Integration and Synthesis Summary for Mammals

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

Most of these species have low exposure to simazine due to the factors described in the tables or individual rationales below, in combination with reductions in simazine spray drift and runoff resulting from implementation of conservation measures 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 that could be surmised 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 biological 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. Simazine is moderately mobile in water and is relatively persistent in the environment relative to other pesticides on the market, indicating that off-site transport, particularly through runoff, may result in exposure to listed species in areas far from use sites.

Exposure To Agricultural Uses

Simazine has several registered agricultural uses (see Appendix 1-4 of EPA's Biological Evaluation) in the coterminous United States. We characterize the expected level of exposure using overlaps between the species' ranges and agricultural areas where simazine is registered for use (i.e., overlap data; including a 305-m off-site transport area adjacent to use sites), past simazine usage data (when available; the amount and location where simazine has been used in the past), any species-specific considerations such as life history information (e.g., 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 simazine use sites are assigned a high overlap score, species with 5-10% overlap are assigned a medium overlap score, and species with less than 5% overlap are assigned a low overlap score. In addition to range overlaps with simazine use sites, we considered past simazine usage data within a species' range to

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

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

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

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

Exposure to Non-Agricultural Uses

Simazine has several registered non-agricultural uses, including nurseries (only ornamental conifers, deciduous trees and woody ornamental species), ornamental ponds (1,000 gallons or less), lawns, golf courses and other turf. In many cases, data provided by EPA indicate low to high levels of overlap between species' ranges and non-agricultural UDLs. Overall, nurseries (including ornamental plant uses) represent a very small footprint across the action area; across all species in this consultation, the Nurseries UDL overlaps between 0%-0.2% of species' ranges and 0%-5.6% of species' ranges plus a 305-m buffer. For species known to occur near nurseries, we assess nurseries specifically in our assessment. UDLs for non-agricultural uses sites that represent turf tend to be less defined than those for agricultural UDLs and are less likely to accurately represent the actual footprint of these use sites on the landscape. As such, we assess exposure of species to all non-agricultural uses of simazine in a qualitative manner, considering the life history of species, methods of application, simazine usage, and any existing conservation measures to reduce drift and runoff or otherwise limit exposure to species. To facilitate this analysis, for every species in this Appendix, we reviewed species' documents (e.g., Status of the

Species (Appendix B), 5-year reviews, Species Status Assessments, recovery plans, listing rules) to determine if the species could occur on or near non-agricultural simazine use sites (i.e., residential areas where lawns are likely present, golf courses, and nurseries) and the manner in which they may rely on these sites.

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

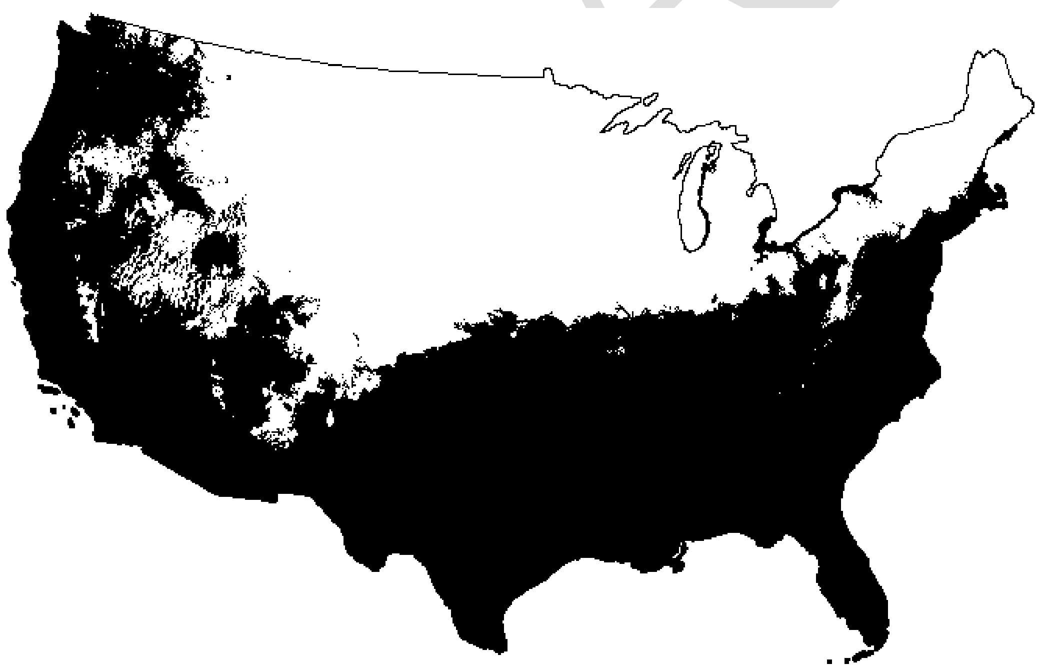

Figure 1. Map showing where cool-season grasses (white areas) and warm-season grasses (black areas) are used on turf across the continental U.S.

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

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

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

References:

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

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

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

Toxicity

We characterize the expected toxic effect to species based on the anticipated level of direct and indirect[4] adverse effects to individuals. Our analysis of toxicity assumes individuals are exposed to simazine at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. Direct effects are based on the anticipated level of mortality and sublethal effects (e.g., reduced growth, 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 simazine and experience adverse effects.

We consider estimated concentrations of simazine on the landscape or within the environment and effects reported in available toxicity studies to determine the level of direct and indirect adverse effects to listed species or critical habitat. Concentrations of simazine 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. Based on available toxicity data, we anticipate mammals that primarily forage on simazine use sites will accumulate sufficiently high levels of simazine 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, alterations in reproductive hormone levels, and reduced fetal weight, 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 simazine through spray drift of runoff) will accumulate levels of simazine that would result in any direct adverse effects.

We anticipate species that only rely on plant-based resources, such as seeds or leaves for food or vegetation as habitat, are likely to experience indirect adverse effects with simazine exposure. In

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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.

contrast, species that rely on animal prey for food resources will experience lower levels of indirect adverse effects (if any) as simazine 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 if they only forage directly in simazine use sites, we do not anticipate this sublethal effect to prey species will 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 simazine 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

Herbicide Strategy Conservation Measures

As part of the simazine ESA consultation with the Service, EPA is implementing the final Herbicide Strategy to inform and identify any necessary mitigations where EPA’s analysis indicated there was a risk of population level effects to listed species. The measures identified by EPA, and committed to by the technical registrants, include a standard 15-foot spray drift buffer and a minimum of three runoff mitigation points[5] necessary in all areas where simazine is used, as well as additional runoff mitigation points for certain simazine uses limited to certain geographic areas when required to protect specific listed species.

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

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

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

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

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

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

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

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

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

We expect implementation of the required runoff and erosion reduction measures to minimize off-site transport of simazine to habitats of listed species. EPA's analyses indicated that the general label requirement of 3 runoff mitigation points will reduce estimated environmental concentrations of simazine in runoff by up to an order of magnitude (i.e., up to 90% reduction, in other words reduce pesticide loading to one-tenth of pre-runoff mitigation levels).

In cases where EPA has identified additional runoff measures are needed, additional points (up to 3, i.e., up to 99% reduction) will be required. EPA will communicate where additional runoff mitigation points are needed and for what specific simazine uses through their Bulletins Live! Two online platform, which all applicators are required to check before making pesticide applications. In areas requiring up to 6 runoff mitigation points total, EPA expects estimated environmental concentrations of simazine will decrease by up to two orders of magnitude (i.e., reduce pesticide loading to one-one hundredth of pre runoff mitigation levels).

For all the species in this document, we expect that the runoff and mitigation measures will reduce exposure concentrations to within one order of magnitude of the exposure level where mammals exposed to simazine in areas off-site will not accumulate more than low levels of simazine 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 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 mammal 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 simazine, as proposed, is not likely to jeopardize the continued existence of at least 26 of the 28 mammal species in this Appendix. For the remaining 2 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 simazine is registered for use. Our concern for adverse effects is 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 account 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
Santa Catalina Island Fox	*Urocyon littoralis catalinae*	Medium	Low	High	4.6	No Jeopardy

The Santa Catalina Island fox is endemic to Santa Catalina Island in California, most of which is owned by two major landowners, the Catalina Island Company and the Catalina Island Conservancy. Private land ownership is only in the City of Avalon. The Catalina Island Conservancy manages the majority of fox habitat on Santa Catalina Island. There are two sub-populations, the larger occupying the southeast portion of the island (including Avalon), the smaller occupying the northwest portion of the island. Island foxes are habitat generalists and use all the habitats available on the islands (USFWS 2005), which includes a wide variety of natural habitat types on the island. They may also forage on and travel through non-agricultural sites (e.g., developed and open space developed use sites), but they are not known to use agricultural sites (USFWS 2015, USFWS 2022). They are omnivores and they eat seasonally available plants and animals, including the fruits of plants, insects, small mammals, birds, and less commonly amphibians, reptiles, and the carrion of marine mammals (USFWS 2015). We believe the population has remained stable since 2015 (USFWS 2022).

Agricultural use sites overlap with 4.6% of the range, and non-agricultural use sites that may be used by the fox on the island include developed and open space developed areas where simazine use sites include lawns, turf, and nurseries. We do not anticipate direct effects are likely for individuals exposed off-site (i.e., from spray drift or runoff), but we expect sublethal effects to growth and reproduction for some individuals that primarily forage on use sites. However, we anticipate low exposure of individuals based on the low overlap with use sites and natural habitats that are widely available on the island and primarily used by the fox. Indirect effects from loss of food resources due to impacts to plants and prey items are a low concern due to the low overlap of use sites where foraging is likely to occur and varied diet of the species. Food resources are anticipated to remain available even where exposed, conservation measures are in place to reduce exposure in off-site areas, and we anticipate individuals will move to foraging sites with sufficient resources as needed.

Thus, we anticipate a very small number of Santa Catalina Island fox individuals are likely to experience sublethal effects from exposures that are great enough to impact growth and reproduction. Direct effects that lead to mortality are not anticipated. While we also anticipate losses of some food resources in areas exposed to simazine, we anticipate sufficient forage plants and prey items will remain available, and given the varied diet and mobility of this species, we expect individuals will be able to find adequate food even if there are localized, temporary reductions in some food items. As such, 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of 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 Santa Catalina Island fox.

References:

U.S. Fish and Wildlife Service. 2022. Santa Catalina Island fox (*Urocyon littoralis catalinae*) 5-Year Review: Summary and Evaluation. Carlsbad, California. 16 pp.

U.S. Fish and Wildlife Service. 2015. Recovery Plan for Four Subspecies of Island Fox (*Urocyon littoralis*). Sacramento, California. 198 pp.

U.S. Fish and Wildlife Service. 2005. Endangered and Threatened Wildlife and Plants; Final Determination Concerning Critical Habitat for the San Miguel Island Fox, Santa Rosa Island Fox, Santa Cruz Island Fox, and Santa Catalina Island Fox. Final Rule. Federal Register 70: 67924-67929.

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

The species in Table 2 are grouped together because they occur completely within California, and very little of their ranges have been treated with simazine in the past according to California Department of Pesticide Regulation's Pesticide Use Reporting data (CalPUR). Our concern for adverse effects is low. While we present some specific information about the species below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 2. Species with low exposure informed by low past usage from the California Department of Pesticide Regulation's Pesticide Use Reporting data and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CalPUR)	Determination
Pacific pocket mouse	*Perognathus longimembris pacificus*	High	Low	High	0	No Jeopardy
Peninsular bighorn sheep	*Ovis canadensis nelsoni*	High	Low	High	0	No Jeopardy
Point Arena mountain beaver	*Aplodontia rufa nigra*	Medium	Low	High	0	No Jeopardy
Stephens' kangaroo rat	*Dipodomys stephensi (incl. D. cascus)*	Medium	Low	High	0.3	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 2 are medium or high. These species occur entirely in the state of California. Simazine was not used within the ranges of the Pacific pocket mouse, Peninsular bighorn sheep, or Point Arena mountain beaver, and was used on 0.3% of the range of the Stephens' kangaroo rat, 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 simazine. In addition, these species are not known to occur on agricultural or non-agricultural use sites of simazine (i.e., nurseries and turf, including golf courses and lawns). The Pacific pocket mouse may occur in proximity to developed roads, dirt roads, powerlines, reservoir facilities and fuel modification zones at the urban interface. Individual Pacific pocket mice may occasionally burrow and travel among these facilities. However, the noted areas are not simazine use sites. We do not anticipate individuals of any of these species that are only exposed off-site (i.e., from spray drift of runoff) will experience any direct adverse effects.

These species use plant-based resources for food. The Pacific pocket mouse and Stephens' kangaroo rat sometimes also eats insects. Losses of plants are likely in off-site foraging areas exposed to simazine. We anticipate low level impacts to insects, but we do not expect losses that will measurably reduce prey availability. 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 these species are 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 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 2.

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

Table 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	3.6	No Jeopardy
Key deer	*Odocoileus virginianus clavium*	High	Low	High	0.3	No Jeopardy
West Indian Manatee	*Trichechus manatus*	Medium	Low	High	2.5	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 3 are medium or high. Low annual agricultural herbicide usage is anticipated within the counties where these species ranges occur (from 0.3 to 3.6% 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.

The key 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. Some Key deer that exclusively forage on-site are anticipated to accumulate sufficiently high enough levels of simazine to cause direct sublethal adverse effects to growth and reproduction. However, exposure in the range is anticipated to be low due to the low usage on agricultural sites (0.3% CoA) and dietary preferences for plants that are typically in natural habitats and thus less likely to be sprayed on non-agricultural sites, such as red and black mangroves which constitute 24 percent by volume of the diet of the Key deer, and over 160 other seasonally available plant species that influence Key deer movements. Key deer in urban areas may consume food directly (e.g., corn feed) and indirectly (e.g., ornamental plants) provided by humans (USFWS 2021), although we anticipate limited exposure from foraging in these areas as only turf and nurseries are non-agricultural use sites. The Carolina northern flying squirrel and West Indian manatee do not occur on use sites and would only be exposed in off-site areas. Exposure of these species off-site is not expected to lead to any direct adverse effects.

The Key deer and West Indian manatee are herbivores, and the Carolina northern flying squirrel is an omnivore that primarily feeds on fungi, lichens, staminate cones, insects, and other animal matter. Indirect effects from loss of food resources due to impacts to plants and prey items are a low concern for 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. 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 be of low concern for impacts to food resources. We expect losses of plants exposed in Key deer foraging areas, but we anticipate sufficient forage plants will remain available, and given the mobility of this species, 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.

Thus, we anticipate a very small number of Carolina northern flying squirrels, West Indian manatee, and Key deer and their food resources will be exposed in localized areas. We do not anticipate mortality from exposure, but we expect effects to reproduction and growth of a very small number of Key deer that primarily forage on use sites. We do not anticipate mortality or any sublethal effects from exposure for Carolina northern flying squirrels or West Indian manatee as they do not occur on use sites and effects are not anticipated in off-site areas. While we anticipate losses of some food resources for each of these species in areas exposed to simazine, we anticipate sufficient forage plants and 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. As such, we anticipate no more than a very small number of individuals are likely to experience 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of 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.

References

U.S. Fish and Wildlife Service. 2021. Species status assessment report for the Florida Key deer (*Odocoileus virginianus clavium*). Atlanta, Georgia.

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

The species in Table 4 were grouped together because there is a high level of overlap with simazine use sites and a high level of past usage within their ranges. However, despite this high level of overlap and usage, we expect these species will have low exposure after incorporating spray drift and runoff conservation measures on the simazine label, including species-specific measures accessed through EPA's Bulletins Live! Two. 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. Mammal species with low agricultural exposure due to spray drift and runoff conservation measures and low likelihood of non-agricultural exposure.

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking	Conservation Measures	Determination
Anastasia Island beach mouse	*Peromyscus polionotus phasma*	High	Low	High	General label measures + 6 runoff points (for FL citrus only)	No Jeopardy
Mexican long-nosed bat	*Leptonycteris nivalis*	Medium	Low	High	General label measures	No Jeopardy
Peñasco least chipmunk	*Tamias minimus atristriatus*	High	Low	High	General label measures	No Jeopardy
Tricolored bat	*Perimyotis subflavus*	High	Low	High	General label measures	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 4 are medium or high. Although modeled overlap between species' ranges and simazine use sites is high for species in this group, the required mitigations are expected to reduce the likelihood, magnitude, and frequency of exposure to a level where we expect no more than low levels of direct and indirect adverse effects to individuals will occur. The combined effect of drift buffers and runoff controls is expected to prevent exceedance of toxicity thresholds for both mortality and sublethal effects.

We do not anticipate any of the species in this group are likely to occur on simazine agricultural use sites where exposures to individuals would be high. We expect the general label measures for agricultural uses (i.e., 15-foot spray drift buffer 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 that provide habitat and food resources to individuals (or to any animal food resources required). An exception to this is simazine use on citrus orchards in Florida, where registered application rates are high enough that individuals foraging in off-field areas may still be exposed to levels of simazine high enough to cause significant adverse effects to growth and reproduction. As such, the Anastasia Island beach mouse is included in a Pesticide Use Limitation Area (PULA) where simazine use on citrus in Florida will require an additional three runoff mitigation points (six total). This will reduce off-field simazine residues by two orders of magnitude (i.e., a 99% reduction), which will ensure no more than low levels of direct and indirect adverse effects to individuals will occur.

We anticipate low exposure of the species in this group to non-agricultural simazine use sites. The Anastasia Island beach mouse inhabits sand dunes. While it is possible individual mice may travel through areas that contain simazine non-agricultural use sites, use sites areas are generally not suitable habitat for the species. The Mexican long-nosed bat may fly over developed areas that may include non-agricultural use sites but is not expected to forage on non-agricultural use sites. The Peñasco least chipmunk is 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; grasses tall enough to provide shelter and cover). The tricolored bat forages in forests, forest edges, forest clearings, and over aquatic habitats. These areas do not tend to be simazine use sites, although it is possible individual bats may forage around trees in nurseries or ornamental ponds (which are simazine use sites). However, we anticipate low overlap of the range with these areas as data indicates the footprint of nurseries is less than 0.2% of most listed species' ranges (specific overlap data is not available for the proposed endangered tricolored bat), and small ornamental ponds (up to 1,000 gallons) are not expected to be common in the range or readily used as foraging sites as they are not the types of wetlands or water features that typically provide for prey and water availability. Additionally, we expect existing pesticide use practices and conditions (e.g., use of coarse droplet sizes, application of only specific areas like fairways in golf courses, continuous vegetative cover, no tillage) will greatly limit the extent of off-site transport and reduce the concentration of simazine residues from non-agricultural uses in off-site areas. We expect individuals exposed to simazine in habitat adjacent to non-agricultural use sites will not accumulate more than low levels of simazine, which will result in low levels of direct adverse effects (if any) that are not expected to impact the growth, survival, or reproduction of individuals, and low levels of adverse effects to plant growth and survival (or to any animal food resources). Sublethal effects to growth and reproduction are anticipated for a small number of individuals that primarily forage directly on non-agricultural use sites.

We anticipate localized losses of food resources from exposure to simazine 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 a high level of past usage within their ranges, we expect no more than low levels of direct and indirect adverse effects will occur to these species with small numbers of individuals experiencing sublethal effects to fitness related to growth and reproduction. After reviewing the current status of the species, environmental baseline for the action area, cumulative effects, and effects of the action (including the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of 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 4.

Species with Individual Integration and Synthesis Summaries

The species in Table 6 have individual Integration and Synthesis summaries. 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 and reduce the likelihood, magnitude, and frequency of exposure to a level where no more than low levels of adverse effects are likely to occur to plants through this exposure route. While the required mitigations are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to these species. They may occur on simazine 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
Florida bonneted bat	*Eumops floridanus*	No Jeopardy
Gray wolf	*Canis lupus*	No Jeopardy
Gray wolf	*Canis lupus*	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
San Joaquin kit fox	*Vulpes macrotis mutica*	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

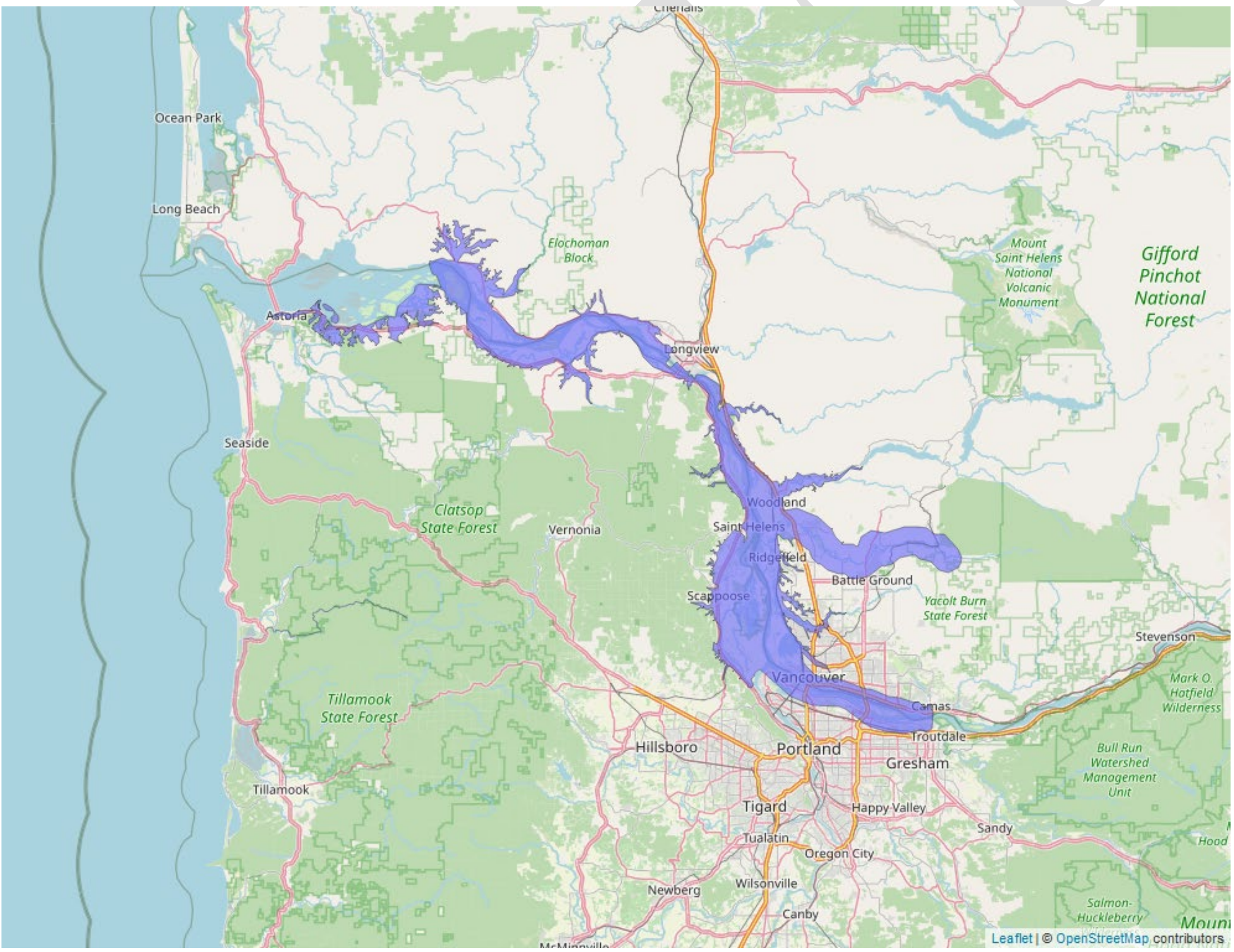

Figure 2. Range map of Columbian white-tailed deer (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/154.

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: Increasing population(s)

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/square meter. The population then declined to 59 deer in 2007, likely due to severe vegetation damage caused by overpopulation and flooding events. The deer density goal was identified at 35 deer/square meter 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. 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 11.8% of the species' range overlaps with agricultural use sites and 88.2% 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) (Table 6). In total, there is approximately 100% overlap[7] between the species' range and the agricultural footprint of simazine use sites.

Table 6. Agricultural simazine use site overlap and annual simazine usage data for the range of the Columbian 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	2.6	30.2	32.8	2.6	30.2	32.8
Grapes	<0.1	10.4	10.5	<0.1	10.4	10.5
Other Crops	4.4	39.3	43.6	4.4	39.3	43.6
Other Orchards	1	27.7	28.7	1	27.7	28.7
Vegetables and Ground Fruit	3.5	39.9	43.4	3.5	39.9	43.4
Christmas Trees	0.4	19	19.4	0.4	19	19.4
Total	**11.8**	**88.2**	**100[7]**	**11.8**	**88.2**	**100[7]**

Usage

Past usage data indicate that up to 100% of the species' range[7] has been treated with simazine 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 simazine use sites at least occasionally.

Exposure from Non-Agricultural Uses

Available information on the species indicates that non-agricultural simazine use sites, including residential lawns, occupy large portions of the species' range. While we do not anticipate these

[7] Total overlap is capped at 100%.

non-agricultural use sites represent preferred foraging areas for the species, we anticipate that individuals are likely to be exposed to simazine through non-agricultural uses at least occasionally.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine use sites can accumulate 31.7-160.2 mg simazine/kg-bw, depending on the specific plant matter consumed and what 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 simazine 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 altered reproductive hormone levels.

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 simazine, 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 exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure 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 simazine 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 from agricultural uses. Similarly, we expect existing pesticide use practices and conditions in non-agricultural uses of simazine (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 simazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate simazine 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 simazine 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 simazine in off-site areas, these conservation measures do not change the level of simazine 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.

Simazine agricultural use sites and off-site areas that may be exposed overlap with up to 100% of the species' range (11.8% overlap with use sites and 88.2% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 100% of the range has been treated with simazine on agricultural use sites annually, exposing up to 100% of the species' range on use sites and from off-site transport annually, with a larger portion of the 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 simazine. We do not expect toxicity from simazine 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 simazine 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 simazine. 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 simazine 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 simazine 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 simazine exposures, we do not anticipate adverse effects to sensitive plant species from simazine 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 simazine, 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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.

References

U.S. Fish and Wildlife Service. 2025. 5-Year Review, Columbian white-tailed deer (*Odocoileus virginianus leucurus*). Portland, Oregon. 19 pp.

U.S. Fish and Wildlife Service. 2016. Endangered and Threatened Wildlife and Plants; Reclassifying the Columbia River Distinct Population Segment of the Columbian White-tailed Deer as Threatened with a Rule Under Section 4(d) of the Act. Final Rule. Federal Register 81(200):71386- 71410.

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: Florida bonneted bat

Scientific Name:	Common Name:	Entity ID:
Eumops floridanus	Florida bonneted bat	9725

Conclusion: No Jeopardy

Species Range

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

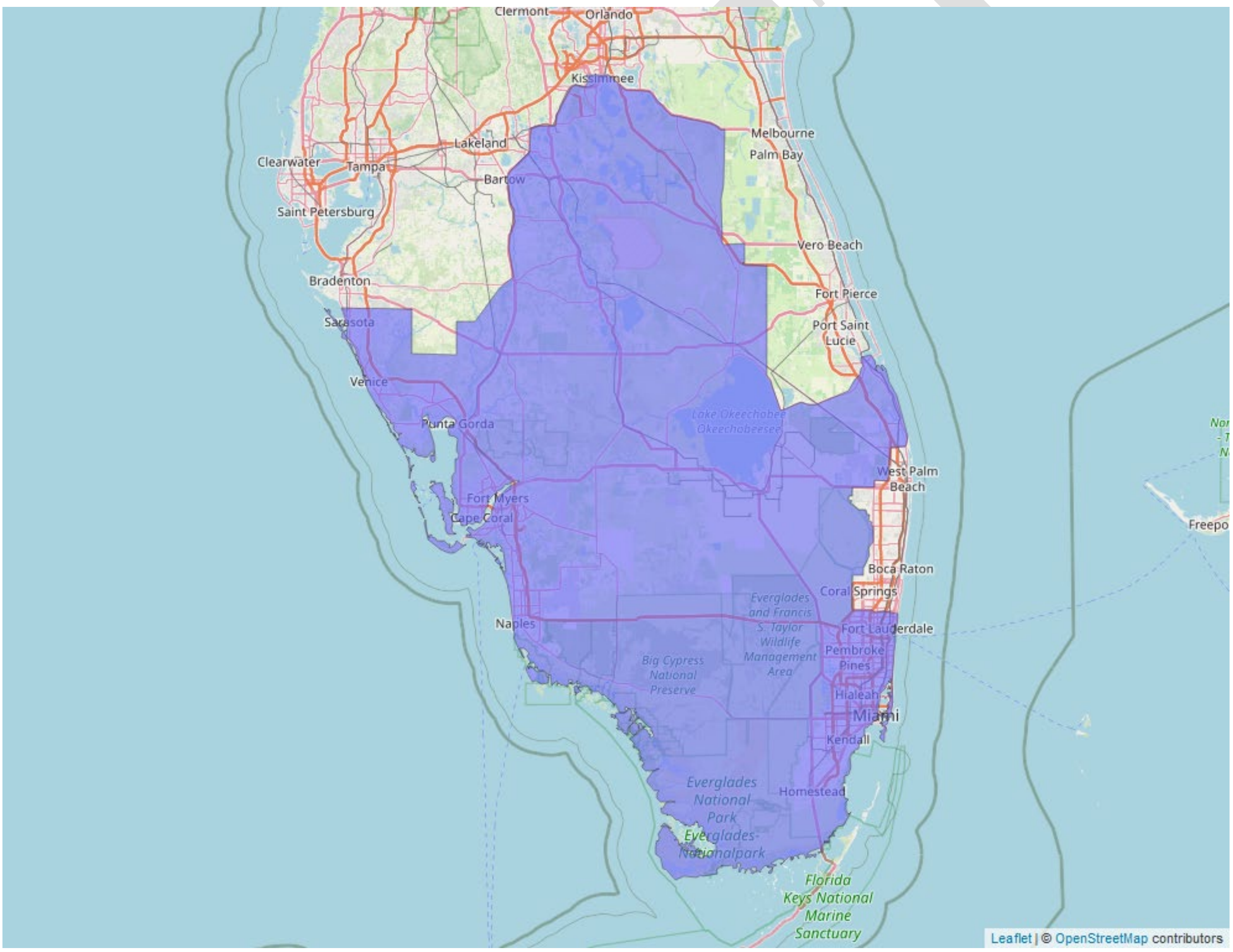

Figure 3. Range map of Florida bonneted bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/8630.

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: 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 Florida bonneted bat is the largest bat in Florida. They roost singly or in colonies of one male and several females and they do not hibernate or migrate. They primarily eat insects (e.g., beetles, flies, true bugs, and moths). Florida bonneted bat habitat consists of mainly open, fresh water and wetlands (for foraging) and trees (e.g., pines, palms) and manmade structures for roosting; protective tree cover may be important for predator avoidance around roosts, but specifics are unknown. They have been found in forested, suburban, and urban areas. Historically, they were found in the southern half of Florida. Florida bonneted bats now occur in a very restricted portion of their historical range in southern Florida and their abundance seems to be low. Actual population size is not known, and no population viability analyses are available (USFWS 2013). The Florida bonneted bat is threatened by habitat loss, fragmentation, and degradation, and associated pressures from increased human population (i.e., interactions due to roosting in or near houses, roosts, culverts, bridges, and utility equipment). The species' use of conservation areas tempers some impacts, yet the threats of major losses of habitat remains. In natural or undeveloped areas, the Florida bonneted bat may be impacted when forests are converted to other uses or when old trees with cavities are removed. Routine land management activities (e.g., thinning, prescribed fire) may also impact unknown roost sites. In urban areas, suitable roost sites may also be lost when buildings are demolished or when structures are modified to exclude bats (USFWS 2013, 2018).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 10.9% of the species' range overlaps with agricultural use sites and 62.3% 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) (Table 7). In total, there is approximately 73.2% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 7. Agricultural simazine use site overlap and annual simazine usage data for the range of the Florida bonneted 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
Citrus	6.3	28.3	34.6	1.3	6	7.4
Corn	<0.1	3.5	3.6	<0.1	3.5	3.6
Grapes	<0.1	1	1	<0.1	1	1
Other Crops	4.1	22.5	26.6	<0.1	<0.1	<0.1
Other Orchards	0.7	6.5	7.2	0.5	5	5.5
Vegetables and Ground Fruit	0.5	8	8.4	<0.1	0.1	0.1
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**10.9**	**62.3**	**73.2**	**1.4**	**9.6**	**11.1**

Usage

Past usage data indicate that up to 11.1% of the species' range has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

While the Florida bonneted bat is known to occupy a range of habitats, individuals are known to consume insects associated with crops and are frequently detected in agricultural areas. As such, we anticipate individuals are likely to be exposed on agricultural simazine use sites.

Exposure from Non-Agricultural Uses

Available information on the species indicate that individuals may occasionally roost and forage in residential areas. While we do not anticipate these non-agricultural simazine use sites represent preferred foraging habitat, we anticipate some individuals are likely to be exposed to simazine through non-agricultural uses as well.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 Florida bonneted bat is an obligate insectivore. An individual bat foraging on arthropod prey exposed to simazine directly on agricultural and non-agricultural use sites can accumulate 49.3-114.2 mg simazine/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 simazine 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 altered reproductive hormone levels, are likely to occur at these exposure levels.

In contrast, arthropod prey exposed to simazine in off-site areas (i.e., through spray drift or runoff) are not likely to accumulate more than low levels of simazine, 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 simazine toxicity studies in terrestrial invertebrates indicate that simazine 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, from agricultural or non-agricultural uses. While we anticipate exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure will destroy or limit the availability of the complex vegetative structure the species requires for its habitat (e.g., trees for roosting) or to support its invertebrate prey. We expect conservation measures for agricultural uses and existing pesticide use practices and conditions in non-agricultural uses of simazine (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 simazine residues in areas adjacent to agricultural and non-agricultural use sites. As such, we do not anticipate effects to prey or sensitive exposed plants to cause changes to food availability or 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 simazine 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 simazine use sites will experience more than low levels of direct adverse effects, if any. We do not anticipate simazine 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 Florida bonneted bat is medium.

Species Conclusion

The Florida bonneted bat has high vulnerability based on factors such as its status (i.e.., endangered), limited distribution, and declining population. Florida bonneted bat habitat consists of mainly open, fresh water and wetlands (for foraging) and trees (e.g., pines, palms) and manmade structures for roosting; protective tree cover may be important for predator avoidance around roosts, but specifics are unknown. The Florida bonneted bat is known to occur on agricultural and non-agricultural use sites and thus is likely to be exposed on use sites and where spray drift or runoff occurs. Roosting and foraging occurs in forested and residential areas, so exposure may also occur in non-agricultural use sites such as nurseries and around areas with turf.

Simazine agricultural use sites and off-site areas that may be exposed overlap with 73.2% of the species' range (10.9% overlap with use sites and 62.3% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that 1.4% of the range has been treated with simazine on agricultural use sites annually, exposing up to 11.1% of the species' range on use sites and from off-site transport annually, with a larger portion of the 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 simazine. However, we expect on-site exposure of bats to simazine on non-agricultural use sites such as nurseries, turf (including golf courses and lawns), and small ornamental ponds (1,000 gallons or less) to be limited, as these areas are less likely support abundant prey than the bat's preferred foraging areas which are typically over ponds (generally expected to be larger than ornamental ponds), streams, and wetlands. Exposure of Florida bonneted bats off-site is not expected to lead to more than low levels of direct adverse effects, if any, but bats with prolonged or repeated on-site exposures for individuals that primarily forage on agricultural or non-agricultural use sites shortly after simazine applications are anticipated to accumulate sufficiently high enough levels of simazine to cause direct sublethal adverse effects to growth and reproduction. However, we expect the majority of foraging to occur in off-site areas that provide more suitable habitat, and predominant foraging on use sites shortly after simazine 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 Florida bonneted bat is an insectivore, primarily foraging on flying insects. Simazine is not likely to cause mortality or sublethal adverse effects to exposed arthropods. As such, we do not anticipate simazine exposure is likely to have any significant effects on the abundance and availability of insect prey. In addition, the bat is highly mobile, and we expect individuals will be able to travel to other sites suitable for foraging if needed. We also do not anticipate simazine exposure will destroy or limit the availability of the complex vegetative structure the species requires for its habitat (e.g., trees for roosting) or to support its invertebrate prey. The conservation measures that are in place will reduce exposure in off-site areas. As such, we do not expect simazine 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, while there is high overlap of the species' range with areas likely to be exposed to simazine, and past usage data indicate there will be high levels of exposure from annual usage on agricultural use sites, usage is only anticipated to occur on 1.4% of agricultural use sites annually. While additional usage is anticipated on non-agricultural use sites, we anticipate no more than a small number of individuals that predominantly forage on simazine use sites will experience impacts to fitness related to growth and reproduction. We do not expect toxicity from simazine to rise to the level of mortality to bats. We also 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. We do not anticipate such adverse effects 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Florida bonneted bat.

References

U.S. Fish and Wildlife Service. 2018. Recovery outline for Florida bonneted bat (*Eumops floridanus*). Vero Beach, Florida. 5 pp.

U.S. Fish and Wildlife Service. 2013. Endangered and Threatened Wildlife and Plants; Endangered Species Status for the Florida Bonneted Bat. Final Rule. Federal Register 78(191): 61003-61043.

Integration and Synthesis Summary: Gray wolf (44-State entity)

Scientific Name:	Common Name:	Entity ID:
Canis lupus	Gray wolf	11

Conclusion: No Jeopardy

Species Range

Based on range map dated: 12/16/2024; U.S.A.: All of AL, AR, CA, CO, CT, DE, FL, GA, IA, IN, IL, KS, KY, LA, MA, MD, ME, MI, MO, MS, NC, ND, NE, NH, NJ, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, and WV; and portions of AZ, NM, OR, UT, and WA as follows: (1) Northern AZ (that portion north of the centerline of Interstate Highway 40); (2) Northern NM (that portion north of the centerline of Interstate Highway 40); (3) Western OR (that portion of OR west of the centerline of Highway 395 and Highway 78 north of Burns Junction and that portion of OR west of the centerline of Highway 95 south of Burns Junction); (4) Most of Utah (that portion of UT south and west of the centerline of Highway 84 and that portion of UT south of Highway 80 from Echo to the UT/WY Stateline); and (5) Western WA (that portion of WA west of the centerline of Highway 97 and Highway 17 north of Mesa and that portion of WA west of the centerline of Highway 395 south of Mesa). Mexico.; *States within the range:* CA, MI, MN, NV, OR, WA, WI

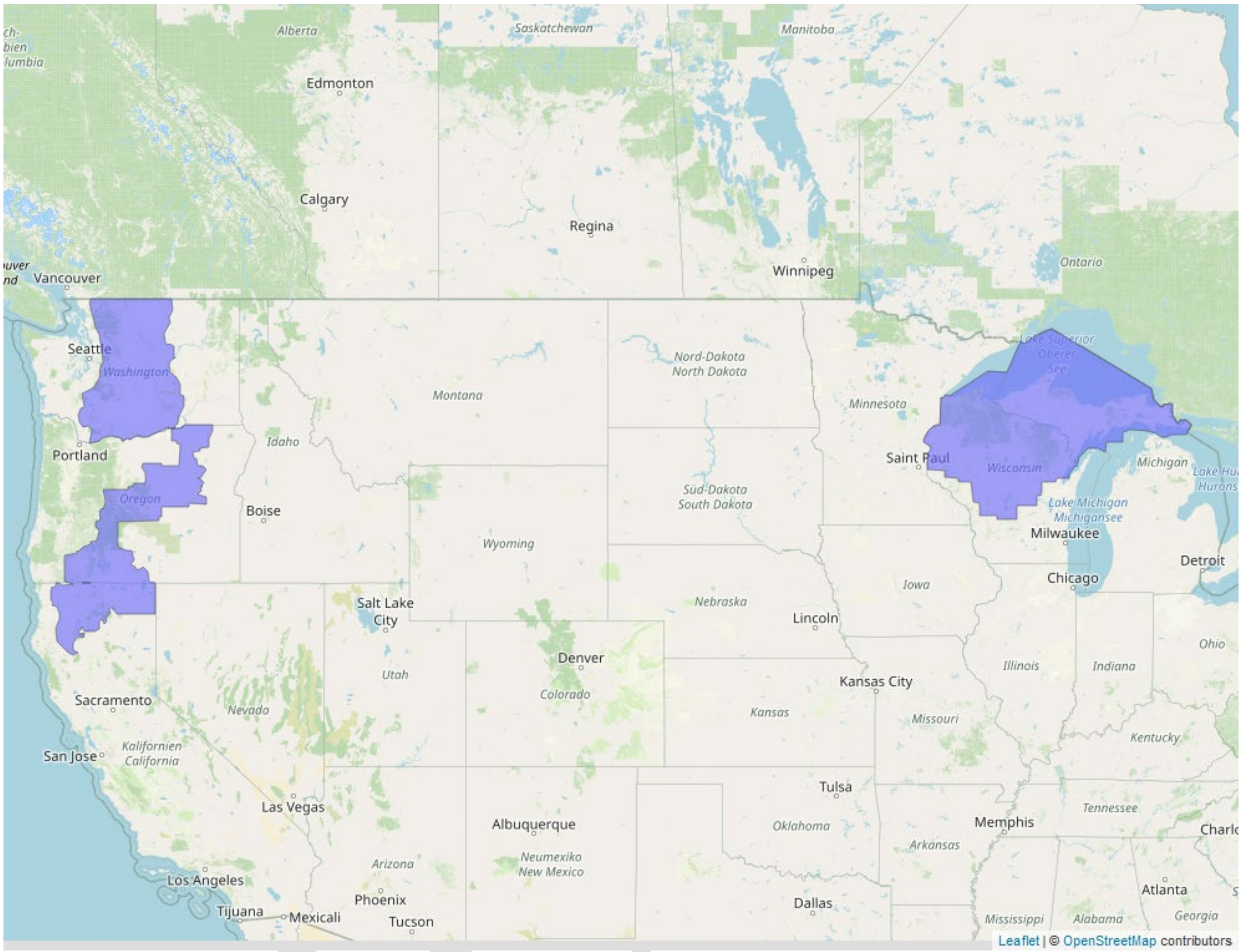

Figure 4. Range map of gray wolf (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4488.

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: Delist: This listed entity of the gray wolf (referred to as the "44-State entity") does not meet the definition of an endangered species or a threatened species (USFWS 2020).

Most recently completed 5-year review: 11/3/2020 (Final rule and notification of petition finding)

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: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Gray wolves are the largest wild members of the canid (dog) family and have a broad circumpolar range including North America, Europe, and Asia. The gray wolf is a keystone predator (in North American, primarily medium and large mammals) and an integral component of their ecosystems. The wide range of habitats in which wolves thrive reflects their adaptability and includes temperate forests, mountains, tundra, taiga, and grasslands. We consider suitable habitat to be areas containing adequate wild ungulate populations (e.g., elk and deer) and a low risk of conflict with humans (e.g., low road density, low human density, adequate natural cover without agricultural land), which generally allows for increased pack persistence (Mech 2017). Specifically, wolf presence is negatively correlated with agricultural land uses. They are highly social animals with the ability to quickly expand and recolonize vacant habitats.

Historical population estimates for gray wolves in the western U.S. are in the hundreds of thousands. They used to occupy most of the conterminous U.S., except the southeast (USFWS 2023). In the northeast, wolves were extirpated by 1900 and as of 2003, there was no reliable evidence of breeding pairs or wolves with established territories. Wolves were also extirpated from the Great Plains by the early 1900s. By the 1940s, wolves in Washington and Oregon became rare due to human persecution and were only found in remote mountainous areas (i.e., National Forests, Cascade Mountains). They were extirpated from Washington, Oregon, California, and Nevada soon after (USFWS 2012). In the 1980s and 1990s, wolves naturally recolonized northern Montana from Canada. In 1995-1996, wolves were reintroduced to central Idaho and Yellowstone National Park. Since then, wolves have continued to expand their range in the western U.S., and wolf packs have established in California, Oregon, Washington, and Colorado. Dispersing wolves have also been observed in Arizona, Nevada, New Mexico, and Utah. Wolves in the western U.S. generally seem to be increasing and their range is expanding (USFWS 2023).

The gray wolf metapopulation in the western U.S. is connected to a large and expansive population of about 15,000 wolves in western Canada (USFWS 2020). As of 2022, states estimated that there were 2,797 wolves distributed among over 286 packs in seven states (USFWS 2023). Between European settlement and the 1930s, poisoning, unregulated trapping and shooting, and public funding of wolf extermination efforts nearly eliminated gray wolves from the western U.S. Still, the primary threat to western gray wolves is human-caused mortality (i.e., regulated harvest in Idaho, Montana, Washington, and Wyoming; lethal control of wolves depredating livestock in the Northern Rocky Mountains; illegal take; vehicle collisions). Because of gray wolf social structure, the death of one or both breeders in a pack may increase breeder turnover and negatively affect pack persistence, reproductive success, and recruitment because, in most instances, only the dominant male and female in a pack breed. Diseases are common in carnivores and cause episodic, but usually short-term, population decreases for gray wolves. Inbreeding depression and other genetic concerns have been documented in wild wolf populations. Climate change may affect wolves through long-term changes to prey availability, increased frequency or intensity of wildfires, and increased exposure to disease (USFWS 2023).

Overall Vulnerability: Low

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 10.3% of the species' range overlaps with agricultural use sites and 50.5% 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) (Table 8). In total, there is approximately 60.8% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 8. Agricultural use overlap and annual usage data for the Gray wolf (44-State entity).

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	4.8	14.5	19.4	0.4	2.3	2.7
Grapes	0.2	2.9	3.1	<0.1	0.6	0.6
Other Crops	2.4	19.7	22.1	1.8	6.8	8.6
Other Orchards	0.6	4.5	5	0.1	1.7	1.8

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	1.3	8.4	9.7	0.2	1.2	1.4
Christmas Trees	<0.1	0.9	0.9	<0.1	0.9	0.9
Total	**10.3**	**50.5**	**60.8**	**2.6**	**12.9**	**15.5**

Usage

Past usage data indicate that up to 6.5% of the species' range has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

Gray wolves are habitat generalists and can successfully occupy a wide range of habitats, provided adequate prey exists and human-caused mortality is sufficiently minimized. Preferred habitat is characterized by relatively large blocks of undeveloped land, abundant year-round wild ungulate populations, low road densities, and low agricultural land uses, including crop fields. As such, we anticipate individuals are not generally likely to occur in or near simazine use sites.

Exposure from Non-Agricultural Uses

While gray wolves can occupy a wide range of habitats, we do not anticipate individuals are likely to occur in highly developed urban areas, indicating that the species is unlikely to be exposed to simazine through applications to residential lawns, golf courses, or nurseries. As such, we do not anticipate non-agricultural uses will expose more than a small number of individuals, if any, over the duration of the proposed action.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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.

While wolves can occasionally consume small mammals, birds, and even large invertebrates, the species primarily predates on medium and large mammals. An individual wolf foraging on large mammal prey exposed to simazine directly on simazine use sites can accumulate 8.3-19.1 mg simazine/kg-bw. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consuming contaminated food directly on simazine 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 reduced body weight and body weight gain, as well as some low level of hormone disruptions, can occur at these doses.

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

Indirect Effects

Available simazine toxicity studies indicate that mammal prey are not likely to experience any mortality from simazine exposure, even if individuals occur on-field where exposures are anticipated to be highest. While some sublethal effects to mammal prey foraging directly on-site (such as reduced growth and altered hormone levels) is possible, we do not anticipate this will appreciably change the availability of large mammal prey for the gray wolf.

Effects of the Action Summary

There is a large extent of overlap between the species' range and simazine use sites and their associated areas of off-site transport (e.g., spray drift and runoff areas). While individual wolves that predominantly forage on large mammal prey directly on simazine use sites are likely to experience sublethal adverse effects to growth and reproduction, we anticipate this is unlikely to occur in more than a small number of individuals as available information on the gray wolf's behaviors and distribution suggest that individuals are not likely to forage on or near human disturbed areas, including simazine use sites. As such, we do not anticipate individual wolves are likely to accumulate more than low levels of simazine and are not likely to experience more than low levels of direct adverse effects. Similarly, while large mammal prey to predominantly feed on simazine use sites may experience sublethal effects to growth and reproduction, we do not anticipate this will appreciably diminish the availability of prey for the gray wolf to consume. Thus, we do not anticipate more than low levels of indirect effects as well. As such, we conclude the overall risk of adverse effects to the gray wolf is low.

Species Conclusion

The gray wolf (44-State entity) has a low vulnerability based on factors such as its recommendation for delisting, wide-ranging distribution, multiple populations, and stable population trends. Though there is high overlap of the action area with the species' range and a high extent of estimated usage across its range, the risk to the gray wolf posed by simazine across the range is low. We anticipate that individuals of the species will only rarely encounter and consume prey that have recently been exposed to simazine given the species general preference for remote sites away from human activities. Individual wolves that predominantly forage on large mammal prey directly on simazine use sites are likely to experience sublethal adverse effects to growth and reproduction, although we anticipate this is unlikely to occur in more than a small number of individuals. Similarly, while large mammal prey that predominantly feed on simazine use sites may experience sublethal effects to growth and reproduction, we do not anticipate this will impact the availability of sufficient prey items for the gray wolf to consume. The gray wolf does not tend to forage near use sites, this species has a varied diet, and individuals are highly mobile, such that we anticipate wolves will be able to continue to find suitable prey items.

While there is high overlap of the range with use sites and a high amount of usage in the range, we anticipate no more than a very small number of individuals are likely to experience adverse effects. We do not anticipate mortality from the consumption of contaminated prey or indirect effects from prey losses, although sublethal effects to growth and reproduction are likely for a small number of individuals that consume large mammals that have predominantly foraged on simazine use sites. We do not anticipate such adverse effects 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray wolf (44-State entity).

References

Mech, D.L. 2017. Where can wolves live and how can we live with them? Biological Conservation 210: 310-317. U.S. Fish and Wildlife Service. 2023. Species status assessment for the gray wolf (*Canis lupus*) in the western United States. Version 1.2. Lakewood, Colorado. 362 pp.

U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Removing Gray Wolf (*Canis lupus*) from the List of Endangered and Threatened Wildlife. Final Rule. Federal Register 85(213): 69778-69895.

U.S. Fish and Wildlife Service. 2012. Lower 48-state and Mexico gray wolf (*Canis lupus*) listing, as reviewed. 5-Year Review: Summary and Evaluation. Arlington, Virginia. 22 pp.

Integration and Synthesis Summary: Gray wolf (Minnesota population)

Scientific Name:	Common Name:	Entity ID:
Canis lupus	Gray wolf	12

Conclusion: No Jeopardy

Species Range

Based on range map dated: 10/10/2024; U.S.A. (MN); *States within the range:* MN

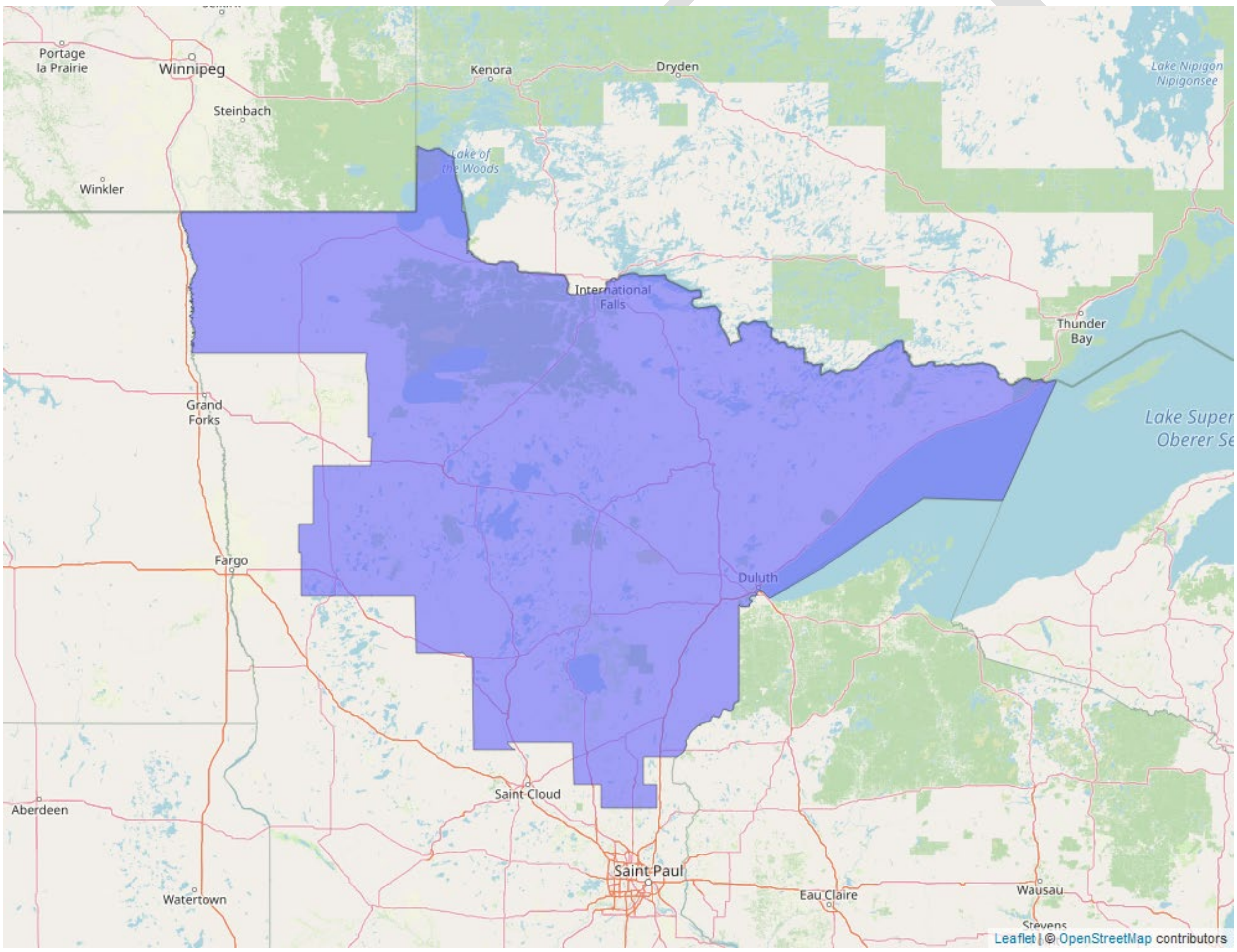

Figure 5. Range map of gray wolf (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4488.

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: Listed gray wolves in Minnesota do not meet the definition of an endangered species or a threatened species (USFWS 2020).

Most recently completed 5-year review: 11/3/2020 (Final rule and notification of petition finding)

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: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Gray wolves are the largest wild members of the canid (dog) family and have a broad circumpolar range including North America, Europe, and Asia. The gray wolf is a keystone predator (in North American, primarily medium and large mammals) and an integral component of their ecosystems. The wide range of habitats in which wolves thrive reflects their adaptability and includes temperate forests, mountains, tundra, taiga, and grasslands. We consider suitable habitat to be areas containing adequate wild ungulate populations (e.g., elk and deer) and a low risk of conflict with humans (e.g., low road density, low human density, adequate natural cover without agricultural land), which generally allows for increased pack persistence (Mech 2017). Specifically, wolf presence is negatively correlated with agricultural land uses. They are highly social animals with the ability to quickly expand and recolonize vacant habitats (USFWS 2023).

Historical population estimates for gray wolves in the Great Lakes suggest there were 4,000-8,000 in Minnesota, 3,000-5,000 in Wisconsin, and fewer than 6,000 in Michigan (USFWS 2020). They used to occupy most of the conterminous U.S., except the southeast (USFWS 2023). In the northeast, wolves were extirpated by 1900 and as of 2003, there was no reliable evidence of breeding pairs or wolves with established territories. Wolves were also extirpated from the Great Plains by the early 1900s. By the 1940s, wolves in Washington and Oregon became rare due to human persecution and were only found in remote mountainous areas (i.e., National Forests, Cascade Mountains). They were extirpated from Washington, Oregon , California, and Nevada soon after (USFWS 2012). In 1978, gray wolves were largely confined to northern Minnesota, with some wolves occupying Isle Royale and possibly other individuals scattered in Wisconsin and Michigan (43 FR 9608). There are no significant physical barriers separating Minnesota wolves from those in Wisconsin and Michigan, as evidenced by frequent movement of wolves among the three States. Eventually, wolves in northern Minnesota dispersed and recolonized Wisconsin and Michigan, resulting in a Great Lakes metapopulation with effective interbreeding.

As of 2020, the Great Lakes metapopulation consists of more than 4,200 individuals that are connected via documented dispersals to the large and expansive population of about 12,000-14,000 wolves in eastern Canada (USFWS 2020). Between European settlement and the 1930s, poisoning, unregulated trapping and shooting, and public funding of wolf extermination efforts nearly eliminated gray wolves from the western U.S. Still, the primary threat to western gray wolves is human-caused mortality (i.e., regulated harvest in Idaho, Montana, Washington, and Wyoming; lethal control of wolves depredating livestock in the Northern Rocky Mountains; illegal take; vehicle collisions). Because of gray wolf social structure, the death of one or both breeders in a pack may increase breeder turnover and negatively affect pack persistence, reproductive success, and recruitment because, in most instances, only the dominant male and female in a pack breed. Diseases are common in carnivores and cause episodic, but usually short-term, population decreases for gray wolves. Inbreeding depression and other genetic concerns have been documented in wild wolf populations. Climate change may affect wolves through long-term changes to prey availability, increased frequency or intensity of wildfires, and increased exposure to disease (USFWS 2023).

Overall Vulnerability: Low

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 9.3% of the species' range overlaps with agricultural use sites and 52.4% 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) (Table 9). In total, there is approximately 61.7% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 9. Agricultural use overlap and annual usage data for the Gray wolf (Minnesota population).

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	5.8	22.6	28.4	1.5	5.7	7.2
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	2.7	20.7	23.4	<0.1	<0.1	<0.1
Other Orchards	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	0.8	9	9.8	<0.1	0.3	0.4
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**9.3**	**52.4**	**61.7**	**1.5**	**6.2**	**7.7**

Usage

Past usage data indicate that up to 7.7% of the species' range has been treated with simazine annually from agricultural uses.

Additional Exposure Considerations

Gray wolves are habitat generalists and can successfully occupy a wide range of habitats, provided adequate prey exists and human-caused mortality is sufficiently minimized. Preferred habitat is characterized by relatively large blocks of undeveloped land, abundant year-round wild ungulate populations, low road densities, and low agricultural land uses, including crop fields. As such, we anticipate individuals are not generally likely to occur in or near simazine use sites.

Exposure from Non-Agricultural Uses

While gray wolves can occupy a wide range of habitats, we do not anticipate individuals are likely to occur in highly developed urban areas, indicating that the species is unlikely to be exposed to simazine through applications to residential lawns, golf courses, or nurseries. As such, we do not anticipate non-agricultural uses will expose more than a small number of individuals, if any, over the duration of the proposed action.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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.

While wolves can occasionally consume small mammals, birds, and even large invertebrates, the species primarily predates on medium and large mammals. An individual wolf foraging on large mammal prey exposed to simazine directly on simazine use sites can accumulate 8.3-19.1 mg simazine/kg-bw. These concentrations on food items represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consuming contaminated food directly on simazine 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 reduced body weight and body weight gain, as well as some low level of hormone disruptions, can occur at these doses.

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

Indirect Effects

Available simazine toxicity studies indicate that mammal prey are not likely to experience any mortality from simazine exposure, even if individuals occur on-field where exposures are anticipated to be highest. While some sublethal effects to mammal prey foraging directly on-site (such as reduced growth and altered hormone levels) is possible, we do not anticipate this will appreciably change the availability of large mammal prey for the gray wolf.

Effects of the Action Summary

There is a large extent of overlap between the species' range and simazine use sites and their associated areas of off-site transport (e.g., spray drift and runoff areas). While individual wolves that predominantly forage on large mammal prey directly on simazine use sites are likely to experience sublethal adverse effects to growth and reproduction, we anticipate this is unlikely to occur in more than a small number of individuals as available information on the gray wolf's behaviors and distribution suggest that individuals are not likely to forage on or near human disturbed areas, including simazine use sites. As such, we do not anticipate individual wolves are likely to accumulate more than low levels of simazine and are not likely to experience more than low levels of direct adverse effects. Similarly, while large mammal prey to predominantly feed on simazine use sites may experience sublethal effects to growth and reproduction, we do not anticipate this will appreciably diminish the availability of prey for the gray wolf to consume. Thus, we do not anticipate more than low levels of indirect effects as well. As such, we conclude the overall risk of adverse effects to the gray wolf is low.

Species Conclusion

The gray wolf (Minnesota population) has a low vulnerability based on factors such as its recommendation for delisting, wide-ranging distribution, multiple populations, and stable population trends. Though there is high overlap of the action area with the species' range and a moderate extent of estimated usage across its range, the risk to the gray wolf posed by simazine across the range is low. We anticipate that individuals of the species will only rarely encounter and consume prey that have recently been exposed to simazine given the species general preference for remote sites away from human activities. Individual wolves that predominantly forage on large mammal prey directly on simazine use sites are likely to experience sublethal adverse effects to growth and reproduction, although we anticipate this is unlikely to occur in more than a small number of individuals. Similarly, while large mammal prey that predominantly feed on simazine use sites may experience sublethal effects to growth and reproduction, we do not anticipate this will impact the availability of sufficient prey items for the gray wolf to consume. The gray wolf does not tend to forage near use sites, this species has a varied diet, and individuals are highly mobile, such that we anticipate wolves will be able to continue to find suitable prey items.

While there is high overlap of the range with use sites and a moderate amount of usage in the range, we anticipate no more than a very small number of individuals are likely to experience adverse effects. We do not anticipate mortality from the consumption of contaminated prey or indirect effects from prey losses, although sublethal effects to growth and reproduction are likely for a small number of individuals that consume large mammals that have predominantly foraged on simazine use sites. We do not anticipate such adverse effects 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray wolf (Minnesota population).

References

Mech, D.L. 2017. Where can wolves live and how can we live with them? Biological Conservation 210: 310-317.

U.S. Fish and Wildlife Service. 2023. Species status assessment for the gray wolf (*Canis lupus*) in the western United States. Version 1.2. Lakewood, Colorado. 362 pp.

U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Removing Gray Wolf (*Canis lupus*) from the List of Endangered and Threatened Wildlife. Final Rule. Federal Register 85(213): 69778-69895.

U.S. Fish and Wildlife Service. 2012. Lower 48-state and Mexico gray wolf (*Canis lupus*) listing, as reviewed. 5-Year Review: Summary and Evaluation. Arlington, Virginia. 22 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: 5/20/2025; 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

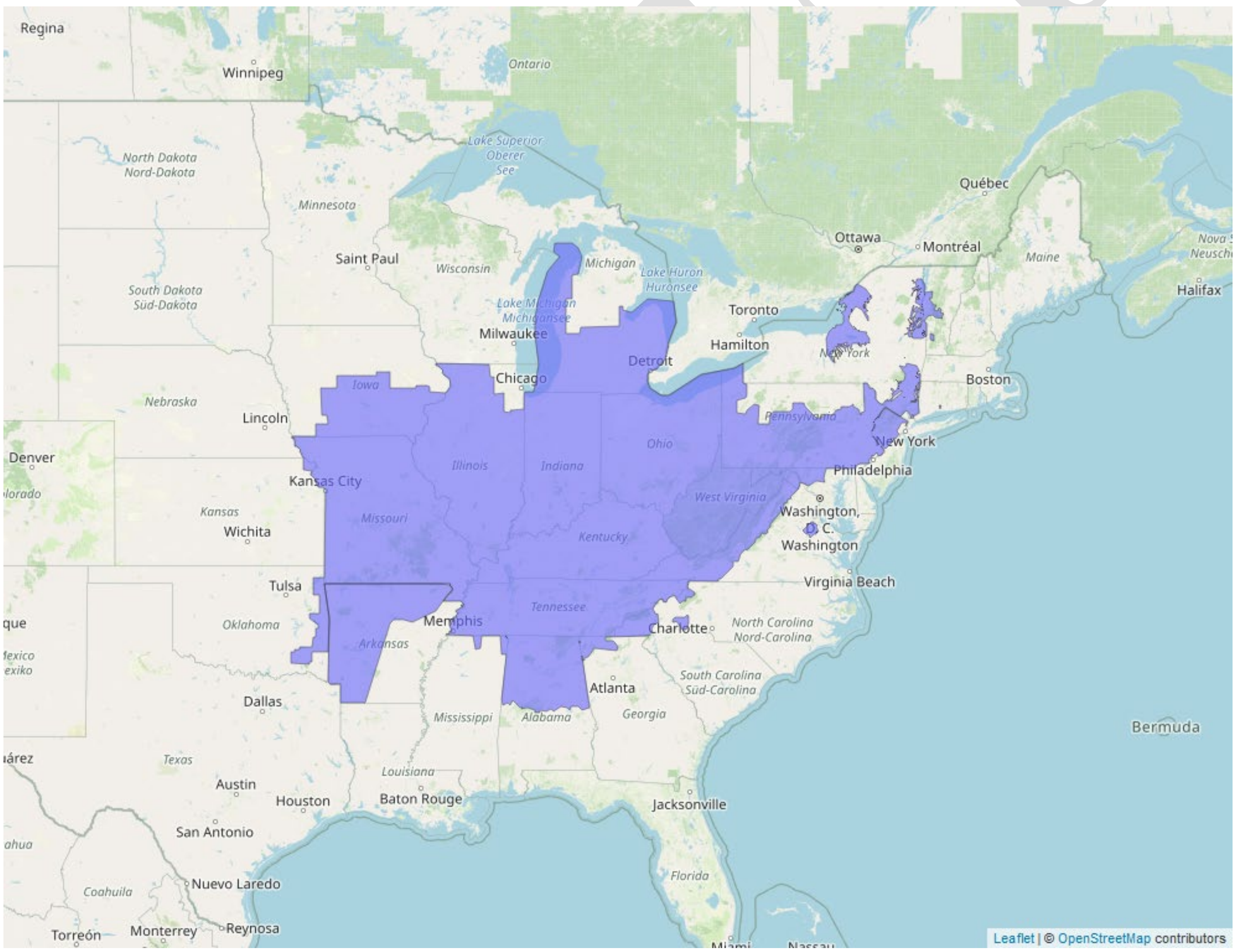

Figure 6. Range map of Indiana bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5949.

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 Alabama 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 26.9% of the species' range overlaps with agricultural use sites and 73.1% 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) (Table 10). In total, there is up to 100% overlap[8] between the species' range and the agricultural footprint of simazine use sites.

Table 10. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	23.3	38.6	61.9	2.1	5	7.1
Grapes	<0.1	0.7	0.8	<0.1	0.6	0.6
Other Crops	2.9	34.2	37.1	<0.1	<0.1	<0.1
Other Orchards	0.2	3.6	3.7	<0.1	1.3	1.4
Vegetables and Ground Fruit	0.5	6.9	7.4	<0.1	0.3	0.3
Christmas Trees	<0.1	1.5	1.5	<0.1	1.3	1.3
Total	**26.9**	**73.1**	**100[8]**	**2.2**	**7.9**	**10**

Usage

Past usage data indicate that up to 10% of the species' range has been treated with simazine 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.

[8] Total overlap is capped at 100%.

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 simazine uses sites, such as residential lawns, golf courses, or nurseries, but individuals may travel through and forage in these areas. As such, we anticipate individuals may be exposed to simazine on non-agricultural use sites.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine directly on simazine use sites can accumulate 63.2-146.4 mg simazine/kg-bw. These dosages represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels, are likely to occur at these exposure levels.

In contrast, arthropod prey exposed to simazine in off-site areas (i.e., through spray drift or runoff) are not likely to accumulate more than low levels of simazine, 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 simazine toxicity studies in terrestrial invertebrates indicate that simazine 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, from agricultural or non-agricultural uses. While we anticipate exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure will destroy or limit the availability of the complex vegetative structure the species requires for its habitat (e.g., trees for roosting) or to support its arthropod prey. We expect conservation measures for agricultural uses and existing pesticide use practices and conditions in non-agricultural uses of simazine (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 simazine residues in areas adjacent to agricultural and non-agricultural use sites. As such, we do not anticipate effects to prey or sensitive exposed plants will cause changes to food availability or 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 simazine 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 use sites are likely to experience sublethal impacts, including reduced growth and reproduction. In contrast, we do not anticipate individuals that forage away from simazine use sites will experience more than low levels of direct adverse effects, if any. We do not anticipate simazine 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.

Simazine agricultural use sites and off-site areas that may be exposed overlap with up to 100% of the species' range (26.9% overlap with use sites and 73.1% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 2.2% of the range has been treated with simazine on agricultural use sites annually, exposing up to 10% of the species' range on-site and from off-site transport annually, with a larger portion of the range likely to be exposed due to variations in use sites where annual usage may occur within the overlapping area over the project duration. Individuals may also travel through and forage in developed areas. As such, we anticipate individuals may also be exposed to simazine on and adjacent to non-agricultural use sites. However, we expect on-site exposure of bats to simazine on non-agricultural use sites such as nurseries, turf (including golf courses and lawns), and small ornamental ponds (1,000 gallons or less) to be limited, as these areas are less likely support abundant prey than the bat's preferred foraging areas. We do not expect toxicity from simazine 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 simazine use sites will experience more than low levels of direct adverse effects, if any. We also do not expect simazine 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, while the overlap between the Indiana bat's range and simazine use sites is large, and past usage data indicate there will be high levels of exposure from annual usage on agricultural use sites, usage is only anticipated to occur on 1.4% of agricultural use sites annually. While additional usage is anticipated on non-agricultural use sites, we anticipate no more than a small number of individuals that predominantly forage on simazine agricultural and non-agricultural use sites will experience impacts to fitness related to growth and reproduction. We do not exposure will lead to mortality of bats, and we do not anticipate more than low levels of adverse effects, if any, will occur to bats from exposure in off-site areas. We also 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. We do not anticipate such adverse effects would result in species-level effects. 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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: 3/2/2022; Wherever found; *States within the range:* ID

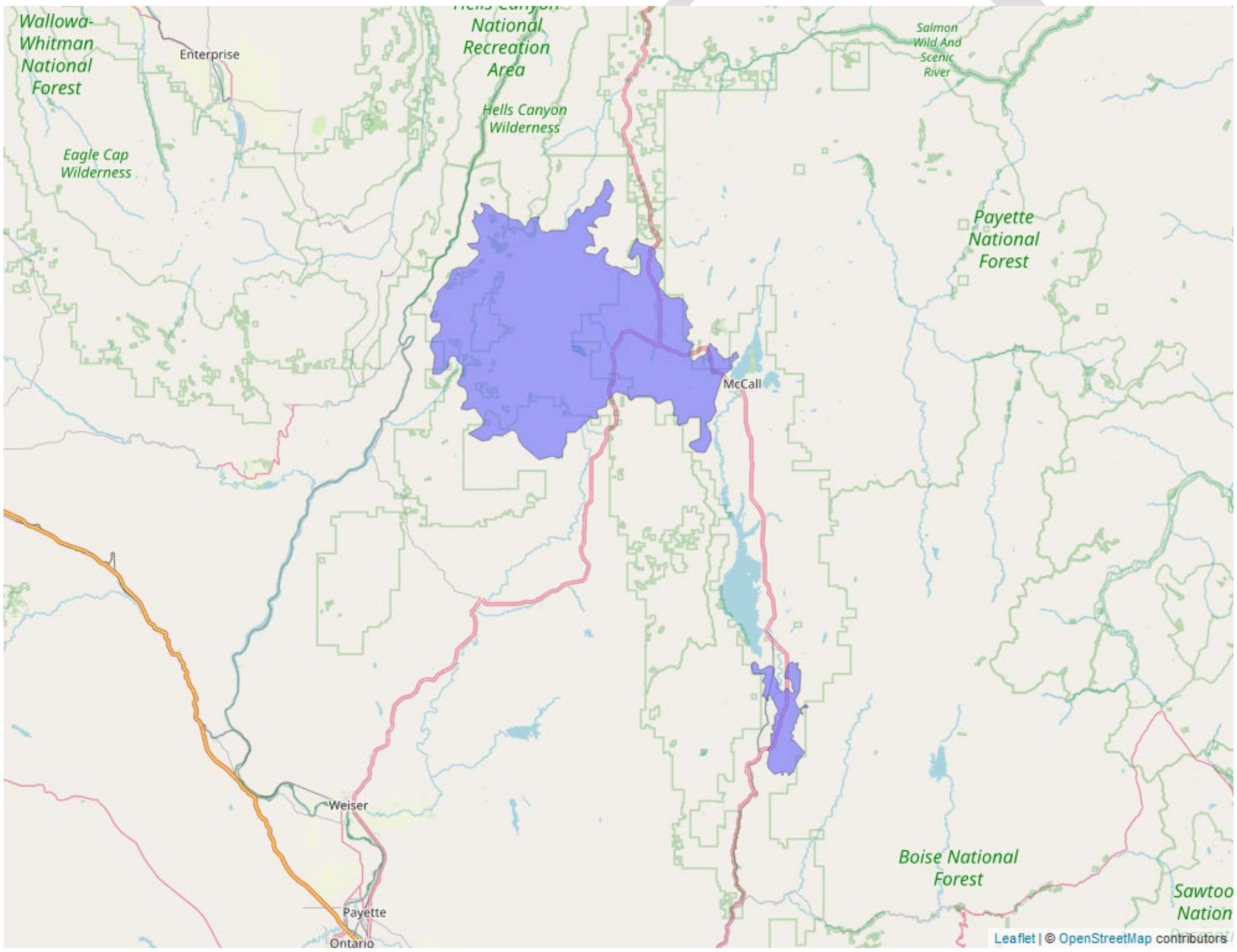

Figure 7. Range map of northern Idaho ground squirrel (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2982.

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: 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: 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. There are 17 metapopulations, including 13 identified in Federal ownership, or in a combination of Federal, State, and/or private ownership. Survey and monitoring results indicate the populations have been relatively stable since 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 was in place for an area that houses the largest population in the range and roughly a third of the known Northern Idaho ground squirrel sites until 2024. Fifteen 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: Medium

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 0.2% of the species' range overlaps with agricultural use sites and 9.9% 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) (Table 11). In total, there is approximately 10.1% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 11. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	<0.1	2.8	2.8	<0.1	2.8	2.8
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

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 Crops	0.1	6	6.1	<0.1	<0.1	<0.1
Other Orchards	<0.1	0.2	0.2	<0.1	0.2	0.2
Vegetables and Ground Fruit	<0.1	0.9	0.9	<0.1	0.9	0.9
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**0.2**	**9.9**	**10.1**	**<0.1**	**3.9**	**3.9**

Usage

Past usage data indicate that up to 3.9% of the species' range has been treated with simazine 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 simazine 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 simazine 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 simazine.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine use sites can accumulate 1.8-499.1 mg simazine/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 simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels.

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 simazine, 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 exposure of simazine on use sites or from off-site transport of simazine can negatively impact the growth and survival of sensitive plants, we do not anticipate adverse effects to some plants 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 simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate simazine 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 simazine use sites and their associated off-site transport areas. Squirrels exposed to simazine 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 simazine 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 simazine 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 simazine 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 simazine in off-site areas where dietary exposures will be low, and given that simazine use will not appreciably reduce food availability within the squirrel's range, we anticipate the overall risk of adverse effects to the species from simazine 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.

Simazine agricultural use sites and off-site areas that may be exposed overlap with 10.1% of the species' range (0.2% overlap with use sites and 9.9% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that <0.1% of the range has been treated with simazine on agricultural use sites annually, exposing up to 3.9% of the species' range on use sites and from off-site transport annually, with a larger portion of the range likely to be exposed due to variations in use sites where annual usage may occur within the overlapping area over the project duration (but still low exposure on use sites based on <0.1% annual usage). Additional exposure may occur from non-agricultural uses of simazine, but this species is not known to occur on non-agricultural (i.e., nurseries and turf, including golf courses and lawns) or agricultural simazine use sites, so we do not anticipate more than a very small number of individuals will be exposed on use sites.

We do not expect toxicity from simazine 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 simazine 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. While we anticipate exposure to simazine 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 simazine exposures, we do not anticipate simazine 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 simazine in off-site areas where dietary exposures will be low and direct adverse effects are not anticipated, and that simazine 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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

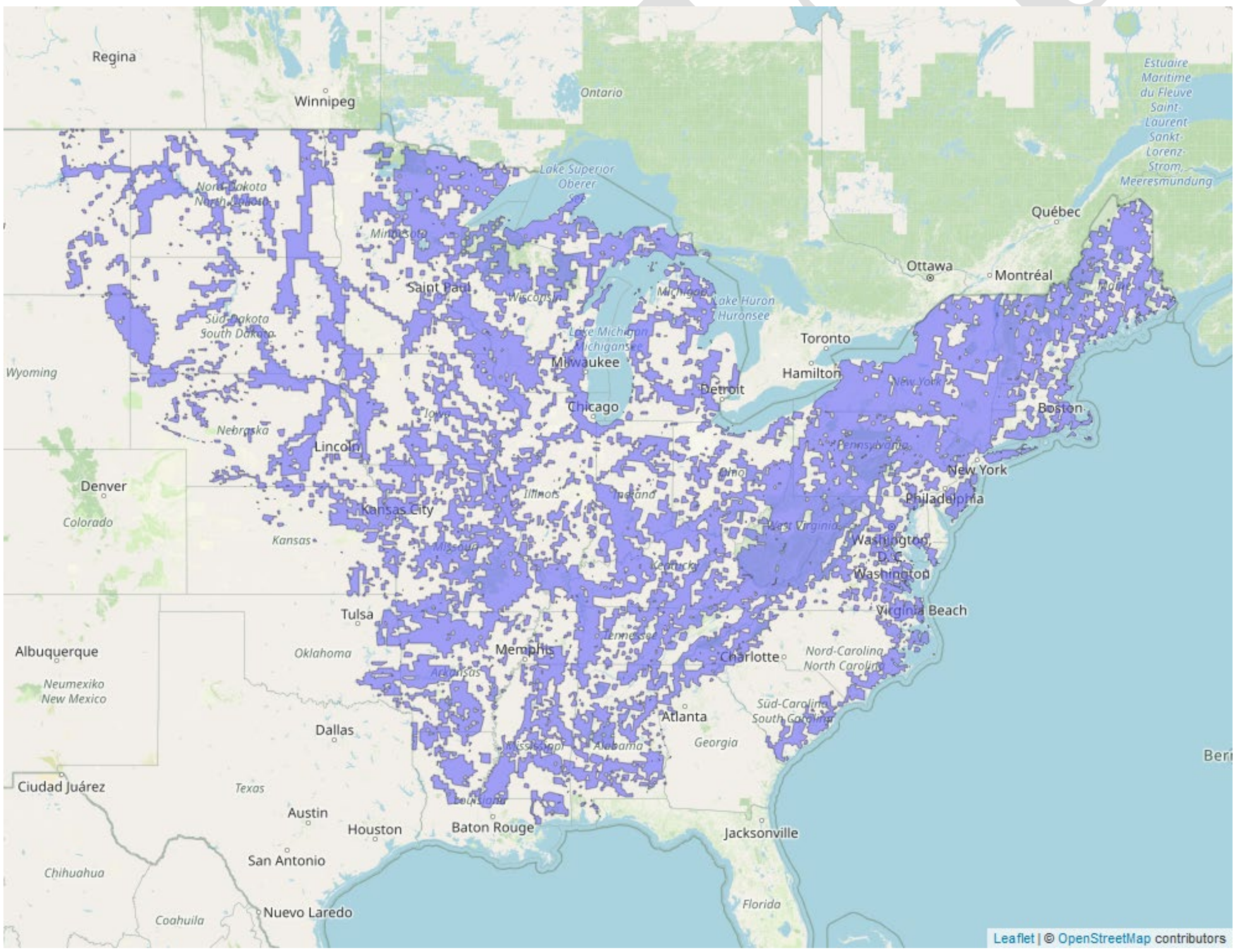

Figure 8. Range map of northern long-eared bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/9045.

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 15.1% of the species' range overlaps with agricultural use sites and 71.1% 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) (Table 12). In total, there is approximately % overlap between the species' range and the agricultural footprint of simazine use sites.

Table 12. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	12.4	32.8	45.3	2.4	8.9	11.3
Grapes	<0.1	0.7	0.7	<0.1	0.5	0.6

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	2	27.4	29.4	<0.1	<0.1	<0.1
Other Orchards	0.1	2.9	3	<0.1	1.7	1.8
Vegetables and Ground Fruit	0.5	6.8	7.3	<0.1	0.7	0.7
Christmas Trees	<0.1	1.1	1.2	<0.1	1.1	1.1
Total	**15.1**	**71.1**	**86.2**	**2.5**	**12.4**	**14.9**

Usage

Past usage data indicate that up to 14.9% of the species' range has been treated with simazine 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 simazine 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 simazine use sites like golf courses. As such, we anticipate non-agricultural simazine use may further contribute to the exposure of the species.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine directly on agricultural and non-agricultural use sites can accumulate 64.4-149.4 mg simazine/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 simazine 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 altered reproductive hormone levels, are likely to occur at these exposure concentrations.

In contrast, arthropod prey exposed to simazine in off-site areas (i.e., through spray drift or runoff) are not likely to accumulate more than low levels of simazine, 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 simazine toxicity studies in terrestrial invertebrates indicate that simazine 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 simazine can negatively impact the growth and survival of sensitive plants, we do not anticipate spray drift or runoff of simazine 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 simazine (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 simazine residues in areas adjacent to non-agricultural use sites. We anticipate simazine 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 simazine 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 simazine use sites will experience more than low levels of direct adverse effects, if any. We do not anticipate simazine 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.

Simazine agricultural use sites and off-site areas that may be exposed overlap with 86.2% of the species' range (15.1% overlap with use sites and 71.1% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 2.5% of the range has been treated with simazine on agricultural use sites annually, exposing up to 14.9% of the species' range on-site and from off-site transport annually, with a larger portion of the range (up to 15.1%) 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 simazine use sites are generally not their preferred habitats. In addition, we expect on-site exposure of bats to simazine on non-agricultural use sites such as nurseries, turf (including golf courses and lawns), and small ornamental ponds (1,000 gallons or less) to be limited, as these areas are less likely support abundant prey than the bat's preferred foraging areas. If applied, we anticipate off-site transport of simazine will be minimal as characteristics of the use sites (i.e., continuous cover, no till) are expected to result in little runoff. We do not expect toxicity from simazine 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 simazine use sites will experience more than low levels of direct adverse effects, if any. We also do not expect simazine 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 simazine, 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 simazine to rise to the level of mortality, we anticipate a moderate number of individual bats that predominantly forage on simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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

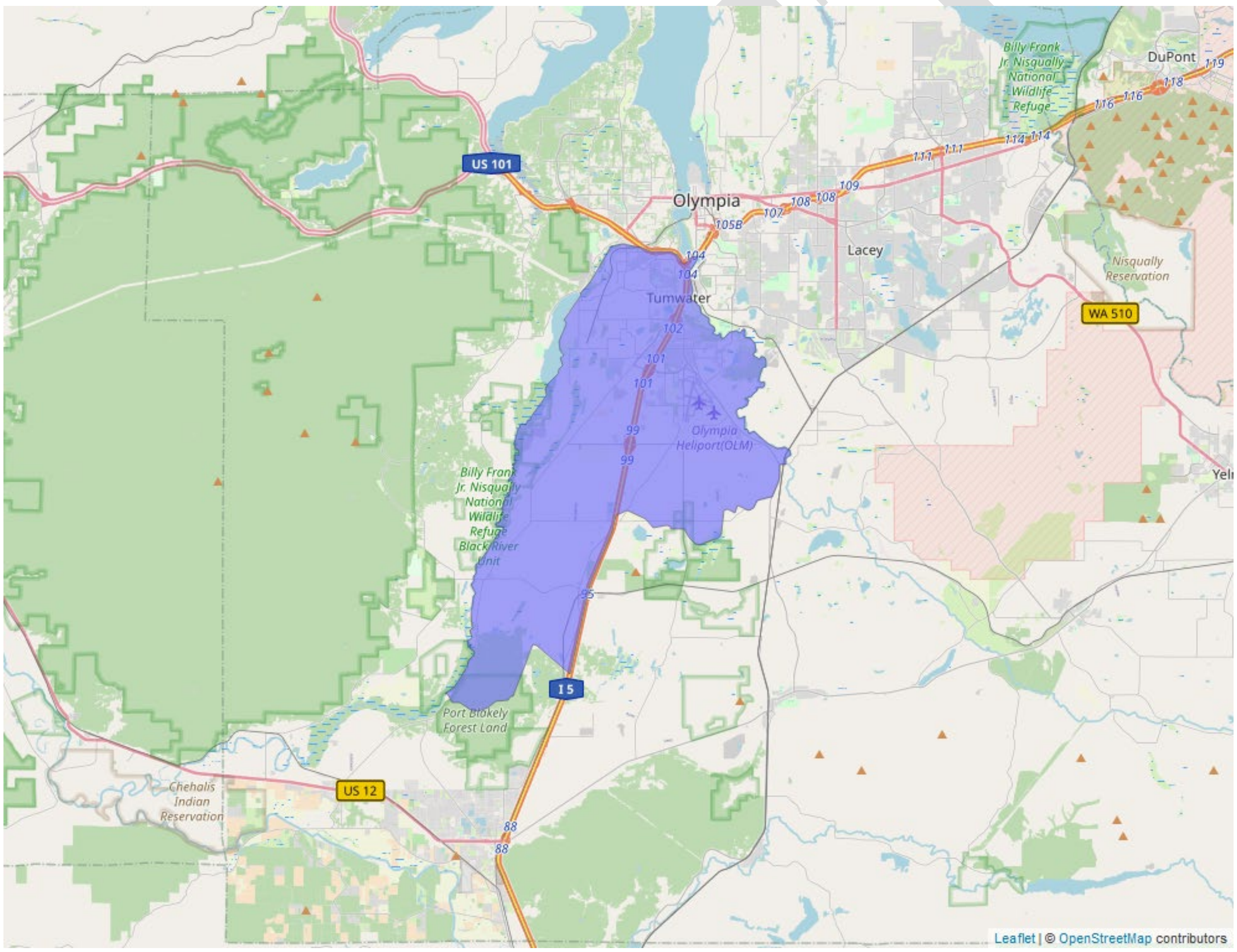

Figure 9. Range map of Olympia pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6713.

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: NA

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 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 or Scotch broom 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. 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 a threat to individual 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 3.2% of the species' range overlaps with agricultural use sites and up to 100% 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) (Table 13). In total, there is up to 100% overlap[9] between the species' range and the agricultural footprint of simazine use sites.

Table 13. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	0.2	24.3	24.5	0.2	24.3	24.5

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[9] 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
Grapes	<0.1	2.9	2.9	<0.1	2.9	2.9
Other Crops	0.2	24.2	24.4	0.2	24.2	24.4
Other Orchards	<0.1	9	9	<0.1	9	9
Vegetables and Ground Fruit	0.4	44.9	45.3	0.4	44.9	45.3
Christmas Trees	2.4	70.2	72.6	2.4	70.2	72.6
Total	**3.2**	**100[9]**	**100[9]**	**3.2**	**100[9]**	**100[9]**

Usage

Past usage data indicate that up to 100% of the species' range[9] has been treated with simazine 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 simazine use sites. However, we anticipate only a small number of individuals are likely to occur on agricultural use sites as there is low overlap between the species' range and on-field areas (i.e., agricultural fields only make up 3.2% of the species' range), with the majority of the use site overlap (2.4%) being with Christmas trees. The species has been considered a pest by some producers because individuals can sometimes damage crops and seedling trees, which may include Christmas trees. However, the overlap with Christmas trees and other use sites is low. Furthermore, as noted in the gopher's recovery plan, 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 simazine use sites, including residential lawns, turf, golf courses, or nurseries. As such, we anticipate non-agricultural uses of simazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine use sites can accumulate 138.6-701.3 mg simazine/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 simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels, reduced fetal weight, and increased incidence of abortions.

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 simazine, 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 exposure of simazine on use sites or from off-site transport of simazine can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure 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 simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate simazine use will result in no more than low levels of indirect adverse effects.

Effects of the Action Summary

There is large extent of overlap between the species' range and simazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on simazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to simazine 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 3.2% 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.

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 simazine 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 simazine, 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 simazine use, and that the species will experience an overall low level of indirect adverse effects resulting from simazine 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. Simazine use sites and off-site areas that may be exposed to annual usage overlap with 100% of the species' range (3.2% of the range is on agricultural use sites, with the rest exposed to simazine in off-site areas from spray drift of runoff, and possibly from non-agricultural 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 simazine 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 simazine 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 simazine 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 simazine, 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 simazine, 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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. 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.

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.

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

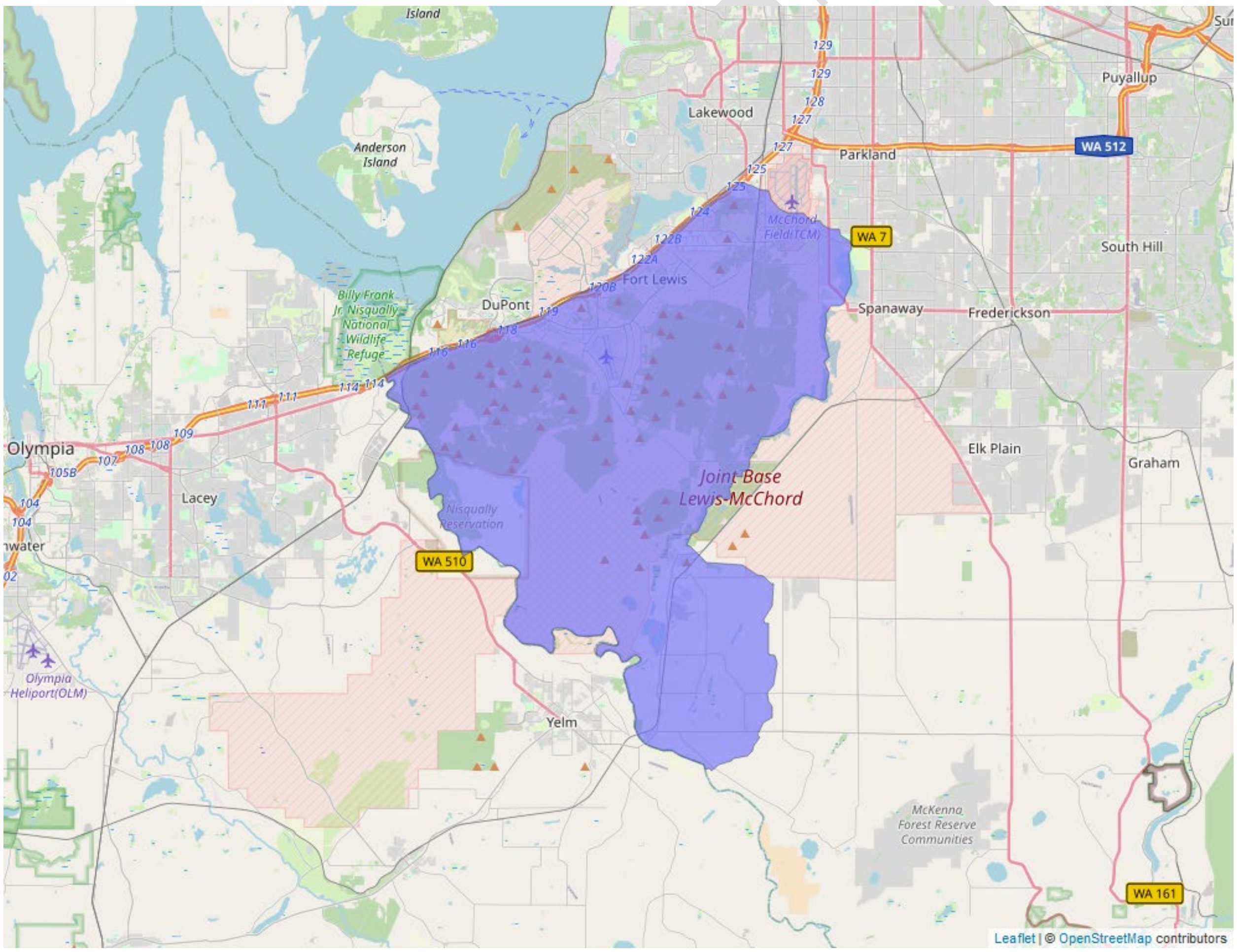

Figure 10. Range map of Roy Prairie pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7821.

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 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 or Scotch broom 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 a threat to individual 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 0.5% of the species' range overlaps with agricultural use sites and 65.1% 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) (Table 14). In total, there is approximately 65.6% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 14. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	<0.1	8.7	8.7	<0.1	8.7	8.7
Grapes	<0.1	0.6	0.6	<0.1	0.6	0.6
Other Crops	<0.1	7.3	7.3	<0.1	7.3	7.3

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 Orchards	<0.1	1.2	1.2	<0.1	1.2	1.2
Vegetables and Ground Fruit	<0.1	17	17.1	<0.1	17	17.1
Christmas Trees	0.3	30.4	30.7	0.3	30.4	30.7
Total	**0.5**	**65.1**	**65.6**	**0.5**	**65.1**	**65.6**

Usage

Past usage data indicate that up to 65.6% of the species' range has been treated with simazine 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 simazine 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 0.5% of the species' range), with the majority of the use site overlap (0.3%) being Christmas trees. The species has been considered a pest by some producers because individuals can sometimes damage crops and seedling trees, which may include Christmas trees. However, the overlap with Christmas trees and other use sites is very low. Furthermore, as noted in the gopher's recovery plan, 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 simazine use sites, including residential lawns, turf, golf courses, or nurseries. As such, we anticipate non-agricultural uses of simazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine use sites can accumulate 138.6-701.3 mg simazine/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 simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels, reduced fetal weight, and increased incidence of abortions.

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 simazine, 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

The Roy Prairie pocket gopher requires plants as a food resource and is known to consume a variety of plant parts (e.g., leaves, roots, bulbs, flowers) from a wide range of plant species. While we anticipate exposure of simazine on use sites or from off-site transport of simazine can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure 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 simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate simazine use will cause no more than low levels of indirect adverse effects to the Roy Prairie pocket gopher.

Effects of the Action Summary

There is large extent of overlap between the species' range and simazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on simazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to simazine 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 0.5% 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.

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 simazine usage. Required agricultural mitigation measures and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-field transport as well as exposure concentrations, resulting in no more than low levels of 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 simazine use, and that the species will experience an overall low level of indirect adverse effects resulting from simazine 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. Simazine use sites and off-site areas that may be exposed to annual usage overlap with 65.6% of the species' range (0.5% of the range is on agricultural use sites, with the rest exposed to simazine in off-site areas from spray drift of runoff, and possibly from non-agricultural 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 simazine 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 simazine 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 simazine 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 simazine, 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 simazine, 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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.

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.

Integration and Synthesis Summary: San Bernardino Merriam's kangaroo rat

Scientific Name:	Common Name:	Entity ID:
Dipodomys merriami parvus	San Bernardino Merriam's kangaroo rat	63

Conclusion: No Jeopardy

Species Range

Based on range map dated: 3/21/2018; Wherever found; *States within the range:* CA

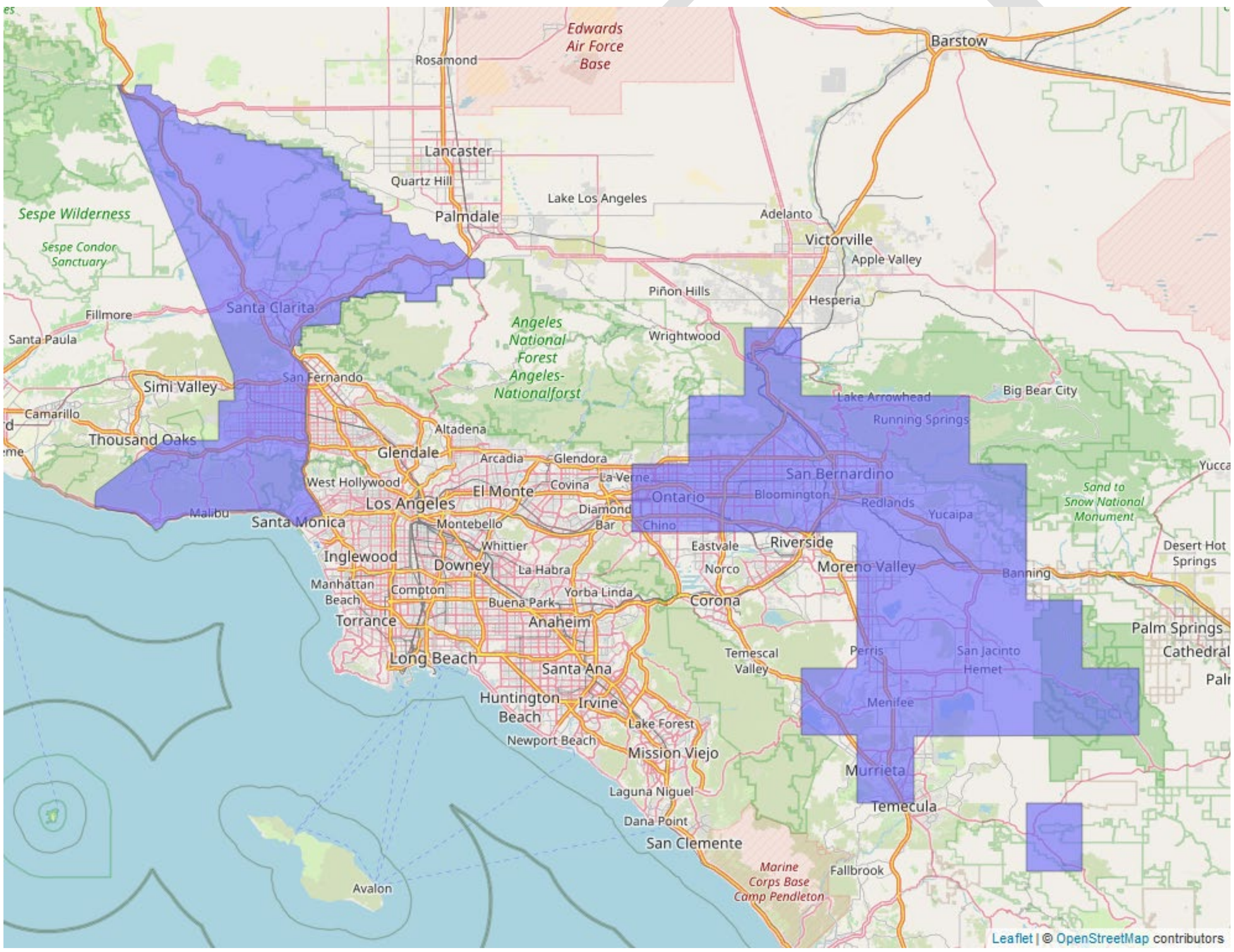

Figure 11. Range map of San Bernardino Merriam's kangaroo rat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2060.

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: 8/13/2024

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: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

There are three recognized subspecies of Merriam's kangaroo rat within California: *Dipodomys merriami merriami*, *D. m. collinus*, and *D. m. parvus* (San Bernardino Merriam's kangaroo rat). As identified in the final listing rule, habitat for the San Bernardino Merriam's kangaroo rat has been severely reduced and fragmented by development, aggregate mining, and related activities in the San Bernardino and San Jacinto valleys. Development within floodplain habitat will continue to increase as a result of population growth within western San Bernardino County and the demand for a larger water supply in southern California, and aggregate mining, agriculture, off-highway vehicle activities, competition, and predation are continuing threats. Flood control structures often confine, isolate, or fragment populations of the San Bernardino Merriam's kangaroo rat, thereby predisposing these populations to catastrophes and other risks inherent to small populations (USFWS 2009, USFWS 2020, USFWS 2024a, USFWS 2024b).

Historically, the San Bernardino Merriam's kangaroo rat occupied floodplains and adjacent upland habitat areas containing appropriate physical and vegetative characteristics. Animals from the upper terraces of the floodplain and adjacent uplands were historically available to recolonize extirpated areas that were flooded and scoured during storm events. However, conversion of floodplains into narrow, monotypic channels has removed the physical structure (i.e., terracing) as well as areas of the active floodplain. An overall reduction in the amount of habitat available to the San Bernardino Merriam's kangaroo rat and greater habitat fragmentation will continue to occur (USFWS 2009).

San Bernardino Merriam's kangaroo rats are primarily granivorous and often store large quantities of seeds in surface caches. Although seeds are the primary food source for the San Bernardino Merriam's kangaroo rat, green vegetation and insects appear to be important seasonal food and water sources. Seed caching may enable them to endure temporary shortages of food, as has been documented for other species of Dipodomys (USFWS 2009).

Although reproductive activities peak in June and July, San Bernardino Merriam's kangaroo rats appear to have a prolonged breeding season. Pregnant or lactating females have been captured between January and November while males in reproductive condition have been captured between January and August. Females are capable of having more than one litter per year, and litter sizes probably average between two and three young (USFWS 2009).

Because of the high level of habitat loss (habitat already reduced by 96% by the time the San Bernardino Merriam's kangaroo rat was emergency listed), our conservation and recovery strategy is to conserve as much remaining habitat as possible (USFWS 2009). San Bernardino Merriam's kangaroo rats are currently distributed among three isolated populations. These core areas make up the majority of the modeled habitat thought to be suitable for the subspecies within the historical range. There is some evidence of inbreeding that could have negative impacts in the future, especially in the smallest and most genetically distinct population (San Jacinto population) (USFWS 2024a). To maintain or improve population resiliency we need to focus efforts to conserve upland refugia habitat and to promote a large enough effective population size to mitigate impacts from inbreeding. There is currently a limited amount of upland habitat available for the subspecies and work is needed to conserve additional habitat in each of the three populations. Effective population sizes are also thought to be smaller than needed to support these populations into the future. If current trends continue, the threats that limit habitat availability (especially upland refugia) may also result in a decline of the effective population sizes. Sufficient redundancy for the San Bernardino Merriam's kangaroo rat likely depends on maintaining occupancy in the three extant populations. Currently, these populations are not considered to be highly resilient. In the future deleterious effects from small effective populations can contribute to further losses in representation as genetic diversity or loss of a population (USFWS 2024b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 1.3% of the species' range overlaps with agricultural use sites and 12.8% 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) (Table 15). In total, there is approximately 14.1% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 15. Agricultural use site overlap for the range of the San Bernardino Merriam's kangaroo rat.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)
Citrus	0.4	2.7	3.1
Corn	<0.1	0.3	0.3
Grapes	<0.1	0.7	0.7
Other Crops	1	8.9	9.8
Other Orchards	<0.1	3.1	3.2
Vegetables and Ground Fruit	<0.1	0.8	0.9
Christmas Trees	<0.1	<0.1	<0.1
Total	**1.3**	**12.8**	**14.1**

Usage

Mandatory reporting data from the state of California indicates that, between 2013-2022, the maximum yearly overlap between the species' range and agricultural areas reporting any pesticide usage was 1.9%. Up to 1.6% of areas overlapping the species' range reported use of any herbicide, and <0.1% reported treatment with simazine. Based on this reporting data, we expect <0.1% of the species' range is likely to be treated with simazine, specifically (Table 16). This pesticide usage data is based on data reported by more than 472 growers within the species' range. The high number of reporters suggests that these usage metrics will be robust to changes over time.

Table 16. Overlap of usage areas within the range of the San Bernardino Merriam's kangaroo rat.

Overlap with all pesticide usage areas (% range)	Overlap with all herbicide usage areas (% range)	Overlap with simazine usage areas (% range)
1.9	1.6	<0.1

Additional Exposure Considerations

Available life history information on the species indicate that individuals are likely to occupy both active and abandoned citrus orchards if suitable soils are present. While citrus orchards make up only a small part of the range, we anticipate any individuals occupying those orchards are likely to be exposed to high levels of simazine.

Exposure from Non-Agricultural Uses

While we do not anticipate individuals are likely to occur in non-agricultural simazine use sites (e.g., residential lawns, turf fields, golf courses, or nurseries), intensive human development activities has greatly fragmented the species' range. While these non-agricultural use sites do not represent preferred habitat, given the proximity between suitable habitat and these developed and open space developed areas, we anticipate some low level of exposure through non-agricultural uses is possible.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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. Typical of kangaroo rats, the San Bernardino Merriam's kangaroo rat is primarily granivorous and predominantly consumes seeds. Succulent green vegetation and insects appear to be additional important seasonal food and water sources. An individual kangaroo rat foraging on contaminated food resources directly on simazine use sites can accumulate 4.0-1121.5 mg simazine/kg-bw, depending on the specific food source consumed. These dietary exposures represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels, reduced fetal weight, and increased incidence of abortions.

In contrast, 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 simazine, 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 exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure will destroy or limit the availability of the complex vegetative structure (e.g., sage scrub vegetative communities) the species requires for its habitat. Similarly, while we anticipate simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine residues in areas adjacent to non-agricultural use sites. Given that the species is not specifically reliant on a single species as a food resource, the required agricultural mitigations, and the low likelihood of off-field exposure through non-agricultural uses, we anticipate there will still be sufficient food resources available for the San Bernardino Merriam's kangaroo rat even with impacts to sensitive plant species from simazine use.

Effects of the Action Summary

While there is a high extent of overlap between the species' range and agricultural simazine use sites, and while we anticipate individuals that forage predominantly on simazine use sites will experience high levels of sublethal adverse effects, we do not anticipate more than a small number of individuals are likely to experience these adverse effects. While individuals are known to occupy citrus orchards, EPA's overlap analysis indicate very little overlap between citrus orchards and the species' range, indicating that few individuals across the range are likely to occur in these areas. Furthermore, mandatory pesticide usage reporting data collected by the state of California show very little simazine usage has occurred within the species' range in the past. Given that large number of growers within the species' range reporting to the state government, we anticipate this level of usage is relatively stable and is not likely to fluctuate significantly in the future. Thus, we anticipate that only a small number of individuals, at most, are likely to be exposed to simazine on agricultural use sites. Similarly, we anticipate exposure in non-agricultural use sites will be limited to small numbers of individuals, if any, given that these use sites do not likely represent preferred habitat for individuals. Required agricultural mitigations and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-site exposure as well as the exposure concentration. Based on these mitigations and protective practices, we anticipate no more than low levels of indirect adverse effects will occur. As such, we anticipate the overall risk of adverse effects to the species is low.

Species Conclusion

The San Bernardino Merriam's kangaroo rat has high vulnerability based on factors such as its status (i.e., endangered), limited distribution, and declining trends. Historical floodplain and adjacent upland habitat areas have been severely reduced and fragmented, with the species now currently distributed among three isolated populations. Recovery efforts are needed to conserve upland refugia habitat for each of the populations and promote large enough effective population sizes to mitigate impacts from inbreeding. Seeds are the primary food source for the San Bernardino Merriam's kangaroo rat, but green vegetation and insects appear to be important seasonal food and water sources.

Simazine agricultural use sites and off-site areas that may be exposed overlap with 14.1% of the species' range (1.3% overlap with use sites and 12.8% overlap with areas that may be exposed off-site from spray drift or runoff). Additional exposure may occur from non-agricultural uses of simazine (i.e., nurseries and turf, including golf courses and lawns). Available life history information for the species indicates that individuals are likely to occupy both active and abandoned citrus orchards if suitable soils are present. While citrus orchards make up only a small part of the range (0.4%), we anticipate any individuals occupying those orchards are likely to be exposed to high levels of simazine. Non-agricultural use sites do not represent preferred habitat, although we anticipate some low level of exposure from non-agricultural uses is possible. However, CalPUR data indicate less than 0.1% of the range has been treated annually with simazine in the past (only 1.6% was treated annually with any herbicide). A larger, but still low (based on the low annual simazine usage) portion of the range likely to be exposed over the project duration. CalPUR data include agricultural and certain non-agricultural uses, such as those performed by professional commercial applicators. While these data do not capture all non-agricultural usage, such as residential applications by consumers, given our broad understanding of simazine usage and general information on non-agricultural use practices, we expect limited exposure from private residential uses of simazine. Given that CalPUR 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 a small portion of the species' range is likely to be exposed to agricultural and most non-agricultural uses of simazine each year.

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 simazine 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 simazine in off-site areas. Thus, while exposure may occur in a large portion of the species' range, only a small portion overlaps with agricultural and non-agricultural use sites where sublethal effects are expected from simazine usage on use sites. 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 San Bernardino Merriam's kangaroo rat, we do not anticipate the entire plant community will die as a result of simazine usage and we do not expect insect prey availability will be affected. We anticipate the loss of some plants that contribute to habitat elements and food resources for the kangaroo rat, but that any indirect adverse effects to kangaroo rats will be localized and minimal, with habitat structure and food availability to remain sufficient for individuals in exposed areas. In addition, required 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 simazine, 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 simazine on use sites and in off-site areas, no more than a small number of individuals are likely to be exposed to simazine based on the low levels of simazine usage expected in the range. We do not anticipate mortality of individuals or indirect effects from insect prey or plant losses, although sublethal effects to growth and reproduction are likely in localized areas for a very small number of individuals that predominantly forage on simazine agricultural and non-agricultural use sites. 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the San Bernardino Merriam's kangaroo rat.

References

U.S. Fish and Wildlife Service. 2024a. San Bernardino Kangaroo Rat (*Dipodomys merriami parvus*) 5-Year Review: Summary and Evaluation. Carlsbad, California. 11 pp.

U.S. Fish and Wildlife Service. 2024b. Species Status Assessment for San Bernardino kangaroo rat. Sacramento, California. ix + 100 pp.

U.S. Fish and Wildlife Service. 2020. San Bernardino kangaroo rat (*Dipodomys merriami parvus*) 5-year Status Review: Summary and evaluation. Carlsbad, California. 2 pp.

U.S. Fish and Wildlife Service. 2009. San Bernardino kangaroo rat (*Dipodomys merriamii parvus*) 5-Year Review: Summary and Evaluation. Carlsbad, California. 32 pp.

Integration and Synthesis Summary: San Joaquin kit fox

Scientific Name:	Common Name:	Entity ID:
Vulpes macrotis mutica	San Joaquin kit fox	6

Conclusion: No Jeopardy

Species Range

Based on range map dated: 3/21/2018; wherever found; *States within the range:* CA

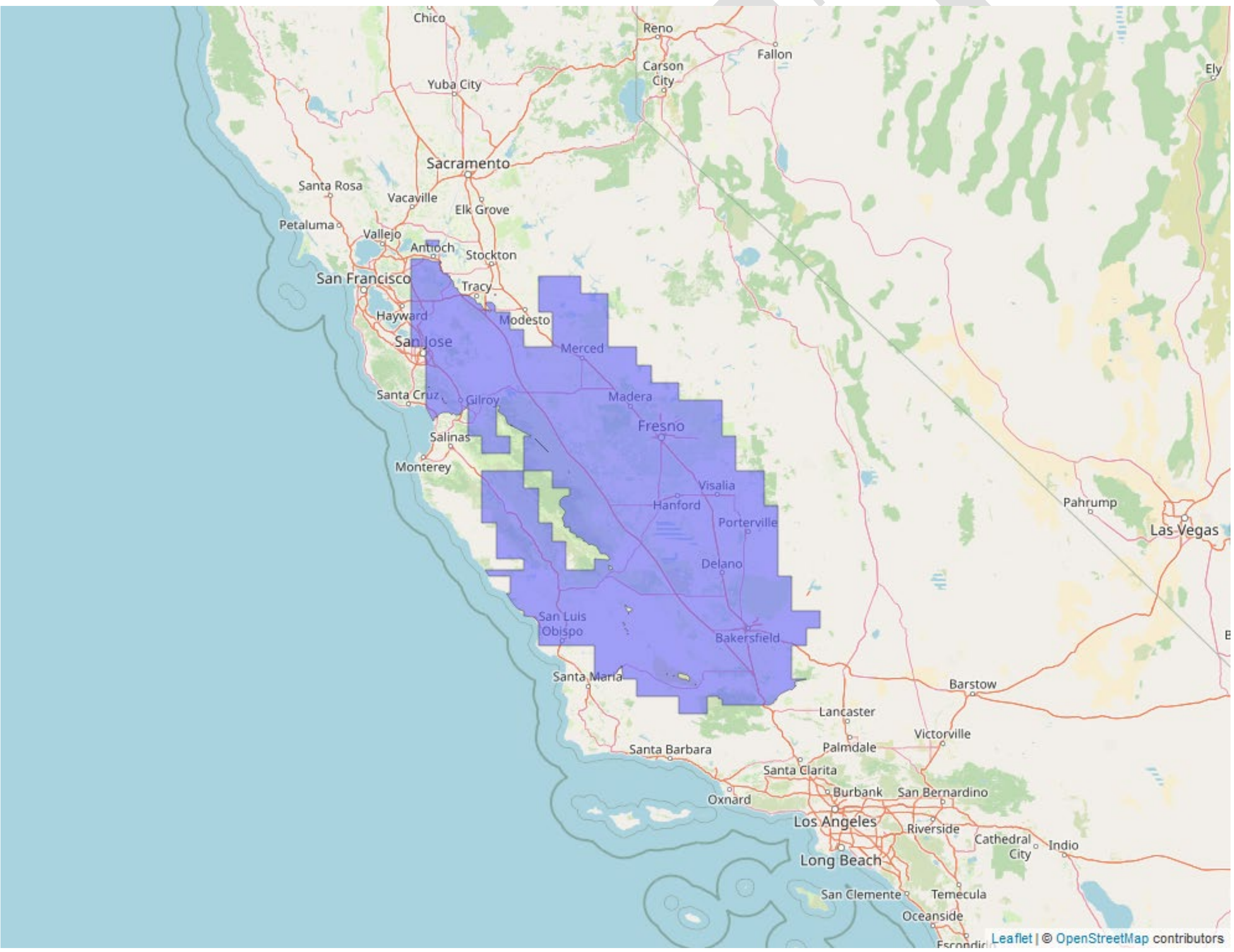

Figure 12. Range map of San Joaquin kit fox (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2873.

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

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: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The San Joaquin kit fox is a primarily nocturnal, arid-adapted species that occurs in semi-desert grassland habitats with sparse vegetation. They use subsurface dens that extend 6+ feet below ground for shelter and breeding. Their primary prey is kangaroo rats (*Dipodomys* spp.), but they will also eat other rodents, lagomorphs, birds, and occasionally insects and plant matter. They are endemic to California and historically, this subspecies of kit fox ranged in alkali scrub/shrub and arid grasslands throughout the San Joaquin Valley floor from Kern County north to Tracy in San Joaquin County and into more gradual slopes of the surrounding foothills and valleys of the interior Coast Range.

At the time of listing, the species' range was reduced to the western and southern ends of the San Joaquin Valley and surrounding foothills. Kit fox subpopulations have become increasingly fragmented since listing. In the 1983 Recovery Plan, the range-wide estimate for San Joaquin kit foxes was 6,961 adults. By 1998, the largest extant populations were known to occur in western Kern County on and around the Elk Hills and Buena Vista Valley (Elk Hills) and in th Carrizo Plain Natural Area in San Luis Obispo County (Carrizo). Surveys on 77,000 ac of Elk Hills resulted in population estimates ranging from 74 to 262 between 1981-1983 and from 46 to 363 between 1983-1995. Carrizo is believed to have the highest population numbers, with a potentially high estimate from the late 1990s of between 251-610 individuals. In other areas of the state, kit fox groups appear to have been locally extirpated in several locations where remnant habitat remains. In 2010, the California Natural Diversity Database included 949 San Joaquin kit fox occurrences that were categorized as "presumed extant", even though 50% of these occurrences were over 20 years old (USFWS 2010). Surveys were conducted in Contra Costa and Alameda counties with no detections (2001-2003), and two observations were made during 2005-2007 surveys in Santa Nella. Kit foxes were reported from the semitropic area of Kern County, Ciervo-Panoche Valley (San Benito County), Coalinga area (Fresno County), western Merced County, Cuyama Valley, and Cholame Valley. A population in Bakersfield appeared to be stable (200-400 individuals) before it began declining from a sarcoptic mange epidemic. There has been no range-wide distribution survey conducted (USFWS 2020a, 2020b).

Threats to the species include loss of habitat to agricultural and urban development, pesticide exposure, competitive exclusion by other canids, the highly fluctuating population dynamic of most kit fox populations, isolation and loss of small subpopulations due to stochastic events and habitat fragmentation, off-road vehicle mortality, and loss of prey. Agricultural, residential, and commercial development of kit fox habitat remains the largest threat and we expect them to continue in the future. Although kit foxes were once thought able to inhabit established agricultural fields, research has shown that kit fox forage into fields at night but are unable to maintain long-term occupancy in these areas. Since listing, kit fox have been increasingly threatened by introduced red fox (Vulpes vulpes), which have expanded their range southward from the San Francisco Bay Area. High coyote densities also threaten kit fox where coyotes apparently exclude kit foxes from what appears to be otherwise suitable open and protected lands. Although substantial progress has been made in protecting habitat, it is not yet likely that all protected habitat parcels contain the requisite contiguous acreage, vegetative structure, and prey base to adequately sustain kit fox. Pesticide and anticoagulant rodenticide use pose an unquantified, but potentially significant, threat to kit fox populations, both through direct mortality and through loss of prey species. Rodenticides used to be broadcast over large areas by airplanes, but this is no longer conducted in CA. Anticoagulant rodenticides are still used in agriculture and other developed areas to prevent damage to plants by wild rodents (USFWS 2020a). Kangaroo rats, preferred prey for the kit fox, may also be killed by rodenticides. Kit foxes are susceptible to diseases like canine distemper virus, canine parovirus, and mange (USFWS 2010, 2020b). We expect climate change to affect kit foxes through changes in precipitation and temperature, which can drive changes to vegetation communities and alter prey species abundance and composition (USFWS 2020a).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 38.2% of the species' range overlaps with agricultural use sites and 61.8% 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) (Table 17). In total, there is approximately 100% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 17. Agricultural use site overlap for the range of the San Joaquin kit fox.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)
Citrus	2	16.5	18.5
Corn	4.6	24.6	29.3
Grapes	4.4	18	22.4
Other Crops	11.3	44.5	55.8
Other Orchards	17.4	29.9	47.3
Vegetables and Ground Fruit	4.9	28	32.9
Christmas Trees	<0.1	<0.1	<0.1
Total	**38.2**	**61.8**	**100***

*Total overlap is capped at 100%.

Usage

Mandatory reporting data from the state of California indicates that, between 2013-2022, the maximum yearly overlap between the species' range and agricultural areas reporting any pesticide usage was 51.3%. Up to 24.6% reported use of any herbicide, and <0.1% reported treatment with simazine. Based on this reporting data, we expect <0.1% of the species' range is likely to be treated with simazine, specifically (Table 18). This pesticide usage data is based on data reported by more than 30,773 growers within the species' range. The high number of reporters suggests that these usage metrics will be robust to changes over time.

Table 18. Overlap of usage areas within the range of the San Joaquin kit fox.

Overlap with all pesticide usage areas (% range)	Overlap with all herbicide usage areas (% range)	Overlap with simazine usage areas (% range)
31	24.6	<0.1

Additional Exposure Considerations

Available information on the species indicate that individuals are likely to occur on agricultural simazine use sites as they can use dry land farmed areas and are found adjacent to tilled or fallow fields, indicating that individuals can be exposed on-field.

Exposure from Non-Agricultural Uses

Available information on the species indicate that individuals are likely to occur in non-agricultural simazine use sites, particularly in urban areas or other intensely developed sites where simazine may be used.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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. Although an individual's diet can very seasonally and in response to available prey, the San Joaquin kit fox primarily consumes small mammal prey, with kangaroo rats being the preferred dietary item (comprising up to 80-90% of fecal material at most collecting sites throughout the species' range). An individual fox that exclusively consumes contaminated small mammal prey directly on simazine use sites can accumulate 69.3-160.7 mg simazine/kg-bw, depending on the specific use site individuals forage on. These dietary exposures represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels.

In contrast, foxes 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 simazine, resulting in no more than low levels of exposures to individuals in these areas. We do not anticipate individuals that consume contaminated small mammal prey off-site are likely to experience any mortality or sublethal adverse effects.

Indirect Effects

Available simazine toxicity studies indicate that mammal prey are not likely to experience any mortality from simazine exposure, even if individuals occur on-field where exposures are anticipated to be highest. While some sublethal effects to mammal prey foraging directly on-site (such as reduced growth and altered hormone levels) is possible, we do not anticipate this will appreciably change the availability of small mammal prey for the San Joaquin kit fox.

Effects of the Action Summary

While there is a high extent of overlap between the San Joaquin kit fox's range and agricultural simazine use sites, we anticipate very few individuals are likely to be exposed given the low level of past simazine usage, as reported by the California Department of Pesticide Regulation. Available information on the species' life history indicates that individuals may occur on both agricultural and non-agricultural simazine use sites. As such, individuals may be exposed to high levels of simazine from on-site exposure. We anticipate individuals exposed on-site will experience high levels of sublethal adverse effects to growth and reproduction but will not experience any mortality. In contrast, we do not anticipate individuals exposed in off-site areas will experience any mortality or sublethal adverse effects. We do not anticipate simazine use will impact small mammal prey availability within the species' range. In summary, despite the potential for high levels of sublethal adverse effects in individuals that forage directly on simazine use sites, given the low level of simazine usage expected within the state of California, we anticipate very few individuals, if any, will likely be exposed to simazine at levels that will cause more than low levels of sublethal adverse effects.

Species Conclusion

The San Joaquin kit fox has high vulnerability based on factors such as its status (i.e., endangered), limited distribution, and declining trends. The species is generally found in semi-desert grassland habitats with sparse vegetation. Their primary prey is kangaroo rats, but they will also eat other small mammals, birds, and occasionally insects and plant matter. Agricultural, residential, and commercial development of kit fox habitat remains the largest threat to the species, although there are many other threats to the species including habitat fragmentation and isolation of populations. They can use dry land farmed areas, but will usually avoid irrigated agricultural areas during foraging and denning. Although kit foxes were once thought able to inhabit established agricultural fields, research has shown that kit fox forage on fields at night but are unable to maintain long-term occupancy in these areas. They sometimes occur in non-agricultural areas such as urban areas and other developed sites to forage, breed, and shelter.

Simazine agricultural use sites and off-site areas that may be exposed to annual usage overlap with 100% of the species' range (38.2% overlap with agricultural use sites, with the rest exposed to simazine in off-site areas from spray drift of runoff, and possibly from non-agricultural uses). CalPUR data indicate that less than 0.1% of the range has been treated annually with simazine in the past (24.6% was treated annually with any herbicide). A larger, but still low (based on the low annual simazine usage) portion of the range likely to be exposed over the project duration. CalPUR data include agricultural and certain non-agricultural uses, such as those performed by professional commercial applicators. While these data do not capture all non-agricultural usage, such as residential applications by consumers, given our broad understanding of simazine usage and general information on non-agricultural use practices, we expect limited exposure from private residential uses of simazine. Given that CalPUR 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 a small portion of the species' range is likely to be exposed to agricultural and most non-agricultural uses of simazine each year.

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 simazine 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 simazine in off-site areas. Thus, while exposure may occur in a large portion of the species' range, only a very small portion overlaps with agricultural and non-agricultural use sites where sublethal effects are expected from simazine usage on use sites. As such, we anticipate a very 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 San Joaquin kit fox, we do not anticipate the entire plant community will die as a result of simazine usage, and we do not expect prey availability will be affected. We anticipate the loss of some plants that contribute to habitat elements and food resources for the San Joaquin kit fox, but that any indirect adverse effects to kit foxes 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 simazine, resulting in no more than low levels of adverse effects to food items and indirect effects to the species.

In summary, while the entire species' range overlaps with areas that could be exposed to simazine on use sites and in off-site areas, no more than a small number of individuals are likely to be exposed to simazine based on the low levels of simazine usage expected in the range. We do not anticipate mortality of individuals or indirect effects from insect prey or plant losses, although sublethal effects to growth and reproduction are likely in localized areas for a very small number of individuals that predominantly forage on simazine agricultural and non-agricultural use sites. 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the San Joaquin kit fox.

References

U. S. Fish and Wildlife Service. 2020a. Species Status Assessment Report for the San Joaquin Kit Fox (*Vulpes macrotis mutica*). Version 1.0. Sacramento, California. 77 pp.

U. S. Fish and Wildlife Service. 2020b. San Joaquin Kit Fox (*Vulpes macrotis mutica*) 5-Year Review: Summary and Evaluation. Sacramento, California. 6 pp.

U. S. Fish and Wildlife Service. 2010. San Joaquin Kit Fox (*Vulpes macrotis mutica*) 5-Year Review: Summary and Evaluation. Sacramento, California. 122 pp.

Integration and Synthesis Summary: Stephens' kangaroo rat

Scientific Name:	Common Name:	Entity ID:
Dipodomys stephensi (incl. D. cascus)	Stephens' kangaroo rat	39

Conclusion: No Jeopardy

Species Range

Based on range map dated: 4/14/2015; Wherever found; *States within the range:* CA

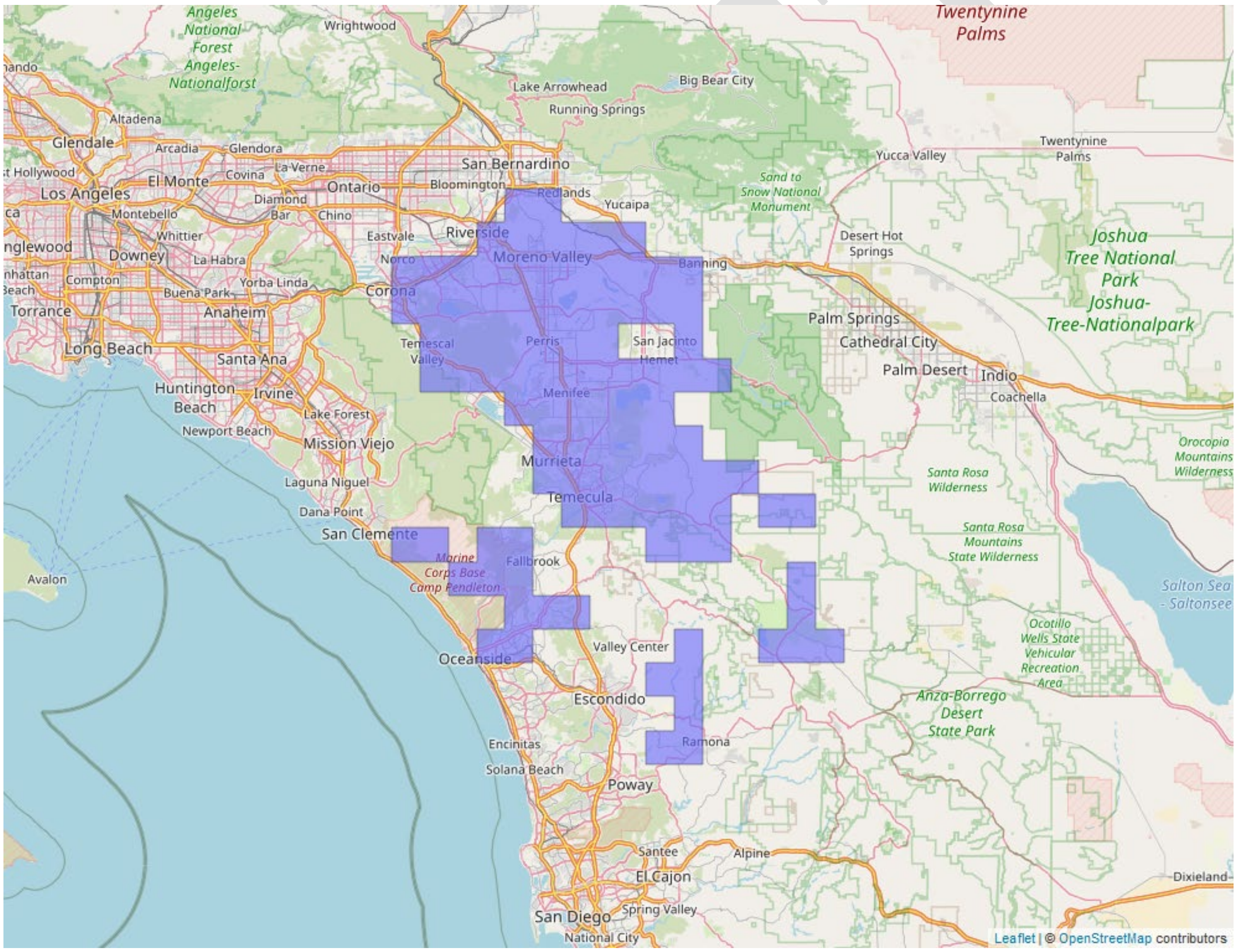

Figure 13. Range map of Stephens' kangaroo rat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/3495.

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: Downlist to threatened status

Most recently completed 5-year review: 2/17/2022 (final rule)

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

The Stephens' kangaroo rat is one of 22 species of kangaroo rat found in North America. They are rodents generally found in well-drained, loamy-sandy, or gravelly soils in open, sparsely vegetated, hot, and dry grasslands. Stephens' kangaroo rates eat seeds and store food in burrow caches during periods of abundance. They occur in Riverside and San Diego Counties in California. They historically occurred in San Bernardino County also. Comprehensive surveys have not been conducted across the species' presumed distribution since 1988. As of 2018, Stephens' kangaroo rats were observed in 11 locations and are believed to have been extirpated from two locations in Riverside County. In San Diego County, there were five locations with extant presence, one presumed extant, and one extirpated. They are found in a patchy distribution with few areas containing high densities. The abundance of the Stephens' kangaroo rat and its probability of capture are highly variable, making it difficult to detect demographic trends, but they are believed to be decreasing in at least one area (Potrero Valley) and increasing in three areas (Detachment Fallbrook, Camp Pendleton, and Lake Henshaw) (USFWS 2021).

Habitat loss due to urban and agricultural development occurred mostly in the early 20th century. Additional habitat threats considered at the time of listing include fragmented and isolated populations; reduction of habitat suitability (from anthropogenic activities including grazing, off-highway vehicle use, disking, plowing, introduction of nonnative vegetation, and rodent control programs); predation by domestic cats; and climate change. Pesticides, particularly rodenticides, are a concern for Stephens’ kangaroo rats, but we consider it to be a low-level risk at the individual level due to use restrictions in California. Habitat destruction from urban and agricultural development was largely ameliorated through the implementation and design of the core reserve system in western Riverside County (through the Stephens’ Kangaroo Rat Habitat Conservation Plan), ongoing land acquisitions and easements, and other conservation plans and efforts (Multiple Species Habitat Conservation Plan and Integrated Natural Resource Management Plans (INRMPs)). The Stephens’ kangaroo rat population at Camp Pendleton and Detachment Fallbrook in San Diego County is covered by active INRMPs that include actions to provide for the long-term conservation of the Stephens’ kangaroo rat on Federal military lands. Significant areas of habitat have been conserved and managed in Riverside and San Diego Counties since the species was listed. Reserves in western Riverside and San Diego Counties effectively have been established that address habitat destruction from urban and agricultural development. Despite this significant reduction in threats, non-conserved Stephens’ kangaroo rat habitat continues to be impacted by urban and agricultural development, while nonnative species, off highway vehicles, and the potential impacts associated with climate change continue to pose a threat to the species over the long term. Projections of temperature increases from climate change may affect the species’ habitat, particularly related to an increase in invasive non-native plants (USFWS 2021). Two large-scale habitat conservation planning efforts have been implemented in Riverside County: the Stephens’ Kangaroo Rat Habitat Conservation Plan and the Western Riverside County Multi-Species Habitat Conservation Plan. These plans have helped to offset potential habitat losses from urban and agricultural development. Three Department of Defense facilities (i.e., Marine Corps Base Camp Pendleton (Camp Pendleton); Naval Base Coronado Remote Training Site Warner Springs (Warner Springs); and Naval Weapons Station Seal Beach Detachment Fallbrook (Detachment Fallbrook)) occur within the species’ range, have developed Service-approved Integrated Natural Resource Management Plans, and are committed to actively managing their activities and habitat for kangaroo rat conservation (USFWS 2016).

In 2022, we published a final rule to downlist the Stephens’ kangaroo rat to threatened status with a 4(d) rule due to a reduction of threats since listing and the implementation of conservation actions. However, the species is still affected by the threats to the extent that the species meets the definition of a threatened species under the ESA. Threats include habitat loss and degradation due to urbanization, agricultural activities, and nonnative vegetation and isolation of existing populations due to habitat fragmentation. The cumulative effects of climate change and wildfire, which could result in an increase in the extent of nonnative grasslands, represents a low-level stressor to the Stephens’ kangaroo rat and its habitat, and based on climate change projections, is likely to remain at this level to the 2060s. Existing regulatory mechanisms and conservation efforts do not effectively address existing habitat fragmentation or the introduction and spread of nonnative plants or improve population connectivity and dispersal (USFWS 2022).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap with Agricultural Use Sites

Data indicate that 2.7% of the species' range overlaps with agricultural use sites and 26.9% 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) (Table 19). In total, there is approximately 29.5% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 19. Agricultural use site overlap for the range of the Stephen's kangaroo rat.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)
Citrus	0.8	6.8	7.5
Corn	<0.1	0.3	0.3
Grapes	0.1	1.9	2
Other Crops	1.9	16.5	18.4
Other Orchards	0.7	9.1	9.7
Vegetables and Ground Fruit	<0.1	1.1	1.1
Christmas Trees	<0.1	<0.1	<0.1
Total	**2.7**	**26.9**	**29.5**

Usage

Mandatory reporting data from the state of California indicates that, between 2013-2022, the maximum yearly overlap between the species' range and agricultural areas reporting any pesticide usage was 4.6%. Up to 3.5% reported use of any herbicide, and 0.3% reported treatment with simazine. Based on this reporting data, we expect 0.3% of the species' range is likely to be treated with simazine, specifically (Table 20). This pesticide usage data is based on data reported by more than 660 growers within the species' range. The high number of reporters suggests that these usage metrics will be robust to change over time.

Table 20. Overlap of usage areas within the range of the Stephen's kangaroo rat.

% overlap with all pesticide usage areas	% overlap with all herbicide usage areas	% overlap with simazine usage areas
4.6	3.5	0.3

Additional Exposure Considerations

While the Stephen's kangaroo rat is primarily associated with open, annual grassland, individuals are known to occur on cultivated lands occasionally, indicating that exposure directly in agricultural simazine use sites is possible.

Exposure from Non-Agricultural Uses

Available information on the species' life history, current, and past distributions does not provide any indication that individuals are likely to use non-agricultural simazine use sites, including residential lawns or turf, golf courses, or nurseries.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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. Like other kangaroo rat species, the Stephen's kangaroo rat primarily consumes seeds but can occasionally consume other plant matter (such as grasses) and arthropod prey. An individual kangaroo rat foraging on contaminated food resources directly on simazine use sites can accumulate 1-171.3 mg simazine/kg-bw, depending on the specific food source consumed. These dietary exposures represent high end exposure scenarios (i.e., maximum body burdens in individuals that only consume contaminated food directly on simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels.

In contrast, 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 simazine, 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 exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure will destroy or limit the availability of the complex vegetative structure (e.g., grassland ecosystems) the species requires for its habitat. Similarly, while we anticipate simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine 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, and the reduction in exposure from required agricultural mitigations, we anticipate there will still be sufficient food resources available for the Stephen’s kangaroo rat even with impacts to sensitive plant species from simazine use.

Effects of the Action Summary

While there is a high extent of overlap between the species’ range and agricultural simazine use sites, past usage data (informed by mandatory pesticide usage data collected by the state of California) indicate that very little of the species’ range is likely to be treated with simazine. Thus, while individuals that predominantly consume contaminated food items directly on simazine use sites will experience high levels of sublethal adverse effects (including potentially altered reproduction), we expect no more than a small number of individuals, if any, will experience such exposures as so little of the range is likely to be treated. Additionally, required agricultural mitigations and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-site exposure as well as the exposure concentration, which will result in no more than low levels of adverse effects to plant habitat and food resources the species relies on. Thus, we expect the overall risk of adverse effects to the species is low.

Species Conclusion

The Stephen's kangaroo rat has medium vulnerability based on factors such as its status (i.e., threatened, recently reclassified from endangered), limited distribution, and declining trends. The species is generally found in grassland habitats. It occurs in a patchy distribution with few areas containing high densities. They may occur occasionally on cultivated lands, although they have lost suitable much of their habitat to agricultural and urban development and are generally only expected to recolonize abandoned agricultural lands if available. We do not expect individuals to occur on non-agricultural simazine use sites. The Stephen's kangaroo rat primarily consumes seeds but can occasionally consume other plant matter (such as grasses) and arthropod prey.

Simazine agricultural use sites and off-site areas that may be exposed to annual usage overlap with 29.5% of the species' range (2.7% overlap with use sites and 26.9% overlap with areas that may be exposed off-site from spray drift or runoff). Additional exposure may occur from non-agricultural uses of simazine (i.e., nurseries and turf, including golf courses and lawns). CalPUR data indicate that 0.3% of the range has been treated annually with simazine in the past (3.5% was treated annually with any herbicide). A larger, but still low (based on the low annual simazine usage) portion of the range likely to be exposed over the project duration. CalPUR data include agricultural and certain non-agricultural uses, such as those performed by professional commercial applicators. While these data do not capture all non-agricultural usage, such as residential applications by consumers, given our broad understanding of simazine usage and general information on non-agricultural use practices, we expect limited exposure from private residential uses of simazine. Given that CalPUR 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 a small portion of the species' range is likely to be exposed to agricultural and most non-agricultural uses of simazine each year.

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 simazine 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 simazine in off-site areas. Thus, while exposure may occur in a large portion of the species' range, only a small portion overlaps with agricultural and non-agricultural use sites where sublethal effects are expected from simazine usage on use sites. 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 Stephens' kangaroo rat, we do not anticipate the entire plant community will die as a result of simazine usage and we do not expect insect prey availability will be affected. We anticipate the loss of some plants that contribute to habitat elements and food resources for the kangaroo rat, but that any indirect adverse effects to kangaroo rats 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 simazine, 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 simazine on use sites and in off-site areas, no more than a small number of individuals are likely to be exposed to simazine based on the low levels of simazine usage expected in the range. We do not anticipate mortality of individuals or indirect effects from insect prey or plant losses, although sublethal effects to growth and reproduction are likely in localized areas for a very small number of individuals that predominantly forage on simazine agricultural use sites. 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Stephen's kangaroo rat.

References

U.S. Fish and Wildlife Service. 2022. Endangered and Threatened Wildlife and Plants; Reclassification of Stephens' Kangaroo Rat From Endangered To Threatened With a Section 4(d) Rule. Final rule. Federal Register 87(33): 8967-8981.

U. S. Fish and Wildlife Service. 2021. Species report for Stephens' kangaroo rat (*Dipodomys stephensi*). Version 1.2. Carlsbad, California. 133 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

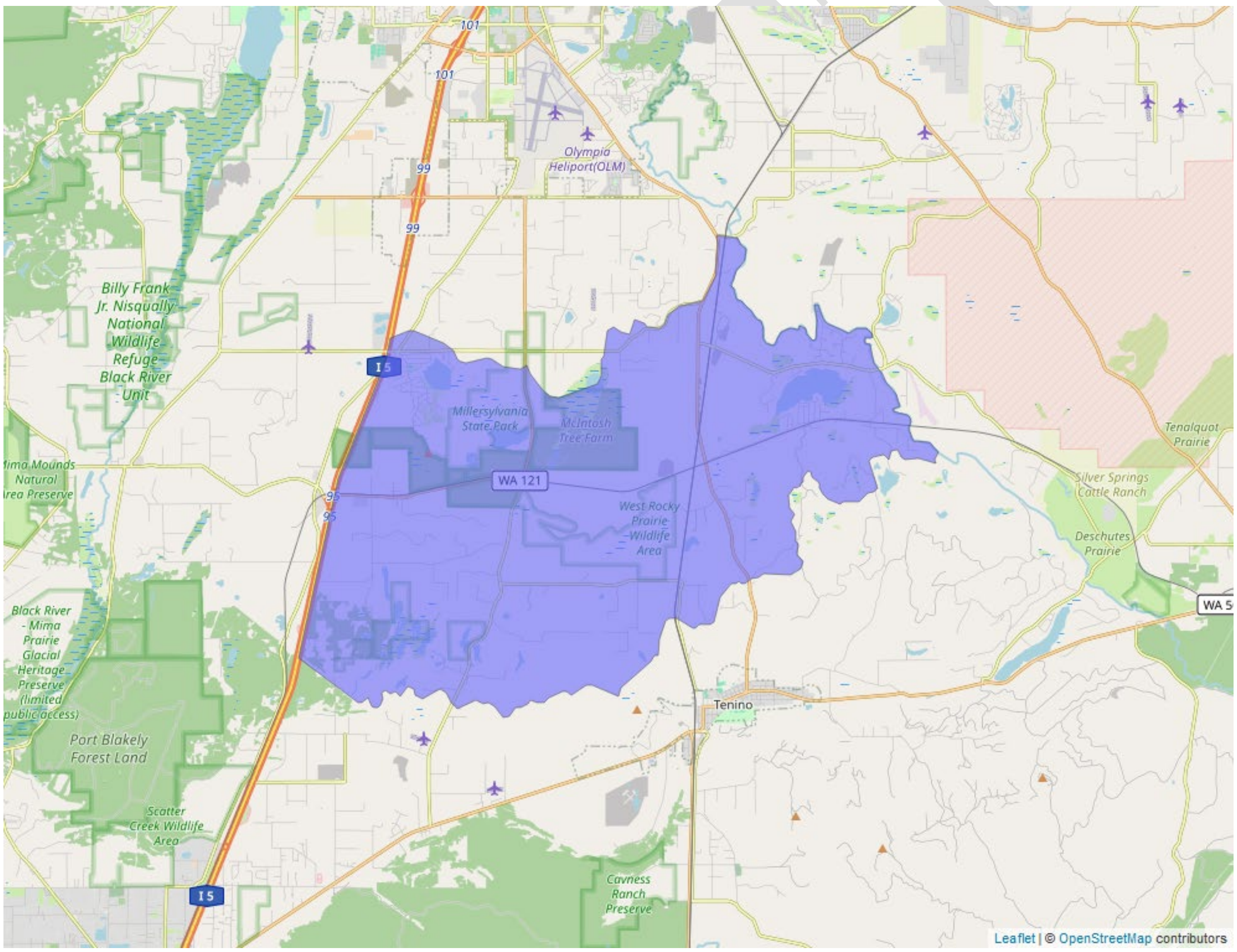

Figure 14. Range map of Tenino pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6290.

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

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

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 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 or Scotch broom 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 a threat to individual Tenino 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 2.2% of the species' range overlaps with agricultural use sites and 97.8% 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) (Table 21). In total, there is approximately 100% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 21. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	<0.1	9.1	9.1	<0.1	9.1	9.1
Grapes	<0.1	0.7	0.7	<0.1	0.7	0.7
Other Crops	<0.1	9.3	9.3	<0.1	9.3	9.3

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 Orchards	<0.1	4.1	4.1	<0.1	4.1	4.1
Vegetables and Ground Fruit	0.2	31	31.2	0.2	31	31.2
Christmas Trees	2	64.5	66.4	2	64.5	66.4
Total	**2.2**	**97.8**	**100***	**2.2**	**97.8**	**100***

*Total overlap is capped at 100%.

Usage

Past usage data indicate that up to 100% of the species' range has been treated with simazine 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 simazine use sites. However, we anticipate only a small number of individuals are likely to occur on agricultural use sites as there is low overlap between the species' range and on-field areas (i.e., agricultural fields only make up 2.2% of the species' range). The majority of the use site overlap (2%) is with Christmas trees. The species has been considered a pest by some producers because individuals can sometimes damage crops and seedling trees, which may include Christmas trees. However, the overlap with Christmas trees and other use sites is low. Furthermore, as noted in the gopher's recovery plan, 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 simazine use sites, including residential lawns, turf, golf courses, or nurseries. As such, we anticipate non-agricultural uses of simazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine use sites can accumulate 138.6-701.3 mg simazine/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 simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels, reduced fetal weight, and increased incidence of abortions.

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 simazine, 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

The Tenino pocket gopher requires plant food resources and is known to consume a variety of plant parts (e.g., leaves, roots, bulbs, flowers) from a wide variety of plant species. While we anticipate exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure 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 simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate simazine use will result in no more than low levels of indirect adverse effects.

Effects of the Action Summary

There is large extent of overlap between the species' range and simazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on simazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to simazine 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 small portion of the species' range contains agricultural use sites (agricultural use sites occur in 2.2% 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.

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 simazine usage as required agricultural mitigations and existing protective practices in non-agricultural use sites will greatly reduce the extent of off-site exposure and reduce the exposure concentrations to levels that will result in no more than low levels of adverse effects to plant species. As such, we expect simazine use will only result in low levels of indirect adverse effects.

In summary, we anticipate no individuals will die, only small numbers of individuals are likely to experience sublethal impacts from simazine use, and that the species will experience an overall low level of indirect adverse effects resulting from simazine 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. Simazine use sites and off-site areas that may be exposed to annual usage overlap with 100% of the species' range (2.2% of the range is on agricultural use sites, with the rest exposed to simazine in off-site areas from spray drift of runoff, and possibly from non-agricultural 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 simazine 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 simazine 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 simazine 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 simazine, 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 simazine, 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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. 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.

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.

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: 5/21/2021; Wherever found; *States within the range:* OK, TX

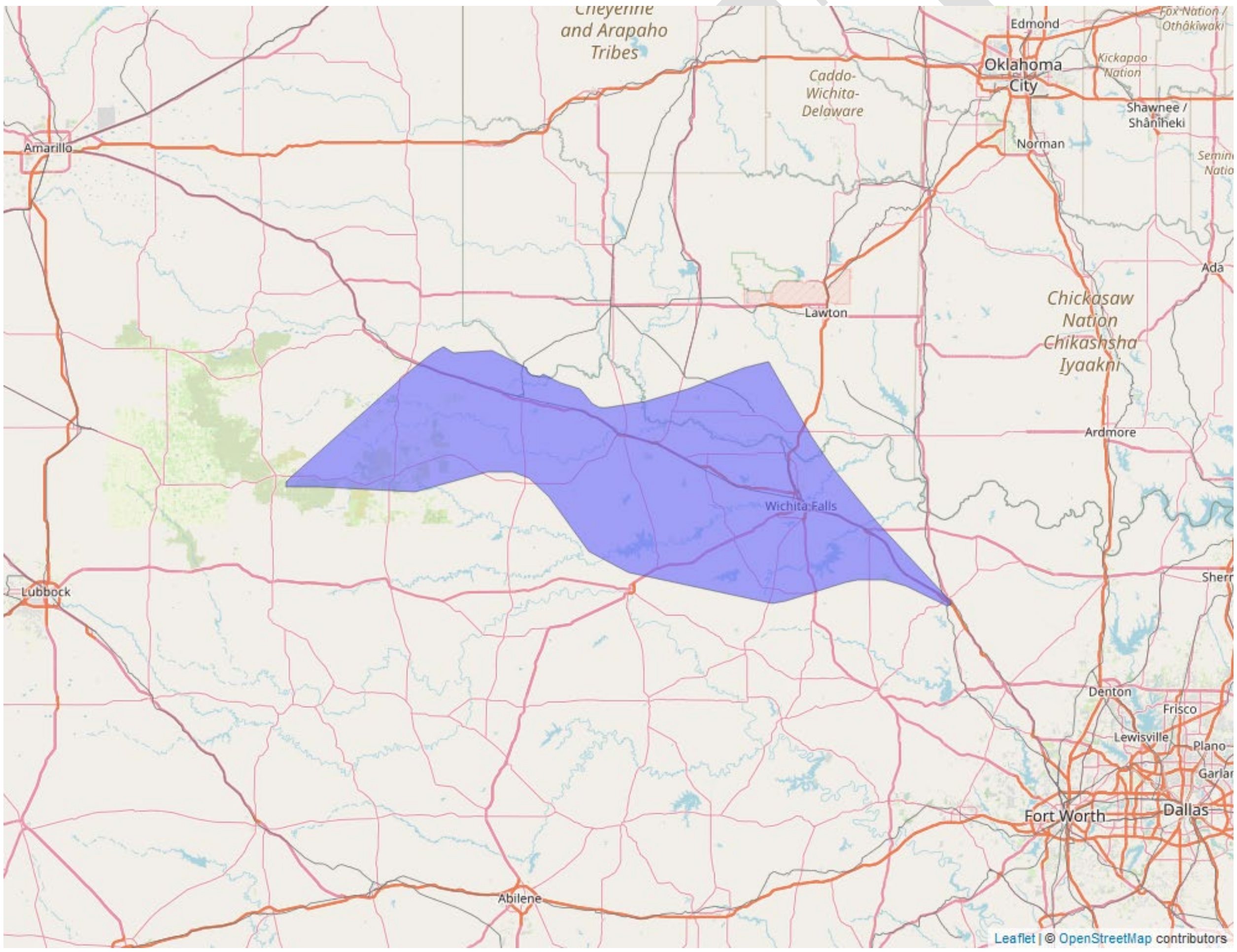

Figure 15. Range map of Texas kangaroo rat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2985.

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: N/A

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

Number of populations: NA

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 5.5% of the species' range overlaps with agricultural use sites and 79.9% 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) (Table 22). In total, there is approximately 85.4% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 22. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	1	15.8	16.8	1	15.8	16.8
Grapes	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Crops	4.1	51.3	55.4	<0.1	<0.1	<0.1
Other Orchards	<0.1	7.1	7.1	<0.1	7.1	7.1
Vegetables and Ground Fruit	0.3	5.7	6	0.1	2.2	2.4
Christmas Trees	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**5.5**	**79.9**	**85.4**	**1.1**	**25.1**	**26.3**

Usage

Past usage data indicate that up to 26.3% of the species' range has been treated with simazine 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 simazine 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 simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 1-171.3 mg simazine/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 simazine 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. Available toxicity data suggest that individuals consuming vegetative material, particularly short grasses, are likely to experience sublethal adverse effects, such as reduced growth (i.e., reduced body weight and body weight gain) and potential reproductive effects, including altered reproductive hormone levels, at the highest estimated exposure concentrations. However, given that the Texas kangaroo rat primarily consumes seeds, which accumulate much lower levels of simazine, we anticipate most individuals exposed directly on use sites will accumulate no more than low levels of simazine, 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 simazine, 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 exposure of simazine on use sites or from off-site transport of simazine can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure 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 simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine 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 simazine use.

Effects of the Action Summary

There is a high extent of overlap between the species' range and agricultural simazine use sites. However, we do not anticipate more than a small number of individuals are likely to occur directly on simazine 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 simazine use sites, we anticipate most individuals are not likely to accumulate more than low levels of simazine 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 simazine. Similarly, individuals that forage on plant matter in off-site areas are not likely to accumulate more than low levels of simazine 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 simazine 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 simazine 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.

Simazine agricultural use sites and off-site areas that may be exposed to annual usage overlap with 85.4% of the species' range (5.5% overlap with use sites and 79.9% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 1.1% of the range has been treated with simazine on agricultural use sites annually, exposing up to 26.3% of the species’ range on use sites and from off-site transport annually, with a larger portion of the 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 may occur from non-agricultural uses of simazine (i.e., nurseries and turf, including golf courses and lawns).

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 simazine 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 simazine 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 simazine 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 simazine use sites. In addition, individuals that do forage extensively directly on simazine 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 simazine 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 simazine usage. We anticipate the loss of some plants that contribute to habitat elements and food resources for the kangaroo rat, but that any indirect adverse effects to kangaroo rats 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 simazine, 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 simazine on use sites and in off-site areas, and a high number of individuals are likely to be exposed to simazine based on simazine 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 simazine use sites. 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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: 4/1/2021; Wherever found; *States within the range:* KY, NC, TN, VA, WV

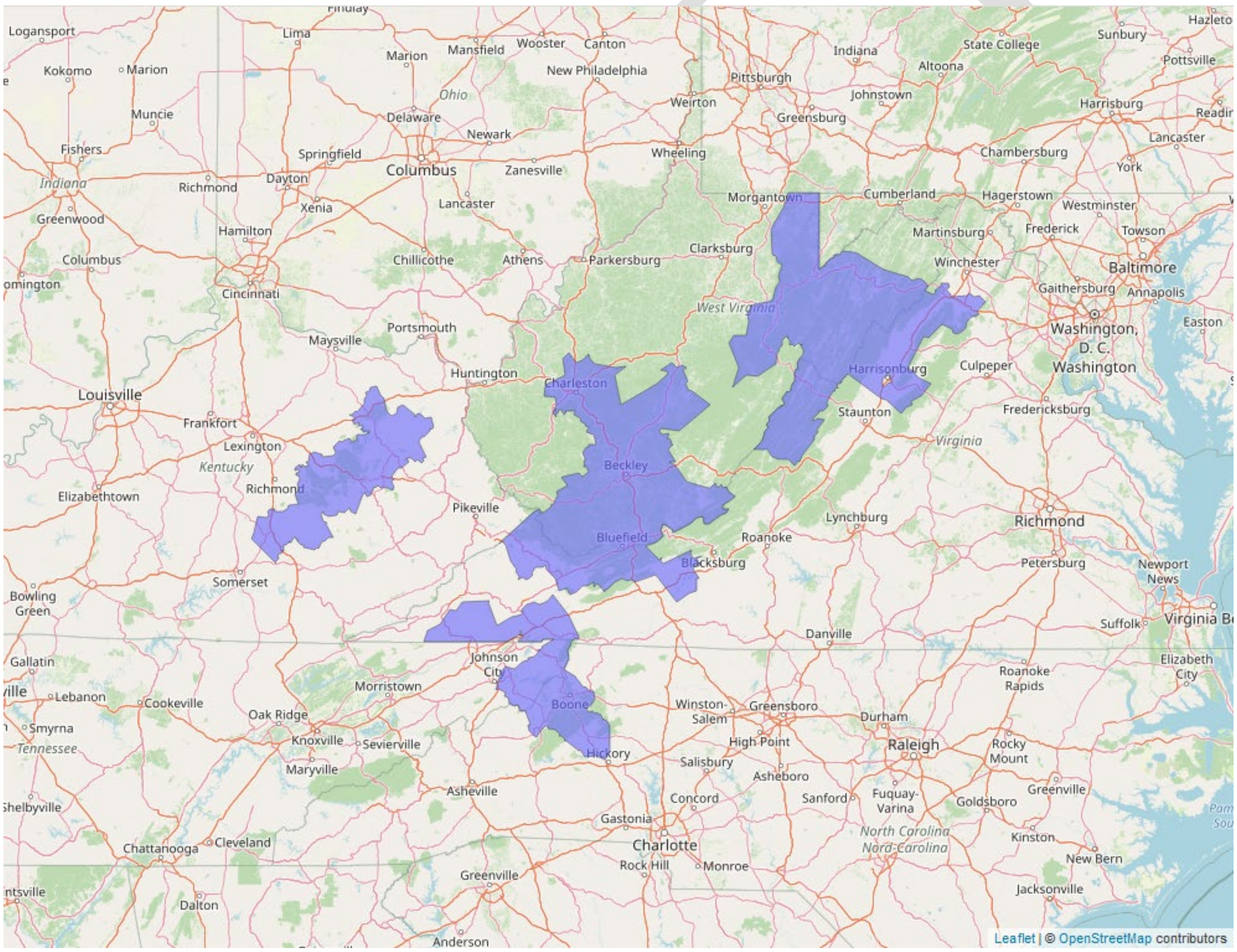

Figure 16. Range map of Virginia big-eared bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/8369.

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

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 35.1% 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) (Table 23). In total, there is approximately 36.6% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 23. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Corn	1.4	22.3	23.6	1.4	22.3	23.6
Grapes	<0.1	0.2	0.2	<0.1	0.2	0.2
Other Crops	<0.1	6.9	6.9	<0.1	<0.1	<0.1
Other Orchards	<0.1	2.1	2.1	<0.1	2.1	2.1
Vegetables and Ground Fruit	<0.1	1.6	1.7	<0.1	1	1
Christmas Trees	<0.1	2.3	2.3	<0.1	2.2	2.3
Total	**1.5**	**35.1**	**36.6**	**1.4**	**27.6**	**29**

Usage

Past usage data indicate that up to 29% of the species' range has been treated with simazine 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 simazine 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 simazine on non-agricultural use sites as well.

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 64.4-149.4 mg simazine/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 simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels.

In contrast, arthropod prey exposed to simazine in off-site areas (i.e., through spray drift or runoff) are not likely to accumulate more than low levels of simazine, 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 simazine toxicity studies in terrestrial invertebrates indicate that simazine 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, from agricultural or non-agricultural uses. While we anticipate exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure will destroy or limit the availability of the complex vegetative structure the species requires for its habitat (e.g., structures for roosting) or to support its invertebrate prey. We expect conservation measures for agricultural uses and existing pesticide use practices and conditions in non-agricultural uses of simazine (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 simazine residues in areas adjacent to agricultural and non-agricultural use sites. As such, we do not anticipate effects to prey or sensitive exposed plants will cause changes to food availability or 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 simazine 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 sublethal impacts, including reduced growth and reproduction, to individuals that forage extensively on agricultural use sites. In contrast, we do not anticipate individuals that forage away from simazine use sites will experience more than low levels of direct adverse effects, if any. We do not anticipate simazine 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 simazine 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 simazine on and adjacent to non-agricultural use sites. However, we expect on-site exposure to simazine on non-agricultural use sites such as nurseries, turf (including golf courses and lawns), and small ornamental ponds (1,000 gallons or less) to be limited, as these areas are less likely support abundant prey than the bat's preferred habitats.

Simazine agricultural use sites and off-site areas that may be exposed overlap with 36.6% of the species' range (1.5% overlap with use sites and 35.1% overlap with areas that may be exposed off-site from spray drift or runoff). Past usage data indicate that up to 29% of the range has been treated with simazine on agricultural use sites and from off-site transport annually (1.4% and 27.6%, respectively), with a larger portion of the range (up to 1.5% on use sites, 36.6% 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. We do not expect toxicity from simazine 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 simazine use sites will experience more than low levels of direct adverse effects, if any. We also do not expect simazine 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 simazine 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 simazine on use sites and in off-site areas. However, adverse effects to bats from foraging extensively on simazine 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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*). 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: 1/18/2023; Wherever found; *States within the range:* WA

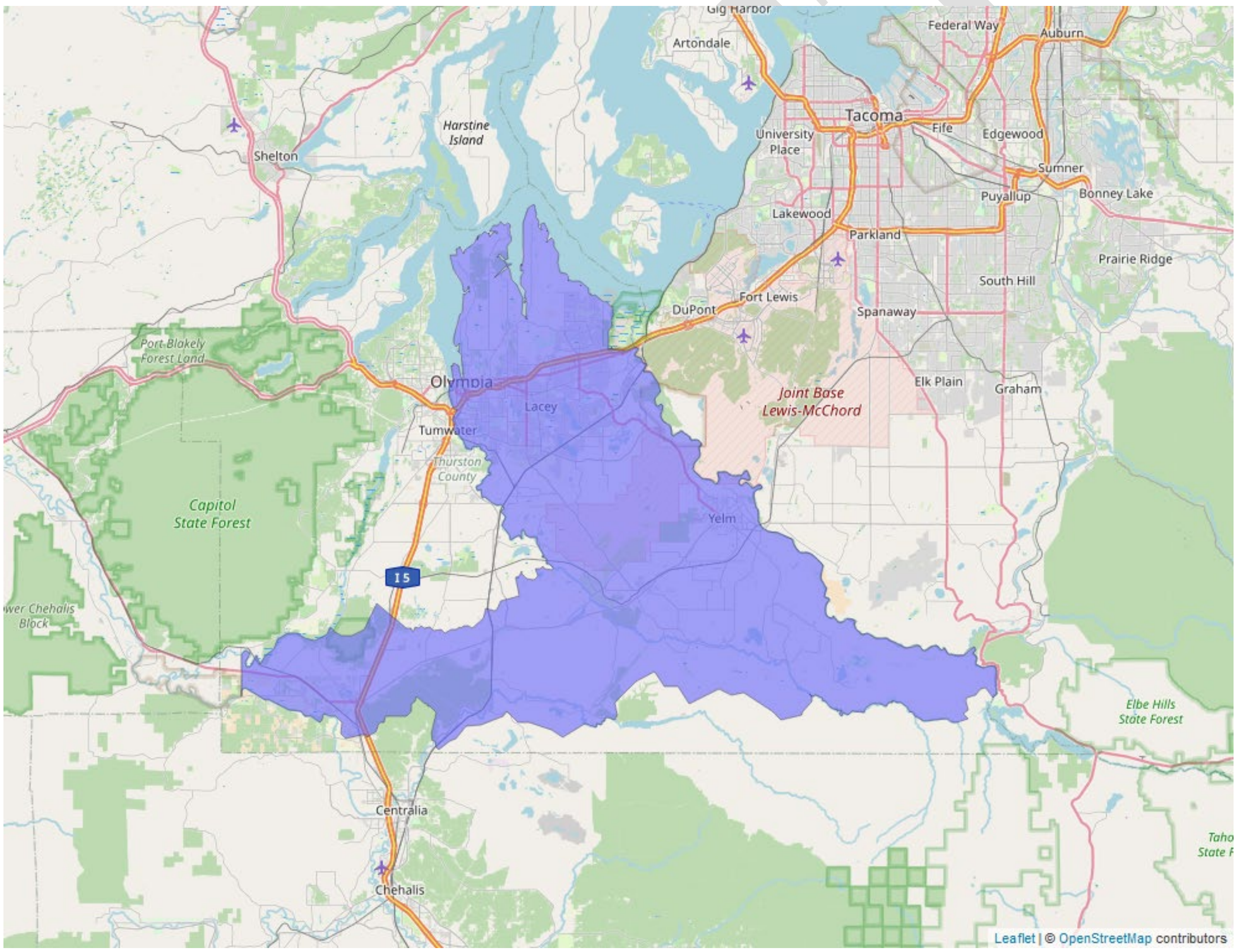

Figure 17. Range map of Yelm pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7257.

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 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 or Scotch broom 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 a threat to individual 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 2.8% of the species' range overlaps with agricultural use sites and 97.2% 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) (Table 24). In total, there is approximately 100% overlap between the species' range and the agricultural footprint of simazine use sites.

Table 24. Agricultural simazine use site overlap and annual simazine usage data for the range of 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
Citrus	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Corn	0.2	13	13.1	0.2	13	13.1
Grapes	<0.1	1.7	1.8	<0.1	1.7	1.8
Other Crops	0.3	14.1	14.4	0.3	14.1	14.4
Other Orchards	<0.1	5.5	5.5	<0.1	5.5	5.5
Vegetables and Ground Fruit	0.4	25.8	26.2	0.4	25.8	26.2
Christmas Trees	2	50	52	2	50	52
Total	**2.8**	**97.2**	**100***	**2.8**	**97.2**	**100***

*Total overlap is capped at 100%.

Usage

Past usage data indicate that up to 100% of the species' range has been treated with simazine 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 simazine use sites. However, we anticipate only a small number of individuals are likely to occur on agricultural use sites as there is low overlap between the species' range and on-field areas (i.e., agricultural fields only make up 2.8% of the species' range), with the majority of the use site overlap (2%) being Christmas trees. The species has been considered a pest by some producers because individuals can sometimes damage crops and seedling trees, which may include Christmas trees. However, the overlap with Christmas trees and other use sites is low. Furthermore, as noted in the gopher's recovery plan, 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 simazine use sites, including residential lawns, turf, golf courses, or nurseries. As such, we anticipate non-agricultural uses of simazine will not appreciably contribute to the overall exposure of the species.

Conservation Measures

There are several conservation measures on the simazine label that apply to all uses and are intended to reduce spray drift to off-site areas, including a 15-foot spray drift buffer and ground use only restriction. Particularly relevant for aquatic species, three runoff mitigation points are also required for all simazine uses to reduce simazine concentrations in runoff. We expect these measures will reduce the concentration of simazine entering terrestrial and aquatic habitats by up to an order of magnitude (i.e., up to a 90% reduction in simazine residues in spray drift and runoff).

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 simazine use sites can accumulate 138.6-701.3 mg simazine/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 simazine 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 and body weight gain) and potential reproductive effects, including altered reproductive hormone levels, reduced fetal weight, and increased incidence of abortions.

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 simazine, 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 plant food resources and is known to consume a variety of plant parts (e.g., leaves, roots, bulbs, flowers) of a wide range of plant species. While we anticipate exposure of simazine on use sites or from off-site transport can negatively impact the growth and survival of sensitive plants, we do not anticipate simazine exposure 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 simazine 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 simazine use. Furthermore, required mitigations for agricultural uses (i.e., 15-foot spray drift buffer and three runoff mitigation points) will reduce simazine exposure concentrations in areas off-field 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 simazine (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 simazine residues in areas adjacent to non-agricultural use sites. As such, we anticipate simazine use will not result in more than low levels of indirect adverse effects.

Effects of the Action Summary

There is large extent of overlap between the species' range and simazine use sites and their associated off-site transport areas. We anticipate individual pocket gophers that predominantly feed on contaminated vegetation directly on simazine use sites will experience high levels of sublethal adverse effects, including reduced growth and reproduction. In contrast, individuals that are only exposed to simazine 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 small portion of the species' range contains agricultural use sites (agricultural use sites occur in 2.8% 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.

While we anticipate simazine exposure will cause impacts to sensitive plant species that serve as habitat components or food resources for the pocket gopher, required agricultural mitigations and existing practices that limit off-site transport of simazine in non-agricultural use sites will greatly reduce the extent of off-site exposure and the level of exposure expected. As such, we anticipate no more than low levels of indirect adverse effects will occur.

In summary, we anticipate no individuals will die, only small numbers of individuals are likely to experience sublethal impacts from simazine use, and that the species will experience an overall low level of indirect adverse effects resulting from simazine 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. Simazine use sites and off-site areas that may be exposed to annual usage overlap with 100% of the species' range (2.8% of the range is on agricultural use sites, with the rest exposed to simazine in off-site areas from spray drift of runoff, and possibly from non-agricultural 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 simazine 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 simazine 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 simazine 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 simazine, 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 simazine, 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 simazine 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 the conservation measures that are incorporated into the proposed action), we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the species in 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. 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.

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.

Species requiring further analysis

In our draft Biological Opinion, we focused our analyses on 1) species with low expected exposure to simazine (due to low overlap, usage, or conservation measures adopted prior to consultation), and 2) species with more than low levels of exposure that benefited from conservation measures identified through the Herbicide Strategy that aimed to reduce off-site transport of simazine (i.e., listed plants and listed animals that depend on plant resources). For the species in Table 25, 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 simazine 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 required mitigations are expected to reduce the extent of off-field exposure and reduce exposure concentrations, we anticipate simazine residues on use sites could remain at levels high enough to cause greater than low levels of adverse direct and/or indirect effects to these mammal species. They may occur on simazine use sites, either agricultural or non-agricultural. We intend to continue coordinating with EPA and simazine registrants between the release of this draft Opinion and the transmission of the final Opinion to gain information regarding the exposure and effects of each species to simazine. As such, we have not yet made determinations for these species.

Table 25. Species requiring further analysis

Common Name	Scientific Name	Vulnerability Ranking	Agricultural Exposure Ranking	Toxicity Ranking
Buena Vista Lake ornate shrew	*Sorex ornatus relictus*	High	Low	High
Red wolf	*Canis rufus*	High	High	High