Integration and Synthesis Summary for Mammals

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

Most of these species have low exposure to atrazine due to the factors described in the tables or individual rationales below, in combination with reductions in atrazine residues in spray drift and runoff resulting from implementation of conservation measures that will be added to the product label (including those developed during this consultation through the Herbicide Strategy[1]; see Conservation Measures section below).

Vulnerability

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

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

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

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

recovery plans, species status assessments, range and critical habitat information from our ECOS[3] repository, and other sources containing the best available scientific information for the species.

We scored each of the six vulnerability components with high, medium, or low scores. We assigned a high vulnerability ranking to a species if all vulnerability components were scored as high, a mixture of medium and high, or if a threatened species was recommended for uplisting to endangered status in the most recent 5-year status review or proposed rule. We assigned a medium vulnerability ranking if a species' scores were all medium, a mix of high, medium, and low, or a mix of high and low (unless the species has been recommended for uplisting or delisting). We assigned a low vulnerability ranking to species with only low scores, a mixture of low and medium scores, or if the species was recommended for delisting. Considerations regarding specific aspects of the species' vulnerability or beyond what was included in the vulnerability ranking were applicable in our jeopardy analyses for some species depending on unique aspects of their vulnerability factors, recovery needs, or life history. This information is reflected in the rationales for conclusion below.

Exposure

We anticipate that the main route of exposure for mammals is dietary, through consumption of contaminated food items either as the result of exposure to pesticide applications on-field or through off-field transport via spray drift or runoff. Atrazine is moderately mobile in water and is relatively persistent in the environment relative to other pesticides, indicating that off-site transport, particularly through runoff, may result in exposure to listed species in areas far from use sites.

Exposure to Agricultural Uses

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

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

action. Except where otherwise noted, usage data is provided by EPA applying data from their National and State Summary Use and Usage Matrix, as described in the Usage Analysis section of this Opinion. Species with usage data that indicate a large portion of their range (>10%) is treated with atrazine each year are assigned a high usage score. Species that have a medium portion of their range (5-10%) treated with atrazine each year are assigned a medium usage score, and species where data indicate a low portion of their range (<5%) is treated with atrazine each year are assigned a low usage score.

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

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

Exposure to Non-Agricultural Uses

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

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

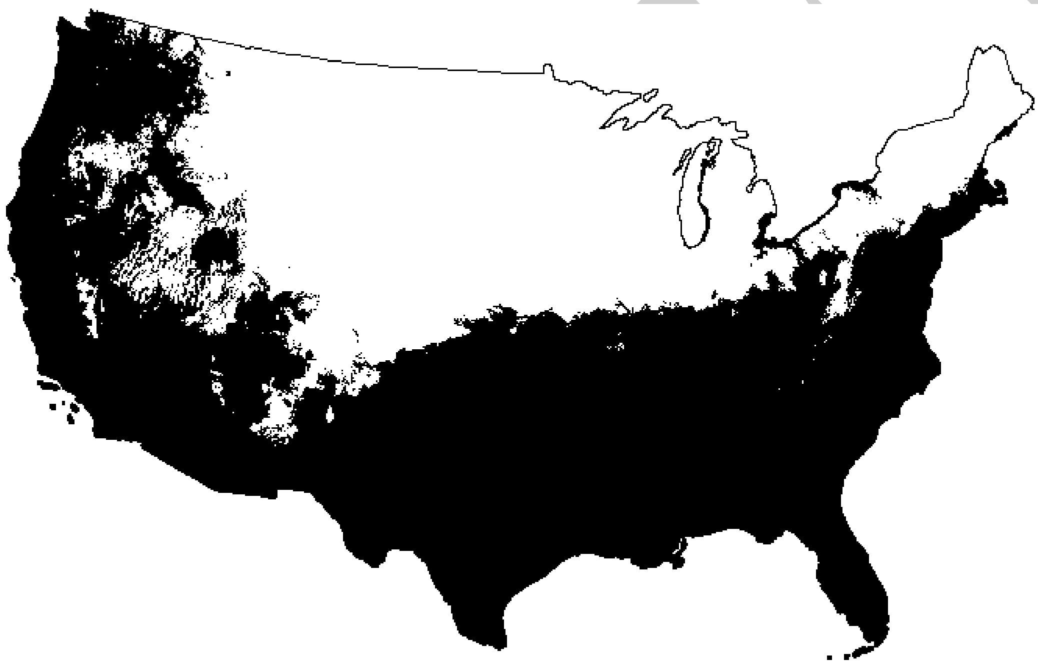

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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

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

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

References:

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

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

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

Toxicity

We characterize the expected toxic effect to species based on the anticipated level of direct and indirect[4] adverse effects to individuals. Our analysis of toxicity assumes individuals are exposed to atrazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. Direct effects are based on the anticipated level of mortality and sublethal effects (e.g., reduced growth, reproduction, impaired motor activity or behavior) likely to occur in exposed individuals. Indirect effects are based on the impact a listed species is likely to experience when the organisms they rely on, such as those that act as food or habitat resources, are exposed to atrazine and experience adverse effects.

We consider estimated concentrations of atrazine on the landscape or within the environment and effects reported in available toxicity studies to determine the level of direct and indirect adverse effects to listed species or critical habitat. Concentrations of atrazine on food items can vary greatly depending on the particular item and where exposure takes place. For instance, exposures on or near use sites are at higher levels than exposures that occur in areas far away from use sites. We anticipate mammals that primarily forage on atrazine use sites will accumulate higher levels of atrazine than individuals that forage solely in off-site areas or those that forage between on- and off-site areas. Based on available toxicity data, we anticipate mammals that primarily forage on atrazine use sites will accumulate sufficiently high levels of atrazine to cause direct adverse effects. We anticipate individuals exposed directly on use sites will not die but will experience sublethal adverse effects, such as reduced body weight gain, reduced food consumption, and potential impacts to reproductive organ development, depending on the extent and magnitude of the exposure. In contrast, we do not anticipate individuals that are only exposed off-site (i.e., in areas only exposed to atrazine through spray drift of runoff) will accumulate levels of atrazine that would result in any direct adverse effects. While this and other reproductive studies are based on long-term chronic exposures, it is often difficult to tease out which aspect of the reproductive process was compromised and the length of exposure required to elicit the effect, as explained in more detail in our Biological Opinion (General Effects to Terrestrial Species). As such, we assess the risk of reproductive effects using estimated exposure concentrations associated with acute exposure but consider the uncertainty associated with that analysis in our weight of evidence for each species. In contrast, we do not anticipate individuals that are only exposed off-site (i.e., in areas only exposed to atrazine through spray drift of runoff) will accumulate levels of atrazine that would result in any direct adverse effects.

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[4] While our Opinion considers all consequences of the proposed action (per the definition of effects of the action at 50 CFR Part 402.02), the terms "direct" and "indirect" effects were used in EPA's BE, and are used in environmental risk assessment terminology in general, and do not have the same meaning as used in ESA regulations. As used in the effects analysis section, direct effects to species are those caused by the pesticide itself through dietary, dermal, or inhalation routes of exposure. Indirect effects occur when the pesticide acts on elements of the ecosystem that are required by the species, such as alterations to prey or vegetation needed for forage, shelter, or other functions. Thus, in the effects analysis section, we may use these terms to link back to the analysis in EPA's BE.

We anticipate species that only rely on plant-based resources, such as seeds or leaves for food or vegetative structures or communities as habitat, are likely to experience indirect adverse effects with atrazine exposure. In contrast, species that rely on animal prey for food resources will experience lower levels of indirect adverse effects (if any) as atrazine exposure will not likely impact the abundance and availability of animal prey. While animal prey, particularly mammalian prey species, will also experience sublethal adverse effects but only if they primarily forage directly in atrazine use sites, we do not anticipate prey are likely to exclusively occur on atrazine use sites, suggesting that this sublethal effect to prey species will not be widespread across the prey base and will not result in significant changes to the overall availability of prey for listed mammal species to forage on. Thus, we anticipate listed mammal species that can rely on animal prey instead of or in addition to plant food resources are less likely to experience indirect adverse effects from atrazine use.

We determine the overall toxicity ranking for mammals by qualitatively assessing both the expected levels of direct adverse effects (e.g., sublethal effects to growth and reproduction) and indirect adverse effects (e.g., prey and vegetation loss).

Experimental Populations, Nonessential

We considered the following nonessential experimental populations for mammal species in this section of the consultation: gray wolf (Entity ID 11698) and red wolf (Entity ID 4369). We do not provide separate analyses and jeopardy determinations for these populations. Rather, we treat all populations of the species (including populations designated as experimental) as a single listed entity when making jeopardy determinations or for other analyses in a section 7 consultation. An "essential experimental population" is a reintroduced population whose loss would be likely to appreciably reduce the likelihood of the survival of the species in the wild. However, there are no “essential experimental populations” in this consultation. A "nonessential experimental population" is a reintroduced population whose loss would not be likely to appreciably reduce the likelihood of survival of the species in the wild. By definition, a "nonessential experimental population" is not essential to the continued existence of the species. Therefore, no proposed action impacting a population so designated could lead to a jeopardy determination for the entire species. In cases where our assessment of the listed entity (i.e., the non-experimental population(s) of the species) leads to a “not likely to jeopardize” determination, we generally assume any added effects to the nonessential experimental population will not change these determinations. However, we consider the role of the experimental population in the survival and recovery of the species and consider this information in our jeopardy analyses as appropriate.

Conservation Measures

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

- Prohibit use in Hawaii, Alaska, and the Territories,

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

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

Herbicide Strategy Conservation Measures

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

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

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

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

The spray drift buffers will be placed on the general label and will apply to all uses of atrazine. EPA's Herbicide Strategy provides applicators with options to reduce the distance of this buffer

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

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

by using other spray drift reduction strategies that we anticipate will result in an equivalent reduction in spray drift entering non-target habitats as stated buffers. These measures and the degree to which applicators can reduce buffers by employing them are described in EPA's Herbicide Strategy and EPA's Ecological Mitigation Support Document to Support Endangered Species Strategies. These documents are provided in Appendix A-1.

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

As stated above, all agricultural labels will include a requirement for applicators to achieve three points of runoff mitigation, as described in the Herbicide Strategy, for all agricultural uses. EPA's Herbicide Strategy provides applicators with various options to reduce runoff and erosion and assigns points to each option based on its effectiveness. Applicators must implement sufficient mitigation points to meet the label requirement. Applicators can achieve the required points using the conservation measures identified on EPA's Mitigation Menu website[7]. The menu provides a suite of options, including relief points for certain field characteristics and likelihood for pesticide transport.

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

In cases where EPA has identified additional runoff measures are needed, additional points (up to six points total) will be required. EPA will communicate where additional runoff mitigation points are needed and for what specific atrazine uses through their Bulletins Live! Two online platform, which all applicators are required to check before making pesticide applications. In areas requiring up to six runoff mitigation points total, EPA expects estimated environmental concentrations of atrazine will decrease by up to two orders of magnitude (i.e., reduce pesticide loading to one-one hundredth of pre runoff mitigation levels; 99% reduction).

For all the species in this document, we expect that the runoff and conservation measures will reduce exposure concentrations to within one order of magnitude of the exposure level where individuals exposed to atrazine in areas off-site will not accumulate more than low levels of atrazine and are not likely to experience more than low levels of sublethal adverse effects to growth or reproduction (if any). Additionally, we anticipate these agricultural measures will

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

reduce exposure to plant species, resulting in no more than low levels of adverse effects to plants that provide food or habitat features for listed species.

Summary of Conclusions for Mammals

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that the registration of atrazine, as proposed, is not likely to jeopardize the continued existence of at least 20 of the 22 mammal species in this Appendix. For the remaining two mammals in this appendix, we plan to continue coordination with EPA and the technical registrants to further assess these species.

In our analysis below, some species that had the same or very similar rationales for their conclusions were grouped together, to increase efficiency and avoid repetition. Relevant information and data unique to each individual species was considered when assigning species to groups and incorporated into the rationales as appropriate. Species-specific information (e.g., environmental baseline, cumulative effects, status of the species, exposure, and toxicity) was considered for all species, including those species in the grouped analyses, and are presented in full in Appendices B and E. Species with rationales that did not fit in a group, or warranted a separate rationale because of their life history, conservation status, or other information indicating that effects could be different, have an individual discussion to provide additional explanation. This approach allowed us to streamline our discussion in this Opinion by avoiding repeating our findings when species in the respective groupings would be expected to be affected similarly. The use of these groupings, therefore, does not mean that our evaluation failed to evaluate each individual species. On the contrary, our detailed process for each species-specific analysis remained the same, including for species for which we summarized our findings in tables below.

Species with low exposure informed by low overlap with agriculture and low likelihood of non-agricultural exposure

For the species in Table 1, we expect low exposure as informed by low overlap between the species' range and agricultural lands where atrazine is registered for use. Therefore, we anticipate adverse effects will be low. While we present some specific information about the species in Table 1 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 1. Species with low exposure informed by low overlap with agricultural areas and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Total Agricultural Action Area Overlap (% Range)	Determination
Key deer	*Odocoileus virginianus clavium*	High	Low	High	0.7	No Jeopardy
Peñasco least chipmunk	*Tamias minimus atristriatus*	High	Low	High	4.5	No Jeopardy

The species in Table 1 have high vulnerabilities. Pesticides are not a noted threat to these species. The key deer is a herbivore that forages on mangroves and a variety of other plants. The deer may occur on agricultural and non-agricultural use sites and thus may be exposed on use sites and where spray drift or runoff occurs. The Peñasco least chipmunk eats a variety of seeds of shrubs, forbs, and some conifers, and other plant parts and fungi as their main food sources, as well as arthropods, carrion, and bird eggs. The least chipmunk is known to forage on and along the edges of oat and wheat fields, but these are not atrazine agricultural use sites and the species is not known to occur on atrazine agricultural use sites. The least chipmunk is also not expected to occur on non-agricultural use sites as these areas generally do not provide the habitat features the species requires (e.g., interspersed open meadows of old growth ponderosa pine forests; habitat with a native grass component). While the chipmunk is known to use habitats with grass, they require native grasses that are tall enough to provide shelter and cover, which do not represent turf grasses.

The species in Table 1 have high toxicity because individuals that predominantly forage on atrazine use sites shortly after exposure are likely to experience high sublethal effects to growth and reproduction. No individuals are expected to die from exposure to atrazine on use sites or in off-site areas, and we do not anticipate direct effects are likely for individuals exposed off-site (i.e., from spray drift or runoff). We anticipate that these species may experience indirect adverse effects from atrazine exposure and affects to plant-based food and habitat resources. However, while we anticipate impacts to some sensitive plant species that serve as habitat components or food resources for these species, we do not anticipate the entire plant community will die as a result of atrazine usage and we expect habitat structure and food availability to remain sufficient for individuals in exposed areas. The diet of the least chipmunk also includes animal-based resources, but we do not anticipate their main animal food items (e.g., arthropods, carrion, and bird eggs) will be adversely affected by exposure to atrazine.

The species in Table 1 have low extents of overlap between their ranges and agricultural atrazine use sites (0.7-4.5%), including associated off-site transport areas. The total overlap metric we use is a conservative estimate of exposure as it does not fully account for redundancy between registered use sites, assumes exposure is occurring in all possible overlapping areas, assumes spray drift will occur in all directions during treatment of fields, and does not consider information on past atrazine usage. As such, we expect that exposure of these species to atrazine from agricultural uses will occur in even smaller portions of the species' ranges than the overlaps shown in Table 1. In addition to agricultural exposure, these species may be exposed to atrazine from non-agricultural (i.e., turf) uses. However, while the key deer may occur on non-agricultural use sites, we expect limited foraging in turf (the only atrazine non-agricultural use sites) as these areas have limited forage, and we do not expect the least chipmunk will occur on these use sites. In addition, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see *Exposure to Non-Agricultural Uses*, above), we expect atrazine usage within the ranges of these species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses. Therefore, we expect atrazine exposure from non-agricultural uses to be low for these species.

In summary, we expect a small number of individuals of the species in Table 1 will experience exposure to atrazine over the project duration. Exposure will be limited to small portions of the species' ranges that overlap with agricultural and non-agricultural use sites and areas of off-site transport. We anticipate a small number of individuals that predominantly forage on use sites shortly after atrazine applications will experience adverse effects to fitness related to growth and reproduction. In addition, a small number of individuals that occur in exposed areas on use sites and in off-site areas will experience low levels of indirect effects from losses of some plants, but we do not anticipate plant losses will adversely affect the habitat suitability for these species or the availability of plant food resources. Therefore, we determine the overall risk of adverse effects to these species is low. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the registration of atrazine, as proposed, is not likely to jeopardize the continued existence of the species in Table .

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

The species in Table are grouped together because they occur completely within California and they have low exposure determined by low levels of past atrazine usage within their ranges (% range treated annually), as informed by the California Department of Pesticide Regulation Pesticide Use Reporting (CalPUR) data. Therefore, we expect adverse effects to be low. While we present some specific information about the species in Table 2 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 2. Species with low exposure informed by low past usage from California Department of Pesticide Regulation, Pesticide Use Reporting Data.

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Peninsular bighorn sheep	*Ovis canadensis nelsoni*	High	Low	High	0.00	No Jeopardy

The Peninsular bighorn sheep in Table has high vulnerability. Pesticides are not a noted threat to the species. This species occurs entirely in the state of California. Atrazine was not used within the species' range between 2013-2022 based on CalPUR data. Given that this usage reporting is mandated by the state of California and that these data are provided regularly at a relatively high spatial resolution (i.e., at the section level, which is per square mile), we have high confidence that only small percentages of the species' ranges, at most, are likely to be exposed to agricultural and most non-agricultural uses of atrazine. In addition, this species is not known to occur on agricultural or non-agricultural use sites of atrazine (i.e., turf on golf courses and lawns). We do not anticipate individual sheep that are only exposed off-site (i.e., from spray drift of runoff) will experience any direct adverse effects.

This species is a herbivore that relies on a variety of plant-based resources for food. Losses of plants are likely in off-site foraging areas exposed to atrazine. With the conservation measures, pesticide use practices, and non-agricultural use site conditions in place to reduce spray drift and runoff, very little exposure is anticipated in off-site areas. Reductions in food resources are likely to lead to indirect effects to a few individuals in localized areas. However, as this species is not known to forage on use sites, and we anticipate low effects to food resources in off-site areas exposed to spray drift or runoff, we anticipate low levels of indirect effects.

We anticipate very small numbers of individuals of these species are likely to be exposed in off-site areas, but direct effects to individuals are not anticipated from exposure. Indirect effects from localized losses of food resources are anticipated to adversely affect, at most, a very small number of individuals of these species in the form of impacts to fitness or survival from localized losses of food items. Therefore, we determine the overall risk of adverse effects to this species is low.

After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Peninsular bighorn sheep.

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

The species in Table were grouped together as we anticipate they will experience low levels of exposure to atrazine based on available data from the USDA's Census of Agriculture (CoA). Therefore, we expect adverse effects to be low. While we present some specific information about the species below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 3. Species with low agricultural exposure informed by low past usage of all herbicides from the USDA's Census of Agriculture (CoA) and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	% Range Treated for Agricultural Uses (CoA)	Determination
Carolina northern flying squirrel	*Glaucomys sabrinus coloratus*	High	Low	High	3.56	No Jeopardy
Mexican long-nosed bat	*Leptonycteris nivalis*	Medium	Low	High	1.51	No Jeopardy
West Indian manatee	*Trichechus manatus*	Medium	Low	Low	2.47	No Jeopardy

In our review of the current status of the species and the environmental baseline and cumulative effects for the action area, we determined that the vulnerability rankings of the species in Table are medium or high. Low annual agricultural herbicide usage is anticipated within the counties where these species ranges occur (from 1.51 to 3.56% of the range treated). Given that CoA data broadly includes all herbicide usage on agriculture, we consider CoA data to provide a conservative estimate of usage that indicates very little of the species' range is likely to be treated with any herbicide. In addition, the Carolina northern flying squirrel and West Indian manatee do not occur on agricultural or non-agricultural use sites and would only be exposed in off-site areas. The Mexican long-nosed bat is not expected to occur on agricultural use sites. The bat may fly over developed areas that include non-agricultural use sites, but is not expected to forage on non-agricultural use sites. Exposure of these species off-site is not expected to lead to any direct adverse effects.

The Mexican long-nosed bat is known to consume the nectar or pollen from at least 49 different species of flowering plants across their range and will occasionally consume insects, but mainly forages on agaves and columnar cacti. The Carolina northern flying squirrel is an omnivore that primarily feeds on fungi, lichens, staminate cones, insects, and other animal matter. The West

Indian manatee is aquatic herbivore that consumes algae and aquatic plants in fresh and marine water. Indirect effects from loss of food resources due to impacts to plants and prey items are not expected to result in any significant adverse effects to these species. The Carolina northern flying squirrel occurs in forested habitats and the West Indian manatee occurs in coastal waters and rivers where exposure to spray drift or runoff that would impact the abundance of plants or other dietary items in foraging areas would only likely occur in very localized areas, such as at the edges of forest habitat reached by spray drift or in shallow aquatic habitats receiving runoff before dilution occurs. Adverse effects to insect prey are not anticipated. In addition, the conservation measures, pesticide use practices, and non-agricultural use site conditions are expected to further reduce off-site transport to these areas to levels that would likely result in low levels of adverse effects to food resources. We expect losses of plants exposed in Mexican long-nosed bat foraging areas, but we anticipate sufficient forage plants will remain available given the variety of plant species used as food sources for this species, and we expect individuals will be able to move to alternate foraging sites to find sufficient food resources even if there are localized, temporary reductions in some food items given the mobility of this species.

Thus, we do not anticipate direct adverse effects to the species in Table 3 on use sites or in off-site areas, as they are not expected to forage in agricultural or non-agricultural atrazine use sites and exposure in off-site areas is not likely to cause adverse effects to individuals. While we anticipate losses of some food resources for each of these species in off-site areas exposed to atrazine, we anticipate sufficient forage plants and insect prey items will remain available, and given the mobility of these species, we expect individuals will be able to find adequate food even if there are localized, temporary reductions in some food items. We do not anticipate impacts to some sensitive plant species that serve as habitat components for these species will affect habitat suitability in exposed areas. As such, we anticipate no more than a very small number of individuals of each of these species is likely to experience indirect adverse effects from insufficient food that leads to reductions in growth or reproduction.

After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 3.

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

For the species in Table 4, we expect they will have low exposure after incorporating general label measures (e.g., measures already on the label, three runoff points and a ground and aerial buffers determined through implementation of the Herbicide Strategy, and rate reductions and other restrictions to particular registered uses). Therefore, we expect adverse effects to be low. While we present some specific information about the species below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 4. Species with low agricultural exposure achieved through conservation measures and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	High	Low	High	General label measures	No Jeopardy
Gray wolf (44-State entity)	*Canis lupus*	Low	Low	High	General label measures	No Jeopardy
Gray wolf (MN entity)	*Canis lupus*	Low	Low	High	General label measures	No Jeopardy
Tricolored bat	*Perimyotis subflavus*	Medium	Low	High	General label measures	No Jeopardy

The species in Table 4 have low, medium, and high vulnerabilities. Pesticides are not a noted threat to any of these species. Although modeled overlap between species' ranges and atrazine use sites is high for species in this group, we do not anticipate the species in this group are likely to occur in agricultural atrazine use sites. In addition, we expect the general label measures for agricultural uses described above (e.g., reduced application rates, 15-foot spray drift buffer for ground application, 170-foot spray drift buffer for aerial applications, and three runoff mitigation points) will reduce off-field exposures by an order of magnitude (i.e., a 90% reduction), which we expect will not cause more than low levels of adverse effects to exposed individuals and will not result in more than low levels of adverse effects to the plant communities and prey that provide habitat and food resources to individuals.

We also anticipate low levels of exposure to the species in this group from non-agricultural atrazine uses, as we do not expect these species will forage on non-agricultural use sites.

In addition, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see *Exposure to Non-Agricultural Uses*, above), we expect atrazine usage within the ranges of these species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses. Therefore, we expect atrazine exposure from non-agricultural uses to be low for these species.

The species in Table 4 have high toxicity because individuals that primarily forage on use sites after atrazine applications would be likely to experience sublethal effects to growth and reproduction. However, we do not anticipate this will occur as these species are not known to forage on atrazine use sites. We anticipate localized losses of food resources from exposure to atrazine from agricultural and non-agricultural uses will adversely affect, at most, a very small number of individuals of these species in the form of impacts to growth or reproduction, but most individuals will continue to find sufficient food resources in the area or will be able to travel and find alternative resources nearby if needed. As such, while these species have high overlap with the action area and high toxicity, we expect no more than low levels of indirect adverse effects will occur to these species.

In summary, based on the typical habitats where these species are expected to occur and with implementation of conservation measures on product labels, we expect that very few individuals or their food resources will be exposed to atrazine via off-site transport from agricultural or non-agricultural areas. Those few individuals in exposed areas may experience indirect effects through the loss of some plant-based food and prey items that lead to sublethal effects to fitness related to growth and reproduction. Therefore, we determine the overall risk of adverse effects to these species is low. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the registration of atrazine, as proposed, is not likely to jeopardize the continued existence of the species in Table 4.

Species with Individual Integration and Synthesis Summaries

The species in Table 5 have individual Integration and Synthesis summaries because they have potential exposure not addressed by the Herbicide Strategy (e.g., on-field exposure or exposure from non-agricultural use). For all these species, we expect Herbicide Strategy conservation measures to reduce pesticide loading into aquatic habitats by up to 90% (i.e., one order of magnitude) compared to unmitigated runoff and reduce spray drift from entering species' terrestrial habitats by >95%. We anticipate that this reduction will minimize off-site transport and reduce the likelihood, magnitude, and frequency of exposure of atrazine to a level where no more than low levels of adverse effects are likely to occur to listed mammals through this exposure route. While the required conservation measures 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 effects to these mammal species. They may occur on atrazine use sites, either agricultural or non-agricultural. For each species, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 5. Species with Individual Integration and Synthesis summaries.

Common Name	Scientific Name	Determination
Columbian white-tailed deer	*Odocoileus virginianus leucurus*	No Jeopardy
Indiana bat	*Myotis sodalis*	No Jeopardy
Northern Idaho ground squirrel	*Urocitellus brunneus*	No Jeopardy
Northern long-eared bat	*Myotis septentrionalis*	No Jeopardy
Olympia pocket gopher	*Thomomys mazama pugetensis*	No Jeopardy
Roy Prairie pocket gopher	*Thomomys mazama glacialis*	No Jeopardy
Tenino pocket gopher	*Thomomys mazama tumuli*	No Jeopardy
Texas kangaroo rat	*Dipodomys elator*	No Jeopardy
Virginia big-eared bat	*Corynorhinus (=Plecotus) townsendii virginianus*	No Jeopardy
Yelm pocket gopher	*Thomomys mazama yelmensis*	No Jeopardy

Integration and Synthesis Summary: Columbian white-tailed deer

Scientific Name:	Common Name:	Entity ID:
Odocoileus virginianus leucurus	Columbian white-tailed deer	3

Conclusion: No Jeopardy

Species Range

Based on range map dated: 10-24-2022; Columbia River (Clark, Cowliz, Pacific, Skamania, and Wahkiakum Counties, WA., and Clatsop, Columbia, and Multnomah Counties, OR.); *States within the range:* OR, WA

Figure 2. Range map of Columbian white-tailed deer (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/154.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: Delist due to recovery

Most recently completed 5-year review: 9/2/2025

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Single population

Species trends: All populations stable, with none known to be increasing or decreasing

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Columbian white-tailed deer is a subspecies of O. virginianus, a species with continuous geographic distribution from southern Canada to South America. They are commonly found in pastures of tall, dense reed canary grass (*Phalaris arundinacea L.*), tall fescue (*Festuca arundinaceae*), mixed deciduous and Sitka spruce (*Picea sitchensis*) forest, and oak-madrone woodland (*Quercus garryana-Arbutus menziesii*) and riparian cover. White-tailed deer are generalist browsers that primarily eat new-growth woody and herbaceous vegetation. Their historical distribution is believed to be from the Willamette Valley in the east to west coast, and they were extirpated throughout most of their historical range by 1900. In 1939, there were an estimated 500-700 whitetails found in diked areas along the Willamette River and on islands near Cathlamet, Washington and Westport, Oregon (USFWS 1983). In 1983, there was one known population in the Julia Butler Hansen National Wildlife Refuge (Julia subpopulation). Between 1985-1988, the Julia population included 410-500 animals at densities between 117-143 deer/m2. The population then declined to 59 deer in 2007, likely due to severe vegetation damage caused by an overpopulation and flooding events. The deer density goal was identified at 35 deer/m2 for the Julia subpopulation and translocation efforts began in 2006. In 2013, there were 46 deer in the Julia subpopulation. Two subpopulations (Puget Island and Westport/Wallace Island) maintain relatively large and stable numbers. The Westport/Wallace Island subpopulation contained 150 deer in 1984 and 163 deer in 2010. The Puget Island subpopulation contained 170 deer in 1984 and 171 deer in 2011. Between 1986-2013, 292 deer (primarily from Westport/Wallace and Puget) were translocated to the Upper Estuary Islands (to establish new subpopulations) and Julia subpopulations. In 2013, there were three viable subpopulations of Columbian white-tailed deer: Tenasillahe Island at 90 deer, Puget Island at 159 deer (171 minus 12 translocated in 2013), Westport/Wallace Island at 163 deer. The Tenasillahe Island and Puget Island subpopulations are now considered to be located on secure habitat (USFWS 2013). In 2015, the range-wide population estimate was 966 deer (USFWS 2016). The historical decline occurred due to European settlers clearing woody cover near rivers, intensively farming, removing beaver ponds (which provided fertile areas for herbaceous vegetation), suppressing fire (which allowed open savanna areas to succeed into forests), and introducing non-native plants. Unregulated shooting of whitetails may have also contributed to their initial decline (USFWS 1983). Due to residential and commercial development, roads, agriculture, etc., causing fragmentation of natural habitats, the species was forced into the lowland areas that it now inhabits.

The species is currently threatened by land conversion, hunting, flooding, invasive species, disease, predation, hybridization, vehicle collisions, and climate change. Habitat loss from development is still a concern, but changes to farmland have not inhibited the deer from persisting and development pressures seem to be decreasing in some areas. In other areas (Willow Grove and Dibblee Point) may experience suburbanization and impact deer. The Julia subpopulation is particularly threatened by frequent flooding and dike failure, which previously led to the loss of up to 50% of the subpopulation. Flooding or inundation of habitat prevents their ability to forage and fawning grounds are unusable. The current major threat to the Julia subpopulation is several floods in consecutive years. Invasive species, especially reed canary grass, reduced forage quality. Necrobacillosis is a primary mortality cause for the Julia subpopulation. Coyote predation is a primary cause of fawn mortality. Vehicle collisions are a source of mortality, especially for newly translocated deer. Rising sea levels and increased flooding from climate change could negatively affect Columbian white-tailed deer (USFWS 2013).

Overall Vulnerability: Low

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 6% of the species' range overlaps with agricultural use sites and 66.1% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 72.2% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 6).

Table 6. Agricultural use overlap and annual usage data (% Range Treated) for the Columbia white tailed deer.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	2.6	30.2	32.8	2.6	30.2	32.8
Vegetables and Ground Fruit (Sweet Corn)	3.5	35.9	39.4	3.5	35.9	39.4
Other Grains (Sorghum & Sugarcane)	0.0	0.0	0.0	0.0	0.0	0.0
Other Orchards (Guava & Macadamia Nut)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Corn-Fallow)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Sorghum-Fallow)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Fallow-Wheat)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Sod)	0.0	0.0	0.0	0.0	0.0	0.0
Total	**6.0**	**66.1**	**72.2**	**6.0**	**66.1**	**72.2**

Usage

Past usage data indicate that up to 72.2% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

Available information on the species' habitat indicates that individuals are likely to occur in close proximity to agricultural areas. While we do not anticipate agricultural areas represent preferred foraging habitat, we anticipate that individuals are likely to forage directly on agricultural atrazine use sites at least occasionally.

Exposure from Non-Agricultural Uses

Available information on the species indicates that non-agricultural atrazine use sites, including residential lawns, occupy large portions of the species' range. While we do not anticipate these non-agricultural use sites represent preferred foraging areas for the species, we anticipate that individuals are likely to be exposed to atrazine through non-agricultural uses at least occasionally.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

An individual deer foraging on contaminated plant food resources directly on atrazine use sites can accumulate 34.2-149.3 mg atrazine/kg-bw, depending on the specific plant matter consumed and the particular use site an individual forages in. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, deer foraging in off-site areas (i.e., areas adjacent to use sites exposed through spray drift or runoff) are not likely to accumulate more than low levels of atrazine, resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate deer that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

The Columbian white-tailed deer is an obligate herbivore that relies on plants as its primary food source. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure (e.g., meadow habitats and bordering coniferous forests) the species requires for its habitat. Furthermore, required conservation measures for agricultural uses (described above in the *Conservation Measures* section) will reduce the extent of area exposed to atrazine from spray drift and runoff as well as reduce the environmental exposure concentrations to a level that will result in no more than low levels of adverse effects to plant species. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate atrazine use will result in no more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a high extent of overlap between the species' range and the action area. Additionally, we anticipate that individuals may be exposed to atrazine directly on agricultural and non-agricultural use sites as individuals are known to occasionally enter and forage in these areas. While we do not anticipate individuals are likely to experience any mortality from consuming contaminated dietary items, we expect individuals exposed on use sites will experience high levels of sublethal adverse effects, including adverse impacts to growth and potentially reproduction. While we anticipate required conservation measures for all agricultural uses and existing pesticide practices for non-agricultural uses will greatly reduce the extent of off-site transport and the environmental concentration of atrazine in off-site areas, these conservation measures do not change the level of atrazine residues that occur on use sites where some individuals may occur. As such, we anticipate the overall risk of adverse effects to the species is medium.

Species Conclusion

The Columbian white-tailed deer has low vulnerability based on factors such as its increasing population and movement toward recovery such that the species is now recommended for delisting. Columbian white-tailed deer are commonly found in pastures of tall, dense grasses, mixed deciduous and Sitka spruce forest, oak-madrone woodland, and areas with riparian cover. White-tailed deer are generalist browsers that primarily eat new-growth woody and herbaceous vegetation. The Columbia white-tailed deer may travel through and forage on agricultural and non-agricultural use sites, and thus is likely to be exposed on use sites and where spray drift or runoff occurs.

Atrazine agricultural use sites and off-site areas that may be exposed overlap with 72.2% of the species' range (6.0% overlap with use sites and 66.1% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 6.0% of the range (the area overlapping with use sites) has been treated with atrazine from agricultural uses annually, exposing up to 72.2% of the range annually. Additional exposure is anticipated from non-agricultural uses of atrazine. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We do not expect toxicity from atrazine to rise to the level of mortality, but we anticipate adverse effects to growth and reproduction for individuals with prolonged or repeated on-site exposures for individuals that predominantly feed on contaminated vegetation directly on atrazine agricultural and non-agricultural use sites after applications are made. In contrast, deer foraging in off-site areas are not likely to accumulate more than low levels of atrazine. We do not anticipate deer that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects. While use sites may be used by the deer for foraging, we expect the majority of foraging to occur in off-site areas that provide more suitable habitat, and predominant foraging on use sites after atrazine applications are made is not expected to be a frequent occurrence. Thus, we anticipate a small number of individuals will experience sublethal effects to fitness related to growth and reproduction.

The Columbia white-tailed deer is a herbivore. While we anticipate exposure to atrazine will adversely affect sensitive plant species that the deer feeds on, given the broad range of plant species the deer is known to consume, the ability of individuals to travel to alternate foraging sites, as well as the fact that required agricultural mitigations and existing protective practices used in non-agricultural use sites will greatly reduce the extent and concentrations off-field atrazine exposures, we do not anticipate adverse effects to sensitive plant species from atrazine will appreciably reduce the overall availability of food resources for the species. Therefore, we do not anticipate there will be indirect effects to the species from reductions in some sensitive plants.

In summary, while there is high overlap of the range with areas likely to be exposed to atrazine, we anticipate no more than a small number of individuals are likely to experience adverse effects. We do not anticipate mortality from the consumption of contaminated plants or indirect effects from plant losses, although sublethal effects to fitness related to growth and reproduction are likely for a small number of individuals that predominantly forage on plants on atrazine use sites after applications are made. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Columbian white-tailed deer.

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U.S. Fish and Wildlife Service. 2013. Columbia River Distinct Population Segment of the Columbian white-tailed deer (*Odocoileus virginianus leucurus*) Lacey, Washington. 53 pp.

U.S. Fish and Wildlife Service. 1983. Columbian white-tailed deer recovery plan. Portland, Oregon. 86 pp.

Integration and Synthesis Summary: Indiana bat

Scientific Name:	Common Name:	Entity ID:
Myotis sodalis	Indiana bat	1

Conclusion: No Jeopardy

Species Range

Based on range map dated: 07-09-2025; Wherever found; *States within the range:* AL, AR, CT, DE, GA, IA, IL, IN, KS, KY, MD, MI, MO, MS, NC, NE, NJ, NY, OH, OK, PA, SC, TN, VA, VT, WI, WV

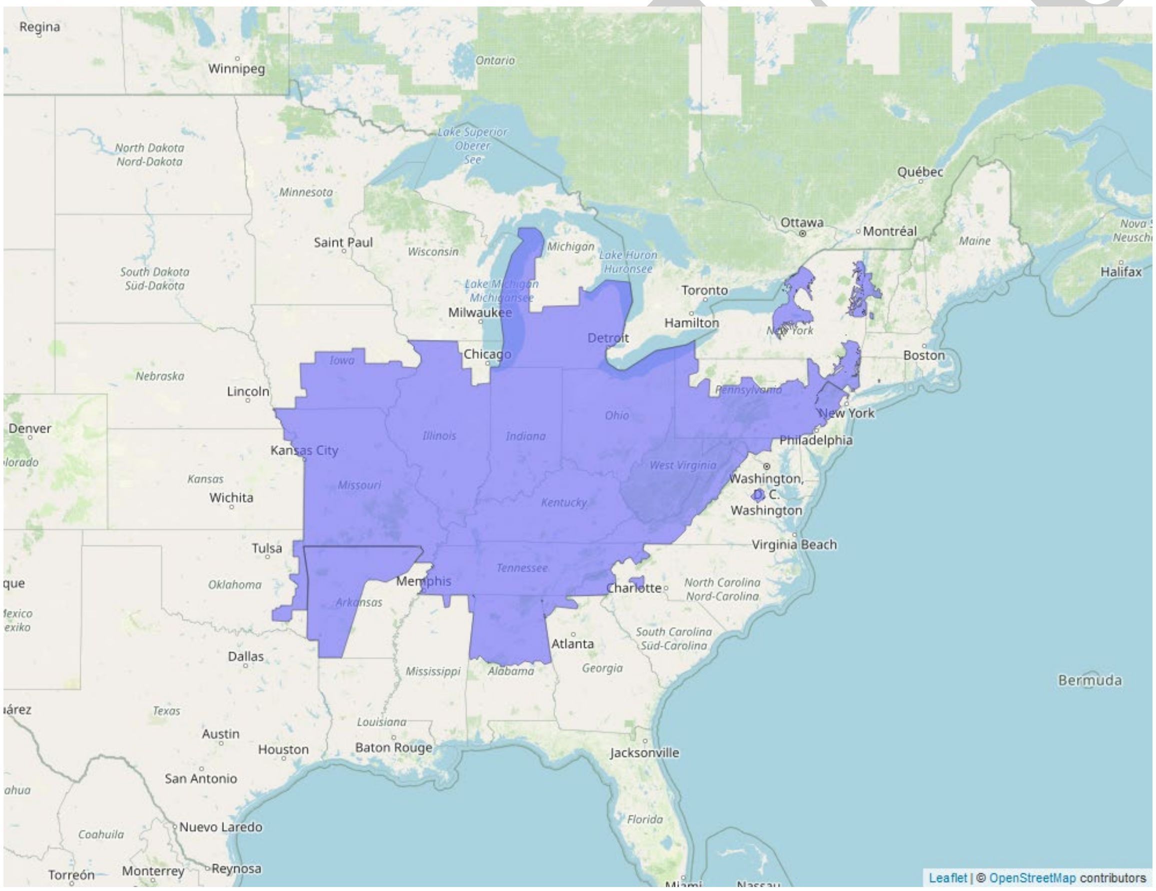

Figure 3. Range map of Indiana bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5949.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-year review recommendation: No change in status

Most recently completed 5-year review: 9/30/2019

Distribution: Species/Populations widespread or wide-ranging

Number of populations: Multiple populations (numerous)

Species trends: All populations stable, with none known to be increasing or decreasing

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Indiana bats are insectivorous, temperate, migratory bats that hibernate colonially in caves and mines in winter. They are restricted to suitable underground hibernacula in winter, typically caves located in karst areas of the east-central U.S. They will occasionally hibernate in abandoned mines also. In summer, most reproductive females occupy roost sites under exfoliating bark of dead trees, usually those that receive direct sunlight for more than half of the day. Their historical distribution is believed to be the eastern United States from the central Mississippi Valley to northern AL and western New England. The current distribution is restricted from the historical distribution and fewer maternity colonies appear in the Midwest and central portions of the range than historically (USFWS 2007).

Indiana bat populations declined from listing in 1967 through 2001, after which the population increased due to growth at hibernacula in Illinois, Indiana, Kentucky, New York, and West Virginia. The range-wide population decreased distinctly after 2009. In 2013, a very large previously unknown Indiana bat hibernaculum was discovered near Hannibal, Missouri and it contained at least 123,000 bats. Hannibal had over 197,000 bats when surveyed again in 2017. The 2019 range-wide Indiana bat population estimate was 537,297 with 71% hibernating in Missouri and Indiana. The 2019 estimate was a 4% decline from 2017 estimates and represented a 19% decline since 2007 (USFWS 2019).

Destruction and degradation of the bat's winter hibernacula (i.e., caves and mines) and summer habitat (i.e., forests) has been identified as a longstanding and ongoing threat to the species (USFWS 2019). Human disturbance of hibernating bats was originally identified as one of the primary threats to the species and remains a threat at several important hibernacula in the bat's range (USFWS 2007). Most human disturbance to hibernating bats result from cave commercialization (e.g., cave tours and other commercial uses of caves), recreational caving, vandalism, and research-related activities. Most Indiana bat declines were attributed to declines at high-priority hibernacula in Kentucky and Missouri and to a lesser extent, Indiana. White-Nose Syndrome (white-nose) emerged in New York in 2007 and caused mortality of thousands of hibernating bats, including Indiana bats. As of 2017, the entire range of Indiana bats is affected by white-nose. Indiana bats fare better than other species affected by white-nose, but their fitness, reproductive success, and survival is still affected, and they remain at risk of long-term extinction from effects of white-nose. Several populations of Indiana bats have severely declined due to white-nose (USFWS 2019). Additional threats include: quarrying and mining operations (summer and winter habitat), loss/degradation of summer/migration/swarming habitat, loss of forest habitat connectivity, some silvicultural practices and firewood collection, disease (i.e., white-nose, rabies) and parasites, predation (i.e., raccoons, mink, snakes, owls, and feral cats), competition with other bat species, environmental contaminants, climate change, and collisions with man-made objects (e.g., wind turbines, communication towers, airplane strikes, and roadkill) (USFWS 2007). Organophosphate and carbamate insecticides, oil spills, and polychlorinated biphenyls (PCBs) were noted as anthropogenic threats. Wind turbines have been associated with bat fatalities; multiple wind energy companies are working with the Service to operate their facilities in ways to avoid impacts to Indiana bats. Changes in climate (i.e., precipitation, temperature, etc) may affect hibernation periods, roosting areas, and general habitat condition in the future (USFWS 2019).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 25.7% of the species' range overlaps with agricultural use sites and 68% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 93.7% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 7).

Table 7. Agricultural use overlap and annual usage data (% Range Treated) for the Indiana bat.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	23.3	38.6	61.9	18.2	32.1	50.3
Vegetables and Ground Fruit (Sweet Corn)	0.5	6.6	7.2	0.1	2.3	2.4
Other Grains (Sorghum & Sugarcane)	0.2	5	5.2	<0.1	2.9	3
Other Orchards (Guava & Macadamia Nut)	0	0	0	0	0	0
Other Crops (Wheat-Corn-Fallow)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops (Wheat-Sorghum-Fallow)	1.1	11.1	12.2	0.6	4.7	5.2
Other Crops (Wheat-Fallow-Wheat)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops (Sod)	0.5	6.6	7.1	0.5	6.6	7.1
Total	**25.7**	**68**	**93.7**	**19.5**	**48.5**	**68.1**

Usage

Past usage data indicate that up to 68.1% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

While the Indiana bat prefers to forage in forested areas, individuals can make use of agricultural areas as foraging grounds when no alternative areas are available. Maternity colonies are commonly found near agricultural areas. Bats hibernate from late October to early April, and they congregate near hibernacula in the fall when bats forage intensively and breed just prior to hibernation. We anticipate pup rearing likely coincides with periods of high agricultural activity, including pesticide application. As such, we expect individuals are likely to experience exposure at different life stages.

Exposure from Non-Agricultural Uses

Based on available information on the species' preferred foraging and roosting behavior, we do not anticipate individuals are likely to roost within non-agricultural atrazine uses sites, such as residential lawns and golf courses, but individuals may travel through and forage in these areas. As such, we anticipate individuals may be exposed to atrazine on non-agricultural use sites.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

The Indiana bat is an obligate insectivore. An individual bat foraging on arthropod prey exposed to atrazine directly on agricultural and non-agricultural use sites can accumulate 68.2-136.3 mg atrazine/kg-bw. These dosages represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, arthropod prey exposed to atrazine in off-site areas (i.e., through spray drift or runoff) are not likely to accumulate more than low levels of atrazine, resulting in no more than low levels of exposures to individual bats that feed on these off-site arthropod prey. We do not anticipate bats that consume prey off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

Available atrazine toxicity studies in terrestrial invertebrates indicate that atrazine is not likely to cause mortality or sublethal adverse effects to exposed arthropods. As such, we expect no more than low levels of impacts to invertebrate prey populations that will not lead to declines in prey abundance, and therefore will not likely result in more than low levels of indirect adverse effects to the species, if any. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure the species requires for its habitat (e.g., trees for roosting). Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. We anticipate atrazine use in non-agricultural areas will not result in more than low levels of adverse effects to plant growth and survival. As such, we do not anticipate effects to sensitive exposed plants to cause changes to vegetative community functions that would result in more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a large extent of overlap between the species' range and atrazine use sites and their associated areas of off-site transport (e.g., spray drift and runoff areas). While we do not anticipate individuals that forage on contaminated arthropod prey will experience any mortality, individuals that forage extensively on agricultural and non-agricultural use sites are likely to experience sublethal impacts, including reduced growth and reproduction. In contrast, we do not anticipate individuals that forage away from atrazine use sites will experience more than low levels of direct adverse effects, if any. We do not anticipate atrazine use will impact the availability of arthropod prey for individuals to forage on, nor will it impact the availability of plant-based habitat features, such as tress for roosting. Based on the potential sublethal impact to the species, we conclude the overall risk of adverse effects to the Indiana bat is medium.

Species Conclusion

The endangered Indiana bat has a wide-ranging distribution, with multiple populations maintaining stability with no known increases or decreases in size. It is an insectivorous species that preferentially forages and roosts in forested landscapes and hibernates colonially in underground caves and mines in winter. Major stressors for the species include disturbances to hibernaculum, white-nose syndrome and other diseases, climate change, insecticides, and other factors. Overall, the Indiana bat has a medium vulnerability ranking.

Atrazine agricultural use sites and off-site areas that may be exposed overlap with 93.7% of the species' range (25.7% overlap with use sites and 68% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 19.5% of the range has been treated with atrazine on agricultural use sites annually, exposing up to 68.1% of the species' range on-site and from off-site transport annually, with a larger portion of the range (up to 93.7%) likely to be exposed due to variations in use sites where annual usage may occur within the overlapping area over the project duration. Indiana bats are known to make extensive use of agricultural edges for foraging and as travel corridors, and maternity colonies are commonly found near agricultural areas. Thus, we anticipate most foraging will occur in nearby off-site areas (i.e., the edges of agricultural use sites and further away), with a moderate number foraging on prey exposed on agricultural use sites across the large range of the species.

Individuals may also travel through and forage in developed areas. As such, we anticipate individuals may also be exposed to atrazine on and adjacent to non-agricultural use sites. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the bat to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses. Therefore, we expect atrazine exposure from non-agricultural uses to be low for the Indiana bat.

We do not expect toxicity from atrazine to rise to the level of mortality, but we anticipate impacts to growth and reproduction for individuals that forage extensively on agricultural and non-agricultural use sites. We do not anticipate individuals that forage away from atrazine use sites will experience more than low levels of direct adverse effects, if any. We also do not expect atrazine exposure to result in any significant decline in prey abundance or the availability of plant-based habitat features, and therefore we expect little to no indirect effects to the species.

In summary, there is high overlap of the species' range with areas likely to be exposed to atrazine, and past usage data indicate there will be high levels of exposure from annual usage on agricultural use sites. While additional usage is anticipated on non-agricultural use sites, exposure on these sites will likely be limited. While we do not expect toxicity from atrazine to rise to the level of mortality to bats, we anticipate a moderate number of individuals that predominantly forage on atrazine use sites will experience impacts to fitness related to growth and reproduction. We do not anticipate exposure will result in any significant decline in prey abundance or the availability of plant-based habitat features, and therefore we expect little to no indirect effects to the species. While a moderate number are anticipated to experience reduced growth and reproduction, which may reduce the survival of individuals or the number of offspring produced, we do not anticipate such adverse effects will result in species-level effects based on the current status of the species. This is wide-ranging species with multiple populations that appear to be stable. We anticipate sublethal effects will occur in bats distributed across the large range of the species. It is unlikely exposure will occur in all areas in any given year, and exposures likely to cause adverse effects to individuals are expected to be limited to those foraging directly on use sites, which are not preferred foraging habitats of the species. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Indiana bat.

References

U.S. Fish and Wildlife Service. 2019. Indiana Bat (*Myotis sodalis*) 5-Year Review: Summary and Evaluation. Fort Snelling, Minnesota. 91 pp.

U.S. Fish and Wildlife Service. 2007. Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision. Fort Snelling, Minnesota. 258 pp.

Integration and Synthesis Summary: Northern Idaho ground squirrel

Scientific Name:	Common Name:	Entity ID:
Urocitellus brunneus	Northern Idaho ground squirrel	59

Conclusion: No Jeopardy

Species Range

Based on range map dated: 03-02-2022; Wherever found; *States within the range:* ID

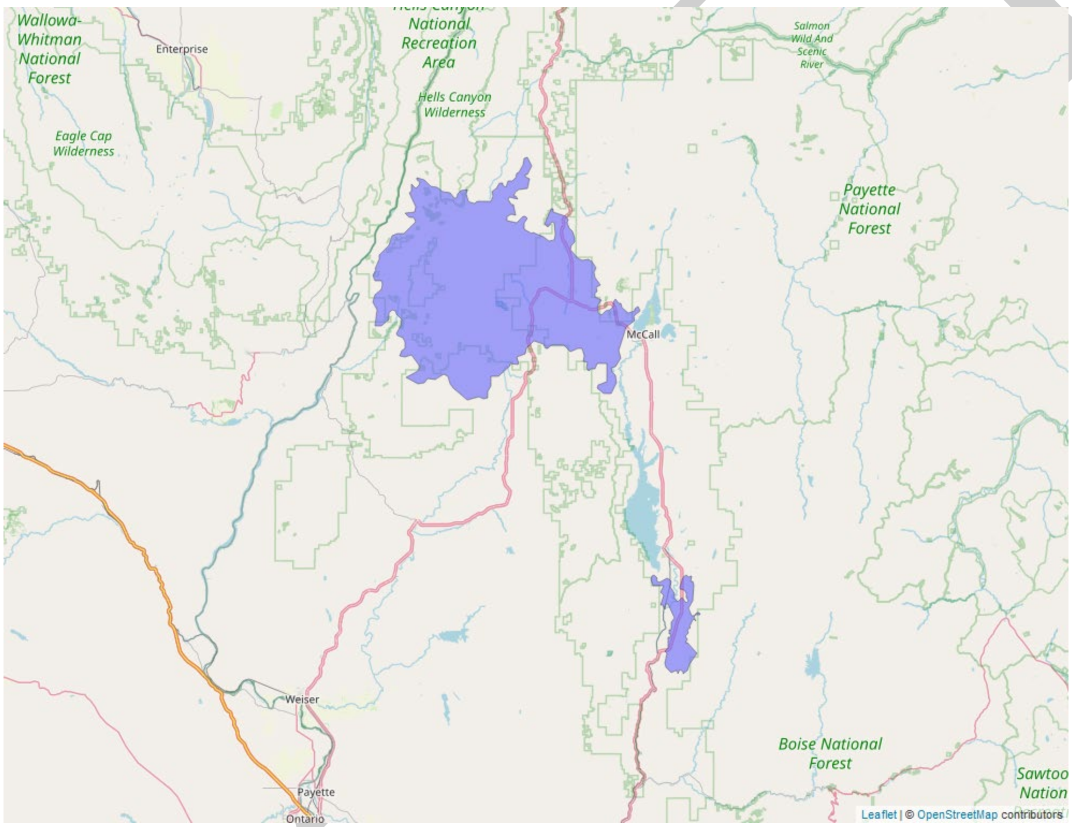

Figure 4. Range map of northern Idaho ground squirrel (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2982.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: No change in status

Most recently completed 5-year review: 8/22/2022

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Single population

Species trends: All populations stable, with none known to be increasing or decreasing

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Northern Idaho ground squirrel is found in Adams and Valley Counties in Idaho. They are associated with shallow, rocky soils where they inhabit nest, escape, and hibernation burrow systems. Their burrows are often under logs, rocks, or other objects in meadows that are near coniferous forests of ponderosa pine and Douglas fir. They are herbivores that eat roots, bulbs, leaf stems, flower heads, and seeds of many plant species (USFWS 2011).

In 1985, the total population was estimated to include 5,000 squirrels across 18 known population sites. In 2002, the population estimate was 450-500 squirrels. In 2010, they occupied 56 sites (34 more than in 2002) and the population minimum was estimated around 1,560 adults. Until 2011, the species range was believed to be expanding. Between 2014-2016, a new survey design was implemented and the population estimate increased from 968 in 2014 to 2,659 in 2016. The distribution between 2017-2020 did not appear to change and the population appears to be relatively stable after 2015 (USFWS 2011, 2017, 2022).

Threats to the species include forest encroachment into grassland meadows, habitat loss from land conversion, and road maintenance. Once open stands of conifers with an herbaceous understory have been replaced by dense stands of trees lacking an understory as a result of logging and fire suppression in post-settlement, which reduced the amount of suitable habitat, further isolated populations, and reduced genetic exchange among populations. With limited connectivity for dispersal opportunities, small and isolated populations are also likely more susceptible to the effects of predation (i.e., domestic dogs, feral cats, badgers). Habitat loss from development (i.e., residential, recreational/golf courses, road construction, agriculture, irrigation) is an important historical and current threat, particularly on the private lands occupied by the species. A relatively new threat is off-road vehicle use, which can impact habitat through soil compaction, vegetation removal, and physical disturbance or harm to individuals. Northern Idaho ground squirrels are illegally shot, in some cases due to them being mistaken for Columbian ground squirrel and are subject to road mortality. They are also threatened by effects of small population sizes and climate change (USFWS 2011, 2017). A Safe Harbor Agreement is in place for an area that houses roughly a third of the known Northern Idaho ground squirrel sites until 2024, 15 known occupied sites are on a private property that is managed for timber extraction and is no longer accessible for monitoring surveys after it changed ownership (USFWS 2022).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that <0.1% of the species' range overlaps with agricultural use sites and 2.8% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is approximately 2.8% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 8).

Table 8. Agricultural use overlap and annual usage data (% Range Treated) for the Northern Idaho ground squirrel.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	<0.1	2.8	2.8	<0.1	2.8	2.8
Vegetables and Ground Fruit (Sweet Corn)	0	0.0	0.0	0	0.0	0.0
Other Grains (Sorghum & Sugarcane)	0	0.0	0.0	0	0.0	0.0
Other Orchards (Guava & Macadamia Nut)	0	0.0	0.0	0	0.0	0.0

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Other Crops (Wheat-Corn-Fallow)	0	0.0	0.0	0	0.0	0.0
Other Crops (Wheat-Sorghum-Fallow)	0	0.0	0.0	0	0.0	0.0
Other Crops (Wheat-Fallow-Wheat)	0	0.0	0.0	0	0.0	0.0
Other Crops (Sod)	0	0.0	0.0	0	0.0	0.0
Total	**<0.1**	**2.8**	**2.8**	**<0.1**	**2.8**	**2.8**

Usage

Past usage data indicate that up to 2.8% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

While agricultural use sites do not represent preferred habitat, extensive human activity and conversion of habitat to agricultural areas places populations of the northern Idaho ground squirrel in close proximity to agricultural atrazine use sites, indicating that exposure on agricultural use sites may occur.

Exposure from Non-Agricultural Uses

While the northern Idaho ground squirrel primarily occurs in meadow habitats bordered by coniferous forests, human development has greatly fragmented the species' habitat and has put populations of the squirrel in close proximity to non-agricultural atrazine use sites, including residential areas and golf courses. While these use sites are not likely preferred foraging habitat for the squirrel, individuals may enter these areas and be exposed to atrazine.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

An individual squirrel foraging on contaminated plant food resources directly on atrazine use sites can accumulate 1.9-213.2 mg atrazine/kg-bw, depending on the specific plant matter consumed. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, squirrels foraging in off-site areas (i.e., areas adjacent to use sites exposed through spray drift or runoff) are not likely to accumulate more than low levels of atrazine, resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate squirrels that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

The northern Idaho ground squirrel requires a diverse array of plant species to use as food resources and is known to consume plant parts (e.g., leaves, roots, bulbs, flower) of at least 45-50 different plant species. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure (e.g., meadow habitats and bordering coniferous forests) the species requires for its habitat. Similarly, while we anticipate atrazine use will negatively impact the abundance and availability of sensitive plant species that the squirrel relies on, we do not anticipate the entire vegetative community will be impacted and completely die off with atrazine use. Furthermore, conservation measures for agricultural uses (described above in the *Conservation Measures* section) will reduce the extent of area exposed to atrazine from spray drift and runoff as well as reduce the environmental exposure concentrations to a level that will result in no more than low levels of adverse effects to plant species. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate atrazine use will result in no more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a high extent of overlap between the species' range and atrazine use sites and their associated off-site transport areas. Squirrels exposed to atrazine are not likely to die but may experience sublethal adverse effects (e.g., reduced growth and altered reproduction) if they predominantly feed on contaminated vegetation directly on atrazine use sites. However, based on the low level of agricultural on-field overlap, coupled with the fact that agricultural and non-agricultural use sites do not represent preferred habitat for the species, we anticipate only small numbers of individuals are likely to be exposed on use sites at all. While we anticipate atrazine use will impact sensitive plant species that the squirrel feeds on, given the broad range of plant species the squirrel is known to consume, as well as the fact that required agricultural mitigations and existing protective practices used in non-agricultural use sites will greatly reduce the extent of off-site exposure and reduce the exposure concentrations off-field, we do not anticipate atrazine impacts to sensitive plant species will appreciably reduce the overall availability of food resources for the species.

In summary, given that we anticipate the majority of individuals will only be exposed to atrazine in off-site areas where dietary exposures will be low, and given that atrazine use will not appreciably reduce food availability within the squirrel's range, we anticipate the overall risk of adverse effects to the species from atrazine use is low.

Species Conclusion

The Northern Idaho ground squirrel has a medium vulnerability based on factors such as its limited distribution, multiple populations, and relative stability since 2015. The squirrel is a herbivore that eats roots, bulbs, leaf stems, flower heads, and seeds of many plant species. They use burrows that are often under logs, rocks, or other objects in meadows that are near coniferous forests. Populations are small and isolated with limited connectivity for dispersal opportunities.

Atrazine agricultural use sites and off-site areas that may be exposed overlap with 2.8% of the species' range (<0.1% overlap with use sites and 2.8% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that <0.1% of the range (the area overlapping with use sites) has been treated with atrazine on agricultural use sites annually, exposing up to 2.8% of the species' range on-site and from off-site transport annually. Additional exposure may occur from non-agricultural uses of atrazine, but this species is not known to occur on non-agricultural (i.e., turf, including golf courses and lawns) or agricultural atrazine use sites, so we do not anticipate more than a very small number of individuals will be exposed on use sites. Additionally, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We do not expect toxicity from atrazine to rise to the level of mortality, but we anticipate impacts to growth and reproduction for individuals that predominantly feed on contaminated vegetation directly on atrazine use sites. However, based on the low level of overlap with agricultural use sites and low level of anticipated usage on agricultural use sites, coupled with the fact that agricultural and non-agricultural use sites do not represent preferred habitat for the species, we anticipate only small numbers of individuals are likely to be exposed on use sites. While we anticipate exposure to atrazine will impact sensitive plant species that the squirrel feeds on, given the broad range of plant species the squirrel is known to consume, as well as the fact that required agricultural mitigations and existing protective practices used in non-agricultural use sites will greatly reduce the extent and concentrations off-field atrazine exposures, we do not anticipate atrazine impacts to sensitive plant species will appreciably reduce the overall availability of food resources for the species.

Given that we anticipate the majority of individuals will only be exposed to atrazine in off-site areas where dietary exposures will be low and direct adverse effects are not anticipated, and that atrazine usage will not appreciably reduce food availability within the squirrel's range, we anticipate no more than a very small number of individuals that predominantly forage on atrazine use sites will experience impacts to fitness related to growth and reproduction. We do not anticipate such adverse effects will result in species-level effects, as very few individuals are likely to forage on use sites and be affected, mortality is not anticipated, and this species is comprised of multiple populations that appear to be stable. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Northern Idaho ground squirrel.

References

U.S. Fish and Wildlife Service. 2022. 5-Year Review Northern Idaho Ground Squirrel (*Spermophilus brunneus*). Boise, Idaho. 18 pp.

U.S. Fish and Wildlife Service. 2017. 5-Year Review Short Form Summary Northern Idaho Ground Squirrel (*Spermophilus brunneus*). Boise, Idaho. 10 pp.

U.S. Fish and Wildlife Service. 2011. Northern Idaho Ground Squirrel (*Spermophilus brunneus brunneus*) 5-Year Review: Summary and Evaluation. Boise, Idaho. 32 pp.

Integration and Synthesis Summary: Northern long-eared bat

Scientific Name:	Common Name:	Entity ID:
Myotis septentrionalis	Northern long-eared bat	10043

Conclusion: No Jeopardy

Species Range

Based on range map dated: 08-05-2024; Wherever found; *States within the range:* AL, AR, CT, DC, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, WV, WY

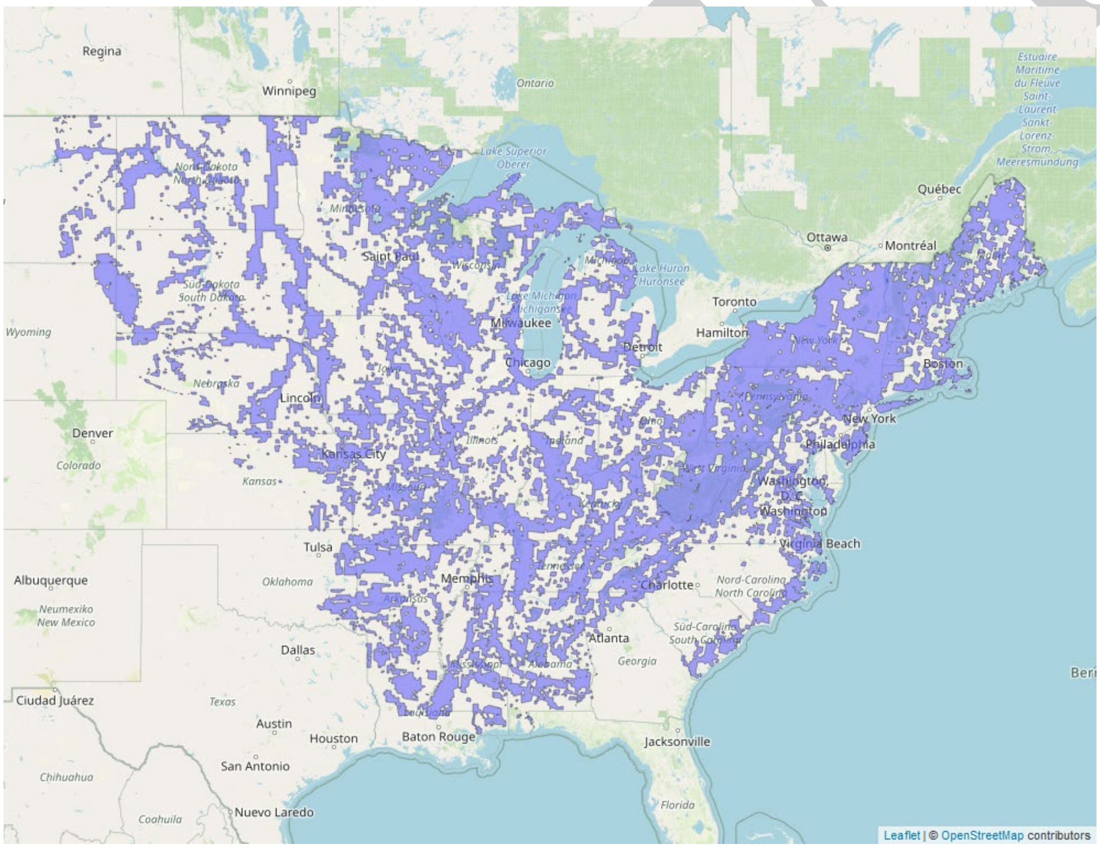

Figure 5. Range map of northern long-eared bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/9045.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-year review recommendation: Uplist from threatened to endangered status

Most recently completed 5-year review: 11/30/2022

Distribution: Species/Populations widespread or wide-ranging

Number of populations: Multiple populations (numerous)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The northern long-eared bat is a wide-ranging insectivorous bat species that overwinter in caves and abandoned mines and use forests otherwise. They are found in 37 states and 8 Canadian provinces across North America (i.e., eastern and north central U.S., all Canadian provinces west to the southern Yukon Territory and eastern British Columbia). The U.S. range includes the District of Columbia and the following 39 states: Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, northern long-eared bats were most frequently observed in the northeastern U.S. and in Canadian Provinces Quebec and Ontario. Throughout most of the species' range, it is patchily distributed and often found in low numbers in inconspicuous roosts. They feed on moths, flies, leafhoppers, caddisflies, and beetles, primarily within 5 hours after sunset and 8 hours after sunset. They forage in mature forests under the canopy and 1-3m above the ground and will occasionally forage along riparian areas, over small forest clearings and water, and along roads. They prefer intact mixed forests to fragmented habitat or areas that have been clear cut.

Northern long-eared bats are typically found roosting in small crevices or cracks on cave or mine walls or ceilings, thus are easily overlooked during surveys and usually observed in small numbers. More than 780 hibernacula have been identified throughout the species' range in the U.S., although many hibernacula contain only a few (1 to 3) individuals. They migrate in spring (mid-March to mid-May) and fall (mid-August to mid-October), and migratory movements are often between 35-55 miles. Range-wide summer occupancy declined by 80% between 2010-2019, and colonies appear to be declining with a 96-100% decline in the number of large hibernacula (≥100 individuals). The maximum historical abundance estimate was 38,131 individuals across 737 hibernacula. The estimated 2020 abundance was 19,356 individuals across 139 hibernacula (USFWS 2022b).

The primary threat to the species is White-Nose Syndrome (white-nose), a disease caused by the fungus *Geomyces destructans* that is known to kill bats. White-nose has led to dramatic and rapid population declines in northern long-eared bats of up to 99% in some areas and it has spread rapidly throughout the East and Midwest. Other sources of mortality to the species include wind-energy development (i.e., 49% of the bat's range includes wind energy mortality risks), habitat modification, habitat destruction (e.g., vandalism to hibernacula, roost tree removal), climate change (i.e., changes in temperature or precipitation), and contaminants. Although no significant decline due to these factors has been observed, they may have cumulative effects to the species in addition to white-nose (USFWS 2022a).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 14.6% of the species' range overlaps with agricultural use sites and 56.8% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is approximately 71.4% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 9).

Table 9. Agricultural use overlap and annual usage data (% Range Treated) for the northern long-eared bat.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	12.4	32.8	45.3	12.4	32.5	44.8

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Vegetables and Ground Fruit (Sweet Corn)	0.5	6.4	6.9	0.2	3.1	3.2
Other Grains (Sorghum & Sugarcane)	0.3	5.6	5.9	0.2	4.2	4.5
Other Orchards (Guava & Macadamia Nut)	<0.1	<0.1	<0.1	0.0	0.0	0.0
Other Crops (Wheat-Corn-Fallow)	0.8	4.4	5.2	0.4	2.8	3.2
Other Crops (Wheat-Sorghum-Fallow)	0.8	8.2	8.9	0.8	8.2	8.9
Other Crops (Wheat-Fallow-Wheat)	1.1	3.7	4.8	1.1	3.7	4.8
Other Crops (Sod)	0.2	4.1	4.4	0.2	4.1	4.4
Total	**14.6**	**56.8**	**71.4**	**14.1**	**51.7**	**65.8**

Usage

Past usage data indicate that up to 65.8% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

Available information on the northern long-eared bat indicate that individuals could forage on the edge of agricultural fields and may travel through agricultural areas, indicating that individuals may be exposed to atrazine directly on agricultural use sites.

Exposure from Non-Agricultural Uses

Available information on the northern long-eared bat indicate that individuals may travel through, forage on, and potentially roost in open space developed areas (but not likely areas of low to high intensity developed), which may include some non-agricultural atrazine use sites like golf courses. As such, we anticipate non-agricultural atrazine use may further contribute to the exposure of the species.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

The northern long-eared bat is an obligate insectivore. An individual bat foraging on arthropod prey exposed to atrazine directly on agricultural and non-agricultural use sites can accumulate 69.5-139.1 mg atrazine/kg-bw, depending on the specific use site an individual forages on. These dosages represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, arthropod prey exposed to atrazine in off-site areas (i.e., through spray drift or runoff) are not likely to accumulate more than low levels of atrazine, resulting in no more than low levels of exposures to individual bats that feed on these off-site arthropod prey. We do not anticipate bats that consume prey off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

Available atrazine toxicity studies in terrestrial invertebrates indicate that atrazine is not likely to cause mortality or sublethal adverse effects to exposed arthropods. As such, we expect no more than low levels of impacts to invertebrate prey populations that will not lead to declines in prey abundance, and therefore will not likely result in more than low levels of indirect adverse effects to the species, if any. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure the species requires for its habitat (e.g., trees for roosting). Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. We anticipate atrazine use in non-agricultural areas will not result in more than low levels of adverse effects to plant growth and survival. As such, we do not anticipate effects to sensitive exposed plants to cause changes to vegetative community functions that would result in more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a large extent of overlap between the species' range and atrazine use sites and their associated areas of off-site transport (e.g., spray drift and runoff areas). While we do not anticipate individuals that forage on contaminated arthropod prey will experience any mortality, individuals that forage extensively on agricultural and non-agricultural use sites are likely to experience sublethal impacts, including reduced growth and reproduction. In contrast, we do not anticipate individuals that forage away from atrazine use sites will experience more than low levels of direct adverse effects, if any. We do not anticipate atrazine use will impact the availability of arthropod prey for individuals to forage on, nor will it impact the availability of plant-based habitat features, such as tress for roosting. Based on the potential sublethal impact to the species, we conclude the overall risk of adverse effects to the northern long-eared bat is medium.

Species Conclusion

The northern long-eared bat has high vulnerability based on factors such as its status (i.e., uplisted from threatened to endangered status in 2023) and declining populations. It is an insectivorous species that preferentially forages in mature forests under the canopy and 1-3 meters above the ground, and will occasionally forage along riparian areas, over small forest clearings and water, and along roads. They prefer intact mixed forests to fragmented habitat or areas that have been clear cut. They are typically found roosting in small crevices or cracks on cave or mine walls or ceilings, and they use hibernacula that often contain only a few (1 to 3) individuals.

Atrazine agricultural use sites and off-site areas that may be exposed overlap with 71.4% of the species' range (14.6% overlap with use sites and 56.8% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 14.1% of the range has been treated with atrazine on agricultural use sites annually, exposing up to 65.8% of the species' range on-site and from off-site transport annually, with a larger portion of the range (up to 71.4%) likely to be exposed due to variations in use sites where annual usage may occur within the overlapping area over the project duration. This species is anticipated to travel through and forage on the edge of agricultural sites and thus may forage on agricultural use sites, although these use sites are generally not their preferred habitats. Thus, we anticipate most foraging will occur in nearby off-site areas (i.e., the edges of agricultural use sites and further away), with a moderate number foraging on prey exposed on agricultural use sites across the large range of the species.

Individuals may also travel through and forage in developed areas (but not likely areas with low to high intensity development where residential lawns are common), although non-agricultural atrazine use sites are generally not their preferred habitats. In addition, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the bat to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses. Therefore, we expect atrazine exposure from non-agricultural uses to be low for the northern long-eared bat.

We do not expect toxicity from atrazine to rise to the level of mortality, but we anticipate impacts to growth and reproduction for individuals that forage extensively on agricultural and non-agricultural use sites. We do not anticipate individuals that forage away from atrazine use sites will experience more than low levels of direct adverse effects, if any. We also do not expect atrazine exposure will result in any significant decline in prey abundance or the availability of plant-based habitat features, and therefore we expect little to no indirect effects to the species.

In summary, there is high overlap of the species' range with areas likely to be exposed to atrazine, and past usage data indicate there will be high levels of exposure from annual usage on agricultural use sites. While additional usage is anticipated on non-agricultural use sites, exposure on these sites will likely be limited within the range. While we do not expect toxicity from atrazine to rise to the level of mortality, we anticipate a moderate number of individual bats that predominantly forage on atrazine use sites will experience impacts to fitness related to growth and reproduction. We do not anticipate exposure will result in any significant decline in prey abundance or the availability of plant-based habitat features, and therefore we expect little to no indirect effects to the species. While a moderate number are anticipated to experience reduced growth and reproduction, which may reduce the survival of individuals or the number of offspring produced, we do not anticipate such adverse effects will result in species-level effects based on the current status of the species. This is wide-ranging species with multiple populations. We anticipate sublethal effects will occur in bats distributed across the large range of the species. It is unlikely exposure will occur in all areas in any given year, and exposures likely to cause adverse effects to individuals are expected to be limited to those foraging directly on use sites, which are not preferred foraging habitats of the species. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the northern long-eared bat.

References

U.S. Fish and Wildlife Service. 2022a. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Northern Long-eared Bat. Final Rule. Federal Register 87(229):73488-73504.

U.S. Fish and Wildlife Service. 2022b. Species Status Assessment Report for the Northern Long-eared Bat (*Myotis septentrionalis)*. Version 1.2. Bloomington, Minnesota. 169 pp.

Integration and Synthesis Summary: Olympia pocket gopher

Scientific Name:	Common Name:	Entity ID:
Thomomys mazama pugetensis	Olympia pocket gopher	8683

Conclusion: No Jeopardy

Species Range

Based on range map dated: 10-20-2022; Wherever found; *States within the range:* WA

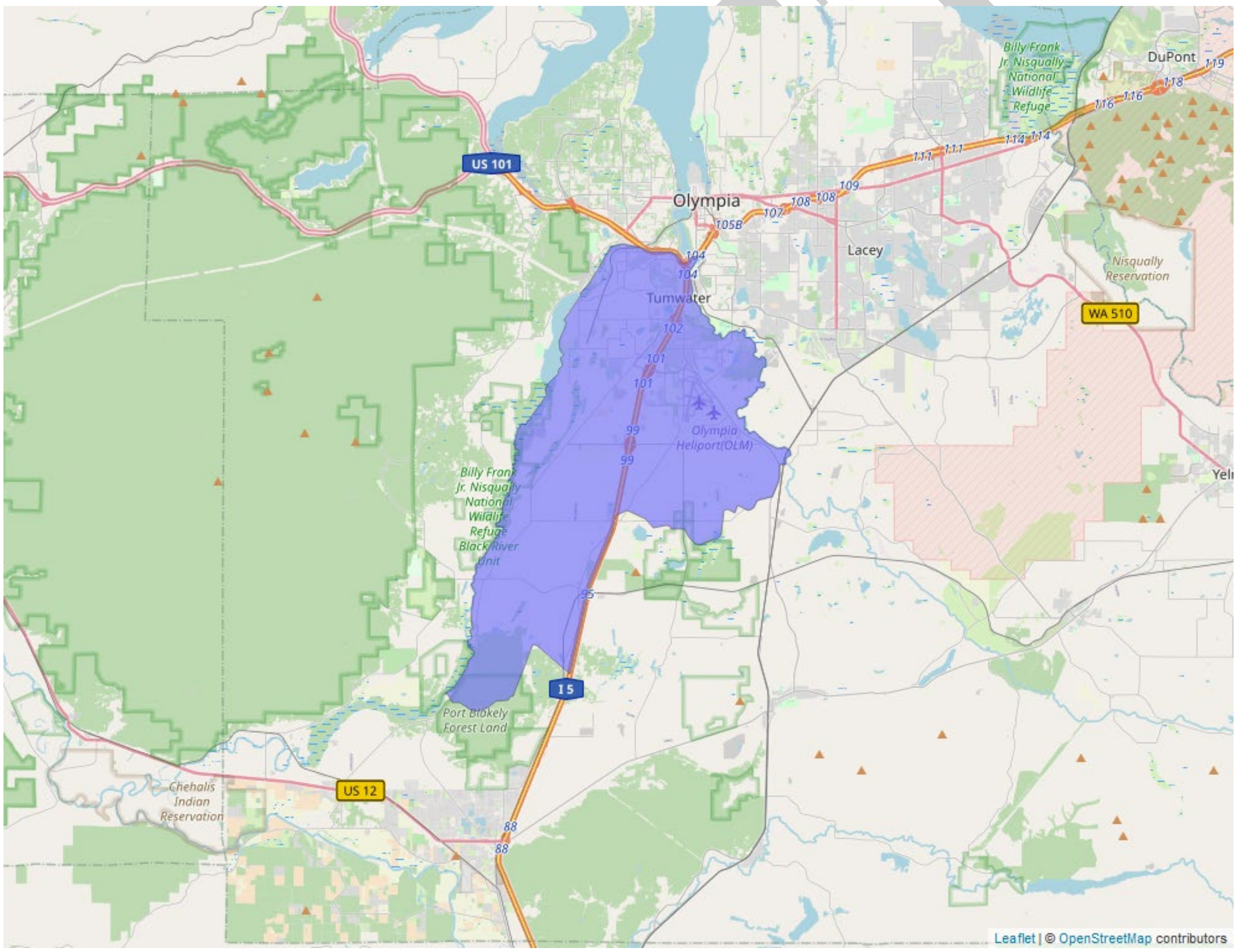

Figure 6. Range map of Olympia pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6713.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: No change in status

Most recently completed 5-year review: 9/28/2020

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Single population

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Olympia pocket gophers are a subspecies of Mazama pocket gopher endemic to Thurston County, Washington. They are concentrated in well-drained, friable soils often associated with glacial outwash that form prairies and grasslands. Though they prefer prairie grassland habitats, they may occur on lands with some agricultural land uses, including crop production, pasture, and hay fields (USFWS 2022a). They are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. Pocket gophers are not known to occur where Douglas-fir (Pseudotsuga menziesii) or Scotch broom (Cytisus scoparius) have invaded. As of 2020, their locations are categorized into two Recovery Units: West of I-5 (low resiliency; no population trends available; not managed for pocket gophers) and East of I-5 (moderate resiliency; no population trends available and uncertain if pocket gophers present are Olympia or other subspecies; some land managed for prairie habitat). Individuals from East of I-5 were translocated to Wolf Haven and West Rocky Prairie Wildlife Area before the subspecies' were listed, but due to lack of connectivity, individuals in those areas do not contribute to the current condition of this recovery unit (USFWS 2022b).

Olympia pocket gophers are currently threatened by habitat loss, primarily caused by development (e.g., residential, road, and commercial) and woody plant encroachment, throughout the range of the subspecies. The action area is undergoing rapid urbanization. Industrial, light industrial, and residential land uses have steadily increased and this trend is expected to continue. Paved areas, compacted soils, excavations, and encroaching shrubs and trees degrade the habitat value on most of the remaining unbuilt parcels. The result is intensive habitat fragmentation throughout the action area and ongoing habitat loss. Fragmentation reduces the gopher's ability to disperse to the decreasing and shrinking patches of suitable habitat. Additionally, most sites used by Yelm pocket gophers require some level of management to maintain suitable habitat conditions. Fires historically maintained the early-successional habitats required by Olympia pocket gophers, but fire suppression encouraged woody plant encroachment and succession. Predation is a significant population-level and ongoing threat, especially from domestic animals associated with residential development and recreation (i.e., feral cats, dogs).

Unlike other pocket gophers, no military training occurs in the range of the Olympia subspecies of the Mazama pocket gopher. Olympia pocket gophers are also at risk of poisoning and trapping as a pest and effects of small and isolated populations (i.e., genetic concerns). Pesticides and herbicides may cause an individual threat to Olympia pocket gophers, but it is not considered a population-level threat (USFWS 2022a). We delineated Service Areas and Reserve Priority Areas for the Olympia pocket gopher to identify locations where impacts to the subspecies or its habitat may be mitigated or offset. There are thirteen Habitat Conservation Plans in the species range. We are also coordinating with Joint Base Lewis McChord to enhance their Army Compatible Use Buffer Program and south Puget Sound Sentinel Landscapes Program to benefit the species (USFWS 2022b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.8% of the species' range overlaps with agricultural use sites and 93.4% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is approximately 94.2% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 10).

Table 10. Agricultural use overlap and annual usage data (% Range Treated) for the Olympia pocket gopher.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	0.2	24.3	24.5	0.2	24.3	24.5

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Vegetables and Ground Fruit (Sweet Corn)	0.4	44.9	45.3	0.4	44.9	45.3
Other Grains (Sorghum & Sugarcane)	0.0	0.0	0.0	0.0	0.0	0.0
Other Orchards (Guava & Macadamia Nut)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Corn-Fallow)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Sorghum-Fallow)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Fallow-Wheat)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Sod)	0.2	24.2	24.4	0.2	24.2	24.4
Total	**0.8**	**93.4**	**94.2**	**0.8**	**93.4**	**94.2**

Usage

Past usage data indicate that up to 94.2% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

Available life history information on the Olympia pocket gopher indicate that individuals are likely to occur on agricultural fields, including potential atrazine use sites. However, we anticipate only a small number of individuals are likely to occur on agricultural use sites as there is very low overlap between the species' range and on-field areas (i.e., agricultural fields only make up 0.8% of the species' range). Furthermore, as noted in the gopher's recovery plan, while herbicides and pesticides are generally considered a threat and may cause harm to individuals, the use of herbicides to control noxious weeds within the species' range is not considered a population-level threat, suggesting that individual occurrence on herbicide use sites is low.

Exposure from Non-Agricultural Uses

Based on available life history information, there is no indication that the Olympia pocket gopher is likely to occur on non-agricultural atrazine use sites, including residential lawns, turf, or golf courses. As such, we anticipate non-agricultural uses of atrazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

An individual gopher foraging on contaminated plant food resources directly on atrazine use sites can accumulate 149.8-653.5 mg atrazine/kg-bw, depending on the specific plant matter consumed. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consuming contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, pocket gophers foraging in off-site areas (i.e., areas adjacent to use sites exposed through spray drift or runoff) are not likely to accumulate more than low levels of atrazine,

resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate pocket gophers that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

The Olympia pocket gopher requires a diverse array of plant species as food resources and is known to consume a variety of plant parts (e.g., leaves, roots, bulbs, flower) from a wide range of plant species. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure (e.g., prairie meadow ecosystems) the species requires for its habitat. Similarly, while we anticipate atrazine use will negatively impact the abundance and availability of sensitive plant species that the pocket gopher relies on, we do not anticipate the entire vegetative community will be impacted and completely die off with atrazine use. Furthermore, conservation measuresr for agricultural uses (described above in the *Conservation Measures* section) will reduce the extent of area exposed to atrazine from spray drift and runoff as well as reduce the environmental exposure concentrations to a level that will result in no more than low levels of adverse effects to plant species. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate atrazine use will result in no more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is large extent of overlap between the species' range and atrazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on atrazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to atrazine in off-site areas (i.e., areas only exposed through spray drift or runoff) will not likely experience any adverse effects as exposure concentrations will be much lower in these adjacent areas. Given that only a very small portion of the species' range contains agricultural use sites (agricultural use sites occur in 0.8% of the range) and that there is no indication of individuals occurring in non-agricultural use sites, we anticipate only a small number of individuals are likely to be exposed on-site and experience direct adverse effects. Furthermore, the species' listing document includes a 4(d) rule exempting certain herbicide uses to control noxious weeds and invasive plants (e.g., when impacts to nontarget plants are avoided to the maximum extent practicable) and the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat, suggesting that individuals are not likely to occur directly on atrazine use sites and that only small numbers of individuals will experience sublethal adverse effects.

While we anticipate some impacts to sensitive plant species that serve as habitat components or food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. Required agricultural mitigations and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plant growth and indirect effects to the species.

In summary, we anticipate no individuals will die, only small numbers of individuals are likely to experience sublethal impacts from atrazine use, and that the species will experience an overall low level of indirect adverse effects resulting from atrazine impacts to habitat and food resources. As such, we conclude the overall risk of adverse effects to the Olympia pocket gopher is low.

Species Conclusion

The Olympia pocket gopher has high vulnerability based on factors such as its limited distribution and declining trends. The gopher's primary habitat includes prairie grasslands, although they may occur on lands with some agricultural uses, including crop production, pasture, and hay fields. Atrazine use sites and off-site areas that may be exposed to annual agricultural usage overlap with 94.2% of the species' range (0.8% of the range is on agricultural use sites, with 93.4% exposed to atrazine in off-site areas from spray drift of runoff). Additional exposure is anticipated from non-agricultural uses of atrazine. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We anticipate dietary exposure will result in the highest levels of exposure, but even in the highest exposure scenarios (i.e., individuals predominantly consuming contaminated food directly on atrazine use sites), we expect reduced growth and reproduction, but no mortality of individuals. We do not expect morality or sublethal effects to individuals that are only exposed to atrazine in off-site areas, and there is no indication that individuals will occur on non-agricultural use sites. Thus, while exposure may occur in areas throughout the species' range, only a small portion overlaps with agricultural use sites where sublethal effects are expected. As such, we anticipate only a small number of individuals are likely to be exposed on use sites and experience direct adverse effects.

Pocket gophers are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. While we anticipate some impacts to sensitive plant species that serve as habitat components or

food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. We anticipate the loss of some plants that contribute to habitat elements and food resources for the pocket gopher, but that any indirect adverse effects to pocket gophers will be localized and minimal, with habitat structure and food availability to remain sufficient for individuals in exposed areas. In addition, required agricultural mitigations and existing practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plants and indirect effects to the species.

In summary, while there is high overlap of the range with areas likely to be exposed to atrazine, we anticipate no more than a small number of individuals are likely to experience adverse effects. We do not anticipate mortality from the consumption of contaminated plants or indirect effects from plant losses, although sublethal effects to growth and reproduction are likely for a small number of individuals that predominantly forage on plants on atrazine use sites (primarily agricultural use sites). Furthermore, the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat. We do not anticipate adverse effects from the proposed action will result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Olympia pocket gopher.

References

U.S. Fish and Wildlife Service. 2020. 5-Year Review, Mazama Pocket Gophers: Olympia, Roy Prairie, Tenino, and Yelm pocket gophers (*Thomomys mazama pugetensis, T. m. glacialis, T. m. tumuli,* and *T. m. yelmensis*). Lacey, Washington. 9 pp.

U.S. Fish and Wildlife Service. 2022a. Recovery Plan for four subspecies of Mazama pocket gopher. Portland, Oregon. 61 pp.

U.S. Fish and Wildlife Service. 2022b. Species Biological Report for four subspecies of Mazama pocket gopher. Version 1.1. Lacey, Washington. 95 pp.

Integration and Synthesis Summary: Roy Prairie pocket gopher

Scientific Name:	Common Name:	Entity ID:
Thomomys mazama glacialis	Roy Prairie pocket gopher	3194

Conclusion: No Jeopardy

Species Range

Based on range map dated: 10-15-2021; Wherever found; *States within the range:* WA

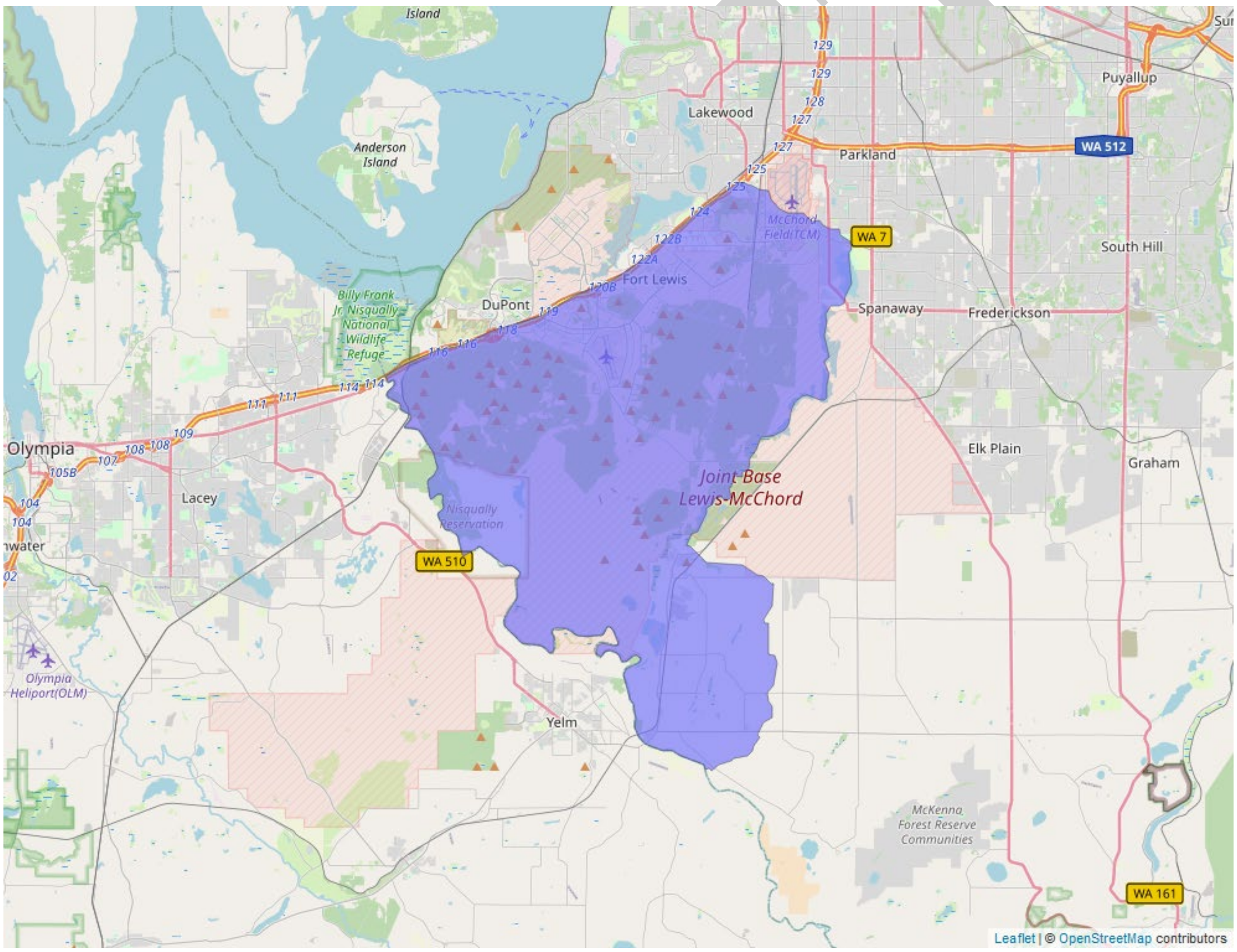

Figure 7. Range map of Roy Prairie pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7821.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: No change in status

Most recently completed 5-year review: 9/28/2020

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Roy Prairie pocket gophers are a subspecies of Mazama pocket gopher endemic to Pierce County, Washington. They are concentrated in well-drained, friable soils often associated with glacial outwash that form prairies and grasslands. Though they prefer prairie grassland habitats, they may occur on lands with some agricultural land uses, including crop production, pasture, and hay fields (USFWS 2022a). They are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. Pocket gophers are not known to occur where Douglas-fir (Pseudotsuga menziesii) or Scotch broom (Cytisus scoparius) have invaded.

As of 2020, they are found near Roy Prairie and on Joint Base Lewis-McChord and their locations are categorized into three Recovery Units: AIA (unknown resiliency; no population trends available but abundance is believed to be high; some habitat is managed for pocket gopher habitat), SIA (high resiliency; no population trends available but abundance is believed to be high; some habitat is managed for pocket gopher habitat), and Roy (low resiliency; no population trends available) (USFWS 2022b). They are currently threatened by habitat loss, primarily caused by development (e.g., residential, road, and commercial) and woody plant encroachment, throughout the range of the subspecies. The action area is undergoing rapid urbanization. Paved areas, compacted soils, excavations, and encroaching shrubs and trees degrade the habitat value on most of the remaining unbuilt parcels. The result is intensive habitat fragmentation throughout the action area and ongoing habitat loss. Fragmentation reduces the gopher's ability to disperse to the decreasing and shrinking patches of suitable habitat. Fragmentation reduces the gopher's ability to disperse to the decreasing and shrinking patches of suitable habitat.

Joint Base Lewis-McChord committed to operational restrictions on military training areas to avoid and minimize potential negative impacts to Roy Prairie pocket gophers on portions of the base. Additionally, most sites used by Roy Prairie pocket gophers require some level of management to maintain suitable habitat conditions. Fires historically maintained the early-successional habitats required by Roy Prairie pocket gophers, but fire suppression encouraged woody plant encroachment and succession. Predation is also a significant population-level and ongoing threat, especially from domestic animals associated with residential development and recreation (i.e., feral cats, dogs). Roy Prairie pocket gophers are also at risk of poisoning and trapping as a pest species, direct mortality and harm from military training, and effects of small and isolated populations (i.e., genetic concerns). Pesticides and herbicides may cause an individual threat to Roy Prairie pocket gophers, but it is not considered a population-level threat (USFWS 2022a). We are coordinating with Joint Base Lewis McChord to enhance their Army Compatible Use Buffer Program and south Puget Sound Sentinel Landscapes Program to benefit the species (USFWS 2022b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.1% of the species' range overlaps with agricultural use sites and 25.7% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 25.9% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 11).

Table 11. Agricultural use overlap and annual usage data (% Range Treated) for the Roy Prairie pocket gopher.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	<0.1	8.7	8.7	<0.1	8.7	8.7
Vegetables and Ground Fruit (Sweet Corn)	<0.1	17	17.1	<0.1	17.0	17.1

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Other Grains (Sorghum & Sugarcane)	0	0	0	0	0.0	0.0
Other Orchards (Guava & Macadamia Nut)	0	0	0	0	0.0	0.0
Other Crops (Wheat-Corn-Fallow)	0	0	0	0	0.0	0.0
Other Crops (Wheat-Sorghum-Fallow)	0	0	0	0	0.0	0.0
Other Crops (Wheat-Fallow-Wheat)	0	0	0	0	0.0	0.0
Other Crops (Sod)	0	<0.1	<0.1	0	0.0	0.0
Total	**0.1**	**25.7**	**25.9**	**0.1**	**25.7**	**25.9**

Usage

Past usage data indicate that up to 25.9% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

Available life history information on the Roy Prairie pocket gopher indicate that individuals are likely to occur on agricultural fields, including potential atrazine use sites. However, we anticipate only a small number of individuals are likely to occur on agricultural use sites as there is very low overlap between the species' range and on-field areas (i.e., agricultural fields only make up 0.1% of the species' range). Furthermore, as noted in the gopher's recovery plan, while herbicides and pesticides are generally considered a threat and may cause harm to individuals, the use of herbicides to control noxious weeds within the species' range is not considered a population-level threat, suggesting that individual occurrence on herbicide use sites is low.

Exposure from Non-Agricultural Uses

Based on available life history information, there is no indication that the Roy Prairie pocket gopher is likely to occur on non-agricultural atrazine use sites, including residential lawns, turf, or golf courses. As such, we anticipate non-agricultural uses of atrazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

An individual gopher foraging on contaminated plant food resources directly on atrazine use sites can accumulate 149.8-653.5 mg atrazine/kg-bw, depending on the specific plant matter consumed. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consuming contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, pocket gophers foraging in off-site areas (i.e., areas adjacent to use sites exposed through spray drift or runoff) are not likely to accumulate more than low levels of atrazine,

resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate pocket gophers that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

The Roy Prairie pocket gopher requires a diverse array of plant species as food resources and is known to consume a variety of plant parts (e.g., leaves, roots, bulbs, flower) from a wide range of plant species. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure (e.g., prairie meadow ecosystems) the species requires for its habitat. Similarly, while we anticipate atrazine use will negatively impact the abundance and availability of sensitive plant species that the pocket gopher relies on, we do not anticipate the entire vegetative community will be impacted and completely die off with atrazine use. Furthermore, conservation measures for agricultural uses (described above in the *Conservation Measures* section) will reduce the extent of area exposed to atrazine from spray drift and runoff as well as reduce the environmental exposure concentrations to a level that will result in no more than low levels of adverse effects to plant species. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate atrazine use will result in no more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is large extent of overlap between the species' range and atrazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on atrazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to atrazine in off-site areas (i.e., areas only exposed through spray drift or runoff) will not likely experience any adverse effects as exposure concentrations will be much lower in these adjacent areas. Given that only a very small portion of the species' range contains agricultural use sites (agricultural use sites occur in 0.1% of the range) and that there is no indication of individuals occurring in non-agricultural use sites, we anticipate only a small number of individuals are likely to be exposed on-site and experience direct adverse effects. Furthermore, the species' listing document includes a 4(d) rule exempting certain herbicide uses to control noxious weeds and invasive plants (e.g., when impacts to nontarget plants are avoided to the maximum extent practicable) and the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat, suggesting that individuals are not likely to occur directly on atrazine use sites and that only small numbers of individuals will experience sublethal adverse effects.

While we anticipate some impacts to sensitive plant species that serve as habitat components or food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. Required agricultural mitigations and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plant growth and indirect effects to the species.

In summary, we anticipate no individuals will die, only small numbers of individuals are likely to experience sublethal impacts from atrazine use, and that the species will experience an overall low level of indirect adverse effects resulting from atrazine impacts to habitat and food resources. As such, we conclude the overall risk of adverse effects to the Roy Prairie pocket gopher is low.

Species Conclusion

The Roy Prairie pocket gopher has high vulnerability based on factors such as its limited distribution and declining trends. The gopher's primary habitat includes prairie grasslands, although they may occur on lands with some agricultural uses, including crop production, pasture, and hay fields. Atrazine use sites and off-site areas that may be exposed to annual usage overlap with 25.9% of the species' range (0.1% overlap with use sites and 25.7% overlap with areas that may be exposed to atrazine in off-site areas from spray drift of runoff). Additional exposure is anticipated from non-agricultural uses of atrazine. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We anticipate dietary exposure will result in the highest levels of exposure, but even in the highest exposure scenarios (i.e., individuals predominantly consuming contaminated food directly on atrazine use sites), we expect reduced growth and reproduction, but no mortality of individuals. We do not expect morality or sublethal effects to individuals that are only exposed to atrazine in off-site areas, and there is no indication that individuals will occur on non-agricultural use sites. Thus, while exposure may occur in areas throughout the species' range, only a small portion overlaps with agricultural use sites where sublethal effects are expected. As such, we anticipate only a small number of individuals are likely to be exposed on use sites and experience direct adverse effects.

Pocket gophers are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. While we anticipate some impacts to sensitive plant species that serve as habitat components or

food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. We anticipate the loss of some plants that contribute to habitat elements and food resources for the pocket gopher, but that any indirect adverse effects to pocket gophers will be localized and minimal, with habitat structure and food availability to remain sufficient for individuals in exposed areas. In addition, required agricultural mitigations and existing practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plants and indirect effects to the species.

In summary, while there is high overlap of the range with areas likely to be exposed to atrazine, we anticipate no more than a small number of individuals are likely to experience adverse effects. We do not anticipate mortality from the consumption of contaminated plants or indirect effects from plant losses, although sublethal effects to growth and reproduction are likely for a small number of individuals that predominantly forage on plants on atrazine use sites (primarily agricultural use sites). Furthermore, the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat. We do not anticipate adverse effects from the proposed action will result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Roy Prairie pocket gopher.

References

U.S. Fish and Wildlife Service. 2022a. Recovery Plan for four subspecies of Mazama pocket gopher. Portland, Oregon. 61 pp.

U.S. Fish and Wildlife Service. 2022b. Species Biological Report for four subspecies of Mazama pocket gopher. Version 1.1. Lacey, Washington. 95 pp.

Integration and Synthesis Summary: Tenino pocket gopher

Scientific Name:	Common Name:	Entity ID:
Thomomys mazama tumuli	Tenino pocket gopher	8684

Conclusion: No Jeopardy

Species Range

Based on range map dated: 10-15-2021; Wherever found; *States within the range:* WA

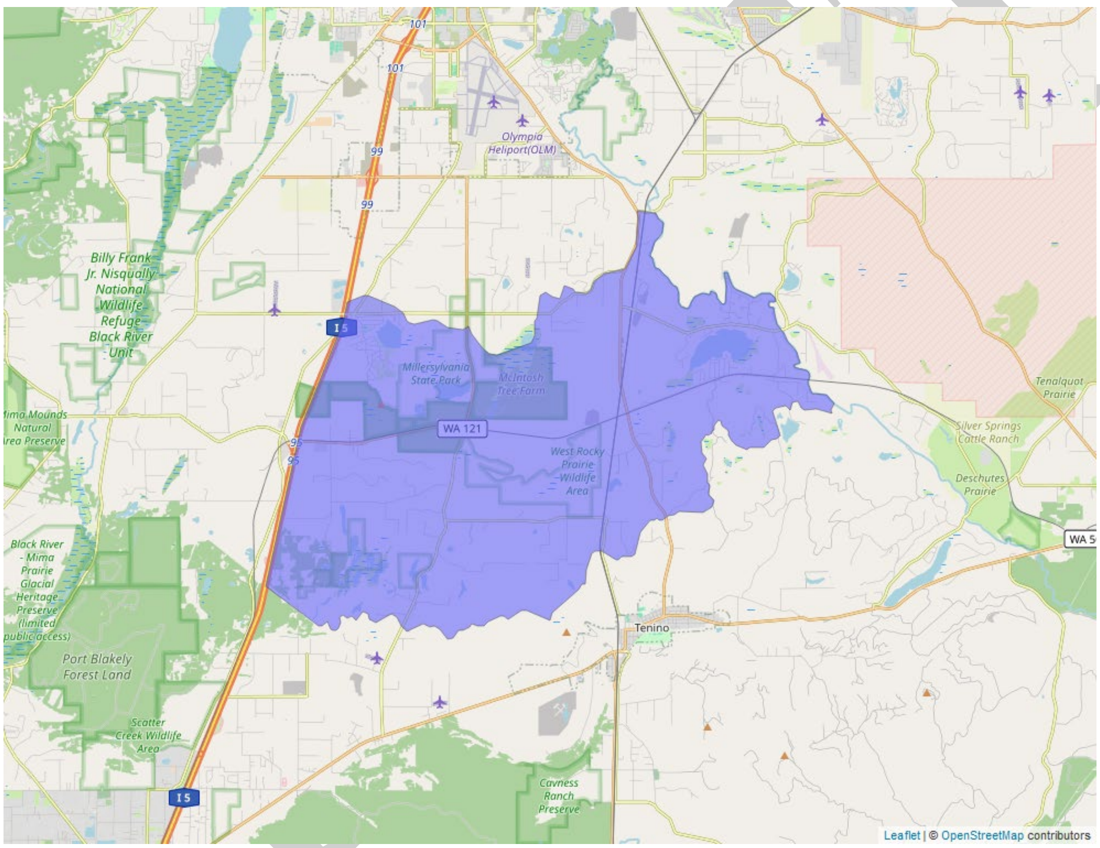

Figure 8. Range map of Tenino pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6290.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Distribution: Small, endemic, constrained, and/or isolated population(s)

Most recent 5-year review recommendation: No change in status

Most recently completed 5-year review: 9/28/2020

Number of populations: Single population

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Tenino pocket gophers are a subspecies of Mazama pocket gopher endemic to Thurston County, Washington. They are concentrated in well-drained, friable soils often associated with glacial outwash that form prairies and grasslands. Though they prefer prairie grassland habitats, they may occur on lands with some agricultural land uses, including crop production, pasture, and hay fields (USFWS 2022a). They are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. Pocket gophers are not known to occur where Douglas-fir (*Pseudotsuga menziesii*) or Scotch broom (Cytisus scoparius) have invaded.

As of 2020, their locations are categorized into two Recovery Units and only one has confirmed occupancy: Rocky Prairie (low resiliency; no population trends available and abundance believed to be low; not managed for pocket gophers) and West Rocky Prairie (low resiliency; pocket gophers are confirmed, but unknown if Teninos are present; some land managed for prairie habitat) (USFWS 2022b). Tenino pocket gophers are currently threatened by habitat loss, primarily caused by development (e.g., residential, road, and commercial) and woody plant encroachment, throughout the range of the subspecies. The action area is undergoing rapid urbanization. Industrial, light industrial, and residential land uses have steadily increased, and this trend is expected to continue. Paved areas, compacted soils, excavations, and encroaching shrubs and trees degrade the habitat value on most of the remaining unbuilt parcels. The result is intensive habitat fragmentation throughout the area and ongoing habitat loss. Fragmentation reduces the gopher's ability to disperse to the decreasing and shrinking patches of suitable habitat. Additionally, most sites used by Tenino pocket gophers require some level of management to maintain suitable habitat conditions. Fires historically maintained the early-successional habitats required by pocket gophers, but fire suppression encouraged woody plant encroachment and succession. As of 2014, the Tenino pocket gopher is not currently surrounded by properties subject to increasing development, and thus predation pressure for the Tenino pocket gopher is likely restricted to that of native predators, such as coyotes and birds of prey.

Unlike other pocket gophers, no military training occurs in the range of the Tenino subspecies of the Mazama pocket gopher. Tenino pocket gophers are at risk of poisoning and trapping as a pest species and effects of small and isolated populations (i.e., genetic concerns). Pesticides and herbicides may cause an individual threat to pocket gophers, but it is not considered a population-level threat (USFWS 2022a). We delineated one Service area and Reserve Priority Area for the Tenino pocket gopher to identify locations where impacts to the subspecies or its habitat may be mitigated or offset. We are also coordinating with Joint Base Lewis McChord to enhance their Army Compatible Use Buffer Program and south Puget Sound Sentinel Landscapes Program to benefit the species (USFWS 2022b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.3% of the species' range overlaps with agricultural use sites and 49.3% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 49.6% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 12).

Table 12. Agricultural use overlap and annual usage data (% Range Treated) for the Tenino pocket gopher.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	<0.1	9.1	9.1	<0.1	9.1	9.1
Vegetables and Ground Fruit (Sweet Corn)	0.2	31.0	31.2	0.2	31.0	31.2

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Other Grains (Sorghum & Sugarcane)	0	0.0	0.0	0	0.0	0.0
Other Orchards (Guava & Macadamia Nut)	0	0.0	0.0	0	0.0	0.0
Other Crops (Wheat-Corn-Fallow)	0	0.0	0.0	0	0.0	0.0
Other Crops (Wheat-Sorghum-Fallow)	0	0.0	0.0	0	0.0	0.0
Other Crops (Wheat-Fallow-Wheat)	0	0.0	0.0	0	0.0	0.0
Other Crops (Sod)	<0.1	9.3	9.3	<0.1	9.3	9.3
Total	**0.3**	**49.3**	**49.6**	**0.3**	**49.3**	**49.6**

Usage

Past usage data indicate that up to 49.6% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

Available life history information on the Tenino pocket gopher indicate that individuals are likely to occur on agricultural fields, including potential atrazine use sites. However, we anticipate only a small number of individuals are likely to occur on agricultural use sites as there is very low overlap between the species' range and on-field areas (i.e., agricultural fields only make up 0.3% of the species' range). Furthermore, as noted in the gopher's recovery plan, while herbicides and pesticides are generally considered a threat and may cause harm to individuals, the use of herbicides to control noxious weeds within the species' range is not considered a population-level threat, suggesting that individual occurrence on herbicide use sites is low.

Exposure from Non-Agricultural Uses

Based on available life history information, there is no indication that the Tenino pocket gopher is likely to occur on non-agricultural atrazine use sites, including residential lawns, turf, and golf courses. As such, we anticipate non-agricultural uses of atrazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

An individual gopher foraging on contaminated plant food resources directly on atrazine use sites can accumulate 149.8-653.5 mg atrazine/kg-bw, depending on the specific plant matter consumed. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consuming contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, pocket gophers foraging in off-site areas (i.e., areas adjacent to use sites exposed through spray drift or runoff) are not likely to accumulate more than low levels of atrazine,

resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate pocket gophers that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

The Tenino pocket gopher requires a diverse array of plant species as food resources and is known to consume a variety of plant parts (e.g., leaves, roots, bulbs, flower) from a wide range of plant species. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure (e.g., prairie meadow ecosystems) the species requires for its habitat. Similarly, while we anticipate atrazine use will negatively impact the abundance and availability of sensitive plant species that the pocket gopher relies on, we do not anticipate the entire vegetative community will be impacted and completely die off with atrazine use. Furthermore, conservation measures for agricultural uses (described above in the *Conservation Measures* section) will reduce the extent of area exposed to atrazine from spray drift and runoff as well as reduce the environmental exposure concentrations to a level that will result in no more than low levels of adverse effects to plant species. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate atrazine use will result in no more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is large extent of overlap between the species' range and atrazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on atrazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to atrazine in off-site areas (i.e., areas only exposed through spray drift or runoff) will not likely experience any adverse effects as exposure concentrations will be much lower in these adjacent areas. Given that only a very small portion of the species' range contains agricultural use sites (agricultural use sites occur in 0.3% of the range) and that there is no indication of individuals occurring in non-agricultural use sites, we anticipate only a small number of individuals are likely to be exposed on-site and experience direct adverse effects. Furthermore, the species' listing document includes a 4(d) rule exempting certain herbicide uses to control noxious weeds and invasive plants (e.g., when impacts to nontarget plants are avoided to the maximum extent practicable) and the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat, suggesting that individuals are not likely to occur directly on atrazine use sites and that only small numbers of individuals will experience sublethal adverse effects.

While we anticipate some impacts to sensitive plant species that serve as habitat components or food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. Required agricultural mitigations and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plant growth and indirect effects to the species.

In summary, we anticipate no individuals will die, only small numbers of individuals are likely to experience sublethal impacts from atrazine use, and that the species will experience an overall low level of indirect adverse effects resulting from atrazine impacts to habitat and food resources. As such, we conclude the overall risk of adverse effects to the Tenino pocket gopher is low.

Species Conclusion

The Tenino pocket gopher has high vulnerability based on factors such as its limited distribution and declining trends. The gopher’s primary habitat includes prairie grasslands, although they may occur on lands with some agricultural uses, including crop production, pasture, and hay fields. Atrazine use sites and off-site areas that may be exposed to annual usage overlap with 49.6% of the species' range (0.3% overlap with use sites and 49.3% overlap with areas that may be exposed to atrazine in off-site areas from spray drift of runoff). Additional exposure is anticipated from non-agricultural uses of atrazine. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We anticipate dietary exposure will result in the highest levels of exposure, but even in the highest exposure scenarios (i.e., individuals predominantly consuming contaminated food directly on atrazine use sites), we expect reduced growth and reproduction, but no mortality of individuals. We do not expect morality or sublethal effects to individuals that are only exposed to atrazine in off-site areas, and there is no indication that individuals will occur on non-agricultural use sites. Thus, while exposure may occur in areas throughout the species’ range, only a small portion overlaps with agricultural use sites where sublethal effects are expected. As such, we anticipate only a small number of individuals are likely to be exposed on use sites and experience direct adverse effects.

Pocket gophers are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. While we anticipate some impacts to sensitive plant species that serve as habitat components or

food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. We anticipate the loss of some plants that contribute to habitat elements and food resources for the pocket gopher, but that any indirect adverse effects to pocket gophers will be localized and minimal, with habitat structure and food availability to remain sufficient for individuals in exposed areas. In addition, agricultural conservation measures and existing practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plants and indirect effects to the species.

In summary, while there is high overlap of the range with areas likely to be exposed to atrazine, we anticipate no more than a small number of individuals are likely to experience adverse effects. We do not anticipate mortality from the consumption of contaminated plants or indirect effects from plant losses, although sublethal effects to growth and reproduction are likely for a small number of individuals that predominantly forage on plants on atrazine use sites (primarily agricultural use sites). Furthermore, the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat. We do not anticipate adverse effects from the proposed action will result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Tenino pocket gopher.

References

U.S. Fish and Wildlife Service. 2020. 5-Year Review, Mazama Pocket Gophers: Olympia, Roy Prairie, Tenino, and Yelm pocket gophers (*Thomomys mazama pugetensis, T. m. glacialis, T. m. tumuli,* and *T. m. yelmensis*). Washington Fish and Wildlife Office, Lacey, Washington. 9 pp.

U.S. Fish and Wildlife Service. 2022a. Recovery Plan for four subspecies of Mazama pocket gopher. Portland, Oregon. 61 pp.

U.S. Fish and Wildlife Service. 2022b. Species Biological Report for four subspecies of Mazama pocket gopher. Version 1.1. Lacey, Washington. 95 pp.

Integration and Synthesis Summary: Texas kangaroo rat

Scientific Name:	**Common Name:**	**Entity ID:**
Dipodomys elator	Texas kangaroo rat	4567

Conclusion: No Jeopardy

Species Range

Based on range map dated: 05-21-2021; Wherever found; *States within the range:* OK, TX

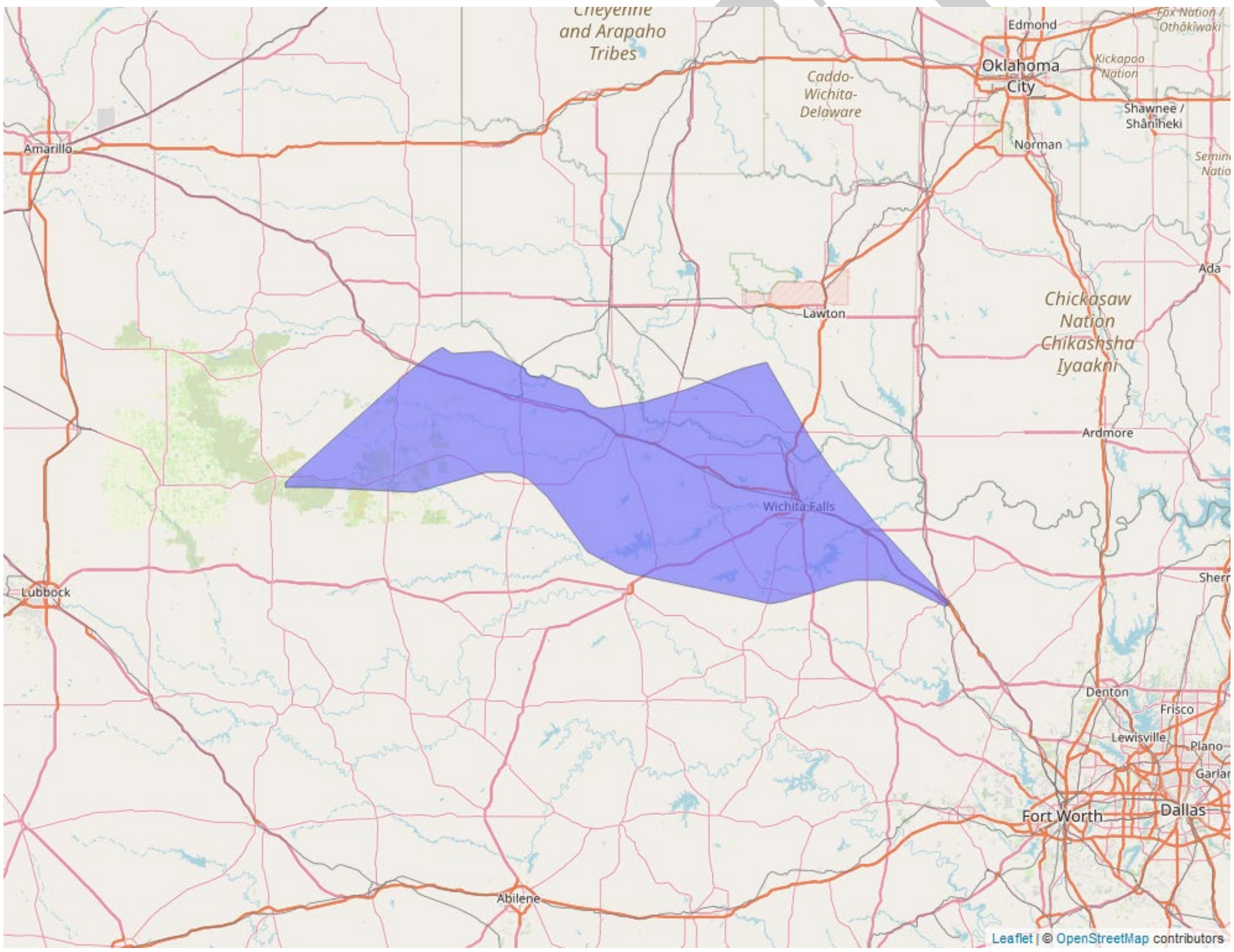

Figure 9. Range map of Texas kangaroo rat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2985.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Proposed Endangered

Most recent 5-year review recommendation: N/A

Most recently completed 5-year review: None are available for this species

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Single population

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Texas kangaroo rat is a nocturnal rodent found in Clay County, Texas. Their habitat generally has (1) loose, friable soils associated with mounds or physical supports like shrub and cactus roots, rocks, upturned rootballs, or manmade structures, (2) bare ground, and (3) short grasses. The rat digs a subterranean burrow system within loam/clay-loam soils that are used for shelter, reproduction, and food storage. They are granivores that use their long hind feet and long tail to jump and escape predators. They were historically found in 11 counties in Texas (i.e., Archer, Baylor, Childress, Clay, Cottle, Foard, Hardeman, Montague, Motley, Wichita, Wilbarger) and 2 counties in Oklahoma (Comanche and Cotton). As of 2021, the Texas kangaroo rat is considered extirpated from Oklahoma. During surveys between 2015-2018, they were found across four analysis units (111,000 ha) of habitat in Texas. The current condition of all occupied areas is low or moderate (USFWS 2021). The primary threat to Texas kangaroo rats is habitat loss and degradation. Their preferred habitat is associated with disturbance, which used to occur from the presence of American bison, black-tailed prairie dogs, and periodic wildfires. Historically, domestic cattle often replaced bison and prairie dogs and changed the disturbance regime. Conversion of native rangeland to row crops also causes direct loss of habitat. Paved roads may create a barrier to rat movement, but unpaved roads provide non-traditional habitat where the species is often found. Woody plant encroachment threatens the persistence of grassland and savanna ecosystems required by this species. Effects of climate change and fire suppression may also affect the species and its habitat (USFWS 2021).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 9.2% of the species' range overlaps with agricultural use sites and 100% of the species' range[8] overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 100% overlap[8] between the species' range and the agricultural footprint of atrazine use sites (Table 13).

Table 13. Agricultural use overlap and annual usage data (% Range Treated) for the Texas kangaroo rat.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	1	15.8	16.8	1	15.8	16.8
Vegetables and Ground Fruit (Sweet Corn)	0.2	3.5	3.8	0.2	3.5	3.8
Other Grains (Sorghum & Sugarcane)	3.8	36.1	39.9	3.8	36.1	39.9
Other Orchards (Guava & Macadamia Nut)	0	0	0	0	0	0
Other Crops (Wheat-Corn-Fallow)	0	0	0	0	0	0
Other Crops (Wheat-Sorghum-Fallow)	4.1	51.3	55.4	1.6	21	22.5

[8] Total overlap is capped at 100%.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Other Crops (Wheat-Fallow-Wheat)	0	0	0	0	0	0
Other Crops (Sod)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**9.2**	**100[8]**	**100[8]**	**6.6**	**76.4**	**83**

Usage

Past usage data indicate that up to 83% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

The Texas kangaroo rate typically occupies areas with loose soil and its burrows are usually associated with a minor topographic uplift (e.g., prairie mounds) or physical support, including woody vegetation (roots of shrubs and cacti) and other natural (e.g., rocks, upturned rootballs) or manmade structures. Common characteristics of habitat include the presence of bare ground and short grasses (often expressed as a lack of dense vegetation) and structures to support burrows, which are predominantly mesquite and lotebush as well as manmade structures (e.g., fence rows, brush piles, abandoned equipment, artificial terraces, and buildings with loose soil at the foundation). As such, we anticipate individuals are not likely to forage significantly on agricultural use sites.

Exposure from Non-Agricultural Uses

As noted above, Texas kangaroo rats are known to occur in areas containing manmade structures, indicating that individuals may be present in non-agricultural atrazine use sites and that these use sites may appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

The Texas kangaroo rat is an opportunistic seed gatherer but may also consume occasionally consume fruits and forb flowers. Dietary exposures to individual kangaroo rats can range from 12.0-677.4 mg atrazine/kg-bw, depending on the type of plant matter consumed. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. In contrast, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations. However, given that the Texas kangaroo rat primarily consumes seeds, which accumulate much lower levels of atrazine, we anticipate most individuals exposed directly on use sites will accumulate no more than low levels of atrazine, resulting in no more than low levels of sublethal adverse effects.

Kangaroo rats foraging in off-site areas (i.e., areas adjacent to use sites exposed through spray drift or runoff) are not likely to accumulate more than low levels of atrazine, resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate individuals that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the vegetative habitat components (e.g., woody vegetation, shrub roots, cacti) and will not impact abiotic features (e.g., prairie mounds, rocks, loose soil) the species requires for its habitat. Similarly, while we anticipate atrazine use will negatively impact the abundance and availability of sensitive plant species that the kangaroo rat relies on, we do not anticipate the entire vegetative community will be impacted and completely die off with atrazine use. Furthermore, conservation measures for agricultural uses (described above in the *Conservation Measures* section) will reduce the extent of area exposed to atrazine from spray drift and runoff as well as reduce the environmental exposure concentrations to a level that will result in no more than low levels of adverse effects to plant species. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. Given that the species can consume a wide range of plant matter from many different plant species, the required agricultural mitigations, and the low likelihood of off-site exposure from non-agricultural uses, we anticipate there will still be sufficient food resources available for the Texas kangaroo rat even with impacts to sensitive plant species from atrazine use.

Effects of the Action Summary

There is a high extent of overlap between the species' range and agricultural atrazine use sites. However, we do not anticipate more than a small number of individuals are likely to occur directly on atrazine use sites, given that these areas are not likely to contain the necessary features to support individuals. In cases where an individual does forage extensively directly on atrazine use sites, we anticipate most individuals are not likely to accumulate more than low levels of atrazine that will not result in mortality or more than low levels of sublethal effect given their preferred food resource (seeds) do not accumulate high levels of atrazine. Similarly, individuals that forage on plant matter in off-site areas are not likely to accumulate more than low levels of atrazine and are not likely to experience adverse effects. We expect required agricultural mitigation measures and existing protective practices employed in non-agricultural use sites will greatly reduce the extent of off-site exposure and the anticipated exposure concentrations, which will result in no more than low levels of adverse effects to the plant species and communities that provide food and habitat resources for the species. Thus, despite a high level of overlap with use sites, we anticipate only a small number of individuals are likely to accumulate more than low levels of atrazine and experience more than low levels of sublethal adverse effects. As such, we conclude the overall risk of adverse effects to the species is low.

Species Conclusion

The Texas kangaroo rat has high vulnerability based on factors such as its status (i.e., proposed endangered), limited distribution, and declining trends. Texas kangaroo rats dig subterranean burrow systems for shelter, reproduction, and food storage in loose, friable soils associated with mounds or physical supports (i.e., like shrub and cactus roots, rocks, upturned rootballs, or manmade structures), bare ground, and short grasses associated with grassland and savanna ecosystems. The species does not typically burrow in agricultural crops but may forage on field edges. They may also use some non-agricultural areas that may include atrazine non-agricultural use sites, although they are not known to occur on nurseries or turf (i.e., golf courses and lawns). The Texas kangaroo rat is a granivore, primarily consuming a variety of seeds, although they also consume fruits and flowers of forbs, and rarely insects.

Atrazine agricultural use sites and off-site areas that may be exposed to annual usage overlap with 100% of the species' range (9.2% overlap with use sites with the rest exposed to atrazine in off-site areas from spray drift of runoff). Past usage data indicate that up to 6.6% of the range has been treated with atrazine on agricultural use sites annually, exposing up to 83% of the species' range on use sites and from off-site transport annually, with up to the entire range likely to be exposed due to variations in use sites where annual usage may occur within the overlapping area over the project duration. Additional exposure is anticipated from non-agricultural uses of atrazine. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We anticipate dietary exposure will result in the highest levels of exposure, but even in the highest exposure scenarios (i.e., individuals consuming contaminated food directly on atrazine use sites immediately after applications are made), we expect reduced growth and reproduction, but no mortality of individuals. We do not expect morality or sublethal effects to individuals that are only exposed to atrazine in off-site areas. Exposure may occur in a large portion of the species' range, with a moderate portion of the range overlapping with agricultural use sites where sublethal effects are expected from atrazine usage on agricultural use sites and the potential for some additional exposure on non-agricultural use sites. However, we do not anticipate more than a small number of individuals are likely to occur directly on atrazine use sites. In addition, individuals that do forage extensively directly on atrazine use sites are not expected to die or experience more than low levels of sublethal effects, especially given that their preferred food resource (seeds) accumulates even lower levels of atrazine than other types of plant-based food. We do not anticipate individuals that forage off-site are likely to experience any mortality or sublethal adverse effects. As such, we anticipate a small number of individuals are likely to be exposed on use sites and experience direct adverse effects.

While we anticipate some impacts to sensitive plant species that serve as habitat components or food resources for the Texas kangaroo rat, we do not anticipate the entire plant community will die as a result of atrazine usage. We anticipate the loss of some plants that contribute to habitat elements and food resources for the kangaroo rat, but habitat structure and food availability will remain sufficient for individuals in exposed areas. In addition, required agricultural mitigations and existing practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plants and indirect effects to the species.

In summary, while a high portion of the species' range overlaps with areas that could be exposed to atrazine on use sites and in off-site areas, and a high number of individuals are likely to be exposed to atrazine based on atrazine usage expected in the range, we do not anticipate more than a small number of individuals are likely to be adversely affected because very few individuals are expected to forage directly on atrazine use sites and atrazine levels in seeds (a primary food item for this species) is expected to be lower than other plant-based foods. Mortality of individuals that do forage directly on use sites is not anticipated, although sublethal effects to growth and reproduction are likely in localized areas for a small number of individuals that predominantly forage on atrazine agricultural and non-agricultural use sites. Direct adverse effects in off-site areas are not anticipated. Indirect effects on use sites or in off-site areas from plant losses that may be used for habitat and forage are also not anticipated. As such, we do not anticipate adverse effects from the proposed action will result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Texas kangaroo rat.

References

U.S. Fish and Wildlife Service. 2021. Species Status Assessment Report for the Texas Kangaroo Rat. Version 1.1. Arlington, Texas. 122 pp.

Integration and Synthesis Summary: Virginia big-eared bat

Scientific Name:	Common Name:	Entity ID:
Corynorhinus (=Plecotus) townsendii virginianus	Virginia big-eared bat	27

Conclusion: No Jeopardy

Species Range

Based on range map dated: 04-01-2021; Wherever found; *States within the range:* KY, NC, TN, VA, WV

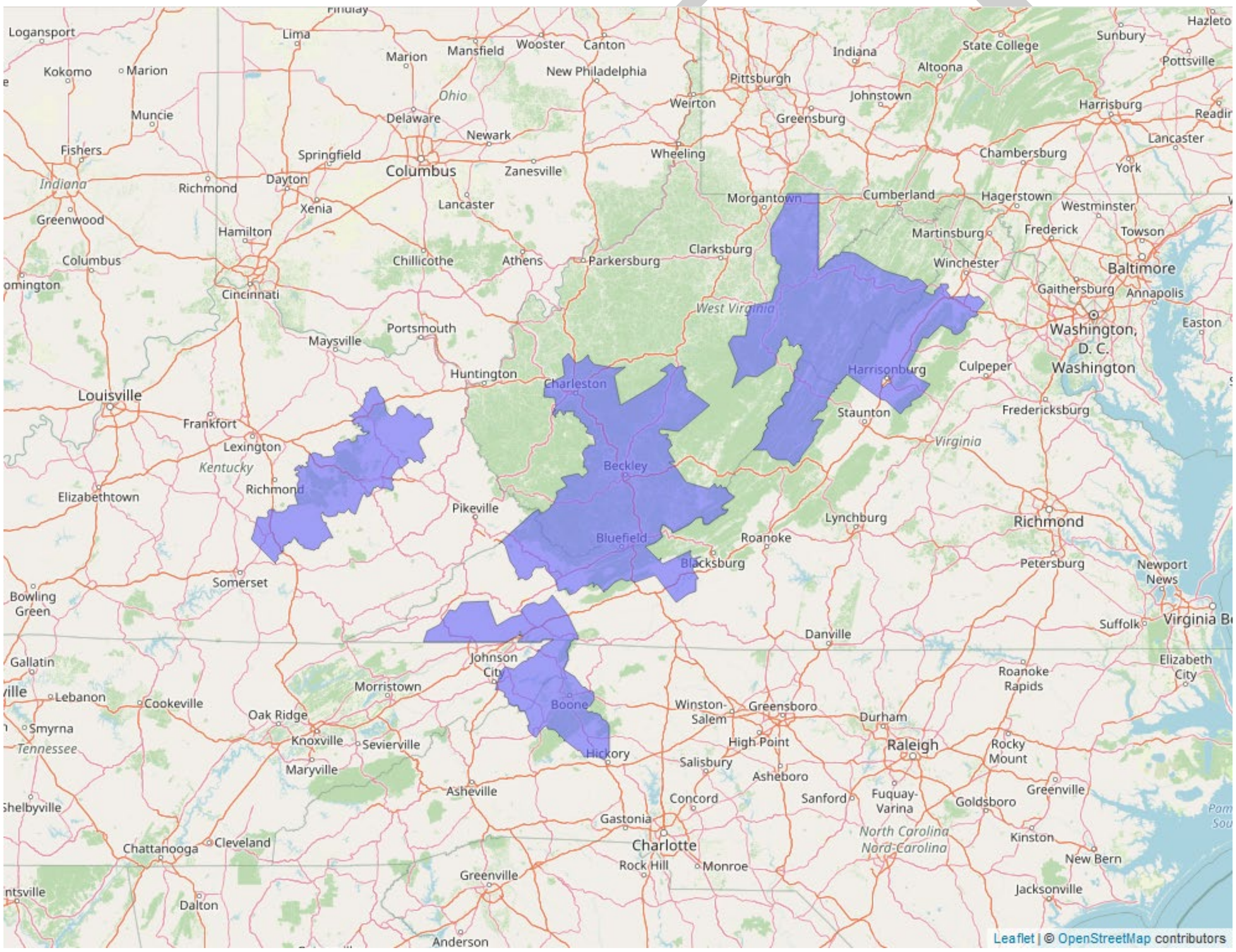

Figure 10. Range map of Virginia big-eared bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/8369.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Endangered

Most recent 5-year review recommendation: No change in status

Most recently completed 5-year review: 2/12/2019

Distribution: Species/Populations neither constrained nor widespread

Number of populations: Multiple populations (few)

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Virginia big-eared bat is a colonial species that congregates in groups in caves or cave-like habitats (e.g., abandoned mine portals, rock crevices) for roosting and raising young in the summer, breeding in the fall, and hibernating during the winter. The species may use different sites during these different seasons and can migrate up to 40 miles when moving between sites. Virginia big-eared bats are foraging specialists with lepidopterans (moths) making up greater than 80 percent of the prey. Foraging areas are generally located within a few miles of roost sites and consist of a mix of primarily forested habitats interspersed with open fields/hay fields, cliff lines, rock shelters or outcrops, riparian areas, and water sources such as streams, ponds, and wetlands. The current range of the species includes Kentucky, Maryland, North Carolina, Tennessee, Virginia, and West Virginia. Archeological records suggest that the historical range of the species once also included Pennsylvania (USFWS 2019, USFWS 2024).

In 2018, the total population estimate for the species was approximately 19,500 bats in hibernacula and 11,800 within the known maternity sites. The large majority of these bats are currently concentrated in 10 hibernacula and 18 maternity sites distributed among 4 genetically distinct populations located in geographically distinct regions (USFWS 2019, USFWS 2024). Of hibernating Virginia big-eared bats, approximately 14,100 (72%) use unprotected caves. Six of the ten occupied caves have documented long-term protection (i.e., State resource agencies, U.S. Forest Service, The Nature Conservancy). About 69% of the range wide population hibernates in the Hellhole cave in West Virginia, which does not have long-term protection and is threatened by limestone quarry development. Of the 18 maternity sites identified for the species, 9 are protected. However, some protected sites are still subject to human threats, like vandalism and illegal access (USFWS 2019).

Total population numbers increased 30% and 28% between 2014-2019 for hibernating and maternity sites, respectively. However, numbers within a single cave, Hellhole, are driving this overall increase. Numbers of bats hibernating within Hellhole increased by 5,853 bats, while the overall population increased by only 4,397 bats. Outside of Hellhole, there was some variation among regions and within specific caves. Six of the 10 major hibernacula (60%) declined between 2014-2019, as have 5 of the 18 major maternity sites (28%) (USFWS 2019).

Virginia big-eared bats require a narrow range of microclimatic conditions (e.g., temperatures, humidity). This makes protecting and maintaining suitable sites highly important to the recovery of the species. The species is acutely sensitive to disturbance within sites, and can have increased mortality, have reduced reproductive success, or abandon sites completely as a result of disturbance or alteration of its habitats. This sensitivity and the species' concentration in a limited number of sites make it highly vulnerable to threats. The species is also threatened by the degradation and fragmentation of foraging areas, activities that could damage or degrade surface or subsurface areas of caves, barriers to migration and activities that reduce connectivity between roosting and foraging areas, as well as sources of direct mortality such as predation, roads, wind farms, and oil and brine pits. The effects of small population size and low genetic variability may also be threats (USFWS 2019, USFWS 2024). White nose syndrome may pose a threat to the species and it has been found in occupied caves and on hibernating Virginia big-eared bats. However, as of 2019, no Virginia big-eared bats have been documented with white nose syndrome and researchers are unsure why the species appears to not be susceptible (USFWS 2019).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 1.5% of the species' range overlaps with agricultural use sites and 26.7% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 28.2% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 14).

Table 14. Agricultural use overlap and annual usage data (% Range Treated) for the Virginia big-eared bat.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	1.4	22.3	23.6	1.4	22.3	23.6
Vegetables and Ground Fruit (Sweet Corn)	<0.1	1.6	1.6	<0.1	1.5	1.5
Other Grains (Sorghum & Sugarcane)	0.1	2.0	2.2	0.1	2.0	2.2
Other Orchards (Guava & Macadamia Nut)	0	0.0	0.0	0	0.0	0.0
Other Crops (Wheat-Corn-Fallow)	0	0.0	0.0	0	0.0	0.0
Other Crops (Wheat-Sorghum-Fallow)	<0.1	0.6	0.6	<0.1	0.6	0.6
Other Crops (Wheat-Fallow-Wheat)	0	0.0	0.0	0	0.0	0.0
Other Crops (Sod)	<0.1	0.2	0.2	<0.1	0.2	0.2
Total	**1.5**	**26.7**	**28.2**	**1.5**	**26.6**	**28.1**

Usage

Past usage data indicate that up to 28.1% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

The Virginia big-eared bat is known to forage close to its roost sites, which can be interspersed with agricultural areas. While the species primarily forages in forested habitats, their occasional presence in and near agricultural areas indicate that some individuals may be exposed to atrazine on-field in addition to areas adjacent to use sites.

Exposure from Non-Agricultural Uses

Available information on the species suggests that individuals may travel through and forage in developed areas, including residential or rural development, and may even roost in man-made structures for short periods of time. As such, we anticipate individuals may also be exposed to atrazine on non-agricultural use sites as well.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

The Virginia big-eared bat is an insectivore that primarily feeds on small moths, though the species is also known to consume other flying insect species. Dietary exposures to individual bats can range from 69.5-139.1 mg atrazine/kg-bw, depending on the type of use site it forages in. These dosages represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, arthropod prey exposed to atrazine in off-site areas (i.e., through spray drift or runoff) are not likely to accumulate more than low levels of atrazine, resulting in no more than low levels of exposures to individual bats that feed on these off-site arthropod prey. We do not anticipate bats that consume prey off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

Available atrazine toxicity studies in terrestrial invertebrates indicate that atrazine is not likely to cause mortality or sublethal adverse effects to exposed arthropods. As such, we expect no more than low levels of impacts to invertebrate prey populations that will not lead to declines in prey abundance, and therefore will not likely result in more than low levels of indirect adverse effects to the species, if any. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure the species requires for its habitat (e.g., structures for roosting). Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. We anticipate atrazine use in non-agricultural areas will not result in more than low levels of adverse effects to plant growth and survival. As such, we do not anticipate effects to sensitive exposed plants to cause changes to vegetative community functions that would result in more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is a large extent of overlap between the species' range and atrazine use sites and their associated areas of off-site transport (e.g., spray drift and runoff areas). While we do not anticipate individuals that forage on contaminated arthropod prey will experience any mortality, we anticipate individuals foraging primarily on agricultural and non-agricultural atrazine use sites will experience sublethal adverse effects, including reduced growth and reproduction. In contrast, we do not anticipate individuals that forage away from atrazine use sites will experience more than low levels of direct adverse effects, if any. We do not anticipate atrazine use will impact the availability of arthropod prey for individuals to forage on, nor will it impact the availability of plant-based habitat features, such as tress for roosting. Based on the potential sublethal impact to the species, we conclude the overall risk of adverse effects to the Virginia big-eared bat is medium.

Species Conclusion

The Virginia big-eared bat has high vulnerability based on factors such as its status (i.e., endangered), few populations and declining trends. It is an insectivorous species that preferentially forages on lepidopterans (moths). Foraging areas are generally located within a few miles of roost sites and consist of a mix of primarily forested habitats interspersed with open fields/hay fields, cliff lines, rock shelters or outcrops, riparian areas, and water sources such as streams, ponds, and wetlands. The degradation and fragmentation of foraging areas has been identified as a threat to the species. The species may use different sites during different seasons and can migrate up to 40 miles when moving between sites. While the species primarily forages in forested habitats, their occasional presence in and near agricultural areas indicate that some individuals may be exposed to atrazine on-field in addition to areas adjacent to use sites. Individuals may also travel through and forage in developed areas, and may even roost in man-made structures for short periods of time. As such, we anticipate individuals may also be exposed to atrazine on and adjacent to non-agricultural use sites.

Atrazine agricultural use sites and off-site areas that may be exposed overlap with 28.1% of the species' range (1.5% overlap with use sites and 26.7% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 28.1% of the range has been treated with atrazine on agricultural use sites and from off-site transport annually (1.5% and 26.6%, respectively), with a larger portion of the range (26.6% in off-site areas due to variations in use sites where annual usage may occur within the overlapping area) likely to be exposed from agricultural uses over the project duration. Additional exposure is anticipated from non-agricultural use sites. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We do not expect toxicity from atrazine to rise to the level of mortality, but we anticipate impacts to growth and reproduction for individuals that forage extensively on use sites. We do not anticipate individuals that forage away from atrazine use sites will experience more than low levels of direct adverse effects, if any. We also do not expect atrazine exposure to result in any significant decline in prey abundance or the availability of plant-based habitat features, and therefore we expect little to no indirect effects to the species.

In summary, the overlap between the Virginia big-eared bat's range and atrazine use sites and off-site areas is large, and past usage data indicate high levels of exposure from usage is likely. As such, we anticipate a high number of individuals will be exposed to atrazine on use sites and in off-site areas. However, adverse effects to bats from foraging extensively on atrazine use sites is only anticipated in a small part of the range due to the low overlap with agricultural use sites and low levels of anticipated foraging directly on non-agricultural use sites. We do not anticipate direct mortality, but a small number of individuals that extensively forage on atrazine agricultural and non-agricultural use sites are likely to experience impacts to fitness related to growth and reproduction. We do not anticipate such adverse effects would result in species-level effects, as this a wide-ranging species with multiple populations that appear to be stable. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Virginia big-eared bat.

References

U.S. Fish and Wildlife Service. 2024. U.S. Fish and Wildlife Service Recovery Plan Amendment for the Virginia Big-Eared Bat (*Corynorhinus townsendii virginianus*). Davis, West Virginia. 20 pp.

U.S. Fish and Wildlife Service. 2019. Virginia Big-Eared Bat (*Corynorhinus townsendii virginianus*) 5-year Review: Summary and Evaluation. Elkins, West Virginia. 45 pp.

Integration and Synthesis Summary: Yelm pocket gopher

Scientific Name:	Common Name:	Entity ID:
Thomomys mazama yelmensis	Yelm pocket gopher	8685

Conclusion: No Jeopardy

Species Range

Based on range map dated: 01-18-2023; Wherever found; *States within the range:* WA

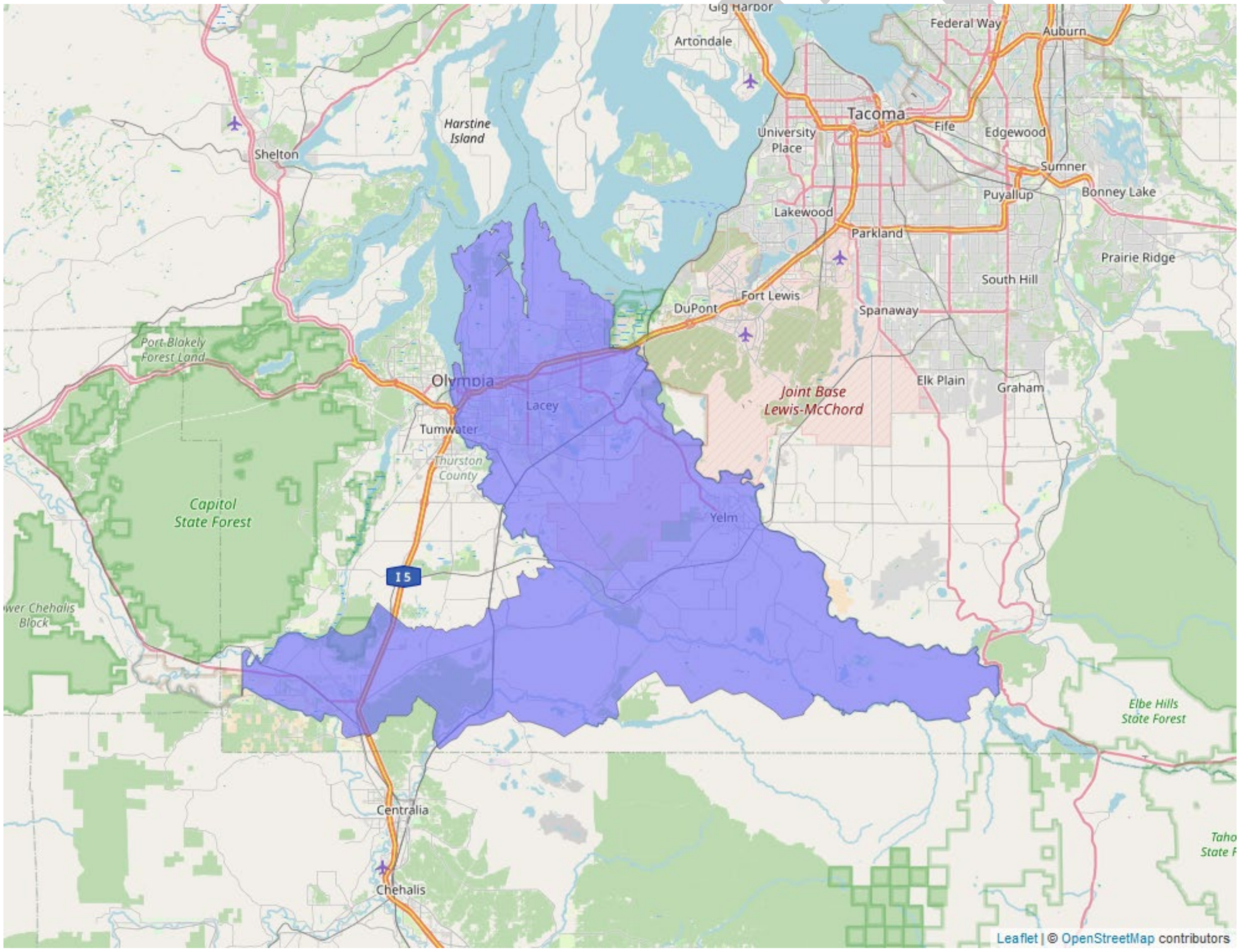

Figure 11. Range map of Yelm pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7257.

Vulnerability

As mentioned in the Introduction, vulnerability considers the present and likely future condition of the species to determine its vulnerability to additional stressors. In making our jeopardy determination, vulnerability of the species is a function not only of its status, but also the environmental baseline and cumulative effects. These are summarized below for this species.

Summary of Status

Listing status: Threatened

Most recent 5-year review recommendation: No change in status

Most recently completed 5-year review: 9/28/2020

Distribution: Small, endemic, constrained, and/or isolated population(s)

Number of populations: Single population

Species trends: Declining population(s) - one or more populations declining

Pesticides noted in Service documents as a threat to the species: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Yelm pocket gophers are a subspecies of Mazama pocket gopher endemic to Thurston County, Washington. They are concentrated in well-drained, friable soils often associated with glacial outwash that form prairies and grasslands. Though they prefer prairie grassland habitats, they may occur on lands with some agricultural land uses, including crop production, pasture, and hay fields (USFWS 2022a). They are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. Pocket gophers are not known to occur where Douglas-fir (*Pseudotsuga menziesii*) or Scotch broom (*Cytisus scoparius*) have invaded.

As of 2020, their locations are categorized into three Recovery Units: YPG-North (low resiliency; no population trends available; not managed for pocket gophers), YPG-East (low-high resiliency; no population trends available but believed to be high; some land managed for prairie habitat), and YPG-South (low-moderate resiliency; some survey data available and abundance believed to be high in two areas; some land managed for prairie habitat) (USFWS 2022b). Yelm pocket gophers were translocated to Wolf Haven and West Rocky Prairie Wildlife Area between 2005-2008 from YPG-North. They are currently threatened by habitat loss, primarily caused by development (e.g., residential, road, and commercial) and woody plant encroachment, throughout the range of the subspecies. The action area is undergoing rapid urbanization. Industrial, light industrial, and residential land uses have steadily increased, and this trend is expected to continue. Paved areas, compacted soils, excavations, and encroaching shrubs and trees degrade the habitat value on most of the remaining unbuilt parcels. The result is intensive habitat fragmentation throughout the action area and ongoing habitat loss. Fragmentation reduces the gopher's ability to disperse to the decreasing and shrinking patches of suitable habitat. Joint Base Lewis-McChord committed to operational restrictions on military training areas to avoid and minimize potential negative impacts to Yelm pocket gophers on portions of the base. Additionally, most sites used by Yelm pocket gophers require some level of management to maintain suitable habitat conditions. Fires historically maintained the early-successional habitats required by Yelm pocket gophers, but fire suppression encouraged woody plant encroachment and succession. Predation is also a significant population-level and ongoing threat, especially from domestic animals associated with residential development and recreation (i.e., feral cats, dogs). Yelm pocket gophers are also at risk of poisoning and trapping as a pest species, direct mortality and harm from military training, and effects of small and isolated populations (i.e., genetic concerns). Pesticides and herbicides may cause an individual threat to Yelm pocket gophers, but they are not considered population-level threats (USFWS 2022a).

We delineated three Service areas and Reserve Priority Areas for the Yelm pocket gopher to identify locations where impacts to the subspecies or its habitat may be mitigated or offset. There are twelve Habitat Conservation Plans in the species range, substantial planning for additional plans, a conservation bank in the Yelm pocket gopher-South Service Area, and provisions of grants for acquisition of several hundred acres of conservation lands or easements in the Yelm pocket gopher's range. We are also coordinating with Joint Base Lewis McChord to enhance their Army Compatible Use Buffer Program and south Puget Sound Sentinel Landscapes Program to benefit the species (USFWS 2022b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.8% of the species' range overlaps with agricultural use sites and 52.9% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff). In total, there is up to 53.7% overlap between the species' range and the agricultural footprint of atrazine use sites (Table 15).

Table 15. Agricultural use overlap and annual usage data (% Range Treated) for the Yelm pocket gopher.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	0.2	13.0	13.1	0.2	13.0	13.1
Vegetables and Ground Fruit (Sweet Corn)	0.4	25.8	26.2	0.4	25.8	26.2
Other Grains (Sorghum & Sugarcane)	0.0	0.0	0.0	0.0	0.0	0.0
Other Orchards (Guava & Macadamia Nut)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Corn-Fallow)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Sorghum-Fallow)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Wheat-Fallow-Wheat)	0.0	0.0	0.0	0.0	0.0	0.0
Other Crops (Sod)	0.3	14.1	14.4	0.3	14.1	14.4
Total	**0.8**	**52.9**	**53.7**	**0.8**	**52.9**	**53.7**

Usage

Past usage data indicate that up to 53.7% of the species' range has been treated with atrazine annually from agricultural uses.

Additional Exposure Considerations

Available life history information on the Yelm pocket gopher indicate that individuals are likely to occur on agricultural fields, including potential atrazine use sites. However, we anticipate only a small number of individuals are likely to occur on agricultural use sites as there is very low overlap between the species' range and on-field areas (i.e., agricultural fields only make up 0.8%

of the species' range). Furthermore, as noted in the gopher's recovery plan, while herbicides and pesticides are generally considered a threat and may cause harm to individuals, the use of herbicides to control noxious weeds within the species' range is not considered a population-level threat, suggesting that individual occurrence on herbicide use sites is low.

Exposure from Non-Agricultural Uses

Based on available life history information, there is no indication that the Yelm pocket gopher is likely to occur on non-agricultural atrazine use sites, including residential lawns, turf, and golf courses. As such, we anticipate non-agricultural uses of atrazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the atrazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer for ground applications and a 170-foot spray drift buffer for aerial applications and three runoff mitigation points for all agricultural uses of atrazine. We expect these measures will reduce the environmental concentration of atrazine by up to an order of magnitude (i.e., up to a 90% reduction in atrazine residues in spray drift and runoff), reducing both the extent of areas exposed to spray drift and runoff and decreasing the exposure concentration in these off-site areas.

Effects of the Action: Toxicity

Direct Effects

For listed terrestrial animal species, we anticipate dietary exposure will result in the highest levels of exposure. Thus, we focus our analyses on dietary exposure for these species as this exposure will result in the largest adverse effects to exposed individuals. While individuals may be exposed through other routes (e.g., dermal exposure, inhalation, drinking water), we anticipate these routes of exposure will result in much lower levels of exposures to individuals and will not significantly contribute to the overall exposure and resulting effects to individuals.

An individual gopher foraging on contaminated plant food resources directly on atrazine use sites can accumulate 149.8-653.5 mg atrazine/kg-bw, depending on the specific plant matter consumed. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consuming contaminated food directly on atrazine use sites immediately after applications are made). This level of exposure is not likely to result in any mortality of individuals as these exposure levels are well below the level where any toxicity studies have observed any mortality in terrestrial animals. However, available toxicity data in mammals have shown sublethal adverse effects, including adverse effects to growth (e.g., reduced body weight, body weight gain, and food consumption) and potential reproductive effects, including reduced reproductive organ weight, are likely to occur at these exposure concentrations.

In contrast, pocket gophers foraging in off-site areas (i.e., areas adjacent to use sites exposed through spray drift or runoff) are not likely to accumulate more than low levels of atrazine, resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate pocket gophers that consume vegetation off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

The Yelm pocket gopher requires a diverse array of plant species as food resources and is known to consume a variety of plant parts (e.g., leaves, roots, bulbs, flower) from a wide range of plant species. While we anticipate off-site transport of atrazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of atrazine will destroy or limit the availability of the complex vegetative structure (e.g., prairie meadow ecosystems) the species requires for its habitat. Similarly, while we anticipate atrazine use will negatively impact the abundance and availability of sensitive plant species that the pocket gopher relies on, we do not anticipate the entire vegetative community will be impacted and completely die off with atrazine use. Furthermore, conservation measures for agricultural uses (described above in the *Conservation Measures* section) will reduce the extent of area exposed to atrazine from spray drift and runoff as well as reduce the environmental exposure concentrations to a level that will result in no more than low levels of adverse effects to plant species. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of atrazine (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 concentration of atrazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate atrazine use will result in no more than low levels of indirect adverse effects to the species.

Effects of the Action Summary

There is large extent of overlap between the species' range and atrazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on atrazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to atrazine in off-site areas (i.e., areas only exposed through spray drift or runoff) will not likely experience any adverse effects as exposure concentrations will be much lower in these adjacent areas. Given that only a very small portion of the species' range contains agricultural use sites (agricultural use sites occur in 0.8% of the range) and that there is no indication of individuals occurring in non-agricultural use sites, we anticipate only a small number of individuals are likely to be exposed on-site and experience direct adverse effects. Furthermore, the species' listing document includes a 4(d) rule exempting certain herbicide uses to control noxious weeds and invasive plants (e.g., when impacts to nontarget plants are avoided to the maximum extent practicable) and the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat, suggesting that individuals are not likely to occur directly on atrazine use sites and that only small numbers of individuals will experience sublethal adverse effects.

While we anticipate some impacts to sensitive plant species that serve as habitat components or food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. Required agricultural mitigations and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plant growth and indirect effects to the species.

In summary, we anticipate no individuals will die, only small numbers of individuals are likely to experience sublethal impacts from atrazine use, and that the species will experience an overall low level of indirect adverse effects resulting from atrazine impacts to habitat and food resources. As such, we conclude the overall risk of adverse effects to the Yelm pocket gopher is low.

Species Conclusion

The Yelm pocket gopher has high vulnerability based on factors such as its limited distribution and declining trends. The gopher's primary habitat includes prairie grasslands, although they may occur on lands with some agricultural uses, including crop production, pasture, and hay fields. Atrazine use sites and off-site areas that may be exposed to annual usage overlap with 53.7% of the species' range (0.8% of the range is on agricultural use sites, with 52.9% exposed to atrazine in off-site areas from spray drift of runoff). Additional exposure is anticipated from non-agricultural uses of atrazine. However, given our understanding of atrazine usage on use sites such as golf courses and residential lawns (see Exposure to Non-Agricultural Uses, above), we expect atrazine usage within the range of the species to be limited. If applied, we anticipate off-site transport of atrazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. Furthermore, commercial and residential applicators typically apply herbicides with hand-held equipment that release course droplets, limiting the potential for spray drift from these specific uses.

We anticipate dietary exposure will result in the highest levels of exposure, but even in the highest exposure scenarios (i.e., individuals predominantly consuming contaminated food directly on atrazine use sites), we expect reduced growth and reproduction, but no mortality of individuals. We do not expect morality or sublethal effects to individuals that are only exposed to atrazine in off-site areas, and there is no indication that individuals will occur on non-agricultural use sites. Thus, while exposure may occur in areas throughout the species' range, only a small portion overlaps with agricultural use sites where sublethal effects are expected. As such, we anticipate only a small number of individuals are likely to be exposed on use sites and experience direct adverse effects.

Pocket gophers are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. While we anticipate some impacts to sensitive plant species that serve as habitat components or food resources for the pocket gopher, we do not anticipate the entire plant community will die as a result of atrazine usage. We anticipate the loss of some plants that contribute to habitat elements and food resources for the pocket gopher, but that any indirect adverse effects to pocket gophers will be localized and minimal, with habitat structure and food availability to remain sufficient for individuals in exposed areas. In addition, required agricultural mitigations and existing practices in non-agricultural use sites will greatly reduce the extent of off-site transport as well as the exposure concentrations of atrazine, resulting in no more than low levels of adverse effects to plants and indirect effects to the species.

In summary, while there is high overlap of the range with areas likely to be exposed to atrazine, we anticipate no more than a small number of individuals are likely to experience adverse effects. We do not anticipate mortality from the consumption of contaminated plants or indirect effects from plant losses, although sublethal effects to growth and reproduction are likely for a small number of individuals that predominantly forage on plants on atrazine use sites (primarily agricultural use sites). Furthermore, the species' recovery plan lists herbicide exposure as an individual-level threat but not a population-level threat. We do not anticipate adverse effects from the proposed action will result in species-level effects. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including general label conservation measures), we have determined the proposed action is not likely to appreciably reduce the survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Yelm pocket gopher.

References

U.S. Fish and Wildlife Service. 2020. 5-Year Review, Mazama Pocket Gophers: Olympia, Roy Prairie, Tenino, and Yelm pocket gophers (*Thomomys mazama pugetensis, T. m. glacialis, T. m. tumuli,* and *T. m. yelmensis*). Lacey, Washington. 9 pp.

U.S. Fish and Wildlife Service. 2022a. Recovery Plan for four subspecies of Mazama pocket gopher. Portland, Oregon. 61 pp.

U.S. Fish and Wildlife Service. 2022b. Species Biological Report for four subspecies of Mazama pocket gopher. Version 1.1. Lacey, Washington. 95 pp.

Species requiring further analysis

In our draft Biological Opinion, we focused our analyses on 1) species with low expected exposure to atrazine (due to low overlap, usage, or conservation measures adopted prior to consultation), and 2) species with more than low levels of exposure that benefited from conservation measures identified through the Herbicide Strategy that aimed to reduce off-site transport of atrazine (i.e., listed plants and listed animals that depend on plant resources). For the species in Table 16, we identified the need for further coordination. We expect Herbicide Strategy mitigations to reduce pesticide loading into aquatic habitats by up to 90% (i.e., one order of magnitude) compared to unmitigated runoff, and reduce spray drift from entering species' terrestrial habitats by >95%. We anticipate that this reduction will minimize off-site transport of atrazine to a level where no more than low levels of adverse effects are likely to occur to mammals through this exposure route. However, these species are highly vulnerable, and while the conservation measures are expected to reduce the extent of off-field exposure and reduce exposure, we anticipate atrazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to these species. They may occur on atrazine use sites, either agricultural or non-agricultural. 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 species.

Table 16. Species requiring further analysis.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking
Florida bonneted bat	*Eumops floridanus*	High	High	High
Red wolf	*Canis rufus*	High	High	High