roswellensis*	2.2	No Destruction or Adverse Modification
Mollusk-Snails	Tumbling Creek cavesnail	*Antrobia culveri*	<0.1	No Destruction or Adverse Modification

Taxa	Common Name	Scientific Name	Total Agricultural Overlap (% range)	Determination
Plant-Dicot	Acuña Cactus	*Echinomastus erectocentrus var. acunensis*	0.0	No Destruction or Adverse Modification
Plant-Dicot	Big Pine partridge pea	*Chamaecrista lineata keyensis*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Plant-Dicot	Blodgett's silverbush	*Argythamnia blodgettii*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Plant-Dicot	Cape Sable Thoroughwort	*Chromolaena frustrata*	0.2	No Destruction or Adverse Modification
Plant-Dicot	Cook's lomatium	*Lomatium cookii*	3.0	No Destruction or Adverse Modification
Plant-Dicot	DeBeque phacelia	*Phacelia submutica*	4.6	No Destruction or Adverse Modification
Plant-Dicot	Everglades bully	*Sideroxylon reclinatum ssp. austrofloridense*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Plant-Dicot	Florida prairie-clover	*Dalea carthagenensis floridana*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Plant-Dicot	Florida semaphore Cactus	*Consolea corallicola*	0.0	No Destruction or Adverse Modification
Plant-Dicot	Malheur wire-lettuce	*Stephanomeria malheurensis*	0.0	No Destruction or Adverse Modification
Plant-Dicot	Pineland sandmat	*Chamaesyce deltoidea pinetorum*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Plant-Dicot	Sand flax	*Linum arenicola*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Plant-Dicot	Wedge spurge	*Chamaesyce deltoidea serpyllum*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Plant-Dicot	beardless chinchweed	*Pectis imberbis*	0.0	No Destruction or Adverse Modification
Plant-Monocot	Florida pineland crabgrass	*Digitaria pauciflora*	No shapefile - qualitative assessment	No Destruction or Adverse Modification
Reptiles	American crocodile	*Crocodylus acutus*	1.4	No Destruction or Adverse Modification
Reptiles	Florida Keys mole skink	*Plestiodon egregius egregius*	0.4	No Destruction or Adverse Modification

The critical habitats in Table 2 have low total overlap with agricultural uses. 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 uses, which was estimated to be low (i.e., less than 5% overlap) for the critical habitats in Table 2. 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 atrazine applications that are expected to reduce estimated environmental concentrations of atrazine 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 the "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 atrazine 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 atrazine, critical habitat can experience additional exposure to atrazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., non-agricultural turf, including residential lawns and golf course turf). Critical habitats in Table 2 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 atrazine use sites such that these areas are generally less likely to contain or produce critical habitat PBFs. Thus, 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 atrazine to be limited from these uses, and generally result in atrazine concentrations below the level where we anticipate adverse effects to the relevant PBFs (i.e., those related to water quality, plants, and animals). Additionally, available information from the NALP about atrazine usage on non-agricultural use sites indicates it is not commonly used on residential or commercial turf, and if it were to be used, applications would likely be carried out using hand-held equipment. Similarly, information for golf course uses indicates that atrazine is only applied to small portions of the golf course and is usually applied at lower application rates than what is allowed on product labels. Given our broad understanding of atrazine use sites, usage, and general information on non-agricultural use practices, we anticipate any of the critical habitats listed in Table 2 that occur on or near developed or open space developed use sites of atrazine are not likely to experience more than low levels of exposure to atrazine from non-agricultural uses.

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 listed insect species in Table 2 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 atrazine 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 amphibians, crustaceans, and fish with water quality PBFs 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 and exposures are from agricultural uses. Available toxicity data suggest that reptiles are not likely to experience more than low levels of adverse effects from exposure to atrazine through water, indicating that there will be no more than low levels of adverse effects to the water quality PBF for critical habitats designated for listed reptiles. We do not anticipate any adverse effects will occur from exposure to levels estimated to occur from non-agricultural uses. We anticipate adverse effects to water quality will be restricted in area because overlap data indicate that only a small portion (0 to 3.9% of those with overlap data) of these critical habitats is likely to overlap with atrazine agricultural use sites and off-site areas that may be exposed from spray drift or runoff, and we do not expect critical habitat with atrazine usage for agricultural uses would exceed that area over the project duration. Only one species with overlap data has agricultural overlaps higher than 3.5% and requires water quality as a PBF, the tidewater goby (3.9%). 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. With the low overlaps with agricultural use sites, conservation measures that are in place to reduce exposure from agricultural uses, and water quality impairments to critical habitats for the species limited to exposure from agricultural uses in low flow and low volume areas, we have high confidence that little, if any, of the critical habitats with water quality PBFs are likely to experience more than low levels of water quality impairment.

Plant Assemblages or Plant Functions as PBFs:

Nearly all critical habitats include plant functions or plant assemblages as a PBF. Given that herbicides like atrazine are designed to control plants, we assume most plants are sensitive to atrazine exposure. In general, we anticipate atrazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation. However, we expect atrazine exposure will be negligible or very low based on the low overlap with the critical habitats in Table 2 and agricultural use sites (0.0-3.9%) for atrazine. Additionally, we expect terrestrial habitats have been altered on atrazine 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 atrazine exposure.

Animals as PBFs:

The Georgetown salamander, San Marcos salamander, Mississippi sandhill crane, Big Creek crayfish, Big Sandy crayfish, Guyandotte River crayfish, St. Francis River crayfish, Atlantic salmon, bull trout, fountain darter, Leon Springs pupfish, leopard darter, pearl darter, sickle darter, slender chub, Warner sucker, 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 atrazine 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 atrazine through dietary exposure, with individuals that forage extensively directly on atrazine 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 atrazine 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 atrazine 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 atrazine use sites and expect atrazine 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 atrazine 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 atrazine 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 atrazine 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 atrazine indicate that no host fish that the species rely on will die, but will likely experience sublethal adverse effects to growth or reproduction, particularly when exposed to atrazine from agricultural uses. However, we anticipate these adverse effects to host fish growth or reproduction will only occur in areas of low flow as areas of high flow will accumulate lower levels of atrazine that are not likely to result in any adverse effects to host fish. All of these species use both low and high flow waterbodies or only high flow waterbodies, with the exception of the Texas fawnsfoot and Texas hornshell, which rely on only low flow waterbodies.

We do not anticipate any adverse effects will occur to fish exposed to atrazine from non-agricultural uses as estimated exposure concentrations from these uses are much lower. Some of the mussels in this group are host fish generalists (i.e., they use a variety of host fish), while others are considered to be host fish specialists, requiring one or two specific types of host fish, or host fish are unknown. 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 and reproduction. 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 the small critical habitat areas overlapping with agricultural uses.

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 or reproduction, 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) that 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 atrazine non-agricultural use sites such that these areas are generally less likely to contain or produce critical habitat PBFs. 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 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 atrazine. EPA’s Herbicide Strategy requires general label measures for all agricultural atrazine applications that are expected to minimize atrazine exposure in off-site areas. While these critical habitats can also be exposed through non-agricultural uses of atrazine, 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 that are exposed from agricultural uses, which will be limited to the small portions of the critical habitats overlapping with agricultural uses. 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 atrazine 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 atrazine exposure, but we expect these adverse effects will be limited to low flow or low volume habitats exposed to atrazine 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 herbicide usage as informed by the California Pesticide Use Report (CalPUR), which includes 10 years of data (2013-2022). For this analysis, we consider only usage in Imperial County, as atrazine will no longer be permitted in the rest of the state. 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 atrazine usage, general information on non-agricultural use practices, we expect limited exposure from these uses of atrazine.

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 atrazine 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 atrazine. 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 atrazine below. In cases where there is a small sample size of growers reporting atrazine usage in the sections containing critical habitats, we pull those critical habitats out of the grouped rationale and provide a more thorough analysis 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 atrazine 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 with atrazine annually (CalPUR data)	Determination
Birds	Least Bell's vireo	*Vireo bellii pusillus*	0.0	No Destruction or Adverse Modification
Insects	Hermes copper butterfly	*Lycaena hermes*	0.0	No Destruction or Adverse Modification

We do not anticipate usage for agricultural uses will occur for the critical habitats in Table 3. Further, EPA's Herbicide Strategy requires general label measures for all agricultural atrazine applications that are expected to reduce estimated environmental concentrations of atrazine 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 the "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 atrazine 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 atrazine, critical habitat can experience additional exposure to atrazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., non-agricultural turf, including residential lawns and golf course turf). 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 atrazine usage, general information on non-agricultural use practices, and existing conservation measures, we expect limited exposure from private residential uses of atrazine. In addition, turf (residential and commercial) is 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 atrazine to be limited from these uses, and generally result in atrazine concentrations below the level where we anticipate adverse effects to PBFs. Given the CalPUR data indicating low atrazine usage, our broad understanding of atrazine usage of residential use sites, and general information on non-agricultural use practices, we expect low exposure from non-agricultural uses of atrazine for the critical habitats in Table 3.

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

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

Critical habitat for the Hermes copper butterfly includes a host plant PBF. This critical habitat is entirely within the state of California and CalPUR data indicates no herbicides have been used in critical habitat areas in Imperial County 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 atrazine is no longer commonly used on residential or commercial turf, and if it were to be used, applications would likely be carried out using hand-held equipment. Similarly, information for golf course uses indicates that atrazine is only applied to small portions of the golf course and is usually applied at lower application rates than what is allowed on product labels. Given the lack of expected usage in the critical habitat, our broad understanding of atrazine usage, and general information on non-agricultural use practices, we expect limited exposure from these uses of atrazine such that any adverse effects to host plant PBFs in 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.

Both of the critical habitats in Table 3 include plant functions or plant assemblages as a PBF. Given that herbicides like atrazine are designed to control plants, we assume most plants are sensitive to atrazine exposure. In general, we anticipate atrazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation. However, we expect atrazine 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% based on CalPUR data) and low anticipated off-site exposure, particularly with the mitigation in place for agricultural uses, and low likelihood of transport of atrazine 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 atrazine exposure.

Group Conclusion

In summary, the critical habitats listed in Table 3 occur entirely within the state of California and have a low level of past agricultural atrazine usage within Imperial County 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 atrazine usage and general information on non-agricultural use practices, we expect limited exposure from these uses of atrazine.

We do not expect more than very low levels of adverse effects to the host plant PBF for the Hermes copper butterfly due to the lack of atrazine usage reported in CalPUR data, which indicates that any adverse effects to the host plant PBF is likely to be low (i.e., small numbers of affected plants) and limited to very small areas within the critical habitat, if any. Any adverse effects to PBFs related to plant functions or plant assemblages are also expected to be minor and localized based on low past usage on agricultural and certain non-agricultural use sites in these critical habitats (0% based on CalPUR data) and low anticipated off-site exposure from use sites, particularly with the conservation measures in place for agricultural uses and low likelihood of transport of atrazine 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 atrazine exposure.

In conclusion, we anticipate any adverse effects to the PBFs of the critical habitats in Table 3 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 Exposure (informed by low past herbicide usage from the USDA 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 atrazine), we have high confidence that this data represents a conservative upper bound estimate of past atrazine 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 atrazine 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 atrazine below.

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

Taxa	Common Name	Scientific Name	% critical habitat treated or exposed to any herbicide	Determination
Amphibians	Jemez Mountains salamander	*Plethodon neomexicanus*	1.6	No Destruction or Adverse Modification
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
Insects	[no common name] Beetle	*Rhadine infernalis*	3.3	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 atrazine applications that are expected to reduce estimated environmental concentrations of atrazine 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 the "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 atrazine 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 atrazine, critical habitat can experience additional exposure to atrazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., non-agricultural turf, including residential lawns and golf course turf). Critical habitats in Table 4 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 atrazine 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 atrazine to be unlikely from these uses. Given our broad understanding of atrazine use sites, usage, and general information on non-agricultural use practices, we expect limited exposure from non-agricultural uses of atrazine. 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 atrazine.

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 includes a water quality-related PBF. The critical habitat designated for the Oregon spotted frog includes low flow waterbodies. Available toxicity data in amphibians indicate estimated environmental concentrations of atrazine in small, low volume aquatic areas within critical habitats exposed to atrazine 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 atrazine use will result in moderate adverse effects to the water quality PBF for the Oregon spotted frog. However, we anticipate any adverse effects to the water quality PBFs for this critical habitat will be limited to small areas because of the low portion of the critical habitat that is likely to be treated with any herbicide for agricultural uses over the project duration (4.2%), including (but not limited to) atrazine, and conservation measures that are in place (see the "Conservation Measures" section above) to reduce off-site exposure from agricultural uses. We also anticipate exposure from non-agricultural uses will be low, as discussed in this section above, and we do not anticipate any adverse effects will occur to amphibians from exposure to levels estimated to occur from non-agricultural uses. 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.

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 atrazine are designed to control plants, we assume most plants are sensitive to atrazine exposure. In general, we anticipate atrazine exposure is likely to kill some plants and result in reduced biomass and growth of vegetation. However, we expect atrazine exposure will be low based on the low level of past usage of any herbicide (including, but not limited to atrazine) in the critical habitats for these species (1.6-4.2%) from agricultural uses and conservation measures that are in place (see the "Conservation Measures" section above) to reduce off-site exposure from agricultural uses. 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 do not expect effects to sensitive plant species will significantly change the overall composition of necessary plant assemblages or reduce their ability to function as food, cover, or general habitat for individuals. We also expect any adverse effects to the host plant PBF in critical habitat for the Island marble butterfly critical habitat to be low (i.e., small numbers of affected plants) with exposure limited to very small areas within the critical habitat, if any.

Group Conclusion

In summary, CoA data indicates there has been a low level of past usage of any herbicide (including, but not limited to atrazine) 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 atrazine 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 the Oregon spotted frog in aquatic areas of critical habitat, particularly in low flow and low volume habitats where water quality is degraded by high concentrations of atrazine. However, we expect very little of the critical habitat with the water quality PBF is likely to experience levels of water quality impairment where would expect adverse sublethal effects to the frog. 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 atrazine 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 atrazine exposure.

In conclusion, even though some critical habitats in this group will experience adverse effects to water quality and plant-based 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 4.

Critical Habitats with Low Agricultural Exposure due to 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 conservation measures (either from the general label measures on the atrazine label alone or with the addition of measures within a PULA) and low likelihood of non-agricultural exposure. We expect off-site transport to be low, 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 atrazine below.

Table 5. Critical habitats with low exposure as a result of 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 all uses	No Destruction or Adverse Modification
Amphibians	Frosted Flatwoods salamander	*Ambystoma cingulatum*	General label measures + 6 points all uses	No Destruction or Adverse Modification
Amphibians	Houston toad	*Bufo houstonensis*	General label measures + 6 points all uses	No Destruction or Adverse Modification
Amphibians	Reticulated flatwoods salamander	*Ambystoma bishopi*	General label measures + 6 points all uses	No Destruction or Adverse Modification
Amphibians	Salado salamander	*Eurycea chisholmensis*	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	Alabama cavefish	*Speoplatyrhinus poulsoni*	General label measures	No Destruction or Adverse Modification
Fish	Amber darter	*Percina antesella*	General label measures	No Destruction or Adverse Modification
Fish	Barrens topminnow	*Fundulus julisia*	General label measures	No Destruction or Adverse Modification
Fish	Conasauga logperch	*Percina jenkinsi*	General label measures	No Destruction or Adverse Modification
Fish	Maryland darter	*Etheostoma sellare*	General label measures	No Destruction or Adverse Modification
Fish	Peppered chub	*Macrhybopsis tetranema*	General label measures	No Destruction or Adverse Modification
Fish	Sharpnose Shiner	*Notropis oxyrhynchus*	General label measures	No Destruction or Adverse Modification
Fish	Slackwater darter	*Etheostoma boschungi*	General label measures	No Destruction or Adverse Modification

Appendix D-A1. Animal and Plants Critical Habitat Determinations and Rationales

Taxa	Common Name	Scientific Name	Conservation measures	Determination
Fish	Smalleye Shiner	*Notropis buccula*	General label measures	No Destruction or Adverse Modification
Fish	Spring pygmy sunfish	*Elassoma alabamae*	General label measures	No Destruction or Adverse Modification
Fish	Trispot darter	*Etheostoma trisella*	General label measures + 6 points all uses	No Destruction or Adverse Modification
Insects	Dakota skipper	*Hesperia dacotae*	General label measures	No Destruction or Adverse Modification
Insects	Taylor's (=whulge) Checkerspot	*Euphydryas editha taylori*	General label measures	No Destruction or Adverse Modification
Insects	[no common name] Beetle	*Rhadine exilis*	General label measures	No Destruction or Adverse Modification
Mammals	Florida bonneted bat	*Eumops floridanus*	General label measures + 6 points for sugarcane, guava, macadamia nut	No Destruction or Adverse Modification
Mammals	New Mexico meadow jumping mouse	*Zapus husonius luteus*	General label measures	No Destruction or Adverse Modification
Mammals	Preble's meadow jumping mouse	*Zapus hudsonius preblei*	General label measures	No Destruction or Adverse Modification
Mollusk-Clams	Green floater	*Lasmigona subviridis*	General label measures	No Destruction or Adverse Modification
Mollusk-Clams	Rabbitsfoot	*Quadrula cylindrica cylindrica*	General label measures	No Destruction or Adverse Modification
Mollusk-Clams	Salamander mussel	*Simpsonaias ambigua*	General label measures	No Destruction or Adverse Modification
Mollusk-Clams	Southern elktoe	*Alasmidonta triangulata*	General label measures	No Destruction or Adverse Modification
Mollusk-Clams	Western fanshell	*Cyprogenia aberti*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Aboriginal Prickly-apple	*Harrisia (=Cereus) aboriginum (=gracilis)*	General label measures + 6 points for sugarcane, guava, macadamia nut	No Destruction or Adverse Modification
Plant-Dicot	Bracted twistflower	*Streptanthus bracteatus*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Bushy whitlow-wort	*Paronychia congesta*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Carter's small-flowered flax	*Linum carteri carteri*	General label measures + 6 points for sugarcane, guava, macadamia nut	No Destruction or Adverse Modification
Plant-Dicot	Florida brickell-bush	*Brickellia mosieri*	General label measures + 6 points for sugarcane, guava, macadamia nut	No Destruction or Adverse Modification
Plant-Dicot	Georgia rockcress	*Arabis georgiana*	General label measures	No Destruction or Adverse Modification

Appendix D-A1. Animal and Plants Critical Habitat Determinations and Rationales

Taxa	Common Name	Scientific Name	Conservation measures	Determination
Plant-Dicot	Huachuca water-umbel	*Lilaeopsis schaffneriana var. recurva*	General label measures + 6 points all uses	No Destruction or Adverse Modification
Plant-Dicot	Kincaid's Lupine	*Lupinus sulphureus ssp. kincaidii*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Large-flowered woolly meadowfoam	*Limnanthes pumila ssp. grandiflora*	General label measures + 6 points for all uses with timing restriction and rate limitation for sweetcorn and sugarcane	No Destruction or Adverse Modification
Plant-Dicot	Navasota False Foxglove	*Agalinis navasotensis*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Neches River rose-mallow	*Hibiscus dasycalyx*	General label measures + 6 points for sweetcorn and sugarcane	No Destruction or Adverse Modification
Plant-Dicot	Prostrate milkweed	*Asclepias prostrata*	General label measures + 6 points for sugarcane, guava, macadamia nut	No Destruction or Adverse Modification
Plant-Dicot	Sand dune phacelia	*Phacelia argentea*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Slickspot peppergrass	*Lepidium papilliferum*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Whorled Sunflower	*Helianthus verticillatus*	General label measures	No Destruction or Adverse Modification
Plant-Dicot	Willamette daisy	*Erigeron decumbens*	General label measures + 6 points for all uses with timing restriction and rate limitation for sweetcorn and sugarcane	No Destruction or Adverse Modification
Plant-Dicot	Wright's marsh thistle	*Cirsium wrightii*	General label measures + 6 points all uses	No Destruction or Adverse Modification
Plant-Dicot	Zapata bladderpod	*Physaria thamnophila*	General label measures	No Destruction or Adverse Modification
Plant-Monocot	Golden sedge	*Carex lutea*	General label measures+ 6 points for all uses with timing restriction and rate limitation for sweetcorn and sugarcane	No Destruction or Adverse Modification
Plant-Monocot	Slender Orcutt grass	*Orcuttia tenuis*	General label measures+ 6 points for all uses with timing restriction and rate limitation for sweetcorn and sugarcane	No Destruction or Adverse Modification
Plant-Monocot	Texas wild-rice	*Zizania texana*	General label measures + 6 points for sweetcorn and sugarcane	No Destruction or Adverse Modification
Reptiles	Narrow-headed gartersnake	*Thamnophis rufipunctatus*	General label measures	No Destruction or Adverse Modification
Reptiles	Northern Mexican gartersnake	*Thamnophis eques megalops*	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 atrazine applications that are expected to reduce estimated environmental concentrations of atrazine 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 atrazine 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 atrazine 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 atrazine 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 atrazine, critical habitat can experience additional exposure to atrazine through non-agricultural uses, such as uses on Developed and Open Space Developed areas (i.e., non-agricultural turf, including residential lawns and golf course turf). The critical habitat boundaries in Table 5 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 atrazine use sites such that these areas are generally less likely to contain or produce critical habitat PBFs. Thus, 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 atrazine to be limited from these uses, and generally result in atrazine concentrations below the level where we anticipate adverse effects to the relevant PBFs (i.e., those related to water quality, plants, and animals). Additionally, available information from the NALP about atrazine usage on non-agricultural use sites indicates it is not commonly used on residential or commercial turf, and if it were to be used, applications would likely be carried out using hand-held equipment. Similarly, information for golf course uses indicates that atrazine is only applied to small portions of the golf course and is usually applied at lower application rates than what is allowed on product labels. Given our broad understanding of atrazine use sites, usage, and general information on non-agricultural use practices, we anticipate any of the critical habitats listed in Table 5 that occur on or near developed or open space developed use sites of atrazine are not likely to experience more than low levels of exposure to atrazine from non-agricultural uses.

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

Water Quality as a PBF:

There are 30 critical habitats for species in taxa groups including amphibians, crustaceans, fish, mussels (i.e., clams), plants (a monocot), and reptiles in Table 5 that list water-quality related PBFs of the critical habitat. Available toxicity data indicate that fish, 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 atrazine 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 growth and reproduction (if any) from exposures to levels estimated to occur from agricultural atrazine use (see also the discussion of host species for mussels under animals as PBFs for this group below). Similarly, available toxicity data suggest that reptiles are not likely to experience more than low levels of adverse effects from exposure to atrazine through water, indicating that there will be no more than low levels of adverse effects to the water quality PBF for critical habitats designated for listed reptiles. 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 atrazine exposure to terrestrial amphibians from exposure to aquatic prey items. For all taxa, we do not anticipate any adverse effects will occur from exposure to levels estimated to occur from non-agricultural uses.

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 that any adverse effects to the species would be low.

Animals as PBFs:

Salado salamander, Brawleys Fork crayfish, Alabama cavefish, Barrens topminnow, slackwater darter, spring pygmy sunfish, narrow-headed gartersnake, Northern Mexican gartersnake, and Plymouth redbelly turtle critical habitats include animal PBFs due to various types of amphibian, crustacean, fish, mammal, reptile, and snail prey that vary by species. We expect terrestrial vertebrate prey species (e.g., mammals, reptiles, and terrestrial phase amphibians) will accumulate the highest concentrations of atrazine through dietary exposure, with individuals that forage extensively directly on atrazine 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 atrazine 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 atrazine 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 atrazine use sites and expect atrazine 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 atrazine 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 atrazine from agricultural uses and will not result in adverse effects to individuals. For all taxa, we do not anticipate any adverse effects will occur to individuals of aquatic prey exposed to atrazine 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 exposed from agricultural uses 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 atrazine from non-agricultural use sites, we anticipate low level adverse effects to prey-based PBFs for these critical habitats.

Critical habitats for all of 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 atrazine indicate that no host species will die, but will likely experience sublethal adverse effects to growth and reproduction, particularly when exposed to atrazine 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 and reproduction will only occur in areas of low flow as areas of high flow will accumulate lower levels of atrazine that are not likely to result in any adverse effects to host species growth or reproduction. We do not anticipate non-agricultural uses of atrazine will cause any adverse effects to host species growth or reproduction as estimated environmental concentrations of atrazine 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. Only the salamander mussel is a specialist that uses a salamander as a host. The others use a wider variety of host fish (i.e. are host fish generalists). Information indicates the host species known to be required by the mussel species in Table 5 are common. Thus, we anticipate that there will likely be sufficient host species remaining in the bivalve critical habitats even if exposed host individuals experience some sublethal effects to growth and reproduction. 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 atrazine from non-agricultural use sites will result in low exposure to critical habitat. Furthermore, we expect any adverse effects to host species will be limited to low flow and low volume areas exposed to atrazine from agricultural uses 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, most of the critical habitats include plant functions or plant assemblages as a PBF. Given that herbicides like atrazine are designed to control plants, we assume most plants are sensitive to atrazine exposure. In general, we anticipate atrazine 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 atrazine 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 atrazine 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 atrazine 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 mussel (clam) critical habitats even if some exposed host individuals experience sublethal effects to growth and reproduction, 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 exposed from agricultural uses, 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 atrazine 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 atrazine 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 atrazine 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 atrazine 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 have individual Integration and Synthesis summaries. For these critical habitats, we 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 atrazine and reduce the likelihood, magnitude, and frequency of exposure to a level where no more than low levels of adverse effects are likely to occur to plant-based PDFs 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 atrazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to PBFs. Information about the critical habitat PBFs and anticipated exposure and toxicity to those PBFs from atrazine 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	Texas pimpleback	*Cyclonaias petrina*	No Destruction or Adverse Modification
Fish	Diamond darter	*Crystallaria cincotta*	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	Texas kangaroo rat	*Dipodomys elator*	No Destruction or Adverse Modification
Mammals	Yelm pocket gopher	*Thomomys mazama yelmensis*	No Destruction or Adverse Modification
Plant-Dicot	Kentucky glade cress	*Leavenworthia exigua laciniata*	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

<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 atrazine 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 atrazine agricultural use sites (and their associated off-site transport areas) and the critical habitat's watershed (23.9% total overlap) (Table 7). There is a high level of past atrazine usage (up to 20.3% critical habitat treated annually, suggesting that a large portion of the critical habitat is likely to be exposed 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 Neuse River waterdog's critical habitat.

% On-field Overlap	% On-field CH Treated Annually
23.9	20.3

<u>Anticipated Effects to PBFs</u>

Based on the PBFs listed above, we anticipate atrazine 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 atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. 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 152.5 µg/L in its aquatic habitats adjacent to use sites agricultural use sites and up to 4.69 µg/L in aquatic habitats adjacent to non-agricultural use sites.

Available toxicity data indicate that estimated environmental concentrations of atrazine from non-agricultural uses will not cause any direct adverse effects to the Neuse River waterdog. In contrast, estimated environmental concentrations of atrazine from agricultural uses will not cause any mortality but will cause sublethal adverse effects to growth or reproduction in the Neuse River waterdog. However, maximum exposure concentrations are associated with atrazine use on sod, and based on EPA's overlap data, there is very little presence of sod farms within the Neuse River waterdog's watershed (sod fields occur in 2.8% of the watershed containing the species' critical habitat). Furthermore, we anticipate these high exposure concentrations will only occur in areas of low flow. Individuals occupying areas of higher flow within critical habitat will only be exposed to low levels of atrazine. Thus, we expect the maximum exposure reported above is an overestimate of exposure concentrations and that agricultural atrazine 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 atrazine. In contrast, atrazine exposure is anticipated to cause sublethal adverse effects to fish prey, likely in the form of reduced growth and altered reproduction. Estimated environmental concentrations of atrazine are not high enough to cause more than low levels of adverse effects to fish growth and reproduction. 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 and reproduction 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	Adverse Effects to PBF
Water Quality	yes	low flow, high flow	Low
Host Plant	no	--	--
Plant Assemblage	no	--	--
Plant Function	no	--	--
Animals	yes	snail, fish 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 atrazine 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 atrazine from non-agricultural uses will cause any direct adverse effects to the Neuse River waterdog, but we expect sublethal adverse effects to growth and reproduction from exposure to atrazine from agricultural uses. However, maximum exposure concentrations are associated with atrazine use on sod, and based on EPA's overlap data, there is very little presence of sod within the Neuse River waterdog's watershed containing the species' critical habitat (sod fields occur in 2.8% of the watershed). As such, we anticipate only low levels of effects to water quality in a 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 atrazine. In contrast, atrazine exposure is likely to lead to sublethal adverse effects to fish prey, likely in the form of reduced growth and reproduction. Estimated environmental concentrations of atrazine are not high enough to cause more than low levels of adverse effects to fish growth and reproduction, 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 and reproduction. 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)

Texas pimpleback (*Cyclonaias petrina*)

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 freshwater mussel and native fish (such as stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel and coarse sand substrates).
- Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the mussels' and fish hosts' habitat, food availability, spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats.
- Water and sediment quality (including, but not limited to, dissolved oxygen levels greater than 2 mg/L, conductivity, hardness, turbidity, temperatures below 29°C (84.2°F), pH (low salinity, less than 2 ppt), low total ammonia (less than 0.77 mg/L total ammonia nitrogen), heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.
- The presence and abundance of fish hosts necessary for recruitment of the central Texas mussels.

Effects of the Action

<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 atrazine 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 medium extent of overlap between atrazine agricultural use sites (and their associated off-site transport areas) and the critical habitat's watershed (5.3% total overlap) (Table 9). There is a high level of past atrazine usage (up to 5.3% critical habitat treated annually), suggesting that a medium portion of the critical habitat is likely to be exposed 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 9. Overlap and past usage data for agricultural use sites in the Texas pimpleback's critical habitat.

% On-field Overlap	% On-field CH Treated Annually
5.3	5.3

<u>*Anticipated Effects to PBFs*</u>

Based on the PBFs listed above, we anticipate atrazine will adversely affect water quality as well as host fish that are necessary for critical habitat to support the Texas pimpleback (Table 10).

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. 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 168.4 µg/L in its aquatic habitats adjacent to use sites agricultural use sites and up to 5.99 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 atrazine 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 atrazine is not likely to prevent individuals from occupying critical habitat.

Available toxicity data on fish exposed to atrazine 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 atrazine 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 atrazine that are not likely to result in any adverse effects to host fish growth or reproduction. Furthermore, the Texas pimpleback is a host generalist that can use a variety of host fish. As such, we do not expect sublethal effects to individual fish (e.g., reduced size or condition) to meaningfully impact overall host fish availability or interfere with glochidia attachment. Even if some host fish are adversely affected, fish hosts will have differing sensitivities to atrazine exposure and the availability of alternate suitable hosts is expected to sustain reproduction. We do not anticipate non-agricultural uses of atrazine 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 10. 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	Adverse Effects to PBF
Water Quality	yes	low flow, high flow, low volume, large volume	Low
Host Plant	no	--	--
Plant Assemblage	no	--	--
Plant Function	no	--	--
Animals	yes	host fish required in CH	Low

Rationale for Conclusion

While we expect there is moderate overlap between critical habitat and agricultural and non-agricultural use sites and there will be agricultural and non-agricultural atrazine 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 atrazine 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 Texas pimpleback.

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 atrazine 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 atrazine 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 atrazine that are not likely to result in any adverse effects to host fish growth or reproduction. Furthermore, the Texas pimpleback is a host generalist that can use a variety of host fish. As such, we do not expect sublethal effects to individual fish (e.g., reduced size or condition) to meaningfully impact overall host fish availability. Even if some host fish are adversely affected, fish hosts will have differing sensitivities to atrazine exposure and the availability of alternate suitable hosts is expected to sustain reproduction. 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). We do not anticipate non-agricultural uses of atrazine will cause any adverse effects to host fish growth or reproduction. 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 Texas pimpleback.

References

U.S. Fish and Wildlife Service. 2024. Endangered and Threatened Wildlife and Plants; Endangered Species Status With Critical Habitat for Guadalupe Fatmucket, Texas Fatmucket, Guadalupe Orb, Texas Pimpleback, Balcones Spike, and False Spike, and Threatened Species Status With Section 4(d) Rule and Critical Habitat for Texas Fawnsfoot. Final Rule. Federal Register 89: 48034-48130.

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.

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 atrazine 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 medium extent of overlap between atrazine agricultural use sites (and their associated off-site transport areas) and the critical habitat's watershed (8.5% total overlap) (Table 11). There is a medium level of past atrazine usage (up to 8.5% critical habitat treated annually), suggesting that a medium portion of the critical habitat is likely to be exposed 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 11. Overlap and past usage data for agricultural use sites in the diamond darter's critical habitat.

% On-field Overlap	% On-field CH Treated Annually
8.5	8.5

Anticipated Effects to PBFs

Based on the PBFs listed above, we anticipate atrazine 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 12).

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. 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 98.5 µg/L in its aquatic habitats adjacent to use sites agricultural use sites and up to 4.26 µg/L in aquatic habitats adjacent to non-agricultural use sites.

Available toxicity data indicate that estimated environmental concentrations of atrazine from non-agricultural uses will not cause any direct adverse effects to the diamond darter. In contrast, estimated environmental concentrations of atrazine from agricultural uses will not cause any mortality but will cause low levels of sublethal adverse effects to growth and reproduction 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 atrazine 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 atrazine 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 atrazine 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 atrazine 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 12. 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	Adverse Effects to PBF
Water Quality	Yes	low flow, high flow	Low
Host Plant	no	--	--
Plant Assemblage	no	--	--
Plant Function	no	--	--
Animals	yes	fish prey	Low

Rationale for Conclusion

There is a moderate extent of overlap between critical habitat and the agricultural use areas and a moderate level of anticipated atrazine 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 identified water quality and animals as prey as relevant PBFs of the critical habitat.

While exposure is anticipated in a moderate 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 atrazine 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 and reproduction in the diamond darter. Similarly, fish larvae prey are also likely to experience low levels of sublethal effects (e.g., reduced growth) with atrazine agricultural exposure, but they are not expected to die even at high 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 atrazine 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 atrazine.

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.

Mammals

Olympia pocket gopher (*Thomomys mazama pugetensis*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

- 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.
- 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
- 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 and golf courses, 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 (39.1% total overlap with critical habitat) (Table 13) and a high level of past atrazine usage (up to 35.1% of 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, but that exposure will primarily occur in off-site areas where PBFs of the critical habitat are likely to be more prevalent.

Table 13. Overlap and past usage data for agricultural use sites in the Olympia pocket gopher's critical habitat.

% On-field Overlap	% Total Overlap	% On-field CH Treated Annually	% Total CH Treated Annually
0.2	39.1	0.2	35.1

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below.

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 (Table 14). As such, we expect that relevant PBFs for the species include plant assemblage and plant function PBFs. Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to all three PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of atrazine will reduce 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 atrazine in the areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural practices will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to atrazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural practices will greatly reduce exposure concentrations of atrazine 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 atrazine 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 atrazine applied to agricultural use sites, indicating that areas of critical habitat to coincide with agricultural use sites will be exposed to high levels of atrazine, 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 (0.2% 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 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	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 exposure from anticipated atrazine 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.

Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to plant assemblage and plant function PBFs is likely. We expect the conservation measures for agricultural uses of atrazine, 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 atrazine 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 atrazine 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 (0.2% 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 atrazine 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:

- 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.
- 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
- 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 and golf courses, 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 (59% total overlap with critical habitat) (Table 15) and a high level of past atrazine usage (up to 45.9% of 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, but that exposure will primarily occur in off-site areas where PBFs of the critical habitat are likely to be more prevalent.

Table 15. Overlap and past usage data for agricultural use sites in the Tenino pocket gopher's critical habitat.

% On-field Overlap	% Total Overlap	% On-field CH Treated Annually	% Total CH Treated Annually
0.3	59.0	0.3	45.9

<u>*Anticipated Effects to PBFs*</u>

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below.

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 16). As such, we expect that relevant PBFs for the species include plant assemblage and plant function PBFs. Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to all three PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of atrazine will reduce 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 atrazine in areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural practices will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to atrazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural practices will greatly reduce exposure concentrations of atrazine 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 atrazine 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 atrazine applied to agricultural use sites, indicating that areas of critical habitat to coincide with agricultural use sites will be exposed to high levels of atrazine, 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 (0.3% 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 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	Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
Plant Assemblage	yes	terrestrial or riparian plants, herbaceous cover, grasses, sedges, or rushes	Low

Physical or Biological Feature	Feature Relevant to species?	PBF Characteristics	Adverse Effects to PBF
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 exposure from anticipated atrazine 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.

Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to plant assemblage and plant function PBFs is likely. We expect the conservation measures for agricultural uses of atrazine, 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 atrazine 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 atrazine 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 (0.3% 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 atrazine 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.

Texas kangaroo rat (*Dipodomys elator*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

We have determined that the following physical or biological features are essential to the conservation of the Texas kangaroo rat:

- Loose loam/clay-loam soils;
- shortgrass or mixed-grass prairie with forbs and less than 50 percent woody canopy cover;
- early successional grassland habitat often created and maintained by a disturbance regime (e.g., grazing, fire);
- proportional mixture of short- statured vegetation (i.e., herbaceous plant species observed at a shortened height rather than their potential maximum height) and bare ground (i.e., at microscale);
- structure that provides uplift for burrows (e.g., prairie mound, shrub, manmade berm) in areas not prone to flooding; and
- habitat connectivity that supports movement and dispersal of Texas kangaroo rats (e.g., open spaces that lack barriers such as large paved roads or dense trees and shrubs).

Effects of the Action

<u>Overlap and Usage</u>

While there is a large overlap between agricultural use sites and the species' proposed critical habitat (14.6% on-field overlap), our review of the species' biology and critical habitat PBF descriptions suggest that agricultural fields 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 agricultural use sites. A large portion of the proposed critical habitat overlaps with areas adjacent to agricultural use sites that are likely exposed through spray drift of runoff (85.4% off-field overlap) (Table 17) and past usage data indicate that a large portion of that overlapping area (up to 86.4%) is likely to be exposed to atrazine each year. Our review of critical habitat PBFs indicate that non-agricultural use sites, particularly residential areas, may contain or produce many of the necessary PBFs to support the species. As such, we anticipate non-agricultural use sites are likely to serve as critical habitat to the species, indicating that non-agricultural uses of atrazine is likely to further expose the overall critical habitat.

Table 17. Overlap and past usage data for agricultural use sites in the Texas kangaroo rat‘s critical habitat.

% On-field Overlap	% Total Overlap	% On-field CH Treated Annually	% Total CH Treated Annually
14.6	100[5]	13.6	100

Anticipated Effects to PBFs

Based on the PBFs listed above, we anticipate atrazine will adversely affect plant assemblages and plant functions that are necessary for critical habitat to support the Texas kangaroo rat (Table 18). Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below.

The Texas kangaroo rat requires shortgrass or mixed-grass prairie plant assemblages, including both herbaceous vegetation and shrubs, that provide shelter and places for individuals to burrow. Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to the plant assemblage and plant function PBFs are likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of atrazine will reduce 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 atrazine in areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural practices will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to atrazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural practices will greatly reduce exposure concentrations of atrazine 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 atrazine 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.

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[5] Total overlap and usage are capped at 100%.

In contrast, these required conservation measures are not likely to significantly reduce the amount of atrazine applied to non-agricultural use sites (such as residential turf or golf courses), indicating that areas of critical habitat to coincide with these non-agricultural use sites will be exposed to high levels of atrazine. However, available information on atrazine usage from the National Association of Landscape Professionals (NALP) indicate that atrazine is no longer commonly used on residential or commercial turf due to preferential use of newer herbicides. We anticipate that if atrazine were to be used, applications would likely be carried out using hand-held equipment, which has a limited exposure footprint and represents only small amounts of atrazine used that will not likely cause more than low levels of adverse effects to the plant assemblages the kangaroo rat relies on. Similarly, available information on atrazine usage from the Golf Course Superintendents Association of America indicate that atrazine is only applied to small portions of the golf course (e.g., applied to fairways but not tee boxes, greens, or rough) and are usually applied at lower application rates than what is allowed on product labels. Thus, while individuals of the species are known to occur in non-agricultural areas, including potential atrazine use sites, we do not anticipate atrazine is likely to be used in these areas, and if used, will only be in small portions of the overall use sites using lower application rates or specialized equipment designed to minimize the exposure footprint. As such, we expect the plant communities supporting the Texas kangaroo rat are not likely to experience more than low levels of adverse effects and will still be able to provide the necessary shelter and burrow habitats for individuals occupying non-agricultural use sites.

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	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 exposure from anticipated atrazine agricultural usage based on past usage data, with additional overlap from non-agricultural use sites and anticipated usage on those sites. The Texas kangaroo rat requires shortgrass or mixed-grass prairie plant assemblages, including both herbaceous vegetation and shrubs, that provide shelter and places for individuals to burrow. As such, relevant PBFs of the critical habitat for the species include plant assemblage and plant function PBFs.

Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to plant assemblage and plant function PBFs is likely. We expect the conservation measures for agricultural uses of atrazine, 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 atrazine 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 atrazine exposure on use sites, leading to greater adverse affects to plants in areas overlapping with use sites. Given that a high portion of critical habitat overlaps with agricultural use sites (14.6% 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 high 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. Additionally, available information about atrazine usage on non-agricultural sites indicates it is not commonly used on residential or commercial turf, and if it were to be used, applications would likely be carried out using hand-held equipment. Similarly, information for golf course uses indicates that atrazine is only applied to small portions of the golf course and is usually applied at lower application rates than what is allowed on product labels. Therefore, we expect atrazine usage on non-agricultural use sites will have a limited exposure footprint and will not likely cause more than low levels of adverse effects to the plant assemblages the kangaroo rat relies on in non-agricultural sites.

Thus, while we anticipate individuals of sensitive plant species will still be adversely affected by exposure to atrazine 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 Texas kangaroo rat.

References

U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Texas Kangaroo Rat and Designation of Critical Habitat. Proposed Rule. Federal Register 88: 55962-55991.

Yelm pocket gopher (*Thomomys mazama yelmensis*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

- 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.
- 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
- 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 and golf courses, 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 (94.4% total overlap with critical habitat) (Table 19) and a high level of past atrazine usage (up to 94.4% of 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, 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 Yelm pocket gopher's critical habitat.

% On-field Overlap	% Total Overlap	% On-field CH Treated Annually	% Total CH Treated Annually
0.6	94.4	0.6	94.4

<u>Anticipated Effects to PBFs</u>

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. We integrate species' specific factors and considerations in the "Rationale for Conclusion" section below.

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 20). As such, we expect that relevant PBFs for the species include plant assemblage and plant function PBFs. Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to all three PBFs is likely. However, we expect mandatory spray drift and runoff conservation measures for agricultural uses of atrazine will reduce 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 atrazine in areas of critical habitat that are located near these non-agricultural use sites. These agricultural measures and protective non-agricultural practices will reduce the extent of off-site transport, reducing the extent of critical habitat that will be exposed to atrazine. Additionally, in areas that are still exposed, we expect agricultural conservation measures and protective non-agricultural practices will greatly reduce exposure concentrations of atrazine 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 atrazine 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 atrazine applied to agricultural use sites, indicating that areas of critical habitat to coincide with agricultural use sites will be exposed to high levels of atrazine, 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 (0.6% 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	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 exposure from atrazine 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.

Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to plant assemblage and plant function PBFs is likely. We expect the conservation measures for agricultural uses of atrazine, 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 atrazine 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 atrazine exposure on use sites, leading to greater adverse effects to plants in areas overlapping with use sites. Given that a low portion of critical habitat overlaps with agricultural use sites (0.6% 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 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 atrazine 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.

Plant-Dicot

Kentucky glade cress (*Leavenworthia exigua laciniata*)

Conclusion: Not likely to destroy or adversely modify critical habitat

Physical & Biological Features:

- 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.
- 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

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 areas adjacent to agricultural use sites. There is a high extent of critical habitat likely to be exposed by spray drift or runoff (85.3% off-field overlap) (Table 21) and a high level of past atrazine usage (up to 85.3% off-field critical habitat exposed annually) from agricultural uses. 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 atrazine 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 21. Overlap and past usage data for agricultural use sites in the Kentucky gladecress's critical habitat.

% On-field Overlap	% Total Overlap	% On-field CH Treated Annually	% Total CH Treated Annually
3.2	88.5	3.2	88.3

Anticipated Effects to PBFs

Our analysis of potential adverse effects to critical habitat PBFs assumes critical habitats are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. 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.

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 22). As such, we anticipate the plant assemblage PBF is a relevant PBF necessary for critical habitat to support the species. Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to the plant assemblage PBF is likely. However, we anticipate mandatory conservation measures required for agricultural uses (including spray drift buffers and 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 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 atrazine.

In contrast, atrazine residues on non-agricultural use sites are much higher and likely to 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 a high level of adverse effects is likely 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 is significant. As such, we anticipate an overall high level of adverse effects to the plant assemblage PBF.

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	Adverse Effects to PBF
Water Quality	no	--	--
Host Plant	no	--	--
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 atrazine agricultural usage annually, with a larger portion of the critical habitat likely to be exposed 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.

Atrazine exposure can cause adverse effects to plant growth and survival, even at low concentrations, indicating that adverse effects from atrazine residues to the plant assemblage PBF is likely. We expect the conservation measures for agricultural uses of atrazine, 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 atrazine to levels that will cause no more than low levels of adverse effects to plant growth and survival in off-site areas. Atrazine 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 3.2% of the species' critical habitat occurs directly on agricultural use sites. We also expect there may be overlap with non-agricultural use sites, where exposures are also expected to have high 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 atrazine, so atrazine applications in these areas are unlikely. Thus, while we expect high levels of adverse effects to plants on use sites from atrazine usage, we do not anticipate atrazine 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

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.

Critical Habitats Requiring Further Analysis

In our draft Biological Opinion, we focused our analyses on 1) critical habitats with low expected exposure to atrazine (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 atrazine (i.e., listed plants and listed animals that depend on plant resources). For the critical habitats in Table 23, 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 atrazine 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 atrazine registrants between the release of this draft Opinion and the transmission of the final Opinion to gain information regarding the exposure and effects of each species to atrazine. As such, we have not yet made determinations for these critical habitats.

Table 23. Critical habitats that require further analysis.

Taxa	Common Name	Scientific Name
Amphibians	Chiricahua leopard frog	*Rana chiricahuensis*
Birds	Streaked Horned lark	*Eremophila alpestris strigata*
Birds	Whooping crane	*Grus americana*
Birds	Yellow-billed Cuckoo	*Coccyzus americanus*
Crustaceans	Black Creek crayfish	*Procambarus pictus*
Crustaceans	Slenderclaw crayfish	*Cambarus cracens*
Fish	Arkansas River shiner	*Notropis Girardi*
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-Dicot	Fleshy-fruit gladecress	*Leavenworthia crassa*