Integration and Synthesis Summary for Mammals

This Integration and Synthesis Summary includes our jeopardy analysis for any species that we or EPA determined will "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 our rankings (high, medium, low) for vulnerability, exposure, and toxicity.

Data and information used to determine each individual species' rankings, including environmental baselines, cumulative effects, exposure information, and expected toxic effects for all species, and a template worksheet to show how rankings were assessed and combined are in Appendix E. Status of the species for each species can be found in Appendix B.

Ranges for all species in this assessment group are entirely within the conterminous United States.

Vulnerability

For the mammal species that we or EPA determined are "likely to be adversely affected" by the proposed action, we considered several factors to summarize the current vulnerability of that species to additional stressors. This effort allows us to consider whether a species' current condition is moving toward recovery or further decline. In general, we expect the species' vulnerability to additional stressors to be higher if they are moving toward further decline than if they their condition is 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* section of this biological opinion.

Our assessment of vulnerability focuses on six factors: (1) the species listing status and recent 5-year status review recommendation (if available), (2) distribution, (3) number of populations, (4) species population trends, (5) if pesticides have been noted as a threat, and (6) 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), the overarching *Environmental Baseline* section of this opinion, 5-year species status reviews, species recovery plans, species status assessments, 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 medium or high. We assigned a medium vulnerability ranking if a species' scores were a mix of high, medium, and low (though exceptions were allowed for species that have a low status score or have an uplisting recommendation). We assigned a low vulnerability ranking to species with only low scores. Considerations regarding specific aspects of the species' vulnerability or beyond what was included in the vulnerability ranking were applicable for some species depending on unique aspects of their life history. This information is reflected in the rationales for conclusion below.

Exposure

While we anticipate mammals may be exposed to methomyl through inhalation and dermal contact with residues on surfaces or in the air, we anticipate that the main route of exposure for mammals is dietary, through the consumption of contaminated food items. Methomyl degrades quickly (i.e., within a few days) in natural environments and is not likely to persist in the environment for long periods of time or be transported long distances.

We characterize the expected level of exposure using overlap data (including on- and off-field overlap), past methomyl usage data, any specific considerations like life history information (e.g., habitat preferences, dispersal behavior) and existing protections or conservation actions. Species with greater than 10% overlap between their range and methomyl use sites are assigned a high overlap score, species with 5-10% overlap are assigned a medium overlap score, and species with less than 5% total overlap are assigned a low overlap score. In addition to range overlaps with methomyl use sites, we considered past methomyl usage data within a species' range to determine how much of a species' range we expect to be treated with methomyl 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 biological opinion. Species that data indicate will have a large portion of their range (>10%) treated with methomyl each year are assigned a high usage score. Species that will have a medium portion of their range (5-10%) treated with methomyl each year are assigned a medium usage score, and species that data indicate will have a low portion of their range (<5%) treated with methomyl each year are assigned a low usage score.

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

Toxicity

We characterize the expected toxic effect to species based on the anticipated level of direct and indirect[1] adverse effects to individuals. Our analysis of toxicity assumes individuals are exposed to methomyl at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. Direct effects are based on the anticipated level of mortality and sublethal effects (e.g., reduced growth) likely to occur in exposed individuals. Indirect effects are based on the impact a listed species is likely to experience when the organisms they rely on, such as those that act as food or habitat resources, are exposed to methomyl and experience adverse effects.

We consider estimated concentrations of methomyl 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 methomyl can vary greatly among different regions and aquatic habitat types (e.g., low flow or low water volume habitats accumulate high levels of methomyl whereas fast flowing or large water volume habitats accumulate only low levels of methomyl). Based on available toxicity data, we anticipate mammals are sensitive to methomyl and some species may die under certain exposure conditions. While sublethal effects, such as reduced growth or reproduction, are also possible with methomyl exposure, we do not anticipate sublethal effects are likely to occur to exposed individuals that are not likely to die.

We anticipate species that rely on plant-based resources, such as grass, leaves, and fruit for food or vegetation as habitat, are not likely to experience any indirect adverse effects, as available toxicity data in plants indicate no reductions in plant survival or growth are likely to occur with methomyl exposure. In contrast, species that rely on arthropods for food resources may experience high levels of indirect adverse effects as methomyl exposure will likely reduce the abundance and availability of arthropod prey. Species that rely on other vertebrates for food resources can experience a range of adverse indirect effects depending on the prey items they consume and whether the prey items have been exposed to methomyl on- or off-field.

We determine the overall toxicity ranking for mammals by qualitatively assessing both the expected levels of direct adverse effects (e.g., mortality) and indirect effects (e.g., prey loss). Given that mortality is the most adverse of direct effects to an individual of a species, we assign

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

the most weight to direct adverse effects resulting in mortality when determining the toxicity ranking.

Summary of Mammal Conclusions

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of methomyl, and the cumulative effects, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the 67 mammal species in this Appendix. We provide additional information about these species below.

In our analysis below, some species that had the same or very similar rationales for their conclusions were grouped together, to increase efficiency and avoid repetition. Relevant information and data unique to each individual species was considered when assigning species to groups and incorporated into the rationales as appropriate. Species-specific information (e.g., environmental baseline, cumulative effects, status of the species, exposure, and toxicity) was considered for all species, including those species in the grouped analyses, and are presented in full in Appendices B and E. Species with rationales that did not fit in a group, or warranted a separate rationale because of their life history, conservation status, or other information indicated that effects could be different, 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 process and analysis for each species remained the same, regardless of the format of the discussion presented below.

Vulnerability, exposure, and toxicity rankings are summarized in Appendix E.

Experimental, non-essential populations

The EPA included in the consultation the experimental, non-essential populations for the following mammal species: black-footed ferret, grizzly bear, red wolf, Sonoran pronghorn, gray wolf, and Mexican wolf. We do not provide separate analyses and jeopardy determinations for these populations independently. Rather, we treat any experimental and non-experimental populations as a single listed species for the purposes of conducting jeopardy analyses and making jeopardy determinations. By definition, a "non-essential experimental population" is not essential to the continued existence of the species. In cases where our assessment of the non-experimental population(s) of the species leads to a “not likely to jeopardize” determination, we generally assume any added effects to the 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.

Species with low exposure (informed by low overlap with agriculture), high vulnerability, and high toxicity

The species listed here are grouped together as they all have low exposure informed by low overlap with agricultural sites where methomyl is registered for use (Table 1). While we present some specific information about the species in Table 1 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 1. Species with low baseline exposure as informed by low overlap between the species' range and agricultural land uses, high vulnerability, and medium/high toxicity.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Action Area Overlap	Draft Determination
Canis lupus baileyi	Mexican wolf	High	Low	High	1.1	No Jeopardy
Dipodomys merriami parvus	San Bernardino Merriam's kangaroo rat	High	Low	High	0.9	No Jeopardy
Dipodomys stephensi (incl. D. cascus)	Stephens kangaroo rat	High	Low	High	2.5	No Jeopardy
Glaucomys sabrinus coloratus	Carolina northern flying squirrel	High	Low	High	1.6	No Jeopardy
Microtus californicus scirpensis	Amargosa vole	High	Low	High	0.0	No Jeopardy
Microtus pennsylvanicus dukecampbelli	Florida salt marsh vole	High	Low	High	0.2	No Jeopardy
Neotoma floridana smalli	Key Largo woodrat	High	Low	High	0.3	No Jeopardy
Odocoileus virginianus clavium	Key deer	High	Low	High	0.3	No Jeopardy
Ovis canadensis nelsoni	Peninsular bighorn sheep	High	Low	High	2.3	No Jeopardy
Peromyscus gossypinus allapaticola	Key Largo cotton mouse	High	Low	High	0.3	No Jeopardy
Peromyscus polionotus allophrys	Choctawhatchee beach mouse	High	Low	High	1.7	No Jeopardy

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Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Action Area Overlap	Draft Determination
Peromyscus polionotus peninsularis	St. Andrew beach mouse	Medium	Low	High	0.9	No Jeopardy
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	High	Low	High	4.1	No Jeopardy
Pteropus mariannus mariannus	Mariana fruit bat (Mariana flying fox)	High	Low	High	2.4	No Jeopardy
Rangifer tarandus ssp. caribou	Woodland caribou	Medium	Low	High	0.4	No Jeopardy
Tamias minimus atristriatus	Penasco least chipmunk	High	Low	High	0.4	No Jeopardy
Trichechus manatus	West Indian manatee	Medium	Low	Low	1	No Jeopardy
Urocitellus brunneus	Northern Idaho ground squirrel	High	Low	High	1.8	No Jeopardy
Vulpes vulpes necator	Sierra Nevada red fox	High	Low	High	0.1	No Jeopardy
Zapus hudsonius luteus	New Mexico meadow jumping mouse	High	Low	High	4.5	No Jeopardy

The species in Table 1 have a medium or high vulnerability ranking, indicating that the species may be less robust to additional stressors in their environment, including exposure to methomyl. All species in this group have a high toxicity ranking (with one exception, the West Indian manatee that has low toxicity), indicating that mortality, sublethal effects to growth or reproduction, and/or loss of food items are likely if exposure occurs. However, we anticipate adverse effects are only likely to occur for individuals that primarily forage on methomyl use sites or forage on prey items that have recently been exposed to methomyl applications on use sites. We expect this is unlikely to occur with any regular frequency given that methomyl use sites do not represent preferred foraging habitat or that agriculture makes up a very small portion of these species' ranges. EPA's exposure modeling indicates that foraging in areas off-field or consuming prey that have only been exposed through spray drift or runoff are not likely to result in more than low levels of methomyl exposure that are not likely to result in mortality and no more than low levels of sublethal effects. Thus, we anticipate few individuals are likely to experience high levels of adverse effects as expected exposure scenarios are not likely to result in appreciable direct or indirect adverse effects to most individuals of these species.

Furthermore, all species in this group have a low exposure ranking, specifically based on the low level of total overlap between their ranges and the action area. The total overlap metric we use is a conservative estimate of exposure as it does not fully account for redundancy between use site layers, assumes exposure is occurring in all possible overlapping areas, and does not consider information on past methomyl usage. Given that we anticipate only a small portion of the range is likely exposed under these conservative assumptions, we have high confidence that only very small numbers of individuals of each of these species are likely to experience exposure to methomyl.

One species, the Stephen’s kangaroo rat, may occur on agricultural lands, but prefers habitats with intermediate stages of succession that include open areas, forbs, and low shrub cover that are maintained by disturbance, including by agriculture. Individuals rarely occur in areas with dense grasses or high cover (USFWS 2021). The species’ range overlaps very few agricultural areas (2.5%) and only 0.1% of the species’ range has been treated with methomyl in the past (per required reporting by the California Department of Pesticide Regulation). After considering this past usage data, we are confident that the Stephen’s kangaroo rat will experience, at most, low exposure to methomyl that would result in effects to very few individuals from direct mortality and/or loss of prey leading to very small impacts to fitness related to growth and reproduction.

Given that we anticipate very small numbers of individuals are likely to be exposed and that most individuals are exposed under conditions that will not result in mortality, sublethal effects, or loss of food resources, we expect the proposed action will adversely affect (in the form of very low levels of mortality and/or impacts to fitness from loss of prey), at most, a very small number of individuals of these species. Therefore, we determine the overall risk of adverse effects to these species is low and will not rise to species-level effects. Thus, we conclude the proposed action will not appreciably reduce the survival and recovery of the mammal species in Table 1 in the wild. It is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 1.

Note: The Mexican wolf has a non-essential experimental population (EXPN Entity ID: 10484).

Reference:

U.S. Fish and Wildlife Service. 2021. Species Report for Stephen’s Kangaroo Rat (*Dipodomys stephensi*). Carlsbad, California. 133 pp.

Species with low exposure (informed by low past usage from USDA Census of Agriculture), medium/high vulnerability, and high toxicity

The species in Table 2 are grouped together because we expect low exposure (% range treated) confirmed by low levels of past insecticide usage within their ranges, as informed by the USDA's Census of Agriculture (CoA) data. While we present some specific information about the species in Table 2 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 2. Species with low exposure (confirmed by low past usage from U.S. Department of Agriculture's Census of Agriculture (CoA)), medium or high vulnerability, and high toxicity.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated (CoA)	Determination
Antilocapra americana sonoriensis	Sonoran pronghorn	High	Low	High	2.8	No Jeopardy
Aplodontia rufa nigra	Point Arena mountain beaver	Medium	Low	High	1.9	No Jeopardy
Corynorhinus (=Plecotus) townsendii-ingens	Ozark big-eared bat	High	Low	High	2.2	No Jeopardy
Corynorhinus (=Plecotus) townsendii virginianus	Virginia big-eared bat	High	Low	High	0.6	No Jeopardy
Dipodomys heermanni morroensis	Morro Bay kangaroo rat	High	Low	High	1.3	No Jeopardy
Leptonycteris nivalis	Mexican long-nosed bat	Medium	Low	High	0.2	No Jeopardy
Lynx canadensis	Canada lynx	Medium	Low	High	1	No Jeopardy
Martes caurina	Pacific marten	High	Low	High	0.9	No Jeopardy

Odocoileus virginianus leucurus	Columbian white-tailed deer	High	Low	High	0.4	No Jeopardy
Panthera onca	Jaguar	Medium	Low	High	0.9	No Jeopardy
Peromyscus polionotus ammobates	Alabama beach mouse	High	Low	High	1	No Jeopardy
Reithrodontomys raviventris	Salt marsh harvest mouse	High	Low	High	3.7	No Jeopardy
Tamiasciurus fremonti grahamensis	Mount Graham red squirrel	High	Low	High	0.1	No Jeopardy
Ursus arctos horribilis	Grizzly bear	Medium	Low	High	0.8	No Jeopardy
Zapus hudsonius preblei	Preble's meadow jumping mouse	Medium	Low	High	3.3	No Jeopardy

The species in Table 2 have a medium or high vulnerability ranking, indicating that the species may be less robust to additional stressors in their environment, including exposure to methomyl. All species in this group have a high toxicity ranking, indicating that high levels of mortality, sublethal effects to growth or reproduction, and/or loss of food items are likely if exposure occurs. However, we anticipate adverse effects are only likely to occur for individuals that primarily forage on methomyl use sites or forage on prey items that have recently been exposed to methomyl applications on use sites. For most species in this group (including the Point Arena mountain beaver and Virginia big-eared bat, discussed further below), we expect this is unlikely to occur with any regular frequency given that methomyl use sites do not represent preferred foraging habitat or that agriculture makes up a very small portion of these species' ranges. EPA's exposure modeling indicates that foraging in areas off-field or consuming prey that have only been exposed through spray drift or runoff are not likely to result in more than low levels of methomyl exposure that are not likely to result in mortality and no more than low levels of sublethal effects. Thus, we anticipate few individuals are likely to experience high levels of adverse effects as expected exposure scenarios are not likely to result in appreciable direct or indirect adverse effects to most individuals of these species.

Furthermore, while the species in Table 2 may have higher percent overlaps than is typical for species with a grouped conclusion, between the action area and their ranges, we anticipate a very small number of individuals are likely to be exposed to methomyl given the low insecticide usage in the past across their ranges. Low CoA usage indicates that very little insecticide usage (of any type) occurred in the past in the counties where the species' ranges occur. Given that this reporting broadly includes all insecticide usage, we consider CoA data to be conservative estimates of methomyl usage that indicate very little of the species' ranges are likely to be treated.

Two species, the Point Arena mountain beaver and the Virginia big-eared bat, may occur on agricultural lands. Point Arena mountain beavers are found near agricultural and ranch lands, but long-term grazing and agricultural practices are not suitable for the species so they are rarely found on agricultural lands (USFWS 2009). Virginia big-eared bats primarily forage for moths, and according to a study from North Carolina, 9% of the areas where the species foraged occurred on agricultural lands. The remaining foraging areas were forest and rock vegetation (76%), riparian vegetation or water (7%), and developed (9%). Preferred habitat for the moths is forested areas and woody vegetation, so agriculture is not their primary habitat (USFWS 2019a).

Given that we anticipate very small numbers of individuals are likely to be exposed and that most individuals are exposed under conditions that will not result in high levels of mortality, sublethal effects, or loss of food resources, we expect the proposed action will adversely affect (in the form of very low levels of mortality and/or impacts to fitness from loss of prey), at most, a very small number of individuals of these species. Therefore, we determine the overall risk of adverse effects to these species is low and will not rise to species-level effects. Thus, we conclude that the proposed action will not appreciably reduce the survival and recovery of these mammal species in the wild. It is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 2.

Note: The Sonoran pronghorn (EXPN Entity ID: 10141) and grizzly bear (EXPN Entity ID: 12372; Entity ID: 1302 is another proposed EXPN) have non-essential experimental populations.

References:

U.S. Fish and Wildlife Service. 2009. Point Arena Mountain Beaver (*Aplodontia rufa nigra*). Arcata, California. 32 pp.

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

Species with low exposure (informed by low past usage from California Department of Pesticide Regulation data), high vulnerability, and high toxicity

The species in Table 3 are grouped together because they have low exposure confirmed by low levels of past methomyl usage within their ranges (% range treated), as informed by data from the California Department of Pesticide Regulation's Pesticide Use Reporting (CalPUR). While we present some specific information about the species in Table 3 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. Mammals with low exposure (confirmed by low past usage from California Department of Pesticide Regulation (CalPUR) data), high vulnerability, and high toxicity.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated	Determination
Dipodomys ingens	Giant kangaroo rat	High	Low	High	1.6	No Jeopardy
Dipodomys nitratoides exilis	Fresno kangaroo rat	High	Low	High	2.1	No Jeopardy
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	High	Low	High	1.5	No Jeopardy
Pekania pennanti	Fisher	High	Low	High	1.6	No Jeopardy
Sylvilagus bachmani riparius	Riparian brush rabbit	High	Low	High	4.2	No Jeopardy
Vulpes macrotis mutica	San Joaquin kit fox	High	Low	High	1.2	No Jeopardy

The species in Table 3 have high vulnerability rankings, indicating that they may be less robust to additional stressors in their environment, including effects to individuals from methomyl exposure. All species in this group also have a high toxicity ranking, indicating that high levels of mortality, sublethal effects to growth or reproduction, and/or loss of food items are likely when exposure occurs. However, we anticipate adverse effects are only likely to occur for individuals that primarily forage on methomyl use sites or forage on prey items that have recently been exposed to methomyl applications on use sites. We expect this is unlikely to occur with any regular frequency given that methomyl use sites do not represent preferred foraging habitat or that agriculture makes up a very small portion of these species' ranges. EPA's exposure modeling indicates that foraging in areas off-field or consuming prey that have only been exposed through spray drift or runoff are not likely to result in more than low levels of methomyl exposure that are not likely to result in mortality and no more than low levels of sublethal effects. Thus, we anticipate few individuals are likely to experience high levels of adverse effects as expected exposure scenarios are not likely to result in appreciable direct or indirect adverse effects to most individuals of these species.

While these species have relatively higher percent overlap than is typical for species in a grouped conclusion, between the action area and their range, we anticipate only a very small number of individuals are likely to be exposed to methomyl. Mandatory pesticide usage reporting data collected by the state of California indicates very little methomyl has been used in the agricultural areas where these species' ranges occur, ranging from up to 1.2 to 4.2% of the range treated annually with any insecticide in the past. Given that usage reporting is mandated by the state of California and that these data are updated regularly with relatively high spatial resolution, we have high confidence that only a small percent of the species' ranges are likely to be exposed to methomyl from the proposed action.

Given that we anticipate very small numbers of individuals are likely to be exposed and that most individuals are exposed under conditions that will not result in mortality, high level of sublethal effects, or loss of food resources, we expect the proposed action will adversely affect (in the form of very low levels of mortality and/or impacts to fitness from loss of prey), at most, a very small number of individuals of these species. Therefore, we determine the overall risk of adverse effects to these species is low and will not rise to species-level effects. Thus, we conclude that the proposed action will not appreciably reduce the survival and recovery of these mammal species in the wild. It is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 3.

Species with Individual Integration and Synthesis summaries

For species in Table 4, our preliminary exposure and toxicity rankings indicate that the proposed action may result in moderate to high adverse effects. As such, we discuss each species in more detail in individual Integration and Synthesis summaries below. In some cases, we modified initial exposure and toxicity rankings due to additional information regarding exposure and effects for individual species, as described below.

Table 4. Mammals with moderate to high adverse effects anticipated from the proposed action. We addressed each species in individual Integration and Synthesis summaries.

Scientific Name	Common Name	Determination
Myotis sodalis	Indiana bat	No Jeopardy
Mustela nigripes	Black-footed ferret	No Jeopardy
Puma (=*Felis*) *concolor coryi*	Florida panther	No Jeopardy
Canis lupus	Gray wolf	No Jeopardy
Canis lupus	Gray wolf (Minnesota DPS)	No Jeopardy
Canis rufus	Red wolf	No Jeopardy
Lasiurus cinereus semotus	Hawaiian hoary bat	No Jeopardy
Cynomys parvidens	Utah prairie dog	No Jeopardy
Myotis grisescens	Gray bat	No Jeopardy
Puma yagouaroundi cacomitli	Gulf Coast jaguarundi	No Jeopardy
Leopardus (=Felis) pardalis	Ocelot	No Jeopardy
Peromyscus polionotus phasma	Anastasia Island beach mouse	No Jeopardy
Peromyscus polionotus niveiventris	Southeastern beach mouse	No Jeopardy
Sorex ornatus relictus	Buena Vista Lake ornate shrew	No Jeopardy
Neotoma fuscipes riparia	Riparian woodrat	No Jeopardy
Brachylagus idahoensis	Columbia Basin pygmy rabbit	No Jeopardy
Thomomys mazama glacialis	Roy Prairie pocket gopher	No Jeopardy
Gulo gulo luscus	North American wolverine	No Jeopardy
Emballonura semicaudata semicaudata	Pacific sheath-tailed bat	No Jeopardy
Thomomys mazama pugetensis	Olympia pocket gopher	No Jeopardy
Thomomys mazama tumuli	Tenino pocket gopher	No Jeopardy
Thomomys mazama yelmensis	Yelm pocket gopher	No Jeopardy
Eumops floridanus	Florida bonneted bat	No Jeopardy
Myotis septentrionalis	Northern long-eared bat	No Jeopardy
Dipodomys elator	Texas kangaroo rat	No Jeopardy
Perimyotis subflavus	Tricolored bat	No Jeopardy

Integration and Synthesis Summary: Mammals - Indiana bat

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is medium. In our preliminary evaluation of the effects of the proposed action to the species (presented below), we determined there is high overlap of the action area with the species' range, and moderate past usage of methomyl within the species' range (Figure 1), indicating a high extent of exposure. Most individuals exposed on-field will die or are likely to experience high levels of indirect adverse effects resulting from loss of affected arthropod prey. Given that the exposure is high, and the level of adverse effects is high, we determined the risk of adverse effects to the species is high. As such, we expected a large number of individuals were likely to experience adverse effects from the proposed action. Because of the effects described in our preliminary evaluation and conclusion, EPA and the applicant agreed to incorporate species-specific conservation measures as part of the action. We now expect exposure for the Indiana bat to be low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the Indiana bat. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Indiana bat.

Species range

Based on range map dated: 12/14/2023; Wherever found; *States within the range:* AL, AR, CT, GA, IA, IL, IN, KY, MD, MI, MO, MS, NC, NJ, NY, OH, OK, PA, TN, VA, VT, WV. Figure 1 depicts a map of the species' range.

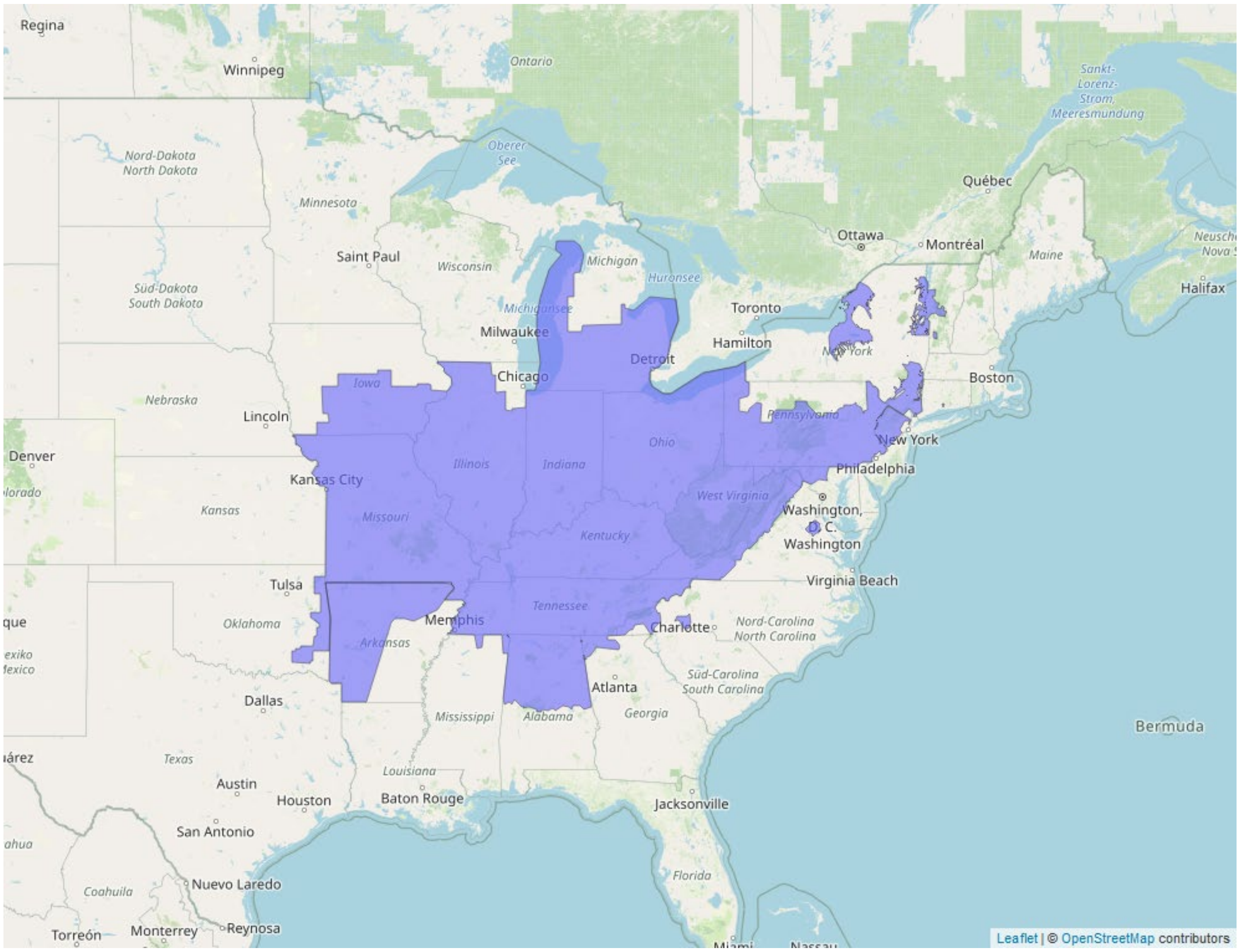

Figure 1. Range map of Indiana bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5949.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

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 (e.g., 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

We expect 53.3% of the species range will overlap with methomyl use sites or will likely be exposed through off-site transport within the action area (Table 5). Up to 27.6% of the species' range overlaps with methomyl use sites while 25.7% of the range occurs off-field (but may still be exposed to spray drift or runoff). Corn/soybean rotation crops are the most prevalent use sites within the species' range, overlapping with 37% of the species' range. However, we anticipate overlap with other, less prevalent use sites will also contribute to the overall exposure of the species.

Table 5. Overlap and annual usage data (% Range Treated) for the Indiana bat. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	1.5	6.2	7.7	0.2	1	1.2
Citrus	NA	NA	NA	NA	NA	NA
Corn	23.5	13.5	37	1.2	0.7	1.9
Cotton	0.4	0.6	1.1	<0.1	<0.1	0.1
Other Grains	0.5	2.6	3.1	<0.1	0.2	0.2
Other Orchards	0.2	0.6	0.7	0.1	0.6	0.7

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Other Row Crops	0.3	0.5	0.8	0.1	0.2	0.3
Soybeans[2]	24.1	13.5	37.6	1.2	0.7	1.9
Vegetables and Ground Fruit	0.7	1.7	2.4	0.7	1.7	2.4
Wheat	NA	NA	NA	NA	NA	NA
Total	**27.6**	**25.7**	**53.3**	**2.4**	**4.4**	**6.8**

Usage

Based on past usage data, we anticipate up to 6.8% of the species' range will be treated with methomyl (i.e., 2.4% on-field and 4.4% off-field).

Additional Exposure Considerations

Indiana bats make extensive use of agricultural edges for foraging and as travel corridors. Maternity colonies are commonly found near agricultural areas (Sparks et al. 2005, Kniowski 2011, Kniowski and Gehrt 2014). Bats hibernate from late October to early April; and they congregate near hibernacula in the fall just prior to hibernation, when bats forage intensively and breed. We anticipate pup rearing likely coincides with periods of high agricultural activity, including pesticide application. As such, we expect individuals are likely to experience exposure at different life stages.

Exposure Summary

There is a high extent of overlap between the action area and the species' range (53% total overlap). Based on past usage data, we expect a medium level of usage within the species' range, with up to 6.8% of the range treated with methomyl annually. While we anticipate only a smaller portion of the range will be treated with methomyl each year, high level of overlap suggests that a large portion of the range may be treated over the duration of the proposed action. As such, we anticipate a large number of individuals are likely to be exposed.

Overall Exposure Ranking: High

[2] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Effects of the Action: Toxicity

Direct Effects

The Indiana bat primarily consumes flying insects for food and has been observed foraging over agricultural fields (among other areas). As such, we anticipate individuals are likely to consume contaminated prey on- and off-field. EPA's exposure modeling predicts individuals that feed on-field are likely to accumulate levels of methomyl up to 19.3 mg/kg-bw, which can cause up to 88.2% mortality of exposed individuals and high levels of sublethal effects (e.g., reduced growth or reproduction) in individuals that do not die. In contrast, individuals foraging off-field will likely only accumulate levels of methomyl up to 0.7 mg/kg-bw, which is not expected to cause mortality or sublethal adverse effects. While we do not anticipate individuals will exclusively feed on methomyl use sites, given that individuals are commonly observed feeding on agricultural areas, we anticipate most individuals that feed on-field will accumulate high levels of methomyl, resulting in a high level of mortality. We anticipate individuals that survive exposure are not likely to experience chronic adverse effects, such as reduced growth.

Indirect Effects

The Indiana bat is considered an obligate insectivore. Based on available toxicity data in insect species, we anticipate there will be a high level of insect mortality. We expect the level of mortality among insects will vary across species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire insect community is likely to experience mortality. However, given the Indiana bat has high daily metabolic energy demands, suggesting that even small losses in prey availability can result in sublethal impacts to growth and survival (D. Sparks, personal communication, November 26, 2024). As such, even though the prey community will not experience complete mortality, we anticipate the proposed action will result in high levels of indirect adverse effects to the Indiana bat.

Toxicity Summary

The Indiana bat is likely to experience a high level of direct adverse effects. Given that individuals are known to forage for insects on agricultural areas, we anticipate most individuals will accumulate a high level of methomyl, resulting in a high level of mortality (up to 88.2% of exposed individuals) and sublethal adverse effects to individuals that do not die.

The Indiana bat is likely to experience high levels of indirect effects. Despite the fact we do not expect the entire insect prey community will die and that there will still be prey available for individuals, given that the species has a high daily metabolic demand, we anticipate even small reductions in prey availability can cause high levels of indirect adverse effects.

Based on the fact that we anticipate high levels of mortality of individuals foraging on or near use sites and that the loss of insect prey will cause high levels of indirect adverse effects, the species has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Indiana bat has a high exposure ranking. There is a high extent of overlap between the action area and the species' range, indicating that large portion of the range may be treated. While past usage data indicate only a smaller portion of the range is likely to be treated each year (up to 6.8% range treated annually), we anticipate this will result in the exposure of a large number of individuals over the duration of the proposed action. Furthermore, given that individuals are known to forage in and near agricultural areas, including possible methomyl use sites, we anticipate exposure is likely to occur.

The Indiana bat has a high toxicity ranking. Individuals foraging on or near methomyl use sites are likely to accumulate high levels of methomyl, which will cause a high level of mortality (up to 88% of exposed individuals). Individuals that do not die are also likely to experience adverse indirect effects as we expect their primary prey species will experience high levels of mortality in response to methomyl exposure, resulting a large reduction in the abundance of their prey.

Given that we expect a large number of individuals are likely to be exposed, that we anticipate individuals exposed on-field are likely to die, and that individuals not exposed are still likely to experience large reductions in prey availability, we expect the overall risk of adverse effects to the species is high.

Preliminary Conclusion

The Indiana bat has a medium vulnerability based on its status, distribution, and trends, as described above. The likelihood of exposure from labeled uses across the range is high, with a medium amount of estimated usage, but a high level of overlap suggesting the species is likely to be exposed across a large percentage of its range.

We anticipate mortality will occur to bats primarily from consumption of insects exposed on use sites. Methomyl usage on any use site has the potential to result in mortality to terrestrial invertebrate prey resources from spray drift (whether the species will use the site itself). Indiana bats make extensive use of agricultural edges (and edges between forested areas and other open areas) for foraging and as travel corridors (D. Sparks, Indiana Field Office, personal communication, 2024). Thus, we anticipate such direct exposure, to contaminated prey, will be the largest source of adverse effects to the species. We also anticipate low levels of adverse effects will occur from a reduction in prey resources (i.e., terrestrial invertebrates) within some use areas and spray drift areas, but that individuals encountering treated fields lacking invertebrate prey can and will seek alternative feeding areas. As the species actively forages in use sites and the edges of such sites, we anticipate large, intense but short duration, reductions in prey resources over the duration of the proposed action.

Final Conclusion (with Species-Specific Conservation Measures)

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Indiana bat:

1) *Applicators are not to apply methomyl from September 1-November 30.*

The PULA for the Indiana bat will encompass agricultural fields within a 5–10-mile radius of each winter hibernacula. Exact buffer distance will be selected according to hibernacula priority, as determined by the Service. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action (i.e., additional options and mitigations for end users). In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.

We anticipate these measures will prevent prey loss and direct mortality and sub-lethal effects (in the form of loss of fitness related to growth and reproduction) to individuals in key areas of the Indiana bat's habitat during critical periods (i.e., pre-hibernation). As such, after incorporating the specific conservation measure above, we anticipate low numbers of individuals of this species will be adversely impacted After reviewing the current status of the species, environmental baseline for the action area, effects of the proposed action, and species-specific conservation measures, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the Indiana bat. Thus, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Indiana bat.

References

Kniowski, A. B., and S. D. Gehrt. 2014. Home range and habitat selection of the Indiana bat in an agricultural landscape. The Journal of Wildlife Management 78(3):503-512.

Sparks, D. W., C. M. Ritzi, J. E. Duchamp, and J. O. Whitaker, Jr. 2005. Foraging habitat of the Indiana bat (*Myotis sodalis*) at an urban-rural interface. Journal of Mammalogy 86(4):713-718.

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: Mammals – Black-footed ferret

Scientific Name:	Common Name:	Entity ID:
Mustela nigripes	Black-footed ferret	5

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. While there is a high degree of overlap between the action and the species' range (Figure 2), we anticipate a low level of exposure is likely as there is a low level of past insecticide usage within the species range. Furthermore, based on the species' habitat preferences, we anticipate individuals are not likely to occur near agricultural areas, further reducing the likelihood of exposure. Thus, while we anticipate exposure can cause high levels of mortality and high levels of indirect effects through the loss of affected prey, we do not anticipate more than a small number of individuals are likely to experience adverse effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the black-footed ferret.

Species range

Last updated: 1/8/2024; Wherever found, except where listed as an experimental population; *States within the range:* AZ, CO, KS, MT, NM, SD. Figure 2 depicts a map of the species' range.

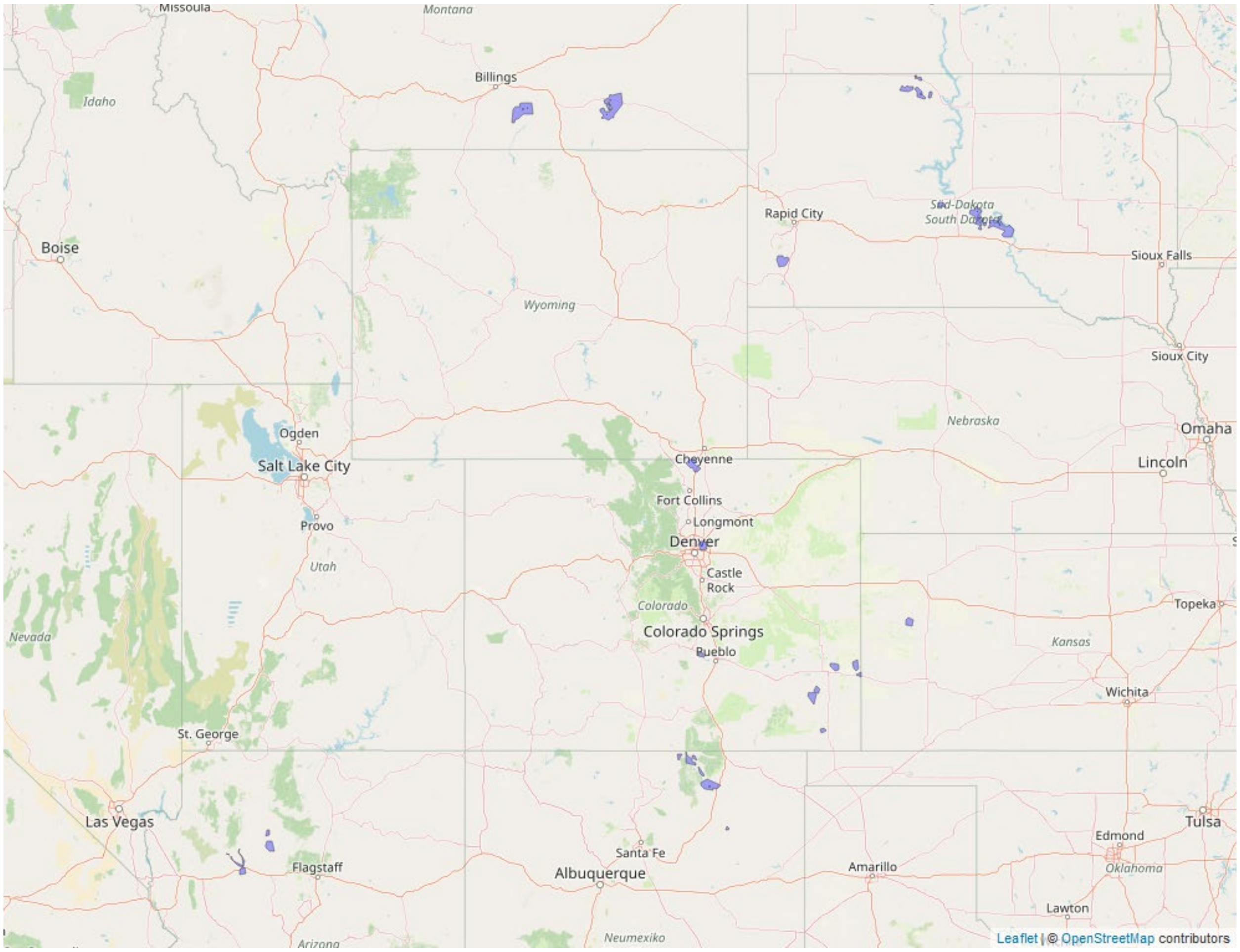

Figure 2. Range map of black-footed ferret (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6953.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 1/21/2020

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: no

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Black-footed ferrets are obligate predators of prairie dogs and they use prairie dog burrows for shelter. The black-footed ferret was historically common throughout the Great Plains, mountain basins, and semi-arid grasslands of North America wherever prairie dogs occurred. The historical range overlapped three species of prairie dog: black-tailed prairie dog (*Cynomys ludovicianus*), Gunnison's prairie dog (*C. gunnisonii*), and white-tailed prairie dog (*C. leucurus*) (USFWS 2019). As of 2020, the species was reintroduced to a small portion of its historic range (i.e., 29 sites between 1991-2019). As of 2019, the wild population was estimated to include 325 individuals across 13 reintroduction sites and there were 301 individuals in captivity (USFWS 2020).

From the late 1800s to the 1960s, prairie dog numbers and occupied habitat were dramatically reduced by conversion of native grasslands to cropland, poisoning, and disease. The ferret's close association with prairie dogs was also an important factor in the ferret's decline. The species remains vulnerable to several threats, including sylvatic plague, declining genetic fitness, drought, agricultural land conversion, poisoning of prairie dogs, recreational shooting or prairie dogs, range management, urbanization, and energy development (USFWS 2013, 2019, 2020).

As of 2020, significant management inputs (sylvatic plague mitigation and captive breeding) were necessary to maintain wild black-footed ferret populations. Low population numbers in the reintroduced population, declining reproductive performance in the captive population, continued risk of extirpation from sylvatic plague, and lack of suitable habitat result in low resiliency for many sites (USFWS 2020). (Note: This species has an experimental population, EXPN Entity ID: 7572.)

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 25% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 6). Up to 9.7% of the species' range overlaps with methomyl use sites while 15.4% of the range occurs off-field (but may still be exposed to spray drift or runoff). Other grains and corn are the most prevalent methomyl use sites within the black-footed ferret's range, making up 8.2% and 6.1% of the range, respectively. However, we anticipate overlap with other use sites can still contribute to the overall exposure of the species.

Table 6. Overlap and annual usage data (% Range Treated) for the black-footed ferret. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	1.7	5.3	7	0.2	0.8	1.0
Citrus	NA	NA	NA	NA	NA	NA
Corn[3]	2.8	3.2	6.1	0.1	0.2	0.3
Cotton	<0.1	<0.1	<0.1	0	0	0.0
Other Grains	3.4	4.7	8.2	0.2	0.2	0.4
Other Orchards	0	0	0	0	0	0.0
Other Row Crops	1.1	1.4	2.5	0.5	0.6	1.1
Soybeans	1.1	1.1	2.2	<0.1	<0.1	0.1
Vegetables and Ground Fruit	0.6	0.8	1.4	0.6	0.8	1.4
Wheat	NA	NA	NA	NA	NA	NA
Total	**9.7**	**15.4**	**25**	**1.7**	**2.5**	**4.2**

Usage

Based on past usage data, we anticipate up to 4.2% of the species' range will be treated with methomyl (i.e., 1.7% on-field and 2.5% off-field) (Table 6).

[3] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Additional Exposure Considerations

The low level of usage noted above is corroborated by data from USDA's Census of Agriculture, which reports only 1.24% of the species' range has been treated with any insecticide in the past. Given that this data is spatially specific to the black-footed ferret's range and includes usage of other insecticides in addition to methomyl, we consider this a conservative metric of past methomyl usage and have high confidence that only small portions of the species' range are likely to be treated annually.

In addition, while there is a high overlap with agricultural use sites for this species', ferrets reside exclusively within prairie dog towns within the range. The incidence of prairie dog towns containing agriculture is uncommon and where crops are adjacent to these habitats, landowners often control prairie dogs to protect crops from damage (J. Hughes and M. Schwarz, Black-footed Ferret Program, personal communications, 2024). As such, we expect exposure of black-footed ferret prey to be minimal.

Exposure Summary

There is a high extent of overlap between the action area and the species' range (25% total overlap). Based on past usage data, we expect a low level of usage within the species' range (up to 4.2% of the range treated annually), which is corroborated by a low level of insecticide usage as reported by the Census of Agriculture. In addition, there is a low likelihood of prairie dogs being exposed to methomyl on use sites within current ferret release sites. As such, we anticipate the exposure to the black-footed ferret will be low.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate the main route of exposure for black-footed ferrets is through dietary exposure (i.e., consuming prey that consumed food contaminated with methomyl). While the ferret can consume a variety of prey items, we expect individuals primarily consume small mammal prey (e.g., prairie dogs) but may consume other animals as well (e.g., birds, arthropods). EPA's exposure modeling indicates that individuals that consume small mammals that have recently fed on contaminated food from methomyl use sites can accumulate levels of methomyl up to 12.9 mg/kg-bw, which can result in up to 99% mortality. Exposure modeling indicates that individuals consuming prey that have only foraged in off-site areas contaminated by spray drift or runoff will accumulate no more than low levels of methomyl that are not likely to cause any mortality. While sublethal adverse effects to growth and reproduction can occur, we anticipate these effects will not occur before the onset of mortality.

Indirect Effects

EPA's exposure modeling indicates that small mammal prey (such as those the ferret primarily consumes) may experience a range of adverse effects depending on where they forage. Small mammal prey that exclusively forage on methomyl use sites are likely to experience high levels of mortality, while individuals that forage off-site are likely to experience only low levels of mortality.

Toxicity Summary

We expect a high level of direct adverse effects will occur. We expect that black-footed ferrets that consume prey that have recently foraged on methomyl use sites will accumulate high dietary dosages likely to cause mortality in exposed individuals. While toxicity studies show adverse effects to growth and reproduction can occur, we do not anticipate these effects will take place before the onset of mortality.

We expect a high level of indirect adverse effects will occur as small mammal prey are likely to die if exposed on use sites.

Given that we expect high levels of direct adverse effects and high levels of indirect adverse effects, we determine the black-footed ferret has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The black-footed ferret has a low exposure ranking. While there is a high extent of overlap between the species' range and the action area (25% total overlap), the USDA's Census of Agriculture data indicated that only 1.24% of the species' range has been treated with any insecticide in the past. In addition, we do not expect the prey species of black-footed ferrets are likely to feed within agricultural crops within current ferret release sites.

The black-footed ferret has a high toxicity ranking. We expect up to 99% mortality of individuals that have foraged on-field or have foraged on prey that have recently consumed contaminated food items on methomyl use sites. We also anticipate their primary prey species (small mammals) will experience high levels of mortality, resulting in a large reduction in the abundance of prey species.

Because we anticipate a small number of individuals are likely to be exposed and that there is a high level of mortality in exposed individuals as well as a high level of prey loss, we anticipate the risk of adverse effects to the species overall is low.

Conclusion

The black-footed ferret has a high vulnerability based on its status (i.e., endangered), limited distribution, and decreasing species trends, as described above. While the overlap between methomyl use sites and the species range is high, the USDA's Census of Agriculture indicated that only 1.24% of the range has been treated with any insecticide in the past. Black-footed ferrets are found where its prey species (i.e., black-tailed, white-tailed, and Gunnison prairie dogs) are found, which could include agricultural lands. However, at a large scale, agricultural land uses are not considered suitable habitat for prairie dogs or black-footed ferrets (USFWS 2019). While prairie dogs may burrow in agricultural lands and feed on agricultural crops, including alfalfa, we do not expect the prey species of black-footed ferrets are likely to feed within agricultural crops within current ferret release sites. The incidence of crops within these sites is uncommon, and growers near the species' occupied areas control for prairie dogs near wheat and alfalfa fields, making their presence on agricultural lands rare. Even though we anticipate mortality from direct and indirect effects will occur if the ferret is exposed to methomyl, particularly because of the species' association with agricultural fields, we expect this exposure to be very low (i.e., we anticipate the mortality of a small number of individuals).

The black-footed ferret is reliant on conservation programs and captive rearing to supplement wild populations, and both wild and captive populations were small as of 2019 (325 in the wild and 301 in captivity). Because of very low anticipated exposure, we anticipate low indirect adverse effects will occur from a reduction in prey resources (i.e., prairie dogs) within use areas and spray drift areas. We anticipate small and infrequent reductions in prey resources over the duration of the action leading to small impact to the fitness of the species related to growth and reproduction. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the black-footed ferret.

References

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U.S. Fish and Wildlife Service. 2019. Species Status Assessment Report for the Black-footed Ferret (*Mustela nigripes*). Version 1.0. Black-footed Ferret Recovery Program. Denver, Colorado. 142 pp.

U.S. Fish and Wildlife Service. 2013. Black-Footed Ferret (*Mustela nigripes*) Recovery Plan Second Revision. Denver, Colorado. 157 pp.

Integration and Synthesis Summary: Mammals – Florida panther

Scientific Name:	Common Name:	Entity ID:
Puma (=Felis) concolor coryi	Florida panther	8

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determine there is a high level of overlap between the action area and the species' range (Figure 3) and a low level of past usage, indicating moderate numbers of individuals are likely to be exposed. Based on the species' life history, we do not anticipate individuals are likely to experience more than low levels of adverse effects, indicating that the risk to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Florida panther.

Species range

Based on range map dated: 1/27/2022; Wherever found; *States within the range:* FL. Figure 3 depicts a map of the species' range.

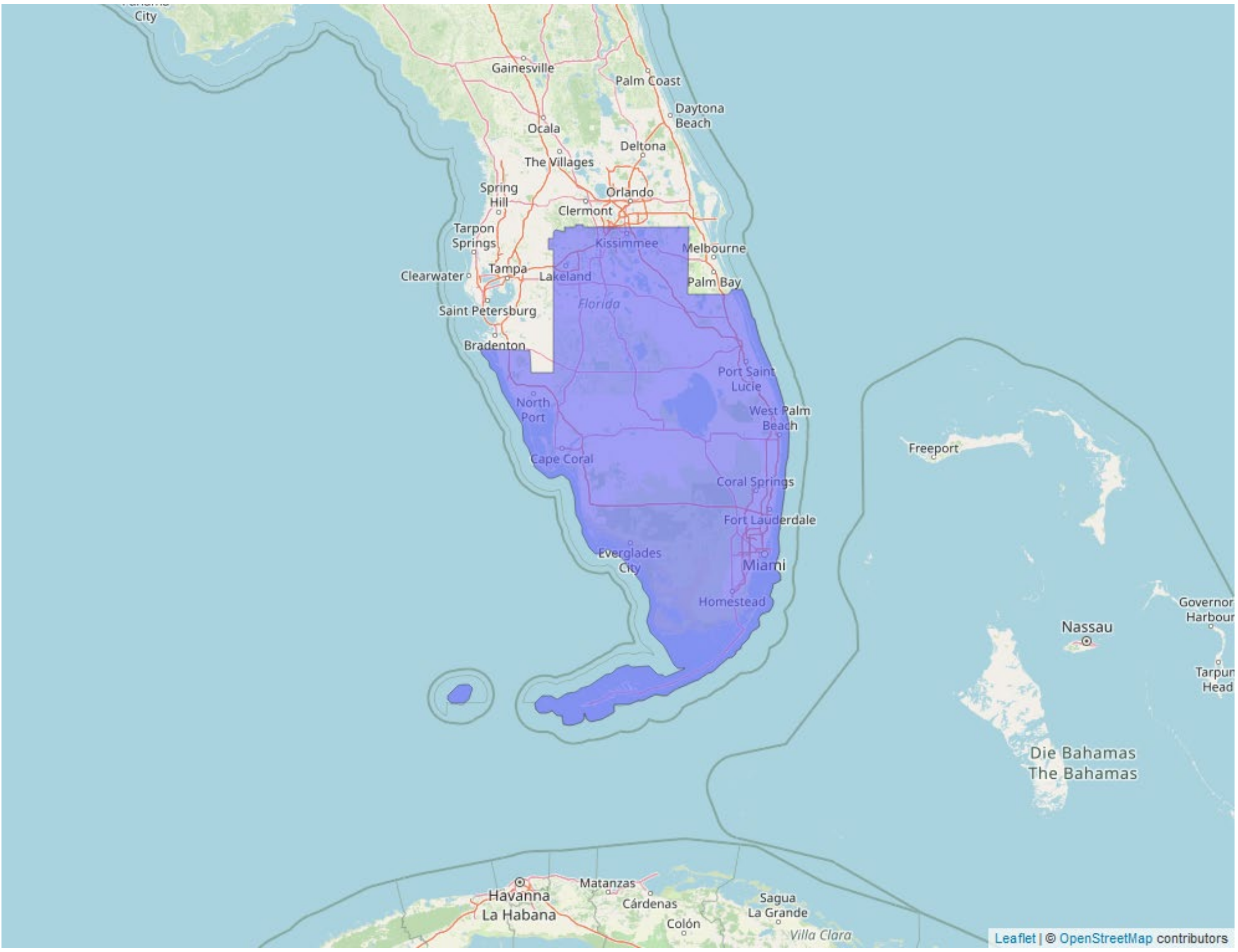

Figure 3. Range map of Florida panther (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/1763.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 4/28/2009

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

The Florida panther is the last subspecies of puma remaining in the eastern U.S. Florida panthers are wide-ranging, secretive, and require large contiguous areas with dense understory to meet their social, reproductive, and energetic needs. They historically occurred throughout the southeastern U.S. (from Arkansas and Louisiana eastward across Mississippi, Alabama, Georgia, Florida, and parts of South Carolina and Tennessee) and are now restricted to less than 5% of their historical range. Florida panthers are only found in one breeding population in south Florida, which increased from 12-20 adults in the 1970s to 100-120 adult in 2007 (USFWS 2008). The population is believed to be increasing, at least in the short-term, due to increased sightings of uncollared panthers, numbers of roadkill panthers, and number of known den sites (USFWS 2009). The primary threat to Florida panthers is human development and resultant habitat loss, degradation, and fragmentation. Potential panther habitat in southern Florida continues to be affected by urbanization, residential development, road construction, conversion to agriculture, mining and mineral exploration, and lack of land use planning (USFWS 2008).

Panthers are also threatened by environmental contaminants, including mercury and pesticides, and they experience bioaccumulation because they are carnivores (USFWS 2009). At least one panther was believed to have died from mercury toxicosis and elevated levels of a breakdown product of an organochloride pesticide (i.e., p,p`-DDE) were detected in fat from a deceased panther (USFWS 2008). Documented mortality causes of collared panthers include intraspecific aggression and vehicle collisions. Natural genetic exchange with other panther populations ceased when the Florida panther became geographically isolated over a century ago, and loss of genetic variability and diminished health are concerns for the Florida panther (USFWS 2009).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 12.5% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (.

Table 7). Up to 6.5% of the species' range overlaps with methomyl use sites while 6% of the range occurs off-field (but may still be exposed to spray drift or runoff). Other grains and vegetables and ground fruit are the methomyl use sites that are most prevalent within the Florida panther's range, making up 8.5% and 2.6% of the range, respectively. However, we anticipate overlap with other use sites can still contribute to the overall exposure of the species.

Table 7. Overlap and annual usage data (% Range Treated) for the Florida panther. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[4]	<0.1	0.2	0.3	<0.1	<0.1	<0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	5	3.5	8.5	0.2	0.2	0.4
Other Orchards	0.4	0.6	1	0.4	0.6	1
Other Row Crops	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	1	1.6	2.6	1	1.6	2.6
Wheat	NA	NA	NA	NA	NA	NA
Total	**6.5**	**6**	**12.5**	**1.6**	**2.4**	**4**

Usage

Based on past usage data, we anticipate up to 4% of the species' range will be treated with methomyl (i.e., 1.6% on-field and 2.4% off-field .

Table 7).

[4] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Exposure Summary

There is a high extent of overlap between the action area and the species' range (12.5% total overlap). Based on past usage data, we expect a low level of usage within the species' range (up to 4% of the range treated annually). Despite this low level of usage, the large extent of overlap suggests that a moderate portion of the range is likely to be treated over the duration of the proposed action. As such, we expect a moderate number of individuals are likely to be exposed.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

We anticipate the main route of exposure for the Florida panther is through dietary exposure (i.e., consuming prey that consumed food contaminated with methomyl). While the panther can consume a variety of prey items, we expect individuals primarily consume large mammal prey (e.g., deer, feral hogs) but may consume smaller animals as well (e.g., raccoons, armadillos, rabbits) and occasionally reptiles (e.g., alligators). EPA's exposure modeling indicates that individuals that consume large mammals that have recently fed on contaminated food on methomyl use sites can accumulate levels of methomyl up to 1.2 mg/kg-bw, which can result in mortality in up to 51% of exposed individuals. Exposure modeling indicates that individuals consuming large mammals that have only foraged in off-site areas contaminated by spray drift or runoff will accumulate no more than low levels of methomyl that are not likely to cause mortality.

While we cannot rule out the possibility of an individual solely consuming large mammal prey that have themselves only recently consumed contaminated plants directly on methomyl use sites, we anticipate this scenario will occur infrequently. As such, we anticipate only a low level of mortality is likely to occur (i.e., a small number of individuals will die). If individuals do not die from dietary exposure, we do not anticipate they will experience sublethal effects (e.g., reduced growth).

Indirect Effects

EPA's exposure modeling indicates that large mammal prey (such as those the Florida panther primarily consumes) may experience a range of adverse effects depending on where they forage. Large mammal prey that exclusively forage on methomyl use sites are likely to experience high levels of mortality, while individuals that forage off-site are likely to experience only low levels of mortality. Given that we expect only a portion of the prey base is likely to die, we anticipate sufficient prey resources will still be available for individual panthers to consume. As such, we expect only low levels of indirect effects are likely to occur.

Toxicity Summary

We expect a low level of direct adverse effects will occur. While we cannot rule out the possibility that an individual panther will consume large mammal prey that have recently consumed contaminated food items on methomyl use sites, we anticipate this scenario will occur relatively infrequently. As such, we anticipate most individual panthers are not likely to accumulate levels of methomyl likely to cause more than low levels of mortality. Similarly, we do not expect individuals exposed to methomyl that survive the exposure are likely to experience any sublethal adverse effects (e.g., reduced growth).

We expect a low level of indirect adverse effects will occur. While large mammal prey that consume contaminated food items on methomyl use sites are likely to die, we do not expect any mortality will occur in individuals that consume contaminated food items off-site. As such, while we anticipate some reductions in prey abundance are likely, we do not anticipate this will result in more than low levels of indirect adverse effects as we expect there will be sufficient prey resources remaining to support individuals.

Given that we expect only low levels of direct adverse effects and low levels of indirect adverse effects, we determine the Florida panther has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Florida panther has a medium exposure ranking. There is a high extent of overlap between the species' range and the action area (12.5% total overlap), while past usage data indicate that only a small portion of the range is likely treated each year (up to 4% range treated annually). Despite the low level of anticipated usage, the high overlap indicate that a potentially large portion of range is likely treated over the duration of the action, particularly if the areas treated change each year. As such, we anticipate a moderate number of individuals are likely to be exposed.

The Florida panther has a low toxicity ranking. While individuals that consume large mammal prey that have themselves consumed contaminated food on agricultural sites that have recently been treated with methomyl (i.e., within the last 24 hours) are likely to die, we anticipate this scenario is unlikely to occur with any regular frequency. As such, we anticipate only low levels of mortality and no sublethal effects are likely to occur. While there may be some mortality of prey species that consume contaminated food items on methomyl use sites, we do not anticipate this level of mortality will result in more than small reductions in the availability of prey for individuals.

While we anticipate a moderate number of individuals will experience exposure over the duration of the proposed action, we do not expect more than low levels of mortality are likely to occur, nor do we expect any sublethal or indirect adverse effects are likely to occur to any individuals, indicating that only a small number of individuals are likely to experience adverse effects. As such, we expect the overall risk of adverse effects to the species is low.

Conclusion

As discussed below, while vulnerability is high for this species, toxicity and estimated exposure are low and there is a low level of resultant mortality anticipated from the action. Thus, we anticipate a small number of individuals will be affected over the duration of the action and species-level effects are unlikely to occur.

The Florida panther has a high vulnerability based on its status, distribution, and trends, as described above. While the overlap of methomyl use sites is high, we anticipate the likelihood of exposure from usage across the range is low as the species will only rarely come into contact with prey items exposed to methomyl at rates that result in mortality (i.e., preying solely on animals that were themselves exposed to on-field rates of methomyl). Florida panthers exposed to prey items that were exposed to methomyl in anticipated off-field rates are not likely to result in mortality of those prey or the Florida panther. Likewise, we expect a low level of indirect adverse effects as most large mammalian prey species of the Florida panther are not likely to be exposed to methomyl at rates that result in their mortality and availability/loss of prey does not appear to be a driver for the threats to this species.

We anticipate that exposure to methomyl will occur at low levels from exposure to contaminated prey and will result in mortality only in scenarios where such prey items have been exposed at rates anticipated from on-field exposure. We anticipate this level of exposure will be rare across the duration of the proposed action. Therefore, we expect exposure to be low and that a low number of exposed individuals will die. We also anticipate low levels of adverse indirect effects from loss of prey items, resulting in small impacts to fitness related to growth and reproduction. Considering the vulnerability, anticipated low level of exposure, and low number of individuals of this species likely to die or experience indirect adverse effects, species-level adverse effects are unlikely to occur. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Florida panther.

References

U.S. Fish and Wildlife Service. 2009. Florida panther (*Puma concolor coryi*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 32 pp.

U.S. Fish and Wildlife Service. 2008. Florida Panther Recovery Plan. 3rd Revision. Atlanta, Georgia. 233 pp.

Integration and Synthesis Summary: Mammals - Gray wolf

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is medium. We determined there is a high level of overlap between the action area and the species' range (Figure 4) and a high level of past usage, indicating a large number of individuals are likely to be exposed. However, based on the species' life history, we do not anticipate individuals will experience more than low levels of adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray wolf.

Species range

Based on range map dated: 1/17/2024; 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, OR, WA, WI. Figure 4 depicts a map of the species' range.

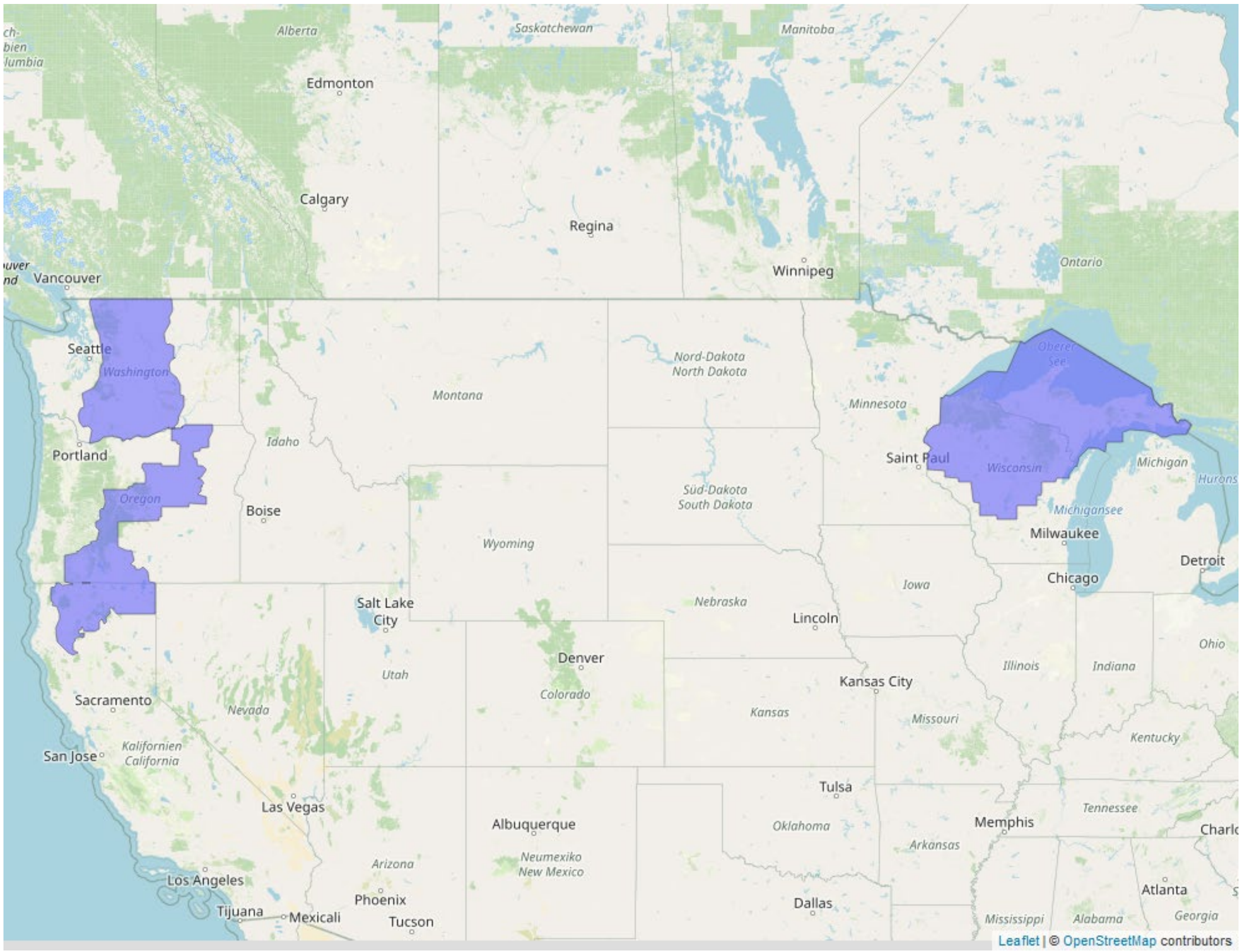

Figure 4. Range map of gray wolf (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4488.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: Delist: The species does not meet the definition of an endangered species or a threatened species.

Most recently completed 5-Year Review: 11/3/2020

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). In Colorado, there is a non-essential experimental population (Entity ID: 11698).

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: Medium

Effects of the Action: Exposure

Overlap

We expect 39.6% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 8). We are not able to parse overlap for this species into on- and off-field components as the EPA did not include that information in the BE. Corn/soybean rotation crops are the most prevalent use sites within the species' range, with 10.44% overlap. However, overlap with other use sites may still contribute to the overall exposure of the species.

Table 8. Overlap and annual usage data (% Range Treated) for the gray wolf. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Total Overlap (% range)	Total % Range Treated
Alfalfa	8.37	1.3
Citrus	0	0
Corn[5]	10.44	0.5
Cotton	0	0
Other Grains	8.89	0.4
Other Orchards	0.63	0.6
Other Row Crops	3.45	1.6
Soybeans	8.53	0.4
Vegetables and Ground Fruit	6.45	6.5

[5] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Use Layer	Total Overlap (% range)	Total % Range Treated
Wheat	1.35	0.1
Total	**39.58**	**11.4**

Usage

Based on past usage data, we anticipate up to 11.4% of the species' range will be treated with methomyl (Table 8).

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 methomyl use sites.

Exposure Summary

The gray wolf has a high extent of overlap (39.58% total overlap). Past usage data indicate a high level of usage within the species' range (up to 11.4% range treated annually). Because of their human avoidance behaviors, we do not expect individuals are likely to occur on or near methomyl use sites, therefore modified the exposure ranking to medium even though overlap and past usage are both high (i.e., a large portion of the range is likely to be treated over the duration of the proposed action). As such, we expect a moderate number of individuals are likely to be exposed.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

We anticipate gray wolves will be exposed to methomyl through dietary exposure by consuming prey species that have accumulated methomyl through consuming contaminated food items. Available information on gray wolves indicates that individuals primarily consume large mammals but have been known to switch to other prey species opportunistically. The dosage that individual wolves will accumulate depends on where its prey species were foraging. EPA's exposure estimates show that wolves that consume prey that have foraged on methomyl use sites recently (i.e., within 24 hours) may accumulate methomyl dosages up to 8.2 mg/kg-bw. We anticipate this level of exposure can cause a high level of mortality in individuals. In contrast, EPA's exposure modeling indicates that wolves that consume prey that have not recently foraged on methomyl use sites are not likely to accumulate any significant levels of methomyl, resulting in no measurable adverse effects.

Wolves are widely distributed throughout their range and typically prefer areas with low risks of human and livestock conflict. While we cannot rule out the possibility that an individual may consume prey that had been foraging on methomyl use sites within the last 24 hours, we anticipate this scenario will occur infrequently given the wide expanse of areas where wolves forage. As such, we anticipate only low levels of mortality are likely to occur.

Based on available toxicity data in mammals, we do not expect any sublethal effects are likely to occur at predicted dosages likely to occur in individuals.

Indirect Effects

While gray wolves can consume a wide variety of animals, we anticipate individuals primarily rely on large mammal prey but can consume a variety of other food items, such as small mammals and even birds. Based on available toxicity data and exposure estimates provided by the EPA, we anticipate prey that forage directly on methomyl use sites are likely to experience high levels of mortality. However, we anticipate that different prey species will exhibit natural variability in their response to methomyl exposure, and as such, do not anticipate all prey species will likely experience the same high level of mortality as predicted by EPA's exposure modeling. Additionally, we anticipate that prey who do not forage on-field are not likely to experience more than low levels of mortality. Given the varied diet of individual wolves and the inherent variability in prey species' responses to methomyl exposure, we anticipate the potential loss of prey resulting from individuals foraging on methomyl use sites experiencing mortality is not likely to significantly alter the overall availability of prey for the gray wolf. As such, we anticipate only low levels of indirect effects are likely to occur.

Toxicity Summary

We expect the gray wolf will experience low levels of direct adverse effects. While mortality may occur if individuals consume prey that have recently (i.e., within the last 24 hours) consumed contaminated food items on methomyl use sites, we anticipate this scenario will occur very infrequently as wolves can forage throughout their expansive range and generally prefer areas with low risk of encountering human activity. As such, we anticipate individuals will primarily consume prey that have not recently foraged on methomyl use sites, resulting in only low levels of methomyl dietary exposure that will not cause any adverse effects to individuals. We do not anticipate dietary exposure will be high enough to cause any sublethal adverse effects (e.g., reduced growth).

We expect the gray wolf will only experience low levels of indirect effects. While there may be some mortality of prey that forage on methomyl use-sites, we do not anticipate this mortality will result in significant reductions in prey availability for individuals. Wolves can consume a variety of prey species, which we expect will exhibit natural variability in response to methomyl exposure, indicating that not all prey species will experience high levels of mortality. Furthermore, we anticipate prey that do not forage on-field will not experience more than low levels of mortality. As such, we do not anticipate methomyl use will cause significant reductions in prey availability.

Given that the gray wolf is not likely to experience more than low levels of direct adverse effects and indirect effects, we assign the species a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The gray wolf has a medium exposure ranking. There is a large extent of overlap between the species' range and the action area (39% total overlap) and a high level of past usage within the range (up to 11% range treated annually), but gray wolves are known to avoid human-dominated landscapes, including agricultural lands (i.e., methomyl use sites). As such, we expect a moderate number of individuals are likely to be exposed over the duration of the proposed action.

The gray wolf has a low toxicity ranking. While individuals that consume large mammal prey that have themselves consumed contaminated food on agricultural sites that have recently been treated with methomyl (i.e., within the last 24 hours) are likely to die, we anticipate this scenario is unlikely to occur with any regular frequency, particularly as we do not anticipate individuals are likely foraging near methomyl use sites where resulting exposure will be the highest. As such, we anticipate most wolves will not accumulate high levels of methomyl and will not experience more than low levels of mortality or any sublethal effects. While there may be some mortality of prey species that consume contaminated food items on methomyl use sites, we do not anticipate this level of mortality will result in more than small reductions in the availability of prey for individuals.

While we anticipate a moderate number of individuals are likely to be exposed, we do not anticipate that exposure is likely to result in mortality or sublethal effects for most individuals, and they are not likely to experience substantial prey loss. This indicates that only a small number of individuals are likely to experience any adverse effects. As such, we expect the overall risk of adverse effects to the species is low.

Conclusion

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is our biological opinion that the registration of methomyl, is not likely to jeopardize the continued existence of the gray wolf. As discussed below, the vulnerability is medium for this species, but the risk to the species is low.

While we anticipate that small numbers of individuals may be affected over the duration of the proposed action, we do not expect species-level effects to occur.

The gray wolf has a medium vulnerability based on its status, distribution, and trends, as described above. Though we anticipate a moderate extent of estimated usage across its range, the risk to the gray wolf posed by methomyl 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 methomyl given the species general preference for remote sites away from human agricultural activities. Moreover, we do not expect that small reductions in prey species will substantially impact fitness, survival, or reproduction for individuals of this species, due to the wide variety of habitats it occupies and ability to cover large distances within its range.

Thus, while we anticipate a small number of individuals is likely to experience direct and indirect adverse effects, including small reductions in prey (that will lead to small impacts to fitness related to growth and reproduction), we do not anticipate such reductions will impact survival, growth, reproduction of individual wolves or result in species-level effects. Therefore, we do not anticipate that the action will appreciably reduce survival and recovery of the gray wolf in the wild. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray wolf.

References

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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: Mammals – Gray wolf

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is medium. We determined there is a high level of overlap between the action area and the species' range (Figure 5), but a low level of past usage, indicating that a moderate number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate individuals are not likely to experience more than low levels of adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray wolf.

Species range

Based on range map dated: 1/16/2024; U.S.A. (MN); *States within the range:* MN. Figure 5 depicts a map of the species' range.

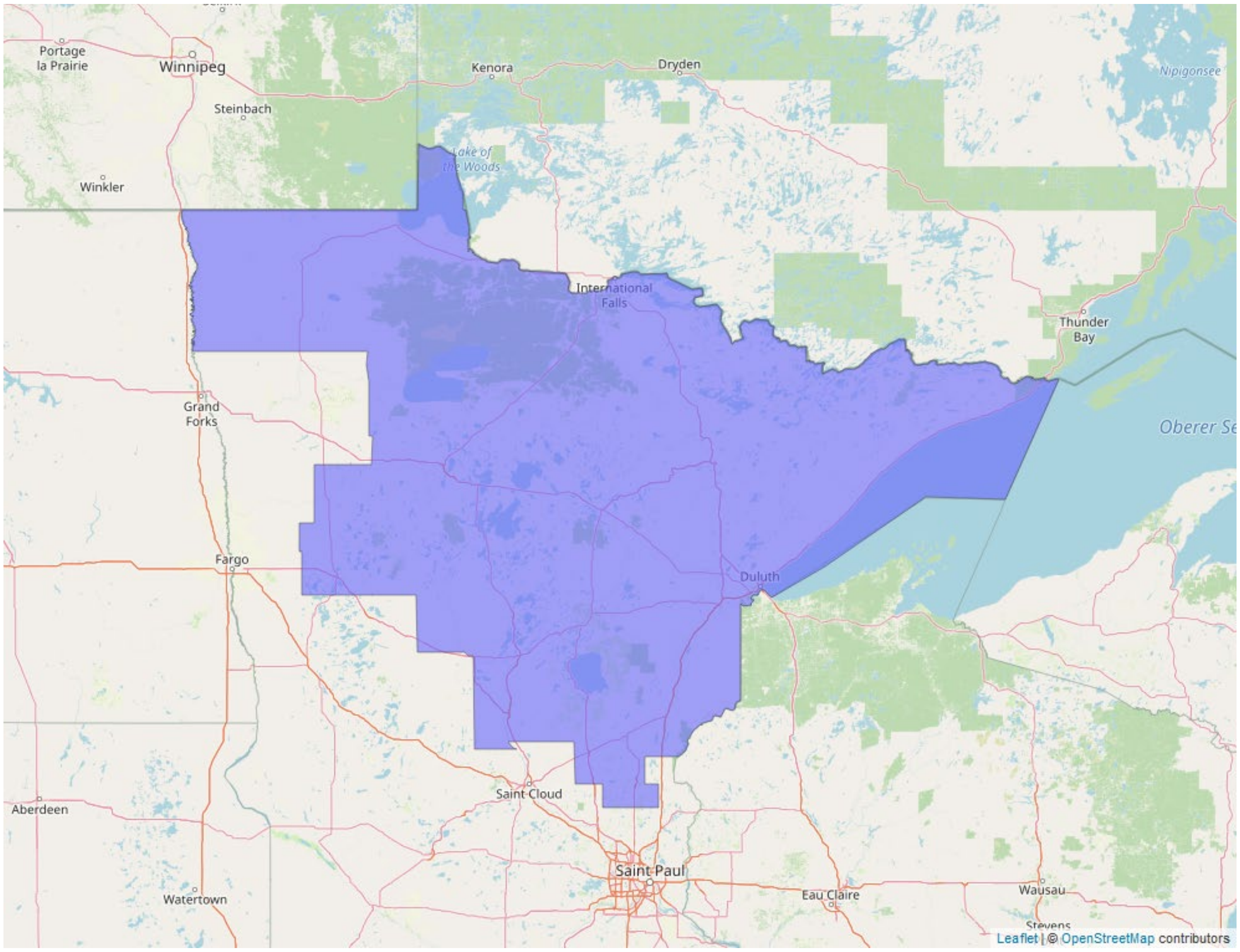

Figure 5. Range map of gray wolf (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4488.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Threatened

Most recent 5-Year Review recommendation: Delist: The species does not meet the definition of an endangered species or a threatened species.

Most recently completed 5-Year Review: 11/3/2020

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: Medium

Effects of the Action: Exposure

Overlap

We expect 32.9% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 9). We are not able to parse overlap for this species into on- and off-field components as the EPA did not include that information in the BE. Alfalfa is the most prevalent use sites within the species' range, with 8.96% overlap. However, overlap with other use sites may still contribute to the overall exposure of the species.

Table 9. Overlap and annual usage data (% Range Treated) for the gray wolf. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Total Overlap (% range)	Total % Range Treated
Alfalfa	8.96	1.3
Citrus	0	0
Corn[6]	8.11	0
Cotton	0	0
Other Grains	4.21	0.2
Other Orchards	0	0
Other Row Crops	1.72	0.8
Soybeans	7.97	0.4
Vegetables and Ground Fruit	1.92	1.9
Wheat	0	0

[6] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Use Layer	Total Overlap (% range)	Total % Range Treated
Total	**32.89**	**4.6**

Usage

Based on past usage data, we anticipate up to 4.6% of the species' range will be treated with methomyl (Table 9).

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 regulated. 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 cropped fields. As such, we anticipate individuals are not generally likely to occur in or near methomyl use sites.

Exposure Summary

The gray wolf has a high extent of overlap (32.9% total overlap). Past usage data indicate a low level of usage within the species' range (up to 4.6% range treated annually). While there is a low level of expected usage within the range, the high level of overlap indicates that a moderate portion of the range is likely to be treated over the duration of the proposed action, especially if the areas treated change over time. However, we anticipate gray wolves will typically avoid areas with agricultural activity as this type of human disturbance is negatively correlated with wolf presence in habitat models. As such, we anticipate only a small number of gray wolves will be exposed to methomyl.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate gray wolves will be exposed to methomyl through dietary exposure by consuming prey species that have accumulated methomyl through consuming contaminated food items. Available information on gray wolves indicates that individuals primarily consume large mammals but have been known to switch to other prey species opportunistically. The dosage that individual wolves will accumulate depends on where its prey species were foraging. EPA's exposure estimates show that wolves that consume prey that have foraged on methomyl use sites recently (i.e., within 24 hours) may accumulate methomyl dosages up to 8.2 mg/kg-bw. We anticipate this level of exposure can cause a high level of mortality in individuals. In contrast, EPA's exposure modeling indicates that wolves that consume prey that have not recently foraged on methomyl use sites are not likely to accumulate any significant levels of methomyl, resulting in no measurable adverse effects.

Wolves are widely distributed throughout their range and typically prefer areas with low risks of human and livestock conflict. While we cannot rule out the possibility that an individual may consume prey that had been foraging on methomyl use sites within the last 24 hours, we anticipate this scenario will occur infrequently given the wide expanse of areas where wolves forage. As such, we anticipate only low levels of mortality are likely to occur.

Based on available toxicity data in mammals, we do not expect any sublethal effects are likely to occur at predicted dosages likely to occur in individuals.

Indirect Effects

While gray wolves can consume a wide variety of animals, we anticipate individuals primarily rely on large mammal prey but can consume a variety of other food items, such as small mammals and even birds. Based on available toxicity data and exposure estimates provided by the EPA, we anticipate prey that forage directly on methomyl use sites are likely to experience high levels of mortality. However, we anticipate that different prey species will exhibit natural variability in their response to methomyl exposure, and as such, do not anticipate all prey species will likely experience the same high level of mortality as predicted by EPA's exposure modeling. Additionally, we anticipate that prey who do not forage on-field are not likely to experience more than low levels of mortality. Given the varied diet of individual wolves and the inherent variability in prey species' responses to methomyl exposure, we anticipate the potential loss of prey resulting from individuals foraging on methomyl use sites experiencing mortality is not likely to significantly alter the overall availability of prey for the gray wolf. As such, we anticipate only low levels of indirect effects are likely to occur.

Toxicity Summary

We expect the gray wolf will experience low levels of direct adverse effects. While mortality may occur if individuals consume prey that have recently (i.e., within the last 24 hours) consumed contaminated food items on methomyl use sites, we anticipate this scenario will occur very infrequently as wolves can forage throughout their expansive range and generally prefer areas with low risk of encountering human activity. As such, we anticipate individuals will primarily consume prey that have not recently foraged on methomyl use sites, resulting in only low levels of methomyl dietary exposure that will not cause any adverse effects to individuals. We do not anticipate dietary exposure will be high enough to cause any sublethal adverse effects (e.g., reduced growth).

We expect the gray wolf will only experience low levels of indirect effects. While there may be some mortality of prey that forage on methomyl use-sites, we do not anticipate this mortality will result in significant reductions in prey availability for individuals. Wolves can consume a variety of prey species, which we expect will exhibit natural variability in response to methomyl exposure, indicating that not all prey species will experience high levels of mortality. Furthermore, we anticipate prey that do not forage on-field will not experience more than low levels of mortality. As such, we do not anticipate methomyl use will cause significant reductions in prey availability.

Given that the gray wolf is not likely to experience more than low levels of direct adverse effects and indirect effects, we assign the species a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The gray wolf has a high exposure ranking. There is a large extent of overlap between the species' range and the action area (32% total overlap), while past usage data indicate only a small portion of the range is likely treated with methomyl each year (up to 4.6% range treated annually). Despite this low level of usage, we expect a moderate portion of the species' range is likely to be treated over the duration of the proposed action, particularly if the areas treated change each year. As such, we anticipate a moderate number of individuals are likely to be exposed.

The gray wolf has a low toxicity ranking. While individuals that consume large mammal prey that have themselves consumed contaminated food on agricultural sites that have recently been treated with methomyl (i.e., within the last 24 hours) are likely to die, we anticipate this scenario is unlikely to occur with any regular frequency, particularly as we do not anticipate individuals are likely foraging near methomyl use sites where resulting exposure will be the highest. As such, we anticipate most wolves will not accumulate high levels of methomyl and will not experience more than low levels of mortality or any sublethal effects. While there may be some mortality of prey species that consume contaminated food items on methomyl use sites, we do not anticipate this level of mortality will result in more than small reductions in the availability of prey for individuals.

While we anticipate a moderate number of individuals are likely to be exposed, we anticipate that exposure is not likely to result in mortality or sublethal effects for most individuals and they are not likely to experience substantial prey loss. This indicates that only a small number of individuals are likely to experience any adverse effects. As such, we expect the overall risk of adverse effects to the species is low.

Conclusion

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the action, and the cumulative effects, it is our biological opinion that the registration of methomyl, is not likely to jeopardize the continued existence of the gray wolf. As discussed below, the vulnerability is medium for this species, but the risk to the species is low.

While we anticipate that small numbers of individuals may be affected over the duration of the proposed action, we do not expect species-level effects to occur.

The gray wolf has a medium vulnerability based on its status, distribution, and trends, as described above. Though we anticipate a moderate extent of estimated usage across its range, the risk to the gray wolf posed by methomyl 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 methomyl given the species general preference for remote sites away from human agricultural activities. Moreover, we do not expect that small reductions in prey species will substantially impact fitness, survival, or reproduction for individuals of this species, due to the wide variety of habitats it occupies and ability to cover large distances within its range.

Thus, while we anticipate a small number of individuals is likely to experience direct and indirect adverse effects, including small reductions in prey (that will lead to small impacts to fitness related to growth and reproduction), we do not anticipate such reductions will impact survival, growth, reproduction of individual wolves or result in species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray wolf.

References

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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: Mammals - Red wolf

Scientific Name:	Common Name:	Entity ID:
Canis rufus	Red wolf	14

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. In our preliminary evaluation of the effects of the proposed action to the species (presented below), we determined there is a high level of overlap between the action area and the species' range (Figure 6) and a low level of past usage, indicating that a moderate number of individuals are likely to be exposed. However, given that we anticipate individuals are likely to be exposed on use sites, we anticipate exposed individuals are likely to die, indicating that the risk of adverse effects to the species is high. As such, we expected a moderate number of individuals were likely to die. Because of the effects described in our preliminary evaluation and conclusion, EPA and the applicant agreed to incorporate species-specific conservation measures as part of the action. We now expect exposure for the red wolf to be low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the red wolf.

Species range

Based on range map dated: 9/13/2023; Wherever found, except where listed as an experimental population; *States within the range:* NC. Figure 6 depicts a map of the species' range.

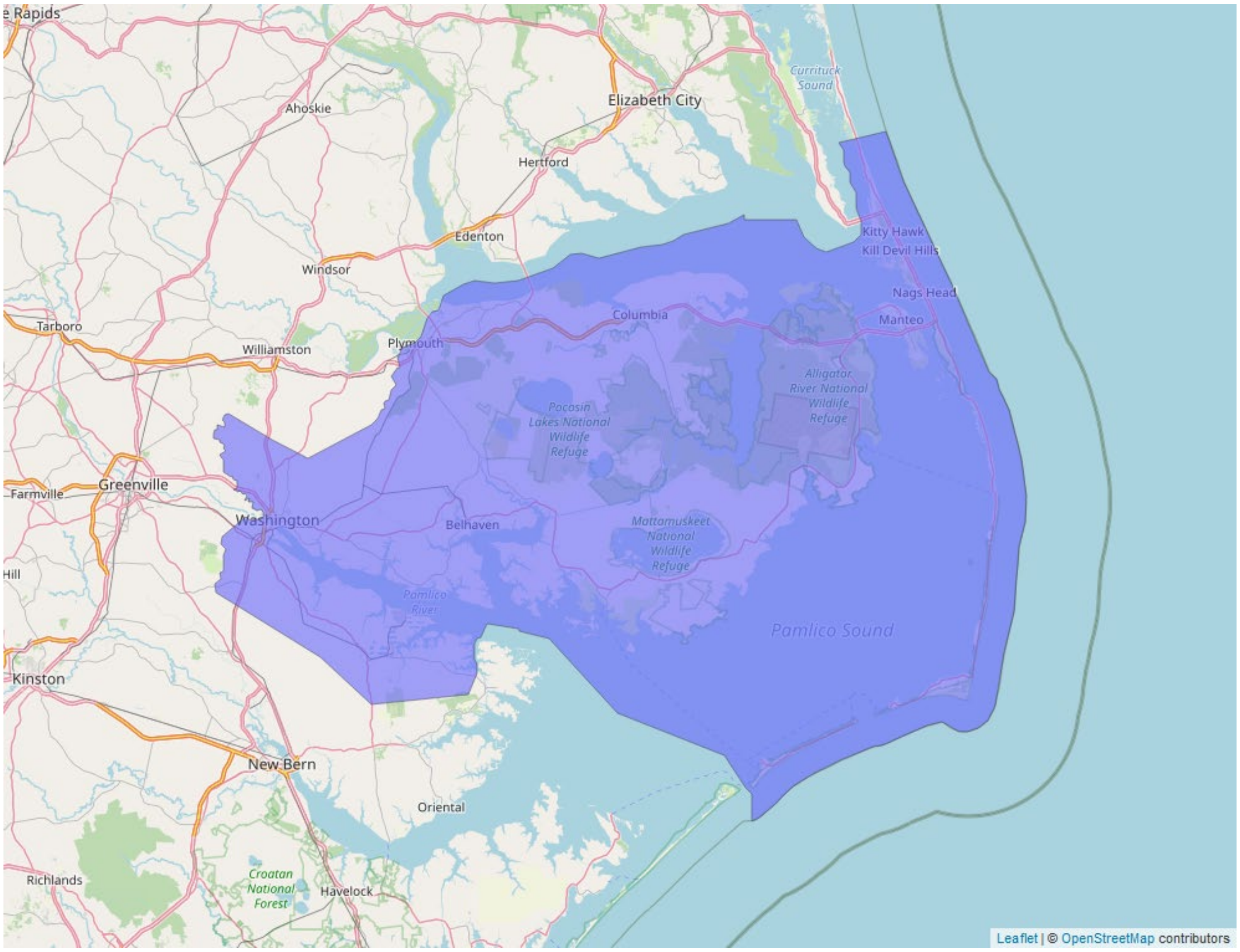

Figure 6. Range map of Red wolf (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/37.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 4/23/2018

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 red wolf is a social, territorial canid found in the southeastern U.S. Even though it is widely believed to not be their preferred habitat, the population in Texas and Louisiana (source for reintroductions) was found in fallow fields, bayous, marshes, and coastal prairie. Their preferred habitat is believed to be open pine forests and bottomland hardwoods, and reintroduced animals use agricultural lands, pine forests, and pocosins (e.g., wetlands found in coastal areas with sandy peat soils and shrubs). They are opportunistic predators and often predate ungulates, small mammals (e.g., rabbits, rodents, nutria), livestock (e.g., sheep, goats, cattle), and birds (USFWS 2018a). The historical range of red wolves encompassed southeastern United States westward to the Edwards Plateau in Texas, north to the lower Midwest (i.e., southeastern Missouri, southern Illinois), and east into southern Pennsylvania and extreme southeastern New York. Between 1973-1980, over 400 canids were captured for the red wolf recovery program and 15 of those became a breeding stock for the captive population and reintroduction efforts. Red wolves were declared extinct in the wild in 1980. In 1987, a nonessential experimental population was initiated in eastern North Carolina with four males and four females (EXPN Entity ID: 4369); sixty more were released between 1987-1994 and the population began maintaining territories, forming packs, and breeding successfully. Another reintroduction was initiated in Tennessee but was terminated in 1998 due to low pup survival and population emigration (USFWS 2018a). As of 2018, it had three breeding pairs (n= ~44) and did not appear to be self-sustaining. The captive population has maintained about 150 individuals for over 20 years across 43 locations. The nonessential experimental population is likely to be extirpated within decades without substantial intervention (USFWS 2018b).

Threats to the red wolf include genetics concerns (i.e., inbreeding due to small population size), hybridization and competition with coyotes (*Canis latrans*), disease and parasites, poisoning, shooting, development, vehicle collisions, fire, hurricanes and storms, sea level rise and habitat inundation, and use of agricultural areas (USFWS 2018b). Coyotes have been expanding their range and they directly compete with red wolves for habitat and prey. Red wolves are at risk of habitat loss, but this concern is outweighed by genetic concerns from small population sizes. The founding stock was very small and resultant genetic diversity is limited. Wolves are susceptible to mange, ticks, biting lice, and other parasites that are carried and transported by coyotes. They also hybridize with other species, mainly coyotes. Poisoning and shooting of red wolves have been confirmed in North Carolina. Development is not considered a historical threat to the species where it is currently found, but development potential in the future may become a concern if habitat is limited by other factors like sea level rise. Wolves adapt well to suburban and urban areas, but then interact more with humans (USFWS 2018a).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 33.8% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 10). Data indicate 12.7% of the species' range overlaps with methomyl use sites while 21.1% of the range occurs off-field (but may still be exposed to spray drift or runoff). Corn/soybean rotation and cotton are the two use sites that are most prevalent within the species' range, with 20.9% and 8.2% overlap, respectively. However, we expect overlap with other use sites can still contribute to the overall exposure of the species.

Table 10. Overlap and annual usage data (% Range Treated) for the red wolf. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn	10.9	9.1	20.0	0.6	0.5	1.1
Cotton	<0.1	8.2	8.2	<0.1	0.4	0.4
Other Grains	0.1	1.7	1.8	<0.1	0.1	0.1
Other Orchards	<0.1	0.2	0.2	<0.1	0.2	0.2
Other Row Crops	0.3	0.7	1.0	0.1	0.3	0.4
Soybeans[7]	12.1	8.8	20.9	0.6	0.4	1.0

[7] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Vegetables and Ground Fruit	0.2	1.2	1.4	0.2	1.2	1.4
Wheat	NA	NA	NA	NA	NA	NA
Total	**12.7**	**21.1**	**33.8**	**0.9**	**2.7**	**3.6**

Usage

Based on past usage data, we anticipate up to 3.6% of the species' range will be treated with methomyl (i.e., 0.9% on-field and 2.7% off-field) (Table 10).

Additional Exposure Considerations

Recent studies show that red wolves are selecting agricultural areas over other cover types, indicating that occurrence on methomyl use sites is likely.

Exposure Summary

There is a high extent of overlap between the action area and the red wolf's range (33.8% total overlap). There is a low level of past methomyl usage (up to 3.6% range treated annually). While this low level of past usage suggests only a small portion of the range is likely to be treated each year, given the high level of overlap, a moderate portion of the species' range may be treated over the duration of the proposed action if the areas that are treated change between years. As such, we anticipate a moderate number of individuals are likely to be exposed.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the main route of exposure for the red wolf. The red wolf can consume a wide variety of prey, including large and small mammals, birds, herpetofauna, fish, crustaceans, and vegetation. EPA's exposure modeling indicates that individuals consuming prey that have been foraging on methomyl use sites will result in higher dosages in wolves in contrast to consuming prey that have been foraging off-site. Given that recent studies have noted red wolves seem to select for agricultural areas over other cover types, we anticipate individuals are likely to consume prey that have recently foraged on methomyl use sites, indicating that a high level of mortality is likely.

Based on available toxicity data in mammals, we do not expect individual red wolves exposed to methomyl that survive are likely to experience sublethal adverse effects (e.g., reduced growth).

Indirect Effects

EPA's exposure modeling indicates that animal prey species of different taxa (e.g., mammals, birds, arthropods) that forage on-field are likely to experience high levels of mortality. Prey species that do not forage on methomyl use sites are less likely to die. Given that recent studies have shown that red wolves select for agricultural areas over other cover types suggests that they likely consume and rely on prey that also occur in agricultural areas. As such, we anticipate the mortality of prey species that forage on-field represents a large loss of available prey. Thus, we anticipate the red wolf is likely to experience high levels of indirect adverse effects.

Toxicity Summary

We expect the red wolf will experience high levels of direct adverse effects. Given that red wolves seem to select agricultural areas over other cover types, we anticipate it is likely that individuals will consume prey that have recently foraged on methomyl use sites, resulting in high levels of methomyl exposure and subsequent high levels of mortality. We do not anticipate individuals exposed to methomyl that do not die will likely experience sublethal adverse effects.

We expect the red wolf will experience high levels of indirect adverse effects as well. While the species can use a variety of species as food resources, prey that forage on methomyl use sites are likely to experience high levels of mortality. Given the red wolf's preference for agricultural areas, prey loss in these areas may result in a substantial reduction in prey availability, resulting in high levels of indirect effects. Because we presume that red wolves heavily forage on agricultural areas, we expect high levels of prey mortality across taxa on-field and we expect high levels of wolf mortality from foraging on-field.

Because we anticipate the red wolf is likely to experience high levels of direct and indirect adverse effects, we assign the species a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The red wolf has a medium exposure ranking. There is a high extent of overlap between the species' range and the action area (21% total overlap), while past usage data indicate only a small portion of the range is likely treated each year (up to 2.7% range treated annually). Despite this low level of usage, given the high extent of overlap, we anticipate a moderate portion of the range is likely to be treated over the duration of the proposed action, particularly if the areas treated change each year. As such, we anticipate a moderate number of individuals are likely to be exposed.

The red wolf has a high toxicity ranking. The red wolf is known to use agricultural areas over other habitat types, suggesting that individuals are more likely to consume prey that have recently consumed contaminated food on methomyl use sites (i.e., within the last 24 hours). As such, individuals are likely to accumulate high levels of methomyl, resulting in high levels of mortality. We do not anticipate exposed wolves that do not die are likely to experience sublethal adverse effects. Prey species that forage on-field will experience high levels of mortality. Even though the red wolf's ability to consume a wide diversity of food items, we anticipate there will be large reductions in all prey taxa on-field, resulting in high levels of indirect effects.

Given that we anticipate a moderate number of individuals are likely to be exposed and that exposed individuals are likely to die (particularly as individuals have shown a preference for areas where consuming contaminated prey is highly likely), we anticipate a moderate number of individuals are likely to experience high levels of adverse effects. As such, we anticipate the overall risk of adverse effects to the species is high.

Preliminary Conclusion

The red wolf has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is high, with a low amount of estimated usage across the range of the species. However, we anticipate that individuals of the species will frequently encounter and consume prey that have recently been exposed to methomyl given the species general preference for agricultural sites. While past usage data indicate only a smaller portion of the range is likely to be treated each year (up to 2.7% range treated annually), we anticipate this will result in the exposure of a moderate number of individuals over the duration of the proposed action. Furthermore, given that individuals are known to forage in and near agricultural areas, including possible methomyl use sites, we anticipate exposure is likely to occur. Moreover, we expect that large reductions in mammals, birds, and other food items will substantially impact fitness, survival, or reproduction for individuals of this species, due to the less variable habitats it occupies.

Thus, we anticipated both direct effects at moderate levels from consumption of contaminated prey and indirect effects resulting in large reductions in prey for individual wolves and anticipate such reductions will result in species-level effects. Therefore, we anticipated that the action would appreciably reduce survival and recovery of the red wolf in the wild.

Final Conclusion (with Species-Specific Conservation Measures)

Following our preliminary draft analyses, we sought additional information on causes of red wolf mortality. Red wolves are an actively managed species, and anthropogenic mortality has been monitored and evaluated to develop conservation strategies for recovery. In a long-term study of factors leading to red wolf mortality, 11 of 300 deaths were diagnosed as poisoning through necropsy and toxicological analysis (Hinton et al., 2017). However, all were determined to have resulted from illegal activities. In the 26 years of monitoring, no mortalities were attributed to incidental exposure to pesticides through agricultural usage, despite 60–70% of the study area being privately owned lands comprising agricultural croplands (i.e., corn, cotton, soybean, winter wheat) and managed pine forests, and the known tendency of red wolves to actively make use of the vegetative cover associated with crops for refugia. As such, acute mortality from agricultural use of pesticides has not been previously identified in this species.

Furthermore, methomyl, like other carbamate insecticides, is readily metabolized by vertebrates. As such, we do not generally expect it to persist in the tissue of prey and result in exposure to predators. However, predators on occasion have been exposed and adversely affected by cholinesterase-inhibiting pesticides to which prey have been recently exposed and the pesticide still resides in the gastrointestinal tract. While this is a possibility for methomyl, its low persistence decreases the likelihood of occurring. Because field residues of methomyl will decrease rapidly, we expect concentrations that will lead to adverse effects in wolves will occur in the first 24 hours following application. We do not expect that exposure to concentrations of methomyl after that time period, or off-site concentrations resulting from spray drift at any time to lead to adverse effects in wolves. As such the risk to wolves is limited to consuming prey that have foraged on fields immediately after methomyl application but have not yet metabolized the pesticide. We anticipate a small window of exposure for wolves in which these circumstances may be expected to occur. Coupled with the low usage of methomyl reported in North Carolina on crops within the range (i.e., no usage reported on soybeans and a maximum of <1% of corn within the state treated yearly), we anticipate a low overall risk that red wolves will be exposed to concentrations of methomyl great enough to cause mortality.

However, due to the high vulnerability of the species, toxicity of methomyl, and the tendency of red wolves to occur on agricultural fields, we sought to incorporate protections to further reduce exposure throughout the action, and EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the red wolf:

1) *Applicators cannot apply methomyl*

The PULA for the red wolf will consist of the Alligator River National Wildlife Refuge.

Though methomyl is typically not used on national wildlife refuges, as explained previously in the Opinion, a significant portion of the population resides on the refuge and this restriction will preclude exposure from those wolves moving forward. Given the lack of documented mortalities attributed to incidental exposure to pesticides through agricultural usage (despite analysis of an extensive dataset), the low likelihood of exposure to the red wolf, and the species-specific measures described herein, we do not anticipate mortality or sublethal effects from methomyl exposure to individuals of this species.

After reviewing the current status of the species, environmental baseline for the action area, effects of the proposed action, and species-specific conservation measures, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the red wolf.

Thus, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the red wolf.

References

Hinton, J.W., G.C. White, D.R. Rabon, Jr. and M.J. Chamberlain. 2017. Survival and population size estimates of the red wolf. Journal of Wildlife Management, 81: 417-428.

U.S. Fish and Wildlife Service. 2018a. Red Wolf Species Status Assessment. Atlanta, Georgia. 97 pp.

U.S. Fish and Wildlife Service. 2018b. 5-Year Review Red wolf (*Canis rufus*). Atlanta, Georgia. 21 pp.

Integration and Synthesis Summary: Mammals - `Ōpe`ape`a (Hawaiian hoary bat)

Scientific Name:	Common Name:	Entity ID:
Lasiurus cinereus semotus	`Ōpe`ape`a (Hawaiian hoary bat)	15

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a low level of overlap between the action area and the species range (Figure 7), indicating that only a small number of individuals are likely to be exposed. While we anticipate individuals that are exposed to methomyl on use-sites are likely to die, we anticipate only a small number of individuals are likely to be affected, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the `Ōpe`ape`a (Hawaiian hoary bat).

Species range

Based on range map dated: 2/14/2022; Wherever found; *States within the range:* HI. Figure 7 depicts a map of the species' range.

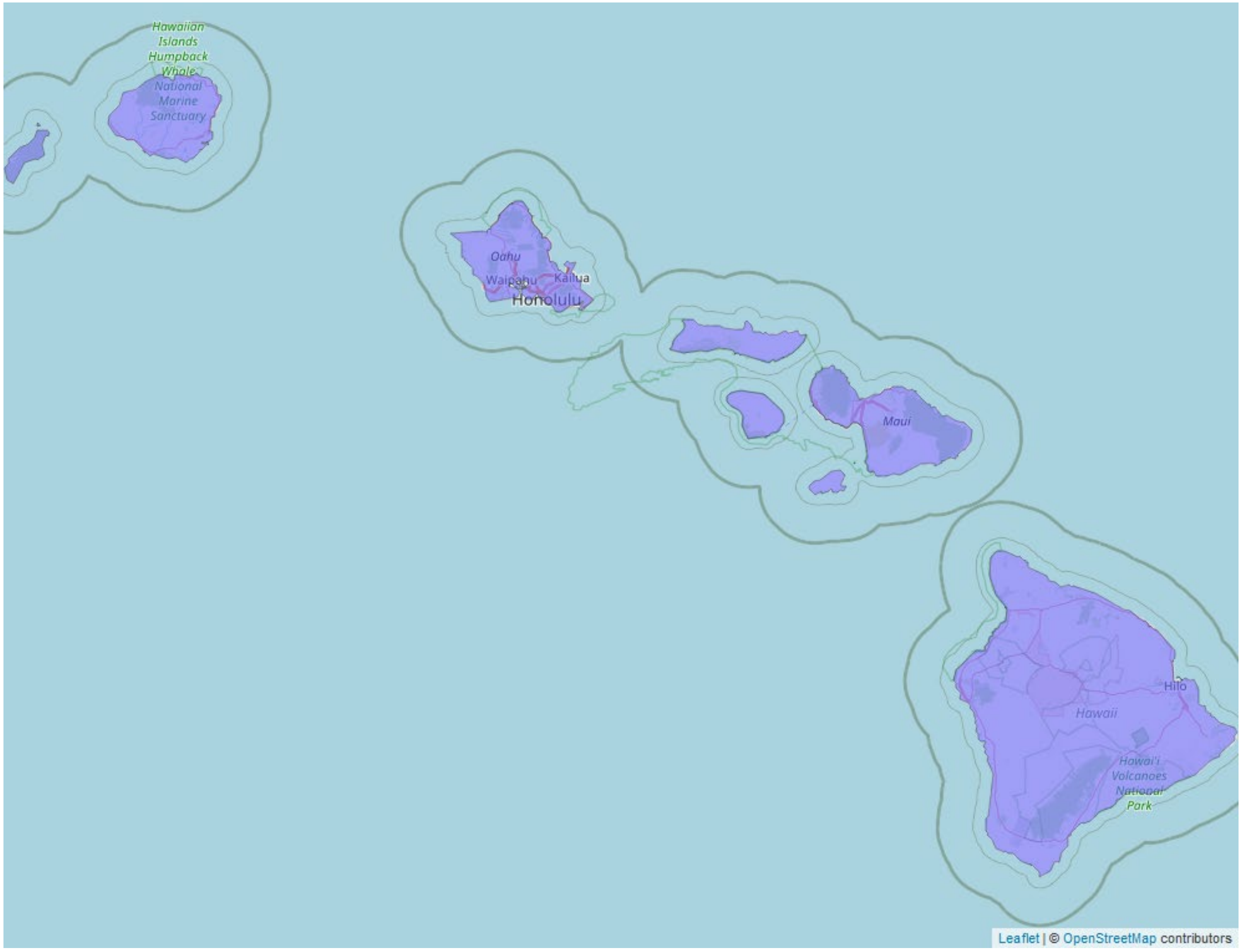

Figure 7. Range map of Hawaiian hoary bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/770.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: Downlist to Threatened

Most recently completed 5-Year Review: 3/16/2021

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 ’ōpe`ape`a or Hawaiian hoary bat is an endemic mammal found in Hawai’i. It is a subspecies of the hoary bat (*Lasiurus cinereus*) that has been observed in coastal areas, above wetlands and streams, rainforest, and dry forest habitats. Lowland sites are generally most important during the pupping season, while bats appear to use upland sites more frequently during the winter and spring. `Ōpe`ape`a roost alone or with dependent young in native and non-native trees, typically more than 4.6 meters tall. They primarily feed on nocturnal moths and beetles, which they hunt in flight across a wide array of habitat types and plant communities from sea level to at least 3,600 meters elevation. `Ōpe`ape`a are distributed across the major islands of the Hawaiian archipelago, including Kaua`i, O`ahu, Lāna`i, Maui, Moloka`i, and Hawai’i. Recently, `ōpe`ape`a were observed visiting the island of Kaho`olawe. No historical or current population estimates exist for this subspecies, although recent studies and ongoing research have shown the bats to be distributed across the Hawaiian archipelago (USFWS 2021).

The species decline occurred primarily due to historical reductions in tree cover. Current threats to `ōpe`ape`a include habitat loss and destruction (i.e., elimination of roosting sites), mortality from barbed wire fences, limited knowledge of its distribution and life history requirements, wind turbines, timber harvest, coqui frogs, climate change, and possibly effects of pesticides (e.g., direct and indirect), introduced insects, and disease (USFWS 1998, 2021). The greatest observed source of bat mortality is barbed wire fences. Wind farms are a new threat to hoary bats, and at least two have been killed at the West Maui wind farm. Pesticides can reduce or alter prey populations and at least two federally endangered insectivorous bats were killed from pesticide ingestion in the past. Coqui frogs have the highest density of any invasive terrestrial amphibian in the world, and they consume large numbers of invertebrates, reducing total insect biomass available for other species like the Hawaiian hoary bat. Climate change may affect bat habitat, particularly low-elevation habitats, but extent of effects from climate change are uncertain (USFWS 2021).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 6.4% of the species' range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 11). Data indicate that 2.9% of the species' range occurs on methomyl use sites while 3.4% of the range occurs off-field but may still be exposed through spray drift and/or runoff.

Table 11. Overlap data for the Hawaiian hoary bat.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
HI state agriculture layer	2.9	3.4	6.4

Usage

Past methomyl usage data in Hawai`i is unavailable. However, prior usage data indicate that 8-45% of agricultural crops in Hawai`i have been treated with insecticides annually, with methomyl presumably being among these insecticides.

Additional Exposure Considerations

Based on information collected regarding pesticide application practices in the state of Hawai`i, we expect all pesticide applications are likely made using ground application methods as aerial application within the state is very unlikely to occur. Ground application methods result in a much smaller off-site transport footprint than aerial applications. As such, we expect a smaller portion of the range is likely to be exposed with methomyl use. Only 4% of the species range occurs either on methomyl use sites or within 30 meters of use sites, indicating that only a small portion of the species' range will likely be exposed to methomyl.

Exposure Summary

There is low extent of overlap between the action area and the species' range. While we cannot adjust these overlap estimates with the generic insecticide usage data available for Hawai`i, we infer from this data that methomyl usage within the species' range is likely to occur. Based on information gathered regarding pesticide application practices in the state of Hawai`i, we expect all applications of methomyl will be made using ground application methods, which greatly limits the extent of off-site transport likely to occur. Given that we only expect a small portion of the species' range is likely to occur within the ground application exposure footprint, we anticipate only a small number of individuals are likely to be exposed.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the Hawaiian hoary bat. Hawaiian hoary bats are insectivorous and can feed on a variety of flying insects. EPA's exposure modeling indicates that individual bats that consume prey that have recently foraged on contaminated food items on methomyl use sites are likely to accumulate high levels of methomyl (up to 17.1 mg/kg-bw), which can result in a high level of mortality (up to 91.6% of exposed individuals). Individuals that consume insect prey that have not been foraging on-field are not likely to accumulate levels of methomyl that will cause any mortality. While the Hawaiian hoary bat can use a wide variety of habitats, people have noted that individuals forage above agricultural clearings, indicating that consumption of insects that have recently consumed contaminated food on methomyl use sites is likely to occur. As such, we anticipate a high level of mortality is likely.

Based on available toxicity data in mammals, we do not anticipate individuals that consume contaminated insect prey that do not die are likely to experience any sublethal effects (e.g., reduced growth).

Indirect Effects

The Hawaiian hoary bat's primary food source is flying insects. Based on available toxicity data in insect species, we anticipate there will be a high level of insect mortality. However, we expect the level of mortality will vary across species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire insect community is likely to experience complete mortality and that individual bats will still have sufficient food resources available, particularly in areas away from methomyl use sites. As such, we do not anticipate more than low levels of indirect adverse effects are likely.

Toxicity Summary

We expect the Hawaiian hoary bat will experience high levels of mortality. While hoary bats can use a wide variety of habitats, individuals are known to forage in agricultural clearings, indicating that individuals are likely to feed on insects that have recently foraged on use sites. As such, individuals are likely to accumulate high levels of methomyl, which will lead to high levels of mortality. We do not anticipate individuals exposed to methomyl that do not die are likely to experience sublethal adverse effects (e.g., reduced growth).

We expect the Hawaiian hoary bat will not experience more than low levels of indirect adverse effects. While we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we expect there will be a variation of response to methomyl exposure across the insect community and that there will not likely be complete mortality of the entire insect community. Given that the species can feed on a wide variety of insect species, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

While we do not anticipate more than low levels of indirect adverse effects, individuals may experience high levels of mortality by consuming insect prey on methomyl use sites. As such, we assign the Hawaiian hoary bat a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Hawaiian hoary bat has a low exposure ranking. While there is a medium extent of overlap between the species' range and the action area (6.4% total overlap), available information on pesticide application methods in Hawai`i suggest that all pesticides are applied using ground application methods, reducing the likely footprint of exposure. Based on a smaller exposure footprint of 30 meters from use sites, which we think adequately captures the most relevant areas of spray drift exposure for ground applications, there is only 4% total overlap between the species' range and the action area, indicating only a small number of individuals are likely to experience exposure.

The Hawaiian hoary bat has a high toxicity ranking. We anticipate individuals that forage near agricultural fields will accumulate high levels of methomyl, resulting in high levels of mortality in exposed individuals. We do not anticipate exposed bats that do not die are likely to experience any sublethal adverse effects. While methomyl use will likely reduce the abundance of insect prey, we do not anticipate more than low levels of indirect effects are likely to occur. The species can feed on a wide variety of insect species that are likely to exhibit a natural range in sensitivity to methomyl exposure, indicating that there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

While we anticipate a high level of mortality in individuals that consume insect prey on and near methomyl use sites, we anticipate this level of exposure will only occur in a small number of individuals as there is only a small portion of the range that is likely to be exposed to methomyl (particularly as we anticipate only ground applications will occur in Hawai`i). As such, we expect only a small number of individuals, at most, will experience any adverse effects. Thus, the overall risk of adverse effects to the species is low.

Conclusion

The `ōpe`ape`a has a high vulnerability based on its status (i.e., endangered), limited distribution, and decreasing species trends, as described above. The likelihood of exposure from labeled uses across the range is medium, with 6.4% of the range overlapping with methomyl use sites or spray drift areas (2.9% on-field and 3.4% off-field where drift and runoff may occur). Because only 4% of the species' range occurs on or within 30 m of methomyl use sites and pesticide use practices in Hawai`i suggest that aerial applications are highly unlikely to occur, we anticipate only a small portion of the range will occur within the ground exposure footprint and only a small number of individuals will be exposed to methomyl. We anticipate mortality from direct and indirect effects will occur within use areas or spray drift areas, particularly because of the species' association with agricultural fields.

`Ōpe`ape`a are known to forage above agricultural fields, indicating that consumption of moths and beetles that recently been contaminated by methomyl is likely to occur. Therefore, individuals that forage on or near agricultural fields will accumulate high levels of methomyl that may result in mortality.

Methomyl use will likely reduce insect prey abundance, but we do not anticipate more than low levels of indirect effects (in the form of impacts to fitness related to growth and reproduction) are likely to occur. The species feeds on a wide variety of insects that occur on non-agricultural land uses and that are likely to exhibit a natural range in sensitivity to methomyl exposure. We expect that there will be sufficient food resources remaining even if sensitive prey species experience high levels of mortality. We anticipate a small number of individuals will experience mortality from consuming insect prey on and near methomyl use sites because only a small portion of the range is likely to be exposed to methomyl through ground applications.

We expect impacts to be low and a small number of individuals will die or experience indirect adverse effects from loss of insect prey. As such, even though the species is highly vulnerable, we do not expect adverse species-level effects to occur. After reviewing the current status of the species, environmental baseline for the action area, effects of the proposed action, and species-specific conservation measures, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the red wolf. Thus, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the ōpe`ape`a, the Hawaiian hoary bat.

References

U.S. Fish and Wildlife Service. 2021. `Ōpe`ape`a or Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) 5-year review. Honolulu, Hawaii. 45 pp.

U.S. Fish and Wildlife Service. 1998. Recovery Plan for the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). Portland, Oregon. 59 pp.

Integration and Synthesis Summary: Mammals - Utah prairie dog

Scientific Name:	Common Name:	Entity ID:
Cynomys parvidens	Utah prairie dog	20

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. In our preliminary evaluation of the effects of the proposed action to the species (presented below), we determined there is a moderate level of overlap between the action area and the species' range (Figure 8) and a low level of past usage within the range. However, based on the species' life history, we anticipate individuals are likely to occur on use sites and be exposed to methomyl on-field. We anticipate individuals exposed to methomyl on-field are likely to die, indicating that the risk of adverse effects to the species is high. Because of the effects described in our preliminary evaluation and conclusion, EPA and the applicant agreed to incorporate species-specific conservation measures as part of the action. We now expect exposure for the Utah prairie-dog to be low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Utah prairie dog.

Species range

Last updated: 1/8/2024; Wherever found; *States within the range:* UT. Figure 8 depicts the species' range.

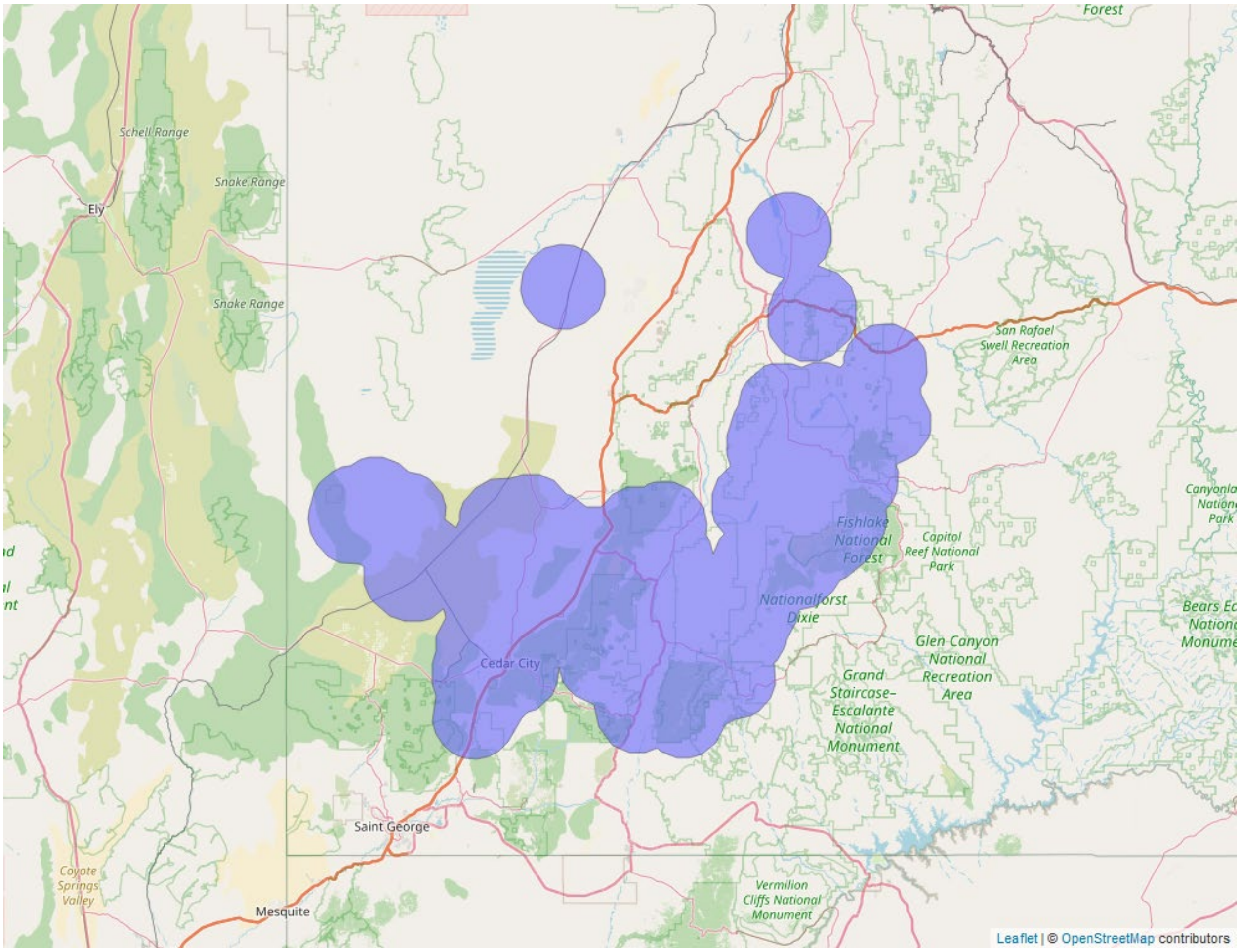

Figure 8. Range map of Utah prairie dog (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5517.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Threatened

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 6/14/2021

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

Utah prairie dogs are rodents in the white-tail sub-genera of prairie dogs. They hibernate annually and occur in semiarid shrub-steppe and grassland habitats. Within these habitats, they prefer swale-type formations where moist herbaceous vegetation (their primary food source) is available. They also occasionally eat insects. Historically, they were found farther north in Utah; today, they are found in portions of Piute, Garfield, Wayne, Sevier, Kane, and Iron Counties in southwestern Utah. Genetic variance within Utah prairie dog populations is very low, less than half that commonly observed for black-tailed prairie dogs, which may be the result of genetic drift in small populations. Utah prairie dog population trends appeared to be stable or increasing until 2016, after which numbers across the range decreased from 11,478 in 2016 to 6,217 in 2020 (USFWS 2021).

In 1973 at the time of listing, the species was threatened by habitat destruction and modification, over-exploitation, disease, and predation. They remain threatened by habitat loss and fragmentation, plague (*Yersinia pestis*), changing climatic conditions, unauthorized take (i.e., poaching), and disturbance from recreational and economic land uses. Urban expansion and plague comprise the most serious threats to Utah prairie dog populations, either of which could potentially lead to extirpation of entire complexes and significantly increase extinction probabilities. Additional habitat threats include over-grazing, cultivated agriculture, vegetation community changes, invasive plants, off-highway vehicles, energy resource exploration and development, and fire management (USFWS 2012a).

In 2018, we released a 10-year General Conservation Plan to aid in Utah prairie dog conservation while supporting community growth goals. As of 2021, we were working on a Conservation Benefit Agreement with School and Institutional Trust Lands, which will protect existing prairie dog colonies and allow for recovery actions to improve the species status. Starting in 2020, the state of Utah began development of a conservation strategy for the Utah prairie dog that is intended to demonstrate that the species no longer needs federal protection (USFWS 2021).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 7.1% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 12). Up to 3.4% of the species' range overlaps with methomyl use sites while 3.7% of the range occurs off-field (but may still be exposed to spray drift or runoff.

Table 12. Overlap and annual usage data (% Range Treated) for the Utah prairie dog. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	2.6	2	4.7	0.4	0.3	0.7
Citrus	NA	NA	NA	NA	NA	NA
Corn[8]	0.5	0.7	1.1	<0.1	<0.1	0.1
Cotton	0	0	0	0	0	0.0
Other Grains	0.3	0.9	1.3	<0.1	<0.1	0.1
Other Orchards	<0.1	<0.1	<0.1	0	0	0.0
Other Row Crops	0	0	0	0	0	0.0
Soybeans	0	0	0	0	0	0.0
Vegetables and Ground Fruit	<0.1	<0.1	<0.1	0	0	0.0
Wheat	NA	NA	NA	NA	NA	NA
Total	**3.4**	**3.7**	**7.1**	**0.5**	**0.4**	**0.9**

[8] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 0.9% of the species' range will be treated with methomyl (i.e., 0.5% on-field and 0.4% off-field).

Additional Exposure Considerations

Additional data from USDA's Census of Agriculture indicate only 1.08% of the species' range has been treated with any insecticide. Given that this data is spatially specific to the Utah prairie dog's range and includes usage of other insecticides in addition to methomyl, we consider this a conservative metric of past methomyl usage and have high confidence that only small portions of the species' range are likely to be treated annually. However, available information on the species' foraging behavior indicates that individuals forage on agricultural fields. When both are available, Utah prairie dogs will preferentially choose alfalfa over grasses (USFWS 2012b). They frequently occur on agricultural lands and in addition to eating grasses and forbs, occasionally eat insects (K. Novak, Utah Field Office, personal communication, 2024). Therefore, we expect that exposure is likely to occur despite a low level of usage.

Exposure Summary

There is a moderate extent of overlap between the action area and the species' range (7.1% total overlap). Past usage data indicate a low level of usage within the species' range (up to 0.9% of the range treated annually), which is corroborated by data from the Census of Agriculture that indicate only 1.08% of the species' range has been treated with any insecticide in the past. However, despite this low level of usage, given that individuals are known to preferentially forage on agricultural areas (including methomyl use sites), we anticipate a large number of individuals are likely to be exposed.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects

We anticipate the main route of exposure for the Utah prairie dog is through dietary exposure (i.e., consuming food contaminated with methomyl). The Utah prairie dog is primarily an herbivore. EPA's exposure modeling indicates that individuals that consume plant matter like leaves on contaminated food on methomyl use sites can accumulate levels of methomyl up to 14.9 mg/kg-bw, which can result in up to 99% mortality. We expect individuals that do not die from on-field exposure will experience sublethal adverse effects to growth and reproduction. Exposure modeling indicates that individuals consuming plant matter in off-site areas contaminated by spray drift or runoff will accumulate up to 0.6 mg methomyl/kg-bw, which can cause mortality in a small number of exposed individuals (up to 0.05% of individuals exposed off-field). We do not anticipate any individuals exposed off-field will experience sublethal adverse effects to growth or reproduction.

Indirect Effects

Available toxicity data indicate that plants are not likely to experience any adverse effects to survival, growth, or reproduction. As such, we do not anticipate there will be any reductions in the availability of the Utah prairie dog's main food resource. As such, we do not anticipate any adverse indirect effects are likely.

Toxicity Summary

We expect a high level of direct adverse effects will occur. EPA's exposure modeling indicates that individuals that forage on use sites are likely to accumulate high levels of methomyl, resulting in high levels of mortality (up to 99% of exposed individuals) and sublethal adverse effects to growth and reproduction. We anticipate a low level of mortality in individuals foraging off-field in areas exposed by spray drift (up to 0.05% of exposed individuals). We do not anticipate individuals exposed off-field will experience sublethal adverse effects to growth or reproduction. We do not anticipate any adverse indirect effects are likely to occur as available toxicity data show no adverse effects to the species' main food resource (i.e., plants).

Given that we expect high levels of mortality as well as sublethal effects, we determine the Utah prairie dog has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Utah prairie dog has a high exposure ranking. While data from the Census of Agriculture indicate only a very small portion of the range has been treated in the past (up to 1.08%), suggesting only a small portion of the range is likely to be treated, the Utah prairie dog is known to preferentially forage on agricultural land, suggesting the potential for a large number of individuals to be exposed despite the low level of overlap and usage.

The Utah prairie dog has a high toxicity ranking. The species is known to forage on agricultural areas, which indicate that individuals are likely to be exposed to high levels of methomyl through their diet. We expect up to 99% mortality of individuals that have foraged on-field and that individuals exposed on-field that do not die will experience sublethal adverse effects to growth and reproduction. Individuals exposed off-field will not experience more than low levels of mortality and are not likely to experience any sublethal adverse effects to growth and reproduction. We do not anticipate any adverse indirect effects to the species as their main food source is not likely to be adversely affected by methomyl.

Since we anticipate a large number of individuals are likely to be exposed and that there is a high level of mortality in exposed individuals, we anticipate the risk of adverse effects to the species overall is high.

Preliminary Conclusion

The Utah prairie dog has a high vulnerability based on its status (i.e., threatened), single population, limited distribution, and decreasing species trends, as described above. The likelihood of exposure from labeled uses across the range is medium, with 7.1% of the range overlapping with methomyl use sites or spray drift areas (3.4% on-field and 3.7% off-field where drift and runoff may occur). In the past, up to 0.9% of the range has been treated with methomyl annually and, according to USDA Census of Agriculture data, 1.08% of the range has been treated with any insecticide in the past. Though we have high confidence in the Census of Agriculture data, we anticipate mortality from direct effects will occur within use areas. Utah prairie dogs primarily use semiarid shrub-steppe and grasslands, but they also often occur on agricultural lands (USFWS 2021, Witmer et al. 2023). They dig burrows and forage on agricultural lands, especially on alfalfa. They preferentially choose alfalfa over other grasses when both are available (USFWS 2012b). Agricultural lands may also aid in their dispersal like other prairie dog species. We expect lower mortality (5%) of individuals that forage off-field in areas exposed to spray drift, but up to 99% mortality for individuals that forage on-field. Because the species actively forages and burrows on use sites and edges of use sites, we anticipate a large number of individuals will be exposed to and adversely impacted by methomyl use over the duration of the action.

We expect impacts to be high and an unknown, but significant number, of individuals will die. Considering the species' high vulnerability, high anticipated level of exposure, and significant number of individuals of this species likely to die, species-level effects are likely to occur.

Final Conclusion (with Species-Specific Conservation Measures)

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Utah prairie dog:

2) *Applicators cannot apply methomyl on alfalfa fields*

The PULA for the Utah prairie dog will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action (i.e., additional options and mitigations for end users). In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon *confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.*

After incorporating the specific conservation measure above, we expect exposure for the Utah prairie dog to be low. As such we anticipate low numbers of individuals of this species will be adversely impacted (i.e., low numbers of individuals will experience mortality or sublethal effects in the form of low impacts to fitness related to growth and reproduction). We anticipate these measures will prevent mortality in key areas of the Utah prairie dog's range and will reduce adverse effects to the species. After reviewing the current status of the species, environmental baseline for the action area, effects of the proposed action, and species-specific conservation measures, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the Utah prairie dog. Thus, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Utah prairie dog.

References

Witmer, G., J. Grant, and K. Cross. 2023. Prairie Dogs. Wildlife Damage Management Technical Series. USDA, APHIS, WS National Wildlife Research Center. Fort Collins, Colorado. 16p.

U.S. Fish and Wildlife Service. 2021. Utah Prairie Dog (*Cynomys parvidens*) 5-Year Review Short Form. West Valley City, UT. 12 pp.

U.S. Fish and Wildlife Service. 2012a. Utah prairie dog *Cynomys parvidens* 5-Year Review: Summary and Evaluation. West Valley City, Utah. 186 pp.

U.S. Fish and Wildlife Service. 2012b. Utah Prairie Dog (*Cynomys parvidens*) Revised Recovery Plan. West Valley City, UT. 169 pp.

Integration and Synthesis Summary: Mammals - Gray bat

Scientific Name:	Common Name:	Entity ID:
Myotis grisescens	Gray bat	21

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is medium. We determined there is a high level of overlap between the action area and the species' range (Figure 9) but a low level of past usage, indicating that a moderate number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate more than a small number of individuals are likely to die or experience sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray bat.

Species range

Based on range map dated: 1/27/2022; Wherever found; *States within the range:* AL, AR, FL, GA, IL, IN, KS, KY, MO, MS, NC, OK, TN, VA, WV. Figure 9 depicts a map of the species' range.

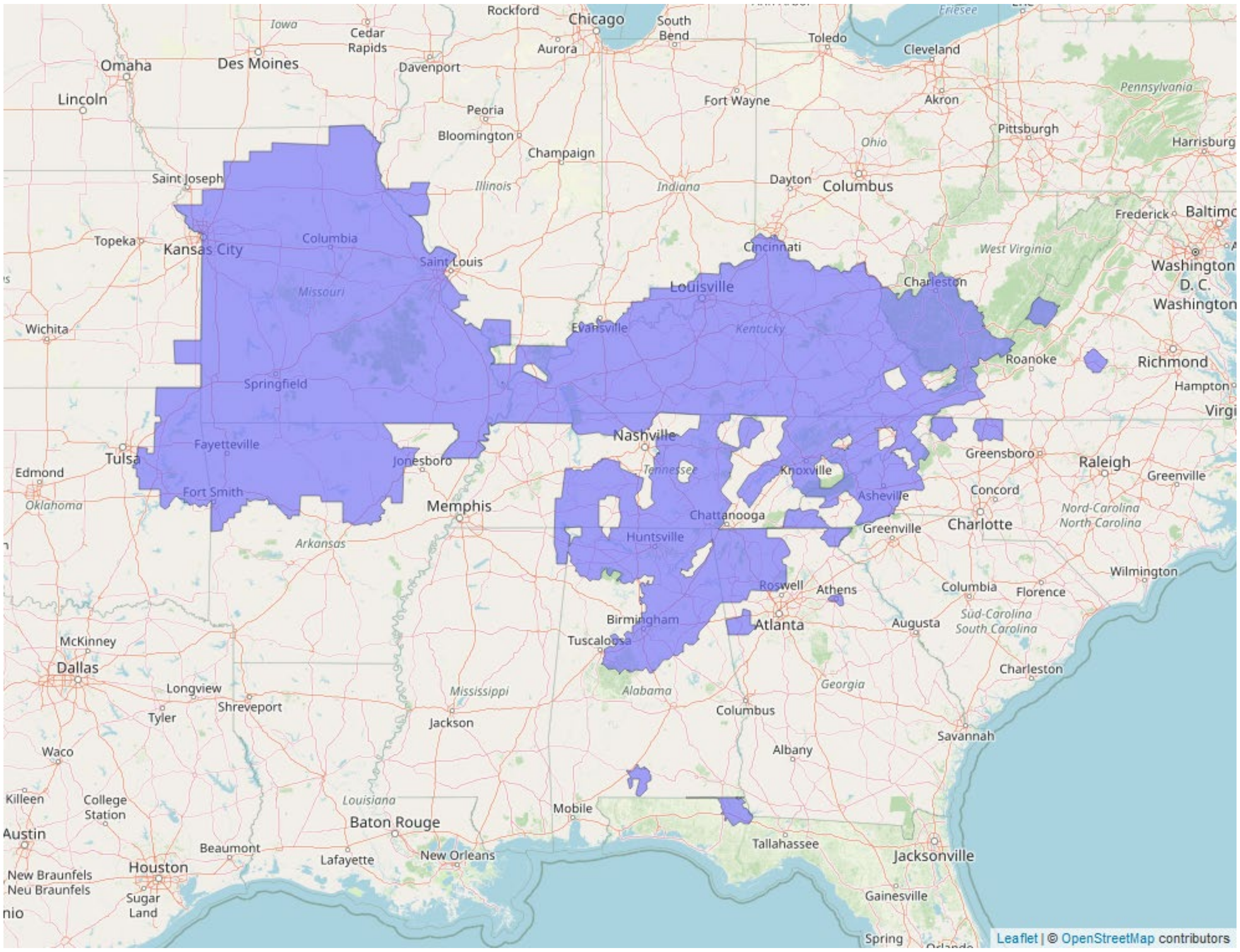

Figure 9. Range map of gray bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6329.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 9/30/2009

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: yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Gray bats are cave-dwelling insectivorous bats found across eastern North America, mostly Alabama, Arkansas, Kentucky, Missouri, and Tennessee. As 2009, there was a growing population in Indiana. They typically inhabit caves year-round, particularly cold hibernating caves in winter and warmer caves in summer. They congregate in large groups and most (95%) of the population is confined to nine caves. Gray bats forage on aquatic insects (e.g., mayflies, caddisflies, and stoneflies) and occasionally moths and beetles in areas with open waters of rivers, streams, lakes, or reservoirs. Only 5% of caves in their range have the requirements gray bats need, and they are a highly philopatric species. Using the U.S. Geological Survey bat population database, Ellison et al. (2003) found that 94.4% of populations were stable or increasing and 6% were decreasing. In 2002, the range-wide population estimate was between 1,575,000-2,678,000 bats, which rose to 3,400,000 in 2004. The gray bat range appears to have expanded into North Carolina (Etchison and Weber 2020) and there is potential for gray bats to expand further into Appalachia as local and global climates change. In addition to caves, gray bats have been discovered roosting in bridges, barns, storm sewers and culverts, and tree roosts (Holliday et al. 2023).

Gray bat declines initially occurred due to human disturbance, natural flooding, impoundment of waterways, and contamination from pesticides (USFWS 2009). Human disturbance remains the primary reason for the continued decline of some populations of gray bat and natural and man-made flooding remains a secondary threat at some sites. Flash flooding in caves can adversely affect gray bats by damaging gates at cave entrances that were constructed to protect roosting bats. Pesticides may affect gray bats and the continued increase of gray bats coincided with the reduced use of pesticides in southern Missouri where the landscape was mostly covered in forest, pasture, and hay fields. Climate change could have a significant impact on gray bats by adversely affecting their food supply or the internal roosting temperature of caves. A rise in ambient temperature could make traditional and occupied hibernacula and maternity sites unsuitable for roosting gray bats and cause a shift in the species' range northward. A shift in the species' range could adversely affect their food supply, affect the ability of bats to adequately deposit important fat reserves, and ultimately reduce their hibernation survival rates. Gray bats are affected by white-nose Syndrome, particularly through long migrations (up to 775 km) and their co-occurrence with other bat species while roosting (USFWS 2009).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 27.9% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area. Up to 13.9% of the species' range overlaps with methomyl use sites while 14% of the range occurs off-field (but may still be exposed to spray drift or runoff). Corn/soybean rotation fields are the most prevalent use sites within the species' range, covering 18-21% of the species' range. However, overlap with other use sites (Table 13) may still contribute to the overall exposure of the species.

Table 13. Overlap and annual usage data (% Range Treated) for the gray bat. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	0.1	1	1.1	<0.1	0.2	0.2
Citrus	NA	NA	NA	NA	NA	NA
Corn	9.7	9.2	18.9	0.5	0.4	0.9
Cotton	0.7	1	1.7	<0.1	<0.1	0.1
Other Grains	0.3	1.5	1.8	<0.1	<0.1	0.1
Other Orchards	<0.1	0.2	0.2	<0.1	0.2	0.2
Other Row Crops	0.2	0.5	0.7	<0.1	0.2	0.3
Soybeans[9]	12.3	9.5	21.8	0.6	0.5	1.1
Vegetables and Ground Fruit	0.1	0.4	0.5	0.1	0.4	0.5
Wheat	NA	NA	NA	NA	NA	NA
Total	**13.9**	**14**	**27.9**	**0.9**	**1.6**	**2.5**

[9] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 2.5% of the species' range will be treated with methomyl (i.e., 0.9 on-field and 1.6% off-field) (Table 13).

Additional Exposure Considerations

Summer foraging is strongly associated with open water areas of rivers, streams, lakes, or reservoirs for gray bat. Although individuals may travel up to 35 kilometers between prime feeding areas over lakes or rivers and occupied caves, most maternity colonies are located between 1-4 kilometers from foraging locations. Given this close association with aquatic areas, we do not expect individuals are likely to forage on-field and will likely only be present near use sites during dispersal events. As such, we only consider off-field exposure and effects in this analysis.

Exposure Summary

Given that we do not expect individual gray bats to be present on methomyl use sites beyond dispersal events, we only consider off-field exposure in our analyses. There is a high extent of overlap between off-field areas that are likely to be exposed to methomyl through spray drift and the gray bat's range (14% total off-field overlap). There is a low level of past usage within the species range, which suggests only a small portion of the range has been exposed through spray drift (up to 1.6% range exposed to spray drift annually). While this low level of past usage suggests that only a small portion of the range is likely to be exposed to methomyl annually, the high level of overlap indicates that a moderate portion of the range is likely to be exposed throughout the duration of the proposed action (assuming different areas of the range are treated each year). As such, we expect a moderate number of individuals will be exposed to methomyl.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the gray bat. Gray bats are insectivorous and can feed on a variety of flying insects. EPA's exposure modeling indicates that individual bats that consume prey that have recently foraged on contaminated food items on methomyl use sites are likely to accumulate high levels of methomyl (up to 18.6 mg/kg-bw), which can result in a high level of mortality (up to 89.3% of exposed individuals) and high sublethal adverse effects (e.g., reduced growth or reproduction) in individuals that do not die. Individuals that consume insect prey that have not been foraging on-field are not likely to accumulate levels of methomyl that will cause any mortality or sublethal adverse effects. Gray bats mainly forage over water and their foraging behavior is strongly correlated with open waters of rivers, streams, lakes, and reservoirs and are especially dependent on insects that emerge from these aquatic habitats. As such, we do not anticipate individuals are likely to exclusively consume insect prey that have recently foraged on methomyl use sites. Thus, we do not anticipate individuals are likely to accumulate high levels of methomyl and are not likely to experience more than low levels of mortality.

Indirect Effects

The gray bat's primary food source is flying insects, specifically those that emerge from aquatic habitats. Based on available toxicity data in insect species, we anticipate there will be a high level of insect mortality. However, we expect the level of mortality will vary across species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire insect community is likely to experience complete mortality and that individual bats will still have sufficient food resources available, particularly in areas away from methomyl use sites (such as open waters of rivers, streams, lakes, and reservoirs that these bats favor). As such, we do not anticipate more than low levels of indirect adverse effects are likely.

Toxicity Summary

We expect the gray bat is likely to experience no more than low levels of direct adverse effects. While we anticipate mortality and sublethal effects to growth or reproduction for individuals that feed exclusively on insect prey that have recently foraged on methomyl use sites, we expect most individuals are unlikely to do so as the species depends on insects that emerge from aquatic habitats and favors open water areas for foraging grounds. As such, we anticipate most individuals are unlikely to accumulate high enough levels of methomyl to result in mortality or sublethal effects. Similarly, we do not anticipate dietary dosages of methomyl from consuming insects is likely to cause any sublethal adverse effects (e.g., reduced growth).

We expect the gray bat will not experience more than low levels of indirect adverse effects. While we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we expect there will be a variation of response to methomyl exposure across the insect community and that complete mortality of the entire insect community is unlikely. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

Given that we do not anticipate more than low levels of direct and indirect adverse effects to individuals, we assign the gray bat a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The gray bat has a medium exposure ranking. While we do not anticipate individuals are likely to occur on methomyl use sites, there is still a high extent of overlap between off-field areas and the species' range (14% total off-field overlap). Past usage data indicate only a small portion of the species' range is likely to be treated each year (up to 1.6% range treated annually). Despite this low level of usage, the high level of overlap indicates that a moderate portion of the range is likely to be treated over the duration of the proposed action, particularly if the treated areas change over time. As such, we anticipate a moderate number of individuals are likely to experience exposure.

The gray bat has a low toxicity ranking. While individuals that exclusively consume insect prey that recently been exposed to methomyl on-field are likely to die or experience high levels of sublethal adverse effects, we anticipate this scenario is unlikely to occur. Gray bats are not known to forage on or above agricultural areas and instead forage over aquatic habitats where they are more likely to feed on insects that have not been exposed to methomyl on-field. As such, we anticipate most bats will not accumulate high levels of methomyl and will not die or experience any sublethal effects. While methomyl use will likely reduce the abundance of insect prey, we do not anticipate more than low levels of indirect effects are likely to occur. The species can feed on a wide variety of insect species that are likely to exhibit a natural range in sensitivity to methomyl exposure, indicating that there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

While we anticipate a moderate number of individuals will likely be exposed, we expect exposed individuals are not likely to accumulate levels of methomyl that will result in mortality or sublethal effects, and we anticipate only low levels of indirect adverse effects. As such, we anticipate only a small number of individuals are likely to experience any adverse effects from the proposed action. We expect the overall risk of adverse effects to the species is low.

Conclusion

The gray bat has a medium vulnerability based on its status (i.e., endangered) and decreasing species trends, as described above. The likelihood of exposure across the range is medium. The species is closely associated with open water areas and may fly over fields during dispersal but is not expected to forage on-field. Therefore, we focused on off-field exposure. Spray drift and runoff may impact 14% of the species' range and, in the past, up to 1.6% of the range was exposed to methomyl usage through off-site transport annually. Even with low past usage, the high level of overlap (14% off-field) indicates that a moderate portion of the range is likely to be exposed and we expect a moderate number of individuals will be exposed to methomyl throughout the duration of the proposed action. Because gray bats forage primarily over open water areas, we only expect small numbers of individuals are likely to exclusively consume insect prey that has recently foraged on methomyl use sites and experience mortality or sublethal effects (in the form of reduced fitness related to growth and reproduction). Thus, we do not anticipate the species is likely to experience more than low levels of mortality or sublethal effects through consumption of prey contaminated on-field. In addition, we expect low levels of indirect adverse effects from loss of insect prey (in the form of small reductions in fitness related to growth and reproduction). We expect impacts to be low and a small number of individuals will die or experience sublethal adverse effects. Even though gray bats have a medium vulnerability ranking, they have medium exposure and low toxicity rankings. We do not expect the small number of individuals likely to die or experience sublethal adverse effects will result in species-level adverse effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the gray bat.

References

Holliday, C., Wisby, J.P., Roby, P.L., Samoray, S.T., and Vannatta, J.M. 2023. Modeling migration and movement of gray bats. The Journal of Wildlife Management 87: e22364.

Etchison, K.L.C., and Weber, J.A. 2020. The discovery of gray bats (*Myotis grisescens*) in bridges in western North Carolina. Southeastern Naturalist 19(3): N53-56.

U.S. Fish and Wildlife Service. 2009. Gray bat (*Myotis grisescens*) 5-Year Review: Summary and Evaluation. Columbia, Missouri. 34 pp.

Integration and Synthesis Summary: Mammals - Gulf Coast jaguarundi

Scientific Name:	Common Name:	Entity ID:
Puma yagouaroundi cacomitli	Gulf Coast jaguarundi	22

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a high level of overlap between the action area and the species' range (Figure 10) and a high level of past usage, indicating a large number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate more than a small number of individuals are likely to die or experience sublethal adverse effects. As such, the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Gulf Coast jaguarundi.

Species range

Based on range map dated: 2/14/2022; Wherever found; *States within the range:* TX. Figure 10 depicts a map of the species' range.

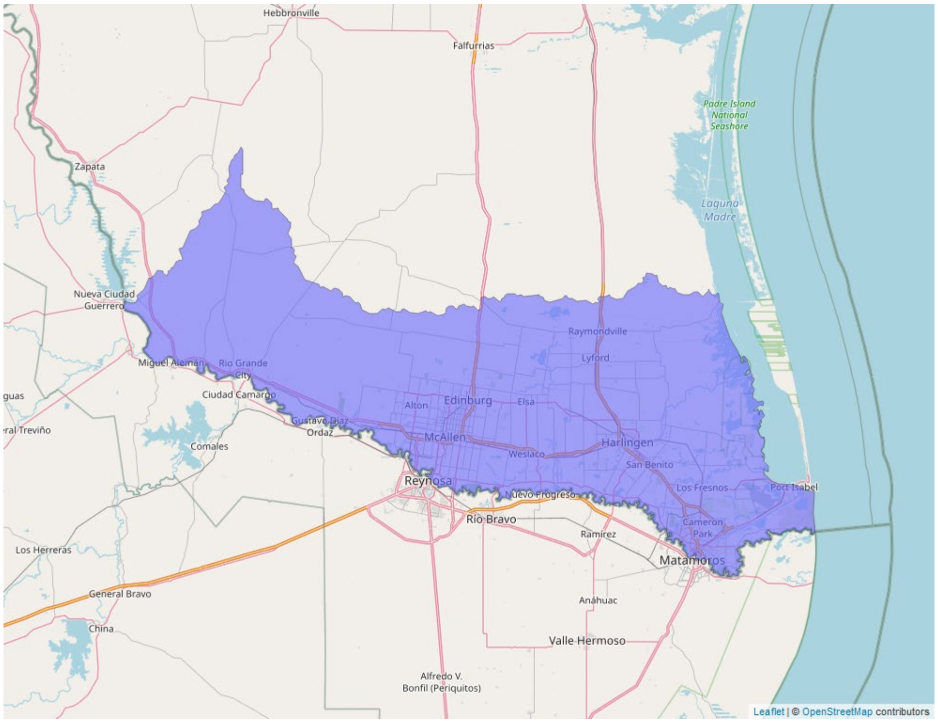

Figure 10. Range map of Gulf Coast jaguarundi (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/3945.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 7/24/2018

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 Gulf Coast jaguarundi was historically distributed from the Lower Rio Grande Valley in southern Texas to eastern Mexico. It is currently believed to be found in the Tamaulipan Biotic Province of Texas, where it uses dense, thorny shrublands or woodlands and bunchgrass pastures adjacent to dense brush or woody cover. Radio-collared jaguarundis spent up to 40% of their time in tall, dense grass habitats, but habitat analysis showed that their preferred habitat was natural undisturbed forest. The last confirmed sighting of jaguarundi in the U.S. was a roadkill specimen found in 1986 near Brownsville, Texas and the closest confirmed sightings since 1986 have been in Nuevo Leon, Mexico (95 mi southwest of Brownsville) (USFWS 2013).

Primary threats to the Gulf Coast jaguarundi include habitat destruction, degradation, and fragmentation associated with agriculture and urbanization, and, to some extent, border security activities. Rapid human population growth in the region caused agricultural land to be converted to urban development, which fragmented habitat. Borderland activities (i.e., building construction, sewage dumping, road construction and maintenance, water development, brush clearing, pesticide run-off, lighting, human activities, fences, and off-road vehicle activity) could affect jaguarundis. Barriers to movement (bridges, dams) also exist across the species' range, including several that may act as east-west barriers for jaguarundis. Additional threats include mortality from collisions with vehicles, competition with bobcats, illegal hunting near settlements, and climate change (i.e., temperature increases and precipitation decreases) (USFWS 2013).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 100% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area. Up to 66.6% of the species' range overlaps with methomyl use sites while 72.5% of the range occurs off-field (but may still be exposed to spray drift or runoff). We expect cotton, vegetables, and ground fruit are the most prevalent methomyl use sites throughout the species' range, with 37.8% and 14.6% overlap, respectively. However, overlap with other use sites (Table 14) may still contribute to the overall exposure of the species.

Table 14. Overlap and annual usage data (% Range Treated) for the Gulf Coast jaguarundi. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	0.6	0.7	<0.1	<0.1	0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[10]	6.9	18.1	25	0.4	0.9	1.3
Cotton	19.4	18.3	37.8	1	0.9	1.9
Other Grains	34.3	21.7	56	1.7	1.1	2.8
Other Orchards	<0.1	0.2	0.2	<0.1	0.2	0.2
Other Row Crops	2.1	2.7	4.8	1	1.2	2.2
Soybeans	0.2	0.9	1.1	<0.1	<0.1	0.1
Vegetables and Ground Fruit	3.7	10.9	14.6	3.7	10.9	14.6
Wheat	NA	NA	NA	NA	NA	NA
Total[11]	**66.6**	**72.5**	**100**	**7.8**	**15.3**	**23.1**

Usage

Based on past usage data, we anticipate up to 23.1% of the species' range will be treated with methomyl (i.e., 7.8% on-field and 15.3% off-field) (Table 14).

Additional Exposure Considerations

We do not anticipate that individual Gulf Coast jaguarundi are likely to occur on methomyl use sites beyond short periods needed to move between habitats or dispersal events. The jaguarundi's preferred habitat is natural, undisturbed forests, but can forage or otherwise use areas of thorny

[10] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

[11] Total overlap is calculated by aggregating all use data layers that are not highly redundant (i.e., all data layers plus corn or soy plus citrus or other orchards). Total overlap is capped at 100%.

shrub lands or bunchgrass pastures if dense brush or woody cover is nearby. As such, we only consider off-field exposures in our analyses.

Exposure Summary

The Gulf Coast jaguarundi's habitat requirements indicate that individuals are not likely to enter or forage on methomyl use sites, we only consider off-field exposures in our analysis. There is a high extent of overlap between off-field areas that are likely to be exposed to methomyl and the species' range (72.5% off-field overlap). There is a high level of past methomyl usage within the species range (up to 15.3% of the range exposed to methomyl annually). Given that both off-field overlap and past usage is high, we anticipate a large portion of the range is likely to be exposed to methomyl throughout the duration of the proposed action. As such, we anticipate that if a jaguarundi occurs in the U.S. portion of the range, it will likely be exposed to methomyl.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the Gulf Coast jaguarundi. Jaguarundi are carnivorous and primarily consume small mammals, birds, and reptiles. EPA's exposure modeling indicates that jaguarundi that exclusively consume prey that have recently foraged on contaminated food items on methomyl use sites (i.e., within the last 24 hours) are likely to accumulate high levels of methomyl (up to 9.9 mg/kg-bw), which can result in a high level of mortality (up to 100% of exposed individuals). Individuals that consume prey that have not been foraging on-field are not likely to accumulate levels of methomyl that will cause any mortality. While we cannot rule out the possibility that an individual may exclusively consume prey that have recently foraged on methomyl use sites, we anticipate this scenario is unlikely to occur frequently given the jaguarundi's preferred habitat is dense, undisturbed forests, where we anticipate prey are less likely to have recently foraged on-field. As such, we anticipate most individuals are not likely to accumulate high levels of methomyl and are not likely to experience more than a low level of mortality.

Based on available toxicity data in mammals, we do not anticipate individuals that consume contaminated prey that do not die are likely to experience any sublethal effects (e.g., reduced growth).

Indirect Effects

The Gulf Coast jaguarundi's primary food source are small mammals, birds, and reptiles. Based on available toxicity data in surrogate species, we anticipate there will be a high level of mortality in these prey items when they consume contaminated food on methomyl use sites.

However, we expect the level of mortality will vary across species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire community of small mammals, birds, and reptiles is likely to experience complete mortality and that individual jaguarundis will still have sufficient food resources available, particularly in areas away from methomyl use sites (such as the dense undisturbed forests that individuals prefer). As such, we do not anticipate more than low levels of indirect adverse effects are likely.

Toxicity Summary

We expect the Gulf Coast jaguarundi is likely to experience no more than low levels of direct adverse effects. While individuals that feed exclusively on prey that have recently foraged on methomyl use sites (i.e., within the last 24 hours), we anticipate most individuals are unlikely to do so as the species' favors dense, undisturbed forests or areas of dense, woody cover. As such, we anticipate most individuals are unlikely to consume prey that have recently foraged on methomyl use sites and are thus, unlikely to accumulate more than low levels of methomyl that are not likely to cause more than low levels of mortality.

We expect the Gulf Coast jaguarundi will not experience more than low levels of indirect adverse effects. While we anticipate prey species that forage on methomyl use sites will experience high levels of mortality, we expect there will be a variation of response to methomyl exposure across the prey community and that there will not likely be complete mortality of species that the jaguarundi can feed on. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality on methomyl use sites.

Given that we do not anticipate more than low levels of direct and indirect adverse effects to individuals, we assign the Gulf Coast jaguarundi a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Gulf Coast jaguarundi has a high exposure ranking. While we do not anticipate individuals are likely to enter methomyl use sites, there is still a high extent of overlap between off-field areas and the species' range (72.5% off-field overlap). Past methomyl usage data indicate that a large portion of the range is likely treated each year (up to 15.3% range treated annually). As such, we anticipate that if a jaguarundi occurs in the U.S. portion of the range, it will likely be exposed to methomyl.

The Gulf Coast jaguarundi has a low toxicity ranking. While individuals that consume small mammal, bird, and reptile prey that have themselves consumed contaminated food on agricultural sites that have recently been treated with methomyl (i.e., within the last 24 hours) are likely to die, we anticipate this scenario is unlikely to occur with any regular frequency, particularly as we do not anticipate individuals are likely foraging near methomyl use sites where resulting exposure will be the highest. As such, we anticipate most individuals will not accumulate high levels of methomyl and will not experience more than low levels of mortality or any sublethal effects. While there may be some mortality of prey species that consume contaminated food items on methomyl use sites, we do not anticipate this level of mortality will result in more than small reductions in the availability of prey for individuals.

While we anticipate a large number of individuals are likely to experience exposure, we anticipate exposed individuals are not likely to die or sublethal adverse effects, and only low levels of indirect adverse effects. As such, we anticipate only a small number of individuals are likely to experience adverse effects from the proposed action. We therefore anticipate the overall risk of adverse effects to the species is low.

Conclusion

The Gulf Coast jaguarundi has a high vulnerability based on its status (i.e., endangered), single population, limited distribution, and declining trends, as described above. Spray drift may occur over 72.5% of the species' range and, in the past, up to 15.3% of the range was exposed to methomyl through spray drift annually. However, we do not expect jaguarundis will occur on methomyl use sites for longer than short periods while moving between habitats or during dispersal events. Their preferred habitat is natural, undisturbed forests, but they can forage or use areas of thorny shrubs or bunchgrass pastures if dense brush or woody cover is nearby. As such, we anticipate exposure will occur very infrequently and only for short durations as individuals move to more suitable habitats. Therefore, we expect only low levels of mortality (small numbers of individuals) through consumption of contaminated prey during the brief periods when individuals may be present on-field Similarly, we expect no more than low levels of adverse indirect effects to the species from small losses of their prey items (i.e., small mammals, birds, and reptiles).

We expect impacts to the species to be low because we rarely expect individuals to occur on-field or to exclusively consume prey that has foraged in these areas. Thus, we anticipate no more than low levels of adverse effects in the form of low levels of mortality or small losses of fitness related to growth and reproduction from prey loss. Therefore, the low levels of adverse effects that we expect from the proposed action will not result in species-level adverse effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Gulf Coast jaguarundi.

References

U.S. Fish and Wildlife Service. 2018. 5-Year Review Jaguarundi (*Puma yagouaroundi cacomitli*). Albuquerque, New Mexico. 3 pp.

U.S. Fish and Wildlife Service. 2013. Gulf Coast Jaguarundi Recovery Plan (*Puma yagouaroundi cacomitli*). Albuquerque, New Mexico. 70 pp.

Integration and Synthesis Summary: Mammals - Ocelot

Scientific Name:	Common Name:	Entity ID:
Leopardus (=Felis) pardalis	Ocelot	30

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a high level of overlap between the action area and the species' range (Figure 11) but a low level of past usage, suggesting only a moderate number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate more than a small number of individuals are likely to be exposed on-field and die, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the ocelot.

Species range

Based on range map dated: 12/14/2021; wherever found; *States within the range:* AZ, TX. Figure 11 depicts a map of the species' range.

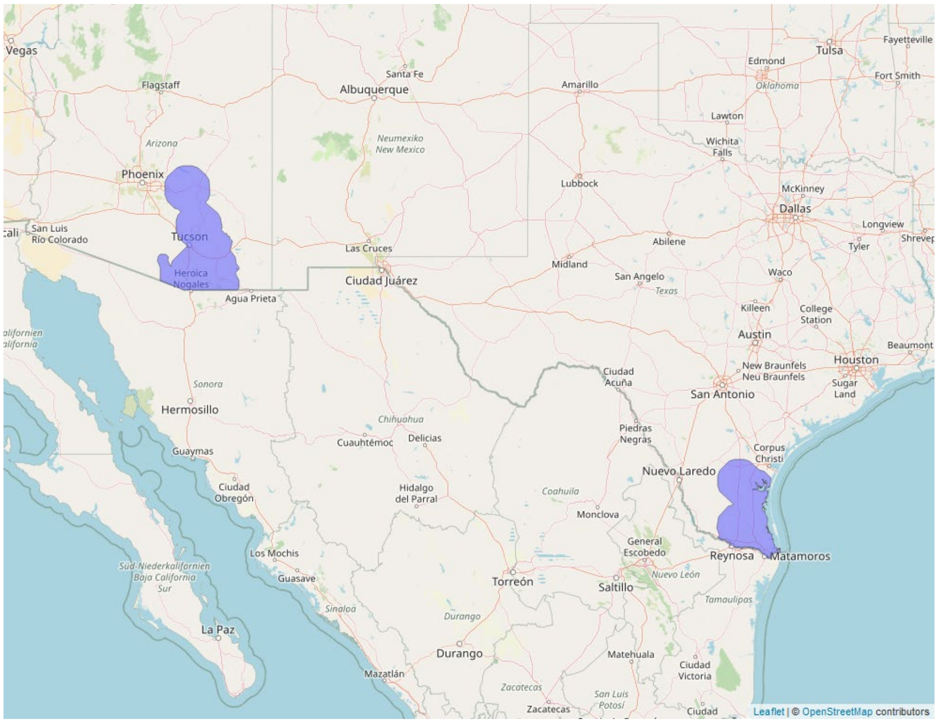

Figure 11. Range map of ocelot (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4474.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 7/24/2018

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

Ocelots are small, cryptic, spotted cats found in the extreme southern U.S. (Texas and Arizona), Mexico, and South America. They use a wide variety of habitats, including thornscrub and semi-arid vegetation, coastal grasslands and coastal tropical forests, tropical dry forests, tropical rain forests, oaks and grasslands, piedmont/montane scrub, cloud forest, pine-oak forests, and fir forests. They are also known to use agricultural lands, especially during dispersal events. Rivers, former river meanders, irrigation canals, irrigation drains, natural drainages, shorelines, fence lines, and brushy road margins provide suitable travel corridors for ocelots, especially as density and percent-cover of thornscrub vegetation increase. One study suggested that ocelots disperse between 2.5-9 km, mostly using narrow (5-100 m) corridors of brush during along remnants of former river meanders and drainage ditches. In 2018, the Texas ocelot population was estimated at 80 ocelots found in two populations. A third population is found in Mexico and is geographically isolated from the Texas populations. In Arizona between 2009-2013, only four individuals were detected, and they appeared to be dispersers as opposed to a population (USFWS 2018). After 1990, the Texas Ocelot Research and Conservation Consortium started research on captive breeding ocelots, and we believe there is potential for captive breeding in the future (USFWS 2016).

Primary threats to ocelots are habitat conversion, fragmentation, and loss. In Texas, over 95% of the dense thornscrub habitat in the Lower Rio Grande Valley was converted to agriculture, rangelands, or urban land uses. Ocelots are threatened by genetic impoverishment from small populations and lack of connectivity among populations due to highways and other roads. Issues associated with developing and patrolling the border between the United States and Mexico further exacerbate the isolation of ocelots in Mexico from those in Texas and Arizona (USFWS 2018). Agricultural pesticides and herbicides (i.e., Round-Up) may have negative impacts on the ocelot, through both direct effects to ocelots and effects to prey. In Texas in 1991, an ocelot was poisoned and killed incidentally when it ate chicken meat laced with aldicarb, a carbamate insecticide, by a hunter (USFWS 2016).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 38.5% of the species range will overlap with methomyl use sites (Table 15) or is likely to be exposed through off-site transport within the action area. Up to 19.3% of the species' range overlaps with methomyl use sites while 19.2% of the range occurs off-field (but may still be exposed to spray drift or runoff). Other grains and cotton crops are the use sites most prevalent within the species' range with 15.7% and 10.4% overlap, respectively. However, overlap with other crop types can still contribute to the overall exposure of the species.

Table 15. Overlap and annual usage data (% Range Treated) for the ocelot. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	0.2	0.4	0.7	<0.1	<0.1	0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[12]	2.4	4.9	7.2	0.1	0.3	0.4
Cotton	5.9	4.5	10.4	0.3	0.2	0.5
Other Grains	9.4	6.2	15.7	0.5	0.3	0.8
Other Orchards	<0.1	0.2	0.3	<0.1	0.3	0.3
Other Row Crops	0.5	0.6	1.1	0.2	0.3	0.5
Soybeans	<0.1	0.2	0.2	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	0.8	2.4	3.2	0.8	2.4	3.2
Wheat	NA	NA	NA	NA	NA	NA
Total	**19.3**	**19.2**	**38.5**	**2**	**3.8**	**5.8**

Usage

Based on past usage data, we anticipate up to 5.8% of the species' range will be treated with methomyl (i.e., 2% on-field and 3.8% off-field) (Table 15).

Additional Exposure Considerations

The species' habitat consists of thorny scrub lands of the Lower Rio Grande Valley and Rio Grande Plains. While the species may use some agricultural areas as transitional corridors, we do not expect individuals are likely to spend large amounts of time on-field because methomyl use sites do not likely provide the necessary habitat features needed to support individual ocelots. As such, we only consider off-field exposure in our analyses.

[12] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Exposure Summary

Given that we do not anticipate ocelots will likely occupy methomyl use sites for more than short periods of time, we focus our analyses for this species on off-field areas. There is a high extent of overlap between the action area and the species' range (19.2% total overlap). Based on past usage data, we anticipate only a small portion of the species' range is likely to be exposed to methomyl (up to 3.8% off-field annually). While we anticipate only a small portion of the range will be treated, the high extent of overlap indicates that a moderate portion of the species range may be treated over the duration of the proposed action, particularly if the areas treated change over time. As such, we anticipate a moderate number of individuals are likely to be exposed to methomyl.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the ocelot. Ocelots are carnivorous and we expect that they primarily consume small mammals, birds, and reptiles. EPA's exposure modeling indicates that ocelot that exclusively consume prey that have recently foraged on contaminated food items on methomyl use sites (i.e., within the last 24 hours) are likely to accumulate high levels of methomyl (up to 10.3 mg/kg-bw), which can result in a high level of mortality (up to 100% of exposed individuals). Individuals that consume prey that have not been foraging on-field are not likely to accumulate levels of methomyl that will cause mortality. While we cannot rule out the possibility that an individual may exclusively consume prey that have recently foraged on methomyl use sites, we do not anticipate this scenario will occur frequently given that ocelot spatial patterns are strongly linked to dense cover or vegetation, where we anticipate prey are less likely to have recently foraged on-field. As such, we anticipate most individuals are not likely to accumulate high levels of methomyl and are not likely to die.

Based on available toxicity data in mammals, we do not anticipate individuals that consume contaminated prey that do not die are likely to experience any sublethal effects (e.g., reduced growth).

Indirect Effects

The ocelot's primary food source are small mammals, birds, and reptiles. Based on available toxicity data in surrogate species, we anticipate there will be a high level of mortality in these prey items when they consume contaminated food on methomyl use sites. However, we expect the level of mortality will vary across species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire community of small mammals, birds, and reptiles is likely to experience complete mortality and that individual ocelots will still have sufficient food resources available, particularly in areas away from methomyl use sites (such as areas of dense cover that individuals prefer). As such, we do not anticipate more than low levels of indirect adverse effects are likely.

Toxicity Summary

We expect the ocelot is likely to experience no more than low levels of direct adverse effects. While individuals that feed exclusively on prey that have recently foraged on methomyl use sites (i.e., within the last 24 hours), we anticipate most individuals are unlikely to do so as the species' favors areas of cover. As such, we anticipate most individuals are unlikely to consume prey that have recently foraged on methomyl use sites and are thus, unlikely to accumulate more than low levels of methomyl that are not likely to cause adverse effects.

We expect the ocelot will not experience more than low levels of indirect adverse effects. While we anticipate prey species that forage on methomyl use sites will experience high levels of mortality, we expect there will be a variation of response to methomyl exposure across the prey community and that there will not likely be compete mortality of species that the ocelot can feed on. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality on methomyl use sites.

Given that we do not anticipate more than low levels of direct and indirect adverse effects to individuals, we assign the ocelot a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The ocelot has a medium exposure ranking. While we do not anticipate individuals are likely to enter methomyl use sites, there is still a high extent of overlap between off-field areas and the species' range (19.2% off-field overlap). Past methomyl usage data indicate that a moderate portion of the range is likely treated each year (up to 5.8% range treated annually). As such, we anticipate a moderate number of individuals are likely to be exposed, particularly if the areas treated change each year.

The ocelot has a low toxicity ranking. While individuals that consume small mammal, bird, and reptile prey that have themselves consumed contaminated food on agricultural sites that have recently been treated with methomyl (i.e., within the last 24 hours) are likely to die, we anticipate this scenario is unlikely to occur with any regular frequency, particularly as we do not anticipate individuals are likely foraging near methomyl use sites where resulting exposure will be the highest. As such, we anticipate most individuals will not accumulate high levels of methomyl and will not experience more than low levels of mortality or any sublethal effects. While there may be some mortality of prey species that consume contaminated food items on methomyl use sites, we do not anticipate this level of prey mortality will result in more than small reductions in the availability of prey for individual ocelots.

While we anticipate a moderate number of individuals are likely to experience exposure, we anticipate exposed individuals are not likely to die or experience sublethal adverse effects, and only low levels of indirect adverse effects. As such, we anticipate only a small number of individuals are likely to experience adverse effects from the proposed action. We therefore anticipate the overall risk of adverse effects to the species is low.

Conclusion

The ocelot has high vulnerability based on its status (i.e., endangered), limited distribution, and declining trends, as described above. Methomyl use may occur over 19.2% of the species' range and, in the past, up to 3.8% of the range was exposed to methomyl annually. Though their primary habitat is grasslands, forests, scrub, and riparian areas, ocelots use a wide variety of habitats and are known to use agricultural lands and pasture, especially during dispersal. However, we do not expect ocelots will occur on methomyl use sites for longer than short periods while moving between habitats. As such, we expect it to be rare for an ocelot to exclusively consume prey (i.e., small mammals, birds, reptiles) that has foraged on methomyl use sites. Therefore, we expect only low levels of mortality (small numbers of individuals) through consumption of contaminated prey during the brief periods when individuals may be present on-field. Similarly, we expect no more than low levels of adverse indirect effects to the species from small losses of their prey items (i.e., mammals, birds, and reptiles). We expect adverse impacts to the species to be low because we rarely expect individuals to occur on-field or to exclusively consume prey that has foraged in these areas. Thus, we anticipate no more than low levels of adverse effects in the form of low levels of mortality or small losses of fitness related to growth and reproduction from prey loss. We do not expect the small number of individuals likely to die or low levels of indirect effects from prey loss will result in species-level adverse effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the ocelot.

References

U.S. Fish and Wildlife Service. 2018. 5-Year Review: Summary and Evaluation Ocelot (*Leopardus pardalis*). Laguna Atascosa National Wildlife Refuge, Los Fresnos, Texas. 13 pp.

U.S. Fish and Wildlife Service. 2016. Recovery Plan for the Ocelot (*Leopardus pardalis*) First Revision. Albuquerque, New Mexico. 237 pp.

Integration and Synthesis Summary: Mammals - Anastasia Island beach mouse

Scientific Name:	Common Name:	Entity ID:
Peromyscus polionotus phasma	Anastasia Island beach mouse	50

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. While there is a moderate level of overlap between the action area and the species' range (Figure 12) and a moderate level of past usage, available information on the species' known locations indicates that no more than a small number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate individuals will be exposed to methomyl on use sites and individuals are not likely to die or experience sublethal adverse effects from exposure off-field, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Anastasia Island beach mouse.

Species range

Based on range map dated: 2/2/2022; Wherever found; *States within the range:* FL. Figure 12 depicts a map of the species' range.

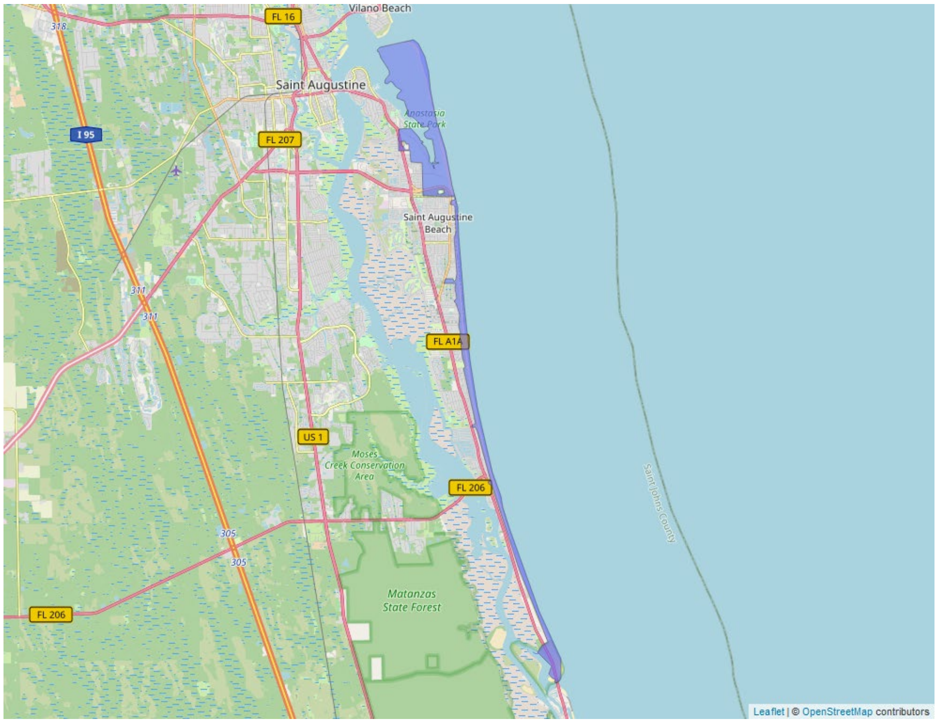

Figure 12. Range map of Anastasia Island beach mouse (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5522.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 6/24/2019

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

Number of populations: Single population

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

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Anastasia Island beach mice are found in coastal dunes and swales along Anastasia Island from St. Augustine Inlet on the north end to Matanzas Inlet at the southern end. In 1992, 55 Anastasia Island beach mice were released in the coastal dunes of Guana-Tolomato-Matanzas National Estuarine Research Reserve (Guana) from Anastasia State Park and Fort Matanzas National Monument (Fort Matanzas). In 2000, an additional 33 beach mice were released at Guana from Anastasis State Park. In 2007, the Guana population was reportedly in decline and there were no captures between 2006-2012, after which monitoring ceased. The Guana population may persist in small numbers, but we believe it is likely extirpated. Anastasia Island beach mice continue along Anastasia Island, though captures declined in the northern section (near St. Augustine's Inlet) after the 2007 5-Year Review. Beach mice responded to habitat restoration efforts and occupied areas of restored dunes at the south end of Anastasia State Park. Anastasia Island beach mice were the only rodent captured on coastal dunes on the island after several damaging hurricanes (Matthew in 2016, Irma in 2017) and they appeared to be recovering by the time surveys were conducted in 2018 (USFWS 2019).

Hurricanes are the most catastrophic threat to the Anastasia Island beach mouse population. When Anastasia Island (including Anastasia State Park and Fort Matanzas National Monument) receives a direct hit from a storm, waves can completely overwash the island and eliminate mouse habitat. Habitat loss and degradation, predators, and other natural factors such as hurricanes are all considered major threats to the Anastasia Island beach mouse. Predation by feral and house cats is an important threat, and Anastasia State Park conducted an extensive feral cat removal program after the mouse was listed. It is unknown if feral cats remain a significant threat to the Anastasia Island beach mouse at Fort Matanzas National Monument, Guana-Tolomato-Matanzas National Estuarine Research Reserve, and St. Johns County parks because they are near residential areas.

Habitat loss was considered the major threat at listing and habitat loss continues to occur throughout the range mainly due to erosion from nor'easters and tropical storms. Coastal development affected most of Anastasia Island with little habitat left to be developed or acquired for conservation of the Anastasia Island beach mouse. Habitat loss has also occurred due to physical damage caused by beach driving and foot traffic through the dunes. Sea level rise from climate change is also a serious threat to beach mice (USFWS 2007, 2019). We have worked with the U.S. Army Corps of Engineers and Florida Department of Environmental Protection to protect the beach mouse when they need to maintain and dredge St. Augustine Inlet. Some impacts to dunes by recreators were eliminated after dune crossovers were built and beach driving was banned in Anastasia State Park and Fort Matanzas. Beach driving still occurs along about 70% of the island's shoreline. St. Johns County developed a Habitat Conservation Plan for beach driving. Anastasia State Park continues to restore interdunal swale habitat in the interior of Conch Island through prescribed burning to create travel corridors for the beach mouse. Predator management has occurred at Anastasia State Park and Fort Matanzas (USFWS 2019).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 7.7% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 16). Up to <0.1% of the species' range overlaps with methomyl use sites while 7.7% of the range occurs off-field (but may still be exposed to spray drift or runoff). We expect vegetables and ground fruit are the most prevalent use sites within the species' range, with 6.8% total overlap between these use sites and the species' range. However, overlap with other use sites may still contribute to the overall exposure of the species.

Table 16. Overlap and annual usage data (% Range Treated) for the Anastasia Island beach mouse. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[13]	<0.1	0.9	0.9	<0.1	<0.1	<0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Orchards	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Row Crops	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	<0.1	6.8	6.8	<0.1	6.8	6.8
Wheat	NA	NA	NA	NA	NA	NA

[13] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Total	**<0.1**	**7.7**	**7.7**	**<0.1**	**6.8**	**6.8**

Usage

Based on past usage data, we anticipate up to 6.8% of the species' range will be treated with methomyl (Table 16).

Additional Exposure Considerations

The areas with the largest populations of the Anastasia Island beach mouse are in state or federal ownership, including Anastasia State Park and the Fort Matanzas National Monument, which have management plans that include the protection of suitable habitat for the beach mouse. We generally do not anticipate agricultural activities are likely to occur in these areas, suggesting that methomyl usage (and subsequent) exposure in these areas is unlikely to occur.

Exposure Summary

There is a medium extent of overlap between the action area and the species' range (7.7% total overlap). Based on past usage data, we expect a medium level of usage within the species' range (up to 6.8% of the range treated with methomyl annually). Available information on the current distribution of the species indicate that the two largest populations of Anastasia Island beach mouse are located on state and federal protected lands where we do not anticipate methomyl use is likely to occur. As such, we anticipate exposure will be limited to a small number of individuals that occur outside of these two protected areas.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the Anastasia Island beach mouse. This species primarily consumes seeds but can also consume invertebrates during periods of low seed availability. EPA's exposure modeling indicates that beach mice that feed on contaminated seeds are not likely to accumulate more than low levels of methomyl (up to 1.2 mg/kg-bw), which is not likely to cause mortality and only low levels of sublethal adverse effects (e.g., reduced growth). Individuals that consume invertebrate prey that have recently been exposed to methomyl on use sites can accumulate high levels of methomyl (up to 29.2 mg/kg-bw), which can cause high levels of mortality (up to 100% of exposed individuals) and sublethal adverse effects to growth and reproduction. While we cannot rule out the possibility of a beach mouse consuming only invertebrate prey that have recently been exposed on methomyl use sites, we anticipate this scenario will occur very infrequently as the Anastasia Island beach mouse's preferred dietary item is seeds. Furthermore, given that the beach mouse's suitable habitat is limited to coastal dunes and swales along the beach in areas away from agricultural fields and are not likely to be exposed to methomyl. As such, we do not anticipate the Anastasia Island beach mouse is likely to experience more than low levels of mortality or sublethal adverse effects.

Indirect Effects

The Anastasia Island beach mouse primarily consumes seeds but can switch to invertebrate prey when seed abundance is low. Based on available toxicity data in plants, we do not anticipate any adverse effects to plant growth or survival are likely to occur, indicating to reductions in the abundance of the beach mouse's primary food source are likely to occur with methomyl use. In contrast, available toxicity studies in insects indicate that insect prey are likely to experience a high level of mortality. However, given that the coastal dune habitat that the species occupies is not likely near agricultural areas, we anticipate insect prey are not likely to experience high levels of exposure or mortality. As such, we do not expect any reductions in the beach mouse's primary food source and only small reductions in secondary food resources, indicating that only low levels of indirect adverse effects are likely to occur.

Toxicity Summary

We expect the Anastasia Island beach mouse is likely to experience only low levels of direct adverse effects. We expect dietary exposure through the beach mouse's primary food source (seeds) is not likely to result in more than low levels of methomyl exposure, resulting in low levels of mortality and, at most, only low levels of sublethal effects (e.g., reduced growth). While some individuals that switch food resources and happen to only consume invertebrate prey that have recently been exposed on methomyl use sites may die, we anticipate this is unlikely to occur given that beach mice are not likely to encounter prey that have recently been exposed to methomyl on-field given the distance of their coastal dune habitat from agricultural areas.

We expect the Anastasia Island beach mouse is likely to experience only low levels of indirect adverse effects. We do not anticipate any adverse effects to the beach mouse's primary food source are likely to occur as available toxicity data in plants show no mortality or growth effects are likely to occur. There may be some reduction in the abundance of the beach mouse's secondary food source (invertebrates), but we do not expect this will result in more than low levels of indirect adverse effect as we anticipate sufficient levels of other food resources will remain for individuals to use.

Given that we anticipate only low levels of direct adverse effects and low levels of indirect adverse effects, we assign the Anastasia Island beach mouse a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Anastasia Island beach mouse has a low exposure ranking. There is a medium extent of overlap between the action area and the species' range (7.7% total overlap) and past usage data indicate a moderate portion of the range is likely to be treated each year (up to 6.8% range treated annually). However, available information on the current distribution of the species indicate that the two largest populations of Anastasia Island beach mouse are located on state and federal protected lands where we do not anticipate methomyl use is likely to occur. As such, we anticipate exposure will be limited to a small number of individuals that occur outside of these two protected areas.

The Anastasia Island beach mouse has a low toxicity ranking. We anticipate individuals are not likely to accumulate high levels of methomyl from consuming their primary food item (seeds), which will not result in any mortality or more than low levels of sublethal effects (i.e., reduced growth). While individuals that switch food items to consume invertebrate prey may occasionally accumulate higher levels of methomyl, we anticipate this is unlikely to occur as the invertebrate prey individuals consume are not likely to have been recently exposed on-field given the distance the mouse's habitat is from methomyl use sites. While we anticipate some reduction in invertebrate prey availability, we do not anticipate any reductions seed availability as we do not expect any adverse effects to plants are likely.

Given that we only expect a small number of individuals are likely to be exposed to methomyl, that exposed individuals are not likely to die or sublethal effects, and that there will be no adverse effects to the species' primary food source, we anticipate very few individuals are likely to experience any adverse effects from the proposed action. As such, we anticipate the risk of overall adverse effects to the species is low.

Conclusion

The Anastasia Island beach mouse a has a high vulnerability based on its status (i.e., endangered), limited distribution, single population, loss of habitat to development, stochastic events (e.g., hurricanes), and predation (e.g., feral cats), as described above. The likelihood of exposure to methomyl is considered low. While 7.7% of the range overlaps with methomyl use sites or adjacent offsite transport areas (<0.1% on-field and 7.7% off-field where drift and runoff may occur), available information on the current distribution of the species indicates that the two largest populations of Anastasia Island beach mouse are located on state and federal protected lands where management plans for the conservation of beach mouse habitat are in place and where we do not anticipate methomyl use is likely to occur. Similarly, based on usage information, approximately 6.8% of the species' range is anticipated to be treated with methomyl annually. However, given the distribution of extant populations of this species, in beach and dunes habitats on low-lying, coastal barrier islands, we anticipate a smaller portion of the range will occur within the exposure footprint and only a very small number of individuals will be exposed to methomyl. We anticipate mortality and sublethal effects from direct exposure (dietary exposure from arthropod prey contaminated on-field) and indirect effects (from loss of available invertebrate prey) will occur rarely because of the species' association with beach and dune habitats that are generally removed from proximity to agricultural fields.

Methomyl use will likely reduce insect prey abundance, but we do not anticipate more than low levels of adverse indirect effects are likely to occur in the form of small impacts to fitness related to growth and reproduction. The species feeds primarily on seeds (granivorous) and supplements its diet with insects seasonally based on availability. We anticipate that there will be sufficient food resources remaining even if sensitive prey species experience high levels of mortality given the species habitat preference and distribution away from agricultural activities. We anticipate mortality of individuals will be rare (small numbers of individuals), as we do not expect that extant sites are likely to be exposed to methomyl. We do not expect the small number of individuals likely to die or the low levels of adverse indirect effects will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Anastasia Island beach mouse.

References

U.S. Fish and Wildlife Service. 2019. Anastasia Island Beach Mouse (*Peromyscus polionotus phasma*) 5-Year Review: Summary and Evaluation. Jacksonville, Florida. 32 pp.

U.S. Fish and Wildlife Service. 2007. Anastasia Island Beach Mouse (*Peromyscus polionotus phasma*) 5-Year Review: Summary and Evaluation. Jacksonville, Florida. 27 pp.

Integration and Synthesis Summary: Mammals - Southeastern beach mouse

Scientific Name:	Common Name:	Entity ID:
Peromyscus polionotus niveiventris	Southeastern beach mouse	53

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. While there is a high level of overlap between the action area and the species' range (Figure 13) and a low level of past usage, available information on the species' known locations indicates that no more than small numbers of individuals are likely to be exposed. Based on the species' life history, we do not anticipate individuals will be exposed on methomyl use sites and are not likely to die or experience more than low levels of sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the southeastern beach mouse.

Species range

Based on range map dated: 2/2/2022; wherever found; *States within the range:* FL. Figure 13 depicts a map of the species' range.

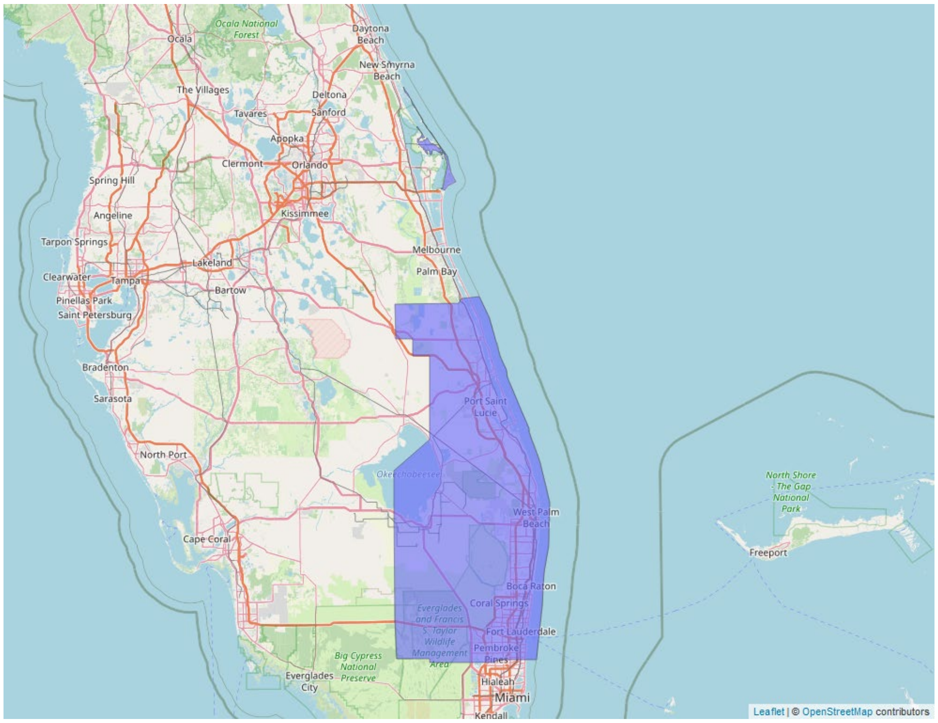

Figure 13. Range map of southeastern beach mouse (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/3951.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Threatened

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 10/11/2019

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

Southeastern beach mice are found on frontal dunes and scrub dunes in coastal Florida. The species historically occupied 360 km of the Atlantic coastline from Volusia to Broward Counties. Due to habitat loss, they now occupy 80.5 km of the coastline from Volusia to Indian River Counties. Two extant populations occur in the northern part of the historic range (i.e., Smyrna Dunes Park and a metapopulation on the Cape Canaveral Complex). The species is extirpated from the coastal dunes from Port Canaveral Inlet south to Sebastian Inlet, and their fate between Sebastian Inlet and Ft. Pierce Inlet is uncertain (USFWS 2019). The species is considered stable across remaining populations. All known areas that currently have the species are in county, state, or federal ownership. Reintroduction is being considered within the historic range to establish additional populations (USFWS 2008), but areas of suitable habitat large enough to support southeastern beach mouse no longer occur south of Palm Beach Inlet (USFWS 2019).

The primary threat to the southeastern beach mouse is the continued loss, fragmentation, and alteration of beach dune, coastal strand, and scrub habitat. Large-scale commercial and residential development on the Atlantic coast eliminated beach mouse habitat in Palm Beach and Broward Counties. Coastal development and inlet construction fragmented habitat and limited movement of the species to recolonize adjacent sites. Urbanization increased the recreational use of dunes and impacted the vegetation needed for dune maintenance and stabilization. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect beach mouse habitat. Habitat is no longer lost from development within the species' range, but development borders the existing protected areas where the species occurs and could affect species management at these sites. Increased predation pressure on isolated beach mouse populations from natural and non-native predators can have substantial impacts to the southeastern beach mouse. Free-roaming and feral cats are considered the primary cause of the extirpation of isolated populations of beach mice and a contributing factor to the extinction of the Pallid beach mouse (*P. polionotus decoloratus*). The encroachment of residential housing on the Atlantic Coast increases the likelihood of predation by domestic cats. A healthy population of the species at Sebastian Inlet State Park (north of the inlet) in Brevard County was completely extirpated by 1972, presumably by feral cats. Large and small hurricanes can cause waves to overwash dunes and impact or eliminate occupied habitat (USFWS 2008). At times, habitat loss resulted from beach renourishment projects that eliminated coastal vegetation. Most of the public lands now have crossovers that allow visitors to access the beach, which has alleviated some impacts to the dunes. Smyrna Dunes Park and Sebastian Inlet State Park are working on restoring the habitat by implementing resource management activities within those areas. At Merritt Island National Wildlife Refuge, Kennedy Space Center, and Cape Canaveral Air Force Station, where mice occupy the coastal scrub, some prescribed burning to reduce hardwoods and create open sandy areas has occurred. Sebastian Inlet State Park and Archie Carr National Wildlife Refuges (just north of Sebastian Inlet State Park) implemented a feral cat removal program and may now be suitable reintroduction sites (USFWS 2019).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 11.8% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 17). While <0.1% of the species' range overlaps with methomyl use sites, 11.7% of the range occurs off-field (but may still be exposed to spray drift or runoff). Other grains and vegetables and ground fruit are the use sites most prevalent within the species' range, with 7.3% and 3.2% total overlap, respectively. However, overlap with other use sites may still contribute to the overall exposure of the species.

Table 17. Overlap and annual usage data (% Range Treated) for the southeastern beach mouse. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[14]	<0.1	0.6	0.6	<0.1	<0.1	<0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	<0.1	7.3	7.3	<0.1	0.4	0.4
Other Orchards	<0.1	0.6	0.7	<0.1	0.6	0.7
Other Row Crops	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	<0.1	3.2	3.2	<0.1	3.2	3.2
Wheat	NA	NA	NA	NA	NA	NA
Total	**<0.1**	**11.7**	**11.8**	**<0.1**	**4.2**	**4.3**

[14] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 4.3% of the species' range will be treated with methomyl (Table 17).

Additional Exposure Considerations

Currently, the southeastern beach mouse is found in two areas in Volusia and Brevard Counties, specifically in Smyrna Dunes Park, Canaveral National Seashore, Merritt Island National Wildlife Refuge/Kennedy Space Center, and Cape Canaveral Air Force Station. We do not expect methomyl use sites are likely to occur in these areas or in adjacent areas, indicating that exposure to methomyl is likely to be low.

Exposure Summary

While there is a high extent of overlap between the action area and the species' range (11.8% total overlap), past usage data indicate that only a small portion of the species' range has been treated with methomyl (up to 4.3% range treated each year). While this level of usage may still result in a moderate portion of the range treated over the duration of the proposed action (especially if the areas treated change over time), available information on the species' distribution indicate that populations occupy areas that are not likely to contain or be located near any agricultural use sites (including a state park, national wildlife refuge, and military station). As such, we anticipate exposure will be limited to only a small number of individuals that are not located within or disperse outside of these protected areas.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the southeastern beach mouse. This species primarily consumes seeds but can also consume invertebrates during periods of low seed availability. EPA's exposure modeling indicates that beach mice that feed on contaminated seeds are not likely to accumulate more than low levels of methomyl (up to 1.2 mg/kg-bw), which is not likely to cause any mortality and only low levels of sublethal adverse effects (e.g., reduced growth). Individuals that consume invertebrate prey that have recently been exposed on methomyl use sites can accumulate high levels of methomyl (up to 29.2 mg/kg-bw), which can cause high levels of mortality (up to 100% of exposed individuals) and sublethal adverse effects. While we cannot rule out the possibility of a beach mouse consuming only invertebrate prey that have recently been exposed on methomyl use sites, we anticipate this scenario will occur very infrequently as the southeastern beach mouse's preferred dietary item is seeds. Furthermore, given that the beach mouse's suitable habitat is limited to coastal dunes and swales along the beach in areas away from agricultural fields and are not likely to be exposed to methomyl. As such, we do not anticipate the southeastern beach mouse is likely to experience more than low levels of mortality or sublethal adverse effects.

Indirect Effects

The southeastern beach mouse primarily consumes seeds but can switch to invertebrate prey when seed abundance is low. Based on available toxicity data in plants, we do not anticipate any adverse effects to plant growth or survival are likely to occur, indicating to reductions in the abundance of the beach mouse's primary food source are likely to occur with methomyl use. In contrast, available toxicity studies in insects indicate that insect prey are likely to experience a high level of mortality. However, given that the coastal dune habitat that the species occupies is not likely near agricultural areas, we anticipate insect prey are not likely to experience high levels of exposure or mortality. As such, we do not expect any reductions in the beach mouse's primary food source and only small reductions in secondary food resources, indicating that only low levels of indirect adverse effects are likely to occur.

Toxicity Summary

We expect the southeastern beach mouse is likely to experience only low levels of direct adverse effects. We expect dietary exposure through the beach mouse's primary food source (seeds) is not likely to result in more than low levels of methomyl exposure, resulting in low levels of mortality and, at most, only low levels of sublethal effects (e.g., reduced growth). While some individuals that switch food resources and happen to only consume invertebrate prey that have recently been exposed on methomyl use sites may die, we anticipate this is unlikely to occur given that beach mice are not likely to encounter contaminated prey given the distance of their coastal dune habitat from agricultural areas.

We expect the southeastern beach mouse is likely to experience only low levels of indirect adverse effects. We do not anticipate any adverse effects to the beach mouse's primary food source are likely to occur as available toxicity data in plants show no mortality or growth effects are likely to occur. There may be some reduction in the abundance of the beach mouse's secondary food source (invertebrates) but we do not expect this will result in more than low levels of indirect adverse effect as we anticipate sufficient levels of other food resources will remain for individuals to use.

Given that we anticipate only low levels of direct adverse effects and low levels of indirect adverse effects, we assign the southeastern beach mouse a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Southeastern beach mouse has a low exposure ranking. While there is a high extent of overlap between the action area and the species' range (11.8% total overlap), past usage data indicate that only a small portion of the is likely to be treated each year (up to 4.3% range treated annually). While this level of usage may still result in a moderate portion of the range treated over the duration of the proposed action (especially if the areas treated change over time), available information on the species' distribution indicate that populations occupy areas that are not likely to contain or be located near any agricultural use sites (including a state park, national wildlife refuge, and military station). As such, we anticipate exposure will be limited to only a small number of individuals that are not located within or disperse outside of these protected areas.

The southeastern beach mouse has a low toxicity ranking. We anticipate individuals are not likely to accumulate high levels of methomyl from consuming their primary food item (seeds), which will not result in any mortality or more than low levels of sublethal effects to growth. While individuals that switch food items to consume invertebrate prey may occasionally accumulate higher levels of methomyl, we anticipate this is unlikely to occur as the invertebrate prey individuals consume are not likely to have been recently exposed on-field given the distance the mouse's habitat is from methomyl use sites. While we anticipate some reduction in invertebrate prey availability, we do not anticipate any reductions seed availability as we do not expect any adverse effects to plants are likely.

Given that we only expect a small number of individuals are likely to be exposed to methomyl, that exposed individuals are not likely to die or sublethal effects, and that there will be no adverse effects to the species' primary food source, we anticipate very few individuals are likely to experience any adverse effects from the proposed action. As such, we anticipate the risk of overall adverse effects to the species is low.

Conclusion

The southeastern beach mouse a has a high vulnerability based on its limited distribution, loss of habitat to development, stochastic events (e.g., hurricanes), predation (e.g., feral cats), and declining trends, as described above. The likelihood of exposure from labeled uses across the range is considered low. While 11.8% of the range overlaps with methomyl use sites or spray drift areas (<0.1% on-field and 11.7% off-field where drift and runoff may occur), available information on the current distribution of the species indicates that the two remaining populations of southeastern beach mouse are located on protected lands with county, state, or federal ownership, where management plans for the conservation of beach mouse habitat are in place and where we do not anticipate methomyl use is likely to occur. Similarly, based on past methomyl usage information, approximately 4.3% of the species' range is anticipated to be treated with methomyl annually (<0.1% on-field and 4.2% off-field). However, given the distribution of extant populations of this species, in beach and dunes habitats on low-lying, coastal barrier islands, we anticipate a smaller portion of the range will occur within the exposure footprint and only a very small number of individuals will be exposed to methomyl. We anticipate mortality and sublethal effects from direct exposure (dietary exposure from arthropod prey contaminated on-field) and indirect effects (from loss of available invertebrate prey) will occur rarely because of the species' association with beach and dune habitats that are generally removed from proximity to agricultural fields.

Methomyl use will likely reduce insect prey abundance, but we do not anticipate more than low levels of adverse indirect effects are likely to occur in the form of small impacts to fitness related to growth and reproduction. The species feeds primarily on seeds (granivorous) and supplements its diet with insects seasonally based on availability. We anticipate that there will be sufficient food resources remaining even if sensitive prey species experience high levels of mortality because the species preferred habitat is not near agricultural activities. We anticipate mortality of individuals that occurs from consumption of insect prey will be rare (small numbers of individuals) because we do not anticipate that extant sites are likely to be exposed to methomyl. We do not expect the small number of individuals likely to die or the low levels of adverse indirect effects will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the southeastern beach mouse.

References

U.S Fish and Wildlife Service. 2019. Southeastern beach mouse (*Peromyscus polionotus niveiventris*) 5-Year Review: Summary and Evaluation. Jacksonville, Florida. 33 pp.

U.S Fish and Wildlife Service. 2008. Southeastern beach mouse (*Peromyscus polionotus niveiventris*) 5-Year Review: Summary and Evaluation. Jacksonville, Florida. 38 pp.

Integration and Synthesis Summary: Mammals - Buena Vista Lake ornate shrew

Scientific Name:	Common Name:	Entity ID:
Sorex ornatus relictus	Buena Vista Lake ornate shrew	58

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. In our preliminary evaluation of the effects of the proposed action to the species (presented below), we determined there is a high level of exposure as there is a high degree of overlap between the action area and the species' range (Figure 14) and given that available information indicates the species occurs near and on agricultural areas, suggesting that a large number of individuals are likely to be exposed. We anticipate individuals exposed to methomyl on use sites are likely to die, indicating that the risk of adverse effects to the species is high. Because of the effects described in our preliminary evaluation and conclusion, EPA and the applicant agreed to incorporate species-specific conservation measures as part of the action. We now expect exposure for the Buena Vista Lake ornate shrew to be low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Buena Vista Lake ornate shrew.

Species range

Based on range map dated: 2/16/2023; Wherever found; *States within the range:* CA. Figure 14 depicts a map of the species' range.

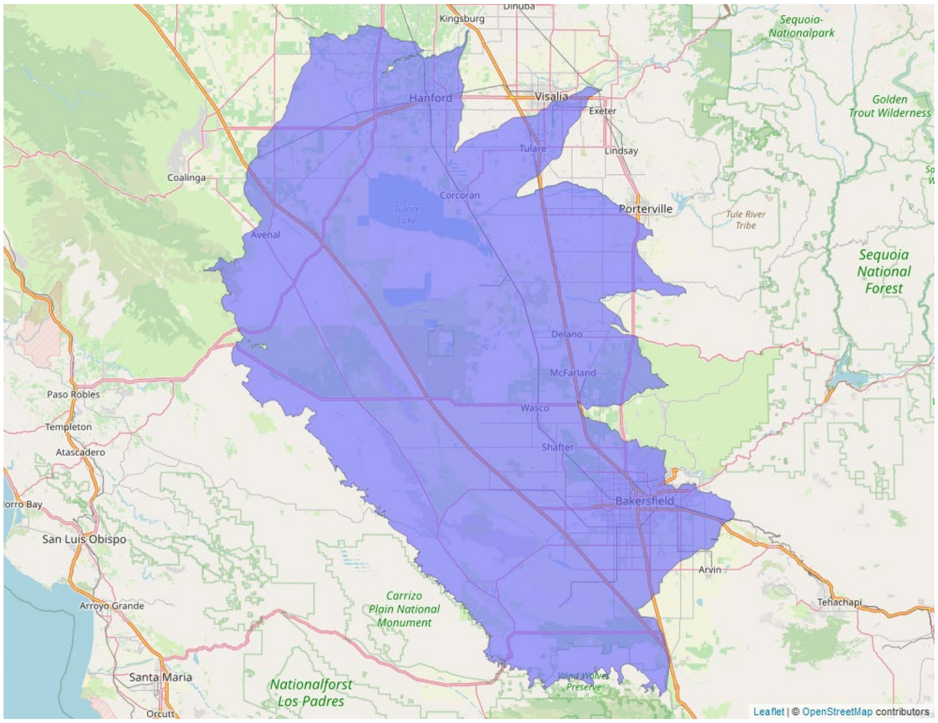

Figure 14. Range map of Buena Vista Lake ornate shrew (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/1610.

Vulnerability

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 8/31/2020

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

The Buena Vista Lake ornate shrew is one of nine subspecies of ornate shrews known to occur in California. Its habitat is riparian and wetland vegetation communities with abundant leaf litter and dense herbaceous cover, and the species is often found near reliable water bodies. They feed indiscriminately on available larvae and adults of aquatic and terrestrial invertebrates, including insects, spiders, centipedes, slugs, snails, and earthworms. Historically, the Buena Vista Lake ornate shrew inhabited the interconnected network of tule marshes and other permanent and seasonal lakes, wetlands, and sloughs around the historic Tulare, Kern, and Buena Vista lakes, and presumably throughout the Tulare Basin. Though the current distribution of the shrew is unknown, it is likely to be restricted due to the loss of >95% of its wetland habitat, lack of connectivity, and additional habitat loss. By 2010, the species was found in eight locations: Goose Lake, Atwell Island, Main Drain Canal/Semitropic Ecological Reserve, Lemoore Wetlands preserve, Coles Levee Ecological Preserve, Kern fan water recharge area, Kern National Wildlife Refuge, and Kern Lake. Several areas of fragmented private lands may support small numbers of this species also (USFWS 2010). As of 2020, there were fifteen sites believed to be occupied: the eight listed in 2010, NAS Lemoore, Pixley National Wildlife Refuge, Poso Creek, Kern River overflow canal at Highway 5 and Highway 46, Kern River overflow canal at Semitropic Canal crossing, Wind Wolves Preserve (Twin Fawns site), and Wind Wolves Preserve (Willow site). Coles Levee is potentially occupied, but the species was not found during recent surveys. Surveys have not been conducted recently at Lemoore Wetland Reserve, Goose Lake, or Kern Lake. Abundance information was not presented (USFWS 2020a).

When the Buena Vista Lake ornate shrew was listed as endangered in 2002, the primary threat to its survival and recovery was habitat loss through diversion and impoundment of rivers, lake draining, and destruction of wetlands for agriculture and urban development. Since then, industrial and agricultural development, urbanization, and lack of allocation of water to riparian and wetland areas have continued to reduce and was identified as a potential new threat. Shrews are generally unpalatable to predators due to an offensive odor in their flank glands and feces, but several species of owls are known to feed on shrews. Pesticides, including methomyl, were identified as a likely stressor, although no studies have been conducted to investigate their effects on the shrew (USFWS 2010). The species could be exposed to pesticides sprayed on nearby crops, including herbicides, and their prey base could be affected by pesticide use (USFWS 2020a).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 100% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 18). Other orchards and alfalfa are the most prevalent use sites within the species' range, with 92.9% and 65.4% of the range, respectively.

Table 18. Overlap data for the Buena Vista Lake ornate shrew. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
Alfalfa	10.1	12.5	22.6
Citrus	2.7	2.7	5.4
Corn[15]	5.9	7.6	13.4
Cotton	7.6	5.8	13.5
Other Grains	4.9	11.3	16.2
Other Orchards[16]	27	14.8	41.8
Other Row Crops	<0.1	<0.1	<0.1
Soybeans	0	0	0
Vegetables and Ground Fruit	6	9.9	15.9
Wheat	0	0	0
Total[17]	**61.5**	**61.9**	**100**

Usage

Mandatory reporting data from the state of California indicates that, between 2012-2021, the maximum yearly overlap between the species' range and agricultural areas reporting any pesticide usage was 51.3%. Of those areas reporting pesticide usage, up to 44.2% reported use of any insecticide. Based on this reporting data, we expect 1.9% of the species' range is likely to be treated with methomyl, specifically (Table 19). This pesticide usage data is based on data reported by more than 7,992 growers within the species' range. The high number of reporters suggests that these usage metrics will be stable over time.

[15] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

[16] We expect 'other orchards' and 'citrus' use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

[17] Total overlap is calculated by aggregating all use data layers that are not highly redundant (i.e., all data layers plus corn or soy plus citrus or other orchards). Total overlap is capped at 100%.

Table 19. Overlap between areas treated with any pesticide, any insecticide, and methomyl with the Bueno Vista Lake ornate shrew's range as reported by the California Department of Pesticide Regulation.

% overlap with all pesticide usage areas	% overlap with all insecticide usage areas	% overlap with methomyl usage areas
51.3	44.2	1.9

Additional Exposure Considerations

The Bueno Vista Lake ornate shrew occurs in remnant patches of wetland or moist-soil vegetation, most of which are surrounded by agricultural development. They may move into surrounding agricultural land on occasion, but there is little data on their movements.

Exposure Summary

There is a high extent of overlap between the action area and the species' range, with nearly the entire species' range overlapping with the action area. Mandatory pesticide usage reporting data from the state of California indicates that only a small portion of the species' range has been treated with methomyl in the past (up to 1.9% range treated annually). While this is a low level of past methomyl usage, the high level of insecticide usage suggests that there may still be a high likelihood of exposure to occur, particularly if pest pressures change or require growers to switch to methomyl. Furthermore, additional information on the current distribution of the species suggests that remaining populations of the species are highly fragmented and likely to occur near agricultural areas, indicating an increased likelihood of exposure. As such, despite the low level of past usage, we anticipate a large number of individuals will be exposed.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the Buena Vista Lake ornate shrew. This species is a generalist invertivore and can consume a variety of invertebrate species, including arthropods, slugs, snails, and earthworms. EPA's exposure modeling indicates that shrews feeding on contaminated invertebrates on methomyl use sites can accumulate up to 42.1 mg/kg-bw methomyl, which can result in a high level of mortality (up to 100% exposed individuals) and sublethal adverse effects to growth and reproduction (in exposed individuals that do not die). In contrast, EPA's exposure modeling indicates that shrews that consume invertebrates in areas off-site that are exposed via spray drift are not likely to accumulate more than low levels of methomyl that are not likely to result in any mortality or more than low levels of sublethal adverse effects (e.g., reduced growth). Given that populations of the shrew are presumed to be located near agricultural fields, we anticipate individuals are likely to frequently consume invertebrate prey that have been recently exposed to methomyl on-field, resulting in high levels of mortality. While sublethal effects to growth and reproduction are also likely to result from this exposure, we do not anticipate these adverse effects will occur before the onset of mortality.

Indirect Effects

The Buena Vista Lake ornate shrew is a generalist invertivore and can consume a wide variety of invertebrates, including arthropods and non-arthropods. Available toxicity data indicate that arthropod species are highly sensitive to methomyl and are likely to experience high levels of mortality even at low levels of exposure. As such, we anticipate methomyl use will reduce the abundance of arthropod prey resources for individuals. However, available toxicity data indicate that non-arthropod invertebrates, including mollusks and annelids, are not likely to experience any adverse effects to survival, growth, or reproduction at predicted levels of methomyl exposure. Thus, while we anticipate a large reduction in the availability of sensitive arthropod prey species, we expect there will be sufficient prey resources to support individuals in the form of non-sensitive prey species like slugs, snails, and worms.

Toxicity Summary

While we do not expect more than low levels of indirect effects, given that known populations likely occur in the vicinity of agricultural areas, we expect individuals are likely to die as a result of consuming invertebrate prey that have recently been exposed to methomyl on-field. As such, the toxicity ranking for this species is high.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Buena Vista Lake ornate shrew has a high exposure ranking. While past usage data from the state of California show a low level of methomyl usage (up to 1.9% range treated annually), the high level of all insecticide usage (up to 44% of the range treated annually with an insecticide) and the high level of overlap (up to 51.3% according to CalPUR data) indicate a large number of individuals may still be exposed, particularly if changes in pest pressures force growers to switch to methomyl from a different insecticide.

The Buena Vista Lake ornate shrew has a high toxicity ranking. While we do not expect more than low levels of indirect effects are likely (given that individuals can switch to prey species that are not sensitive to methomyl), given the proximity of known populations to agricultural areas, we expect there is a high likelihood that individuals will consume prey species that have recently been exposed on methomyl use sites. This consumption of recently exposed prey will result in high concentrations of methomyl, which will result in high levels of mortality.

Given that a large number of individuals are likely to be exposed and that exposed individuals are likely to experience high levels of adverse effects, we expect a large number of individuals will experience high levels of adverse effects. As such, we expect the overall risk of adverse effects to the species is high.

Preliminary Conclusion

The Buena Vista Lake ornate shrew has high vulnerability based on its status (i.e., endangered), limited distribution, and declining trends, as described above. Their primary habitat includes riparian and wetland areas where abundant leaf litter and dense herbaceous cover are present, and they feed on aquatic and terrestrial invertebrates. The shrew can be affected by herbicides and other pesticide sprayed on nearby agricultural lands, and most of their remaining habitat areas are surrounded by agriculture. The species may occur on and likely feeds on invertebrates that occur on, to some extent, agricultural lands. Methomyl use may occur on or near up to 100% of the species' range, but only 1.9% of the range was treated annually with methomyl in the past (44.2% was treated annually with any insecticide). Even though methomyl past usage is low, overlap is high, past insecticide usage is high, and future pest pressures may change and additional growers could respond to these pressures by using methomyl on more allowable use sites. The species' fragmented habitat areas are likely to be affected by increased methomyl use on nearby agricultural lands. Therefore, we anticipate a large number of individuals will be exposed throughout the duration of the proposed action. Because their habitats are so close to methomyl use sites and their invertebrate prey are highly sensitive to methomyl, we expect individual shrews are likely to experience high levels of mortality from consuming prey that was recently exposed to methomyl on-field.

We expect impacts to be high and a large number of individuals will die. Because of the species high vulnerability, we expect the large number of individuals likely to die will cause species-level effects.

Final Conclusion (with Species-Specific Conservation Measures)

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Buena Vista Lake ornate shrew:

1) *Methomyl must be applied using the following buffers: 320 feet for aerial applications, 105 feet for ground applications, and 160 feet for airblast applications. Based on AgDRIFT modeling, the buffers will reduce spray drift from entering habitat for the Buena Vista Lake ornate shrew by >95%. These buffer distances may be reduced using other measures identified as equivalent mitigations (i.e., reducing spray drift by similar magnitude) as specified in EPA's Draft Insecticide Strategy and as described in Appendix A-1 of this Opinion.*

The PULA for the Buena Vista Lake ornate shrew will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action. In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.

After incorporating the specific conservation measure above, we expect exposure for the Buena Vista Lake ornate shrew to be low. As such we anticipate low numbers of individuals of this species will be adversely impacted (small numbers of individuals will die from direct exposure or have small impacts to fitness related to growth and reproduction through loss of prey). We anticipate these measures will prevent mortality in key areas of the species' range and will reduce adverse effects to the species. After reviewing the current status of the species, environmental baseline for the action area, effects of the proposed action, and species-specific conservation measures, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Buena Vista Lake ornate shrew.

References

U.S. Fish and Wildlife Service. 2020a. Buena Vista Lake Ornate Shrew Species Status Assessment. Version 1.0. Sacramento, California. 102 pp.

U.S. Fish and Wildlife Service. 2020b. Buena Vista Lake Ornate Shrew (*Sorex ornatus relictus*) 5-Year Review: Summary and Evaluation. Sacramento, California. 6 pp.

U.S. Fish and Wildlife Service. 2011. Buena Vista Lake Ornate Shrew (*Sorex ornatus relictus*) 5-Year Review: Summary and Evaluation. Sacramento, California. 31 pp.

Integration and Synthesis Summary: Mammals - Riparian woodrat (San Joaquin Valley)

Scientific Name:	**Common Name:**	**Entity ID:**
Neotoma fuscipes riparia	Riparian woodrat (San Joaquin Valley)	62

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. While there is a high level of overlap between the action area and the species' range (Figure 15) and a moderate level of past usage, available information on the known locations of the species indicates that exposure to the species is unlikely to occur. Based on the species' life history, we do not anticipate individuals are likely to be exposed on methomyl use sites and that individuals are not likely to die or experience sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the riparian woodrat.

Species range

Based on range map dated: 3/21/2018; Wherever found; *States within the range:* CA. Figure 15 depicts a map of the species' range.

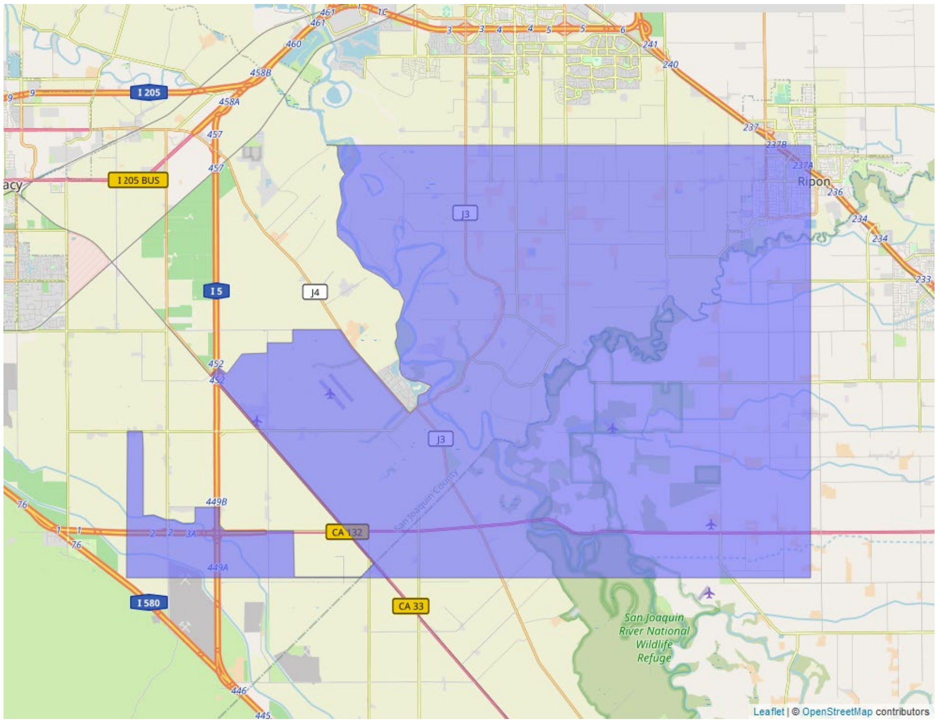

Figure 15. Range map of riparian woodrat (=San Joaquin Valley) (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6191.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 7/8/2020

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, rodenticides

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Riparian woodrats are endemic to the San Joaquin Valley in California. They are nocturnal rodents that occupy multi-storied riparian habitat consisting of shrubby understory, a midstory of willows or vines, and a well-developed overstory of valley oaks or other large trees (USFWS 1998). They are generalist herbivores and eat a wide variety of nuts, fruits, fungi, foliage, and forbs. Historically, it ranged from northern Fresno County or southern Merced County north to San Joaquin County; after 1938, its habitat was fragmented (USFWS 1998) and 95% of the species' habitat was lost before 2000 (USFWS 2012). It is now only known to occur in two populations in San Joaquin County: one within Caswell Memorial State Park (Caswell) and one five miles away within the San Joaquin River National Wildlife Refuge (San Joaquin River). At the time of listing, only the Caswell population was known; it is believed to have a higher population density and more individuals than the San Joaquin River population. By the 2012 5-Year Review, no focused surveys were conducted for riparian woodrats at San Joaquin River, but 34 individuals were captured, and no stick lodges were observed there (USFWS 2012). Kelly et al. (2001) suggests that absence of stick lodges should not be used as an index of population size. Both populations have experienced multiple genetic bottleneck events over time, and as of 2012, they exhibit measurable genetic differences across the two populations (USFWS 2012). In 2017, photos of riparian woodrats were captured at San Joaquin River during a camera trap study of riparian brush rabbits (USFWS 2020).

Historical habitat loss resulted from large-scale land conversions to agriculture, extensive flood control projects (i.e., levees), and altered hydrology (i.e., dams, water diversion for agriculture and municipal uses). Several of these threats were still considered at the time of listing, but because the lands for both are protected (i.e., Caswell Memorial State Park by the State of California and San Joaquin River National Wildlife Refuge by the U.S. Fish and Wildlife Service), they are no longer considered serious concerns (USFWS 2020). Other threats to riparian woodrats include impacts of past development, fires, floods, disease (i.e., bubonic plague), predation (e.g., coyotes (*Canis latrans*), gray foxes (*Urocyon cinereoargenteus*), long tailed weasels (*Mustela frenata*), raccoons (*Procyon lotor*), feral domestic cats (*Felis domesticus*) and dogs (*Canis lupus familiaris*), owls (*Strigidae* spp.), and other raptors), exotic species (e.g., black rats (*Rattus rattus*)), inbreeding depression, genetic drift, and climate change (USFWS 2012, 2020). There are no sufficiently large areas of undeveloped riparian habitat into which new riparian woodrat populations can expand due to past development. Natural events (wildfires and floods) between 2004-2011 and again in 2017 are believed to have significantly affected the San Joaquin River population (USFWS 2012, 2020). Fires are particularly a concern at Caswell due to lack of fuel management in the park (USFWS 2012, 2020). Rodenticide applications in nearby areas is considered a threat to the riparian woodrat (USFWS 2020), though they are no longer applied in Caswell (USFWS 2000). Since 2000, the nonprofit River Partners collaborated with the U.S. Fish and Wildlife Service to restore riparian habitat at Dos Rios Ranch, a property adjacent to the San Joaquin River National Wildlife Refuge. Some restoration directly benefited the riparian woodrat by expanding the amount of riparian forest habitat available (600 ac as of 2020). As of 2018, the Bureau of Reclamation is also working toward restoring an additional 159 ac of riparian habitat on the same property (USFWS 2020). Beginning in 2012, funding from CALFED Bay-Delta Program was used to acquire and restore habitat between Caswell and San Joaquin River. The Service authorized expanding the San Joaquin River National Wildlife Refuge to include areas north along the San Joaquin River and south to the San Luis National Wildlife Refuge System through conservation easements or fee titles (10,783 ac total).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 100% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 20). Up to 100% of the species' range overlaps with the action area. Other orchards and alfalfa are the most prevalent use sites within the species' range, with 92.9% and 65.4% of the range, respectively.

Table 20. Overlap data for the riparian woodrat. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
Alfalfa	31.7	33.7	65.4
Citrus	2.4	0.6	3
Corn[18]	23.2	23.3	46.4
Cotton	0.2	1.6	1.8
Other Grains	30.2	32.7	62.8
Other Orchards[19]	70.1	22.7	92.9
Other Row Crops	0.1	1.8	1.9
Soybeans	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	14	30.4	44.3

[18] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

[19] We expect 'other orchards' and 'citrus' use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
Wheat	NA	NA	NA
Total[20]	**100**	**100**	**100**

Usage

Mandatory reporting data from the state of California indicates that, between 2012-2019, the maximum yearly overlap between the species' range and agricultural areas reporting any pesticide usage was 66.6%. Of those areas reporting pesticide usage, up to 53.3% reported use on any insecticide. Based on this reporting data, we expect 7.8% of the species' range is likely to be treated with methomyl, specifically (Table 21). This pesticide usage data is based on data reported by more than 400 growers within the species' range. The high number of reporters within the species' range suggests that these usage metrics will be stable despite changes in pesticide use patterns of individual growers as this represents a substantial sample size.

Table 21. Overlap between areas treated with any pesticide, any insecticide, and methomyl with the riparian woodrat's range as reported by the California Department of Pesticide Regulation.

Average # of growers reporting within the species' range	% overlap with all pesticide usage areas	% overlap with all insecticide usage areas	% overlap with methomyl usage areas
460.1	66.6	53.3	7.8

Additional Exposure Considerations

There are two known populations of riparian woodrats: one population occurs along the Stanislaus River at Caswell Memorial State Park and the other occurs at the San Joaquin River National Wildlife Refuge. We do not anticipate methomyl use is likely to occur in the national wildlife refuge as past records of pesticide usage on national wildlife refuge lands indicates no methomyl has been used in these areas previously. Similarly, we do not anticipate methomyl usage within the state park is likely to occur, as methomyl is only registered for use on agricultural crops. While we do not anticipate methomyl will be used in the locations where the woodrat occupies, both areas are near methomyl use sites, indicating that off-field exposure is still likely to occur.

[20] Total overlap is calculated by aggregating all use data layers that are not highly redundant (i.e., all data layers plus corn or soy plus citrus or other orchards). Total overlap is capped at 100%.

Exposure Summary

There is a high extent of overlap between the action area and the species' range, with nearly the entire species' range overlapping with the action area. Mandatory pesticide usage reporting data from the state of California indicates that only a moderate portion of the species' range has been treated with methomyl in the past (up to 7.8% range treated annually). However, available information on the species' distribution indicates that there are only two populations that occur within the range, with both populations occurring on protected lands where we do not anticipate any methomyl will be used. These protected areas occur near agricultural areas, suggesting that while on-field exposure is unlikely to occur, these areas may still experience exposure through spray drift. Given the restricted locations of current populations, that these populations occur in protected areas with no expected methomyl use sites, but may be exposed to spray drift, we determine the riparian woodrat has a medium exposure ranking. As such, we anticipate a moderate number of individuals will be exposed.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the riparian woodrat. This species is a generalist herbivore and can consume a variety of vegetative material, including nuts, fruits, fungi, foliage, and forbs. EPA's exposure modeling indicates that woodrats that feed on contaminated vegetation on methomyl use sites can accumulate up to 11.2 mg/kg-bw methomyl, which can result in a high level of mortality (up to 100% exposed individuals) and sublethal effects to growth and reproduction in exposed individuals that do not die. In contrast, EPA's exposure modeling indicates that woodrats that consume vegetation in areas off-site that are exposed via spray drift are not likely to accumulate more than low levels of methomyl that are not likely to result in any mortality or sublethal adverse effects (e.g., reduced growth). We generally do not anticipate riparian woodrats are likely to forage on methomyl use sites as they tend to occupy areas of dense shrub and tree cover and are more likely to forage in areas that are only exposed via spray drift. As such, we anticipate few individuals are likely to experience high levels of methomyl exposure and are not likely to experience more than low levels of mortality or sublethal adverse effects.

Indirect Effects

The riparian woodrat is a generalist herbivore and can consume a wide variety of vegetative material. Available toxicity studies in plants indicate that no adverse effects to plant survival or growth are likely to occur with exposure to methomyl. As such, we do not anticipate the riparian wood rat will experience any reductions in the abundance of its food or habitat resources. Therefore, we do not anticipate the species will experience any indirect adverse effects.

Toxicity Summary

We expect the riparian woodrat will experience a low level of direct adverse effects. While individuals that consume vegetative material on methomyl use sites will accumulate high levels of methomyl that will cause mortality or high levels of sublethal adverse effects to growth and reproduction, we expect most individuals are not likely to forage on methomyl use sites as agricultural areas do not represent preferred habitat and are unlikely to occur where current populations exist. As such, we do not expect the species will experience more than low levels of mortality or sublethal adverse effects.

We expect the riparian wood rat will not experience any indirect adverse effects. The species is a generalist herbivore and available toxicity studies in plants indicate that methomyl exposure will not cause any mortality or reductions in growth. Thus, there will not likely be any reductions in the availability of plant-based food or habitat resources that the species requires.

Given that we expect only low levels of direct adverse effects and low levels of indirect adverse effects, we assign the riparian woodrat a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The riparian woodrat has a medium exposure ranking. While past usage data from the state of California show a high level of overlap and a moderate level of usage (up to 9% range treated annually), available information on the species' distribution indicates that only remaining populations occur on protected lands where we do not anticipate any methomyl will be used. However, these protected areas occur near agricultural areas, suggesting that while on-field exposure is unlikely to occur, these areas may still experience exposure through spray drift. As such, we anticipate a moderate number of individuals will be exposed.

The riparian woodrat has a low toxicity ranking. While individuals that consume vegetative material on methomyl use sites will accumulate high levels of methomyl that could cause mortality and sublethal effects to growth and reproduction, we expect most individuals are not likely to forage on methomyl use sites as agricultural areas do not represent preferred habitat. As such, we do not expect the species will experience more than low levels of mortality or sublethal adverse effects. We expect the riparian wood rat will not experience any indirect adverse effects as available toxicity data shows methomyl has no adverse effects on the species' main food items (plants).

While we anticipate a moderate number of individuals will be exposed, we do not anticipate exposed individuals are likely to experience more than low levels of mortality and sublethal effects, nor will they experience any indirect adverse effects. As such, we anticipate only a small number of individuals, at most, are likely to experience any adverse effects from the proposed action. We therefore expect the overall risk of adverse effects to the species is low.

Conclusion

The riparian woodrat has high vulnerability based on its status (i.e., endangered), limited distribution, and declining trends, as described above. Their primary habitat includes multi-stored riparian areas, with shrubby understory, midstory or willows or vines, and well-developed overstory. The species occurs in two populations, neither of which is expected to be impacted directly by methomyl exposure. Both are near methomyl use sites, so spray drift and runoff exposure may occur. Methomyl exposure from off-field use may occur on up to 100% of the species' range, but only 7.8% of the range was treated annually with methomyl in the past (53.3% was treated annually with any insecticide). We expect a moderate number of individuals will be exposed based on this past usage data.

Riparian woodrats consume plant material, which will not be affected by methomyl exposure and thus we do not anticipate indirect effects to the species from loss of forage. We also do not expect that the species will experience more than low levels of mortality (small numbers of individuals) or sublethal adverse effects from methomyl exposure on agricultural use sites as it is unlikely the species will forage in these locations.

We expect impacts to be low and a small number of individuals will die. Even though the species' vulnerability is high, we do not expect the small number of individuals likely to die or experience sublethal effects from small impacts to fitness related to growth and reproduction (from consumption of contaminated vegetation on use sites) will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the riparian woodrat.

References

U.S. Fish and Wildlife Service. 2020. Riparian Woodrat (*Neotoma fuscipes riparia*) 5-Year Review. Sacramento, California. 9 pp.

U.S. Fish and Wildlife Service. 2012. Riparian Woodrat (*Neotoma fuscipes riparia*) 5-Year Review: Summary and Evaluation. Sacramento, California. 25 pp.

U.S. Fish and Wildlife Service. 2000. Endangered and Threatened Wildlife and Plants; Final Rule to List the Riparian Brush Rabbit and the Riparian, or San Joaquin Valley, Woodrat as Endangered. Federal Register 65(36): 8881-8890.

C-A7. Mammals: Integration and Synthesis Summaries

U.S. Fish and Wildlife Service. 1998. Recovery Plan for Upland Species of the San Joaquin Valley. Portland, Oregon. 340 pp.

Integration and Synthesis Summary: Mammals - Columbia Basin pygmy rabbit

Scientific Name:	Common Name:	Entity ID:
Brachylagus idahoensis	Columbia Basin pygmy rabbit	1240

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. While there is a high level of overlap between the action area and the species' range (Figure 16) and a high level of past usage, available information on the species' known locations indicates that exposure to the species is unlikely to occur. Based on the species' life history, we do not anticipate individuals are likely to be exposed on methomyl use sites and that individuals are not likely to die or experience sublethal adverse effects or indirect effects from loss of forage, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Columbia basin pygmy rabbit.

Species range

Based on range map dated: 6/8/2022; Columbia Basin DPS (WA-Douglas, Grant, Lincoln, Adams, Benton Counties); *States within the range:* WA. Figure 16 depicts a map of the species' range.

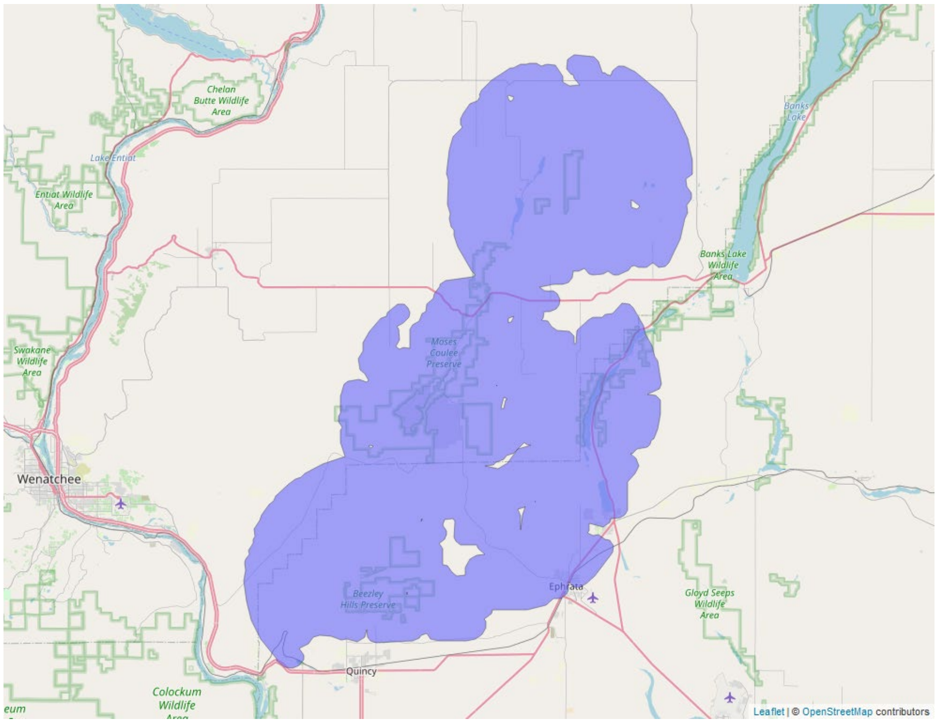

Figure 16. Range map of Columbia Basin pygmy rabbit (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/1126.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 5/15/2019

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

The pygmy rabbit differs significantly from species within either the Lepus or Sylvilagus genera and is now generally considered to be *Brachylagus idahoensis*. Their winter diet includes mostly sagebrush. During spring and summer, their diets consist of up to 51% sagebrush, 39% grasses (particularly native bunch grasses, such as *Agropyron* spp. and *Poa* spp.), and 10% forbs. Population cycles are not known in pygmy rabbits, although local, rapid population declines were noted in several states. After initial declines, pygmy rabbit populations may not have the same capacity for rapid increases in numbers as other leporids due to their close association with specific components of sagebrush ecosystems, and the relatively limited availability of their preferred habitats (USFWS 2013). Historically, pygmy rabbits were found in central Washington, southeastern Oregon, southern Idaho, southwestern Montana, southwestern Wyoming, northern Nevada, western Utah, and northeastern California in shrub steppe and grassland habitats. The Columbia Basin distinct population segment of the pygmy rabbit is found over 125 miles from the nearest historic pygmy rabbit population in central Oregon. The last known wild subpopulation of pygmy rabbits in the Columbia Basin are believed to have been extirpated before 2004, though others may exist (USFWS 2019b). Captive breeding began in 2002 at Washington State University, the Oregon Zoo, and later at Northwest Trek Wildlife Park. Because of their low genetic diversity, captive Columbia Basin pygmy rabbits were interbred with pygmy rabbits from Idaho, but juvenile mortality remained high. In 2011, off-site captive breeding was transitioned to semi-wild breeding in large enclosures. Between fall 2011-spring 2013, 109 pygmy rabbits from Nevada, Utah, Oregon, and Wyoming were translocated to breeding enclosures. Since then, 2,200 kits have been produced and most were released into the Sagebrush Flats Wildlife Area. Some were also released at Beezley Hills Recovery Emphasis Area. Many rabbits released on Sagebrush Flats have migrated to adjacent shrub-steppe habitat enrolled in the Conservation Reserve Program. Annual survival of the released animals varies but has been as high as 30% and reproduction of fully wild animals has been documented. There are 250 rabbits estimated in the areas adjacent to Sagebrush Flats. The Sagebrush Flats population is in a landscape mosaic of native shrub steppe and agriculture, and pygmy rabbits were observed using the agricultural lands and small drainages between them for dispersal (USFWS 2019a, 2019b).

Large-scale loss and fragmentation of native shrub steppe habitats, primarily for agricultural development, likely played a primary role in the long-term decline of the pygmy rabbit. Once a population declines below a certain threshold, it is at risk of extirpation from several influences including chance environmental events (e.g., extreme weather), catastrophic habitat loss or resource failure (e.g., from wildfire or insect infestations), predation, disease, demographic limitations, loss of genetic diversity, and inbreeding. When emergency listed in 2003, the pygmy rabbit was imminently threatened by its small population size, loss of genetic diversity, and inbreeding depression, coupled with a lack of suitable, protected habitats in the wild. Annual mortality rates of adult pygmy rabbits may be as high as 88%, and over 50% of juveniles may die within 5 weeks of birth. Mortality rates vary considerably between years, and even between juvenile cohorts within years. Starvation and environmental stress likely account for some mortality in wild pygmy rabbits, but predation is generally considered to be the main cause of mortality. Potential predators include fossorial and terrestrial mammals such as badgers, long-tailed weasels (*Mustela frenata*), coyotes (*Canis latrans*), bobcats (*Felis rufus*), great horned owls (*Bubo virginianus*), long-eared owls (*Asio otus*), ferruginous hawks (*Buteo regalis*), northern harriers (*Circus cyaneus*), and common ravens (*Corvus corax*) (USFWS 2013). Wildfires are also a threat; in 2017, a wildfire at Breezley burned 30,000 ac of shrub-steppe habitat and claimed 80 rabbits in net pens and enclosures (USFWS 2019a). In addition, many captive pygmy rabbits have died from diseases like coccidiosis and mycobacteriosis, a threat that is preventing the captive population from being able to support reintroduction efforts as of 2019 (USFWS 2019b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 56.9% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 22). Up to 27.9% of the species' range overlaps with methomyl use sites while 28.9% of the range occurs off-field (but may still be exposed to spray drift or runoff). Vegetables and ground fruit and alfalfa are the use sites that are most prevalent within the species' range and are overlapping the range by 16.2% and 13.2%, respectively. However, overlap with other use sites may still contribute to the overall exposure of the species.

Table 22. Overlap and annual usage data (% Range Treated) for the Columbia Basin pygmy rabbit. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	6	7.1	13.2	0.9	1.1	2
Citrus	NA	NA	NA	NA	NA	NA
Corn[21]	4.8	4.5	9.3	0.3	0.2	0.5
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	2.7	4.4	7.2	0.2	0.2	0.4

[21] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Other Orchards	3.5	5.7	9.2	3.5	5.7	9.2
Other Row Crops	0.4	1.4	1.9	0.2	0.6	0.8
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	10.5	5.7	16.2	10.5	5.7	16.2
Wheat	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**27.9**	**28.9**	**56.9**	**15.5**	**13.6**	**29.1**

Usage

Based on past usage data, we anticipate up to 29.1% of the species' range will be treated with methomyl (15.5% on-field and 13.6% off-field) (Table 22).

Additional Exposure Considerations

Columbia basin pygmy rabbits are sagebrush obligates and, as such, are not likely to occur on methomyl use sites. Within their broad geographic range, pygmy rabbits have a patchy distribution and are found where sagebrush occurs in tall, dense clusters and soils are sufficiently deep and friable to allow for burrowing. Populations of Columbia Basin pygmy rabbits are concentrated around recovery emphasis areas, including the Sagebrush Flat Wildlife Area (managed by the Washington Department of Fish and Wildlife) and adjacent Conservation Reserve Program lands, and the Beezley Hills area (managed by the Nature Conservancy). Given that these areas are specifically managed for conservation purposes, we do not anticipate methomyl is likely to be used. The species uses drainages between agricultural areas and Conservation Reserve Program fields for dispersal. As such, we only consider off-field exposure and effects in this analysis.

Exposure Summary

Given that we do not expect individual pygmy rabbits to be present on methomyl use sites, we only consider off-field exposure in our analyses. There is a high extent of overlap between off-field areas that are likely to be exposed to methomyl through spray drift and the pygmy rabbit's range (28.9% total off-field overlap). There is a high level of past usage within the species range, which suggests a large portion of the range has been exposed through off-site transport (up to 13.6%). This high level of past usage suggests that a large portion of the range is likely to be exposed to methomyl annually, and the high level of overlap indicates that a more of the range is likely to be exposed throughout the duration of the proposed action (assuming different areas of the range are treated each year). As such, we expect a large number of individuals will be exposed to methomyl.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the Columbia basin pygmy rabbit. This species is an herbivore and primarily consumes brush leaves and grasses. EPA's exposure modeling indicates that rabbits that feed on contaminated vegetation on methomyl use sites can accumulate up to 40.4 mg/kg-bw methomyl, which can result in a high level of mortality (up to 100% exposed individuals). In contrast, EPA's exposure modeling indicates that rabbits that consume vegetation in areas off-site that are exposed via spray drift are not likely to accumulate more than low levels of methomyl (up to 1.5 mg/kg-bw) that are not likely to result in more than low levels of mortality (up to 4% of exposed individuals). We generally do not anticipate any Columbia Basin pygmy rabbits are likely to forage on methomyl use sites as the known populations are carefully managed in areas that are not expected to be near any agriculture.

Based on available toxicity data in mammals, we anticipate pygmy rabbits that consume contaminated vegetation, specifically contaminated grasses, in areas adjacent to methomyl use sites are likely to experience low levels of sublethal adverse effects (e.g., reduced growth). However, similar to mortality effects, given that the species' populations are carefully managed on protected lands and the species is only known to use drainages near agricultural fields for dispersal, we anticipate that individuals are not likely to forage on plant matter that is highly contaminated with methomyl applied to agricultural fields. As such, we anticipate a low level of sublethal effects are likely to occur to the species.

Indirect Effects

The Columbia Basin pygmy rabbit is a generalist herbivore and can consume a wide variety of vegetative material. Available toxicity studies in plants indicate that no adverse effects to plant survival or growth are likely to occur with exposure to methomyl. As such, we do not anticipate the species will experience any reductions in the abundance of its food or habitat resources. Therefore, we do not anticipate the species will experience any indirect adverse effects.

Toxicity Summary

We expect the Columbia Basin pygmy rabbit will experience a low level of direct adverse effects. While individuals that consume vegetative material on methomyl use sites will accumulate high levels of methomyl that could cause mortality, we expect most individuals are not likely to forage on methomyl use sites. The known locations of populations are near agricultural areas, but the species is only believed to use these areas for dispersal. Similarly, while the consumption of contaminated grass off-field in areas adjacent to methomyl use sites may cause sublethal adverse effects (e.g., reduced growth), we anticipate areas where rabbits forage are not likely to experience high levels of exposure through off-site transport as these areas are not likely near any agricultural areas. Therefore, we do not anticipate many individuals are likely to experience sublethal adverse effects as well.

We expect the Columbia Basin pygmy rabbit will not experience any indirect adverse effects. The species is a generalist herbivore and available toxicity studies in plants indicate that methomyl exposure will not cause any mortality or reductions in growth. Thus, there will not likely be any reductions in the availability of plant-based food or habitat resources that the species requires.

Given that we expect only low levels of direct adverse effects and low levels of sublethal adverse effects, we assign the Columbia Basin pygmy rabbit a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Columbia Basin pygmy rabbit has a high exposure ranking. There is a high extent of overlap between off-field areas and the species' range (28.9% total overlap) and a high level of past usage within the range (up to 13.6% range treated annually). Available information on the species' distribution indicates that known populations of Columbia Basin pygmy rabbits occur on lands managed specifically for conservation purposes and where we anticipate little to no methomyl usage. However, they are known to use drainages areas between agricultural lands and Conservation Reserve Program lands in their range as dispersal corridors. As such, we anticipate a large number of individuals are likely to be exposed.

The Columbia Basin pygmy rabbit has a low toxicity ranking. While individuals that consume vegetative material on methomyl use sites will accumulate high enough concentrations to cause mortality, we expect most individuals are not likely to forage on methomyl use sites. Consumption of contaminated grass off-field in areas adjacent to methomyl use sites may cause sublethal adverse effects (e.g., reduced growth), but we expect the pygmy rabbit to use these off-field sites for dispersal and not for foraging. We do not anticipate any indirect effects will occur as available toxicity data show that plants will not experience any adverse effects from methomyl exposure, indicating no loss of food or habitat resources is likely.

Even though we anticipate a large number of individuals are likely to experience exposure, individuals are not likely to die or experience adverse indirect effects, and few individuals are likely to experience sublethal effects. Therefore, we anticipate only a small number of individuals are likely to experience any adverse effects from the proposed action. As such, we anticipate the overall risk of adverse effects to the species is low.

Conclusion

The Columbia Basin pygmy rabbit has high vulnerability based on its status (i.e., endangered), limited distribution, few reintroduced populations (i.e., zero natural wild populations), and declining trends, as described above. Their primary habitat is shrub steppe, and the few reintroduced populations occur on lands protected or managed for conservation, particularly for the pygmy rabbit. Both populations, however, are surrounded by agriculture and potential methomyl use sites. The species is known to disperse through drainages between agricultural areas and Conservation Reserve Program fields, though their preferred habitat remains shrub steppe. Spray drift and runoff exposure may occur, and 28.9% of the species' range overlaps areas that may experience such offsite transport from methomyl use sites. A high portion of the range (13.6% annually) has also experienced spray drift from methomyl use in the past.

Pygmy rabbits consume plant material, which will not be directly affected by methomyl exposure, so we do not anticipate indirect adverse effects to the species from loss of forage. In addition, we expect the species will experience low levels of direct effects because we do not expect individuals to forage exclusively on methomyl use sites. Thus, we do not expect reductions in plant-based food items, and we do not expect that the species will experience more than low levels of mortality or sublethal adverse effects (in the form of small impacts to fitness related to growth and reproduction) from methomyl exposure.

We expect impacts to be low and a small number of individuals will die or experience sublethal adverse effects from exposure to contaminated forage on agricultural fields. Even though the species' vulnerability is high, we do not expect the small number of individuals likely to experience adverse effects will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Columbia basin pygmy rabbit.

References

U.S. Fish and Wildlife Service. 2019a. Amendment to the recovery plan for the Columbia Basin Distinct Population Segment of the Pygmy Rabbit (*Brachylagus idahoensis*). Portland, Oregon. 12 pp.

U.S. Fish and Wildlife Service. 2019b. 5-Year Review Columbia Basin Distinct Population Segment of the Pygmy Rabbit (*Brachylagus idahoensis*). Portland, Oregon. 54 pp.

C-A7. Mammals: Integration and Synthesis Summaries

U.S. Fish and Wildlife Service. 2013. Recovery Plan for the Columbia Basin Distinct Population Segment of the Pygmy Rabbit (*Brachylagus idahoensis*). Portland, Oregon. ix + 109 pp.

Integration and Synthesis Summary: Mammals - Roy Prairie pocket gopher

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a low level of overlap between the action area and the species range (Figure 17) and a low level of past usage, indicating only a small number of individuals are likely to be exposed. While individuals foraging on methomyl use sites are likely to die, we do not anticipate these adverse effects will occur in more than a small number of individuals, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Roy Prairie pocket gopher.

Species range

Last updated: 10/15/2021; Wherever found; *States within the range:* WA

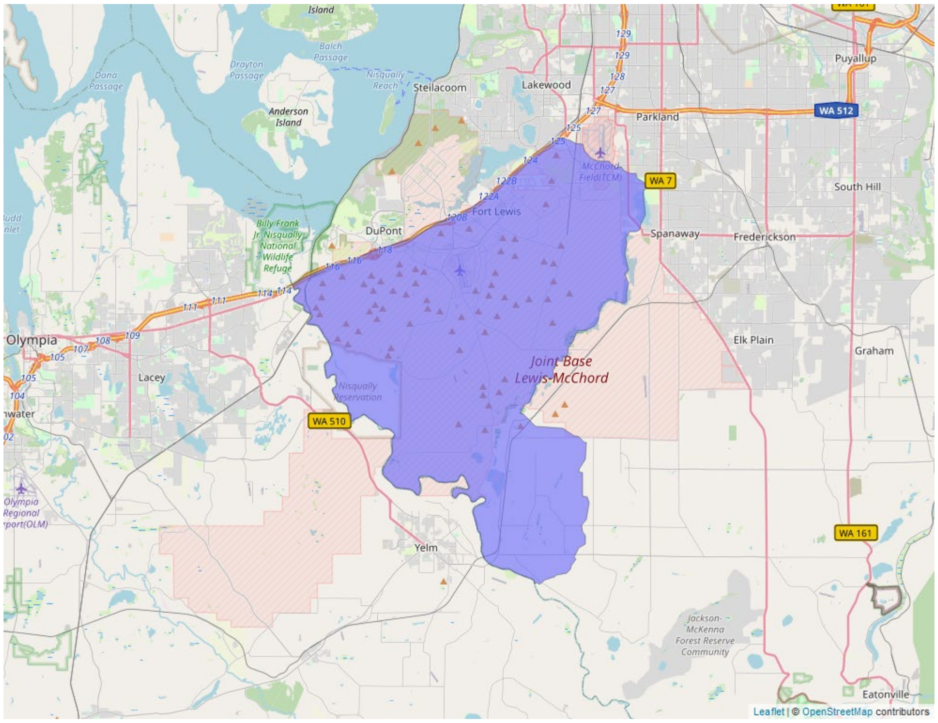

Figure 17. Range map of Roy Prairie pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7821.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Threatened

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 9/28/2020

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

Number of populations: Multiple populations (few)

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

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Roy Prairie pocket gophers are a subspecies of Mazama pocket gopher endemic to Pierce County, Washington. They are concentrated in well-drained, friable soils often associated with glacial outwash that form prairies and grasslands. Though they prefer prairie grassland habitats, they may occur on lands with some agricultural land uses, including crop production, pasture, and hay fields (USFWS 2022a). They are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. Pocket gophers are not known to occur where Douglas-fir (*Pseudotsuga menziesii*) or Scotch broom (*Cytisus scoparius*) have invaded. As of 2020, they are found near Roy Prairie and on Joint Base Lewis-McChord and their locations are categorized into three Recovery Units: AIA (unknown resiliency; no population trends available but abundance is believed to be high; some habitat is managed for pocket gopher habitat), SIA (high resiliency; no population trends available but abundance is believed to be high; some habitat is managed for pocket gopher habitat), and Roy (low resiliency; no population trends available) (USFWS 2022b).

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

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 3.6% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 23). Up to 0.2% of the species' range overlaps with methomyl use sites while 3.4% of the range occurs off-field (but may still be exposed to spray drift or runoff. Other orchards and vegetables and ground fruit are the methomyl use sites that are most prevalent within the Roy Prairie pocket gopher's range, making up 1.8% and 1.6% of the range, respectively. However, we anticipate overlap with other use sites can still contribute to the overall exposure of the species.

Table 23. Overlap and annual usage data (% Range Treated) for the Roy Prairie pocket gopher. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	<0.1	<0.1	0	0.0	0.0
Citrus	NA	NA	NA	NA	NA	NA
Corn[22]	<0.1	0.1	0.1	0	0.0	0.0
Cotton	0	0	0	0	0.0	0.0
Other Grains	<0.1	<0.1	<0.1	0	0.0	0.0
Other Orchards	<0.1	1.7	1.8	<0.1	1.7	1.8
Other Row Crops	0	0	0	0	0.0	0.0
Soybeans	0	0	0	0	0.0	0.0
Vegetables and Ground Fruit	0.1	1.5	1.6	0.1	1.5	1.6
Wheat	0	0	0	0	0.0	0.0
Total	**0.2**	**3.4**	**3.6**	**0.2**	**3.2**	**3.4**

[22] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 3.4% of the species' range will be treated with methomyl (0.2% on-field, 3.2% off-field) (Table 23).

Additional Exposure Considerations

The low level of usage noted above is corroborated by data from USDA's Census of Agriculture, which reports only 0.08% of the species' range has been treated with any insecticide. Given that this data is spatially specific to the Roy Prairie pocket gopher's range and includes usage of other insecticides in addition to methomyl, we consider this a conservative metric of past methomyl usage and have high confidence that only small portions of the species' range are likely to be treated annually. However, available information on the species' foraging behavior indicate that individuals are likely to forage on agricultural fields, indicating that exposure is likely to occur on these small portions of the range.

Exposure Summary

There is a low extent of overlap between the action area and the species' range (3.6% total overlap). Based on past usage data, we expect a low level of usage within the species' range (up to 3.4% of the range treated annually), which is corroborated by a low level of insecticide usage as reported by the Census of Agriculture. Despite this low level of usage, given that individuals may occasionally forage on agricultural use sites, we anticipate exposure is likely to occur in these small portions of the range.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate the main route of exposure for the Roy Prairie pocket gopher is through dietary exposure (i.e., consuming prey that consumed food contaminated with methomyl). The Roy Prairie pocket gopher is an obligate herbivore. EPA's exposure modeling indicates that individuals that consume plant matter like leaves on contaminated food on methomyl use sites can accumulate levels of methomyl up to 25.3 mg/kg-bw, which can result in up to 99% mortality and high levels of sublethal effects to growth and reproduction in exposed individuals that do not die. Exposure modeling indicates that individuals consuming plant matter in off-site areas contaminated by spray drift or runoff will accumulate up to 0.9 mg methomyl/kg-bw, which can cause up to only low levels of mortality and no sublethal effects to growth and reproduction to exposed individuals. Even though pocket gophers may occasionally forage on agricultural lands, their primary food sources are prairie forbs and grasses. We anticipate at most, a low level of lethal and sublethal effects are likely to occur to the species.

Indirect Effects

Available toxicity data indicate that plants are not likely to experience any adverse effects to survival, growth, or reproduction. As such, we do not anticipate there will be any reductions in the availability of the Roy Prairie pocket gopher's main food resource. As such, we do not anticipate any adverse indirect effects are likely.

Toxicity Summary

We expect a low level of direct adverse effects will occur. EPA's exposure modeling indicates that individuals that forage on use sites are likely to accumulate high levels of methomyl, resulting in high levels of mortality (up to 99% of exposed individuals) and sublethal adverse effects. We anticipate a low level of mortality in individuals foraging off-field in areas exposed by spray drift (up to 0.02% of exposed individuals) and no sublethal adverse effects likely at these exposures. Any exposed individuals that do not die are likely to experience some level of adverse effect to growth and reproduction. We do not anticipate any adverse indirect effects are likely to occur as available toxicity data show no adverse effects to the species' main food resource (i.e., plants).

Given that we expect most individuals will forage off-field, we expect low levels of mortality and sublethal effects, confined to those individuals that forage in agriculture where methomyl has been used. As such. we determine the Roy Prairie pocket gopher has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Roy Prairie pocket gopher has a low exposure ranking. While there is a low extent of overlap between the species' range and the action area (3.6% total overlap), and a low level of past usage (up to 3.4% range treated annually, which is corroborated by data from the Census of Agriculture), the Roy Prairie pocket gopher is known to occupy and forage in agricultural areas, including methomyl use sites. As such, we anticipate exposure to methomyl is likely to occur to individuals in these small portions of the range.

The Roy Prairie pocket gopher has a low toxicity ranking. The species is known to forage on agricultural areas, though their primary forage species are forbs and grasses found in prairies and grasslands. A few individuals are likely to be exposed to high levels of methomyl through their diet on agricultural use sites. We expect up to 99% mortality of individuals that have foraged on-field and up to 5% mortality in individuals foraging off-field. We expect exposed individuals that do not die are likely to experience sublethal effects to growth and/or reproduction. We do not anticipate any adverse indirect effects to the species as their main food source is not likely to be adversely affected by methomyl.

Because we anticipate a small number of individuals are likely to be exposed and that only those few individuals that forage on methomyl treated sites are likely to die, we anticipate the risk of adverse effects to the species overall is low.

Conclusion

The Roy Prairie pocket gopher has high vulnerability based on its limited distribution, single population, and declining trends, as described above. Their primary habitat is prairies and grasslands with friable soils, but they also occur on agricultural lands, including crops, pasture, and hay fields, and are known to eat crops. Methomyl use sites overlap 3.6% of the species range, 0.2% of which is on-field. Data indicate that up to 3.4% of the range has been treated annually with methomyl in the past (0.2% on-field and 3.2% off-field), and an even smaller area (0.08%) was reported in the USDA Census of Agriculture as having been treated with any insecticide. The Roy Prairie pocket gopher has a low exposure ranking. However, because the species is known to forage on agricultural lands, we expect that adverse effects are likely to occur in these small portions of the range.

Pocket gophers consume plant material, which will not be directly affected by methomyl exposure, thus we do not anticipate indirect adverse effects to the species from loss of forage. However, the species occasionally eats agricultural crops and we expect that pocket gophers that consume contaminated vegetation on methomyl use sites are likely to experience mortality or adverse sublethal effects (in the form of loss of fitness related to growth and reproduction). However, as pocket gophers primarily eat forbs and grasses found in prairies and grasslands, we expect only a few individuals will experience lethal or sublethal effects from foraging on methomyl use sites.

We expect impacts to be low and a small number of individuals will die or experience adverse sublethal effects. Even though the species' vulnerability is high, we do not expect the small number of individuals likely to die or experience a small loss of fitness will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. 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, OR. 61 pp.

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

Integration and Synthesis Summary: Mammals – North American wolverine

Scientific Name:	Common Name:	Entity ID:
Gulo gulo luscus	North American wolverine	4016

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is medium. While there is a moderate level of overlap between the action area and the species' range (Figure 18) and a low level of past usage, available information on the species' habitat preferences indicates that the species is unlikely to be exposed to methomyl. Based on the species' life history, we do not anticipate individuals are likely to be exposed on methomyl use sites and individuals are not likely to die or experience sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the North American wolverine.

Species range

Based on range map dated: 1/12/2024; Wherever found; *States within the range:* CA, ID, MT, NV, OR, UT, WA, WY. Figure 18 depicts a map of the species' range.

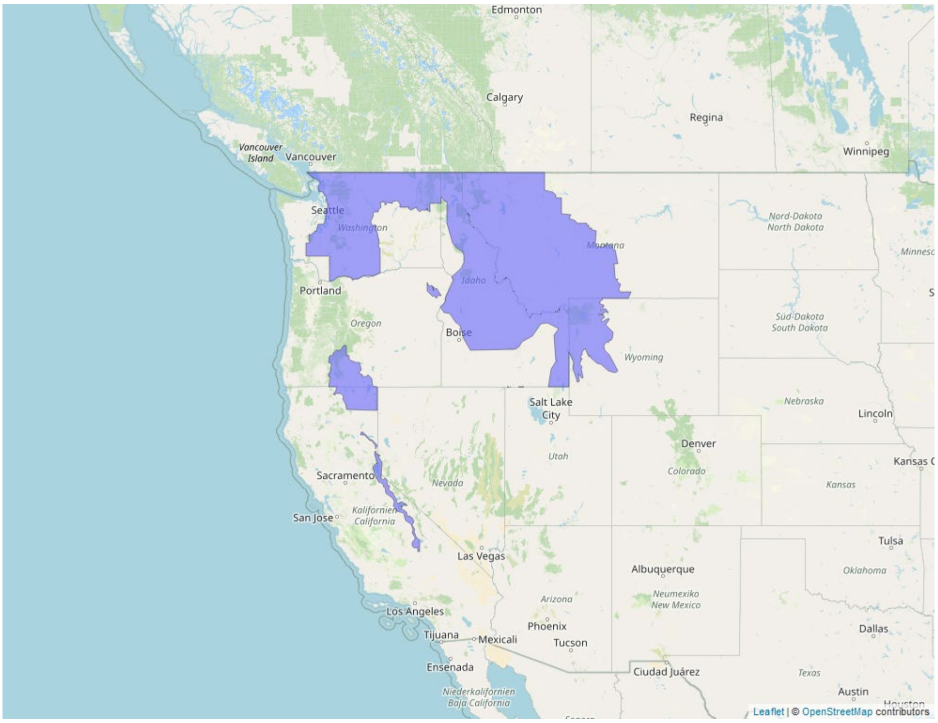

Figure 18. Range map of North American wolverine (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/5123.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Threatened

Most recent 5-Year Review recommendation: N/A

Most recently completed 5-Year Review: N/A

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

Wolverines are highly mobile and primarily nocturnal carnivores in the west-northwestern North America. They occupy various habitats, including Arctic tundra, subarctic-alpine tundra, boreal forest, mixed forest, redwood forest, and coniferous forest. They are opportunistic foragers that act as a scavenger and a predator (i.e., deer, elk, hoary marmots, Columbian ground squirrels, rabbits, ptarmigans, porcupines, mice, beaver, fish, ducks, seals, gulls and gull eggs, and lemmings) and they are known to eat antlers, bones, and skulls. They use large territories in relatively inaccessible landscapes between 1,800-3,500 m in elevation (USFWS 2023b). Historically, they were found in much of the northern portion of North America and extended southward through Maine to Washington (USFWS 2020). Wolverine occupancy varies across their range, with highest occupancy probability in the Northern Continental Divide ecosystem in Montana, intermediate occupancy in the Cascade Mountains in Washington and central Idaho, and low occupancy in the Greater Yellowstone ecosystem. Surveys in 2016-2017 indicated a range expansion into southern Cascades in Washington and Wind River Range in Wyoming. A resident male wolverine was observed in California between 2008-2018, the first seen in California since the 1920s. As of 2023, there have been several verified observations of a potentially different individual in the Inyo National Forest and Yosemite National Park. The only wolverine confirmed in Colorado since the early 1900s was killed in 2016.

Wolverine occupancy is believed to have been consistent between 2016-2017 and 2021-2022. There seems to have been an incremental loss of resident wolverines between 2010-2014 in Idaho and trapping efforts in Payette National Forest support a decline (2011: nine captured, 2021: four captured). Surveys in Boise National Forest in central Idaho suggest a stable population. Additional detections of wolverines (via camera bait stations) were confirmed in the Lost River and Lemhi Ranges in southeastern Idaho in the winter of 2017-2018. Surveys conducted in 2019-2020 in the Caribou Targhee National Forest in both the Southeast and Upper Snake regions of Idaho, and in the Boise National Forest detected wolverines at one location in the Magic Valley Region and one location in the Southeast Region. No wolverines were detected in the Upper Snake Region despite this area containing a larger amount of modeled wolverine habitat and its proximity to known occupied habitat in the Greater Yellowstone Ecosystem. Several wolverines were confirmed through DNA to use Bitterroot National Forest in Idaho and Montana between 2013-2019. Montana statewide occupancy seems to have declined between 2016-2017 and 2021-2022. In Oregon, there were five verified wolverine sightings between 1929-1992. One male was detected in 2011 and again in 2022. Multiple wolverines were sighted in 2023 around Portland and the central Cascades. In Utah, wolverines have been confirmed in the Bear River, Wasatch, and Uinta Ranges since 2005 and one was relocated to the Uinta Mountains due to depredation of domestic sheep. There are no recent records of wolverine reproduction in Utah. The Cascades population in Washington likely consists of fewer than 50 individuals. Wolverines appear to be distributed across the Greater Yellowstone ecosystem in Wyoming, but occupancy rates were low in 2016-2017. The true population size in the contiguous U.S. is unknown, as is the effective population size; best available estimates suggest populations are relatively small (~300 in the western U.S.) (USFWS 2023b).

Wolverines are threatened by vehicle collisions and roads generally reduce the habitat quality for wolverines. Large transportation corridors can have a significant impact on wolverine population connectivity and gene flow. Habitats in the contiguous U.S. outside of the known breeding distribution of wolverines, including the Sierra Nevada in California and the central Rocky Mountains in Colorado, are separated from occupied habitats by large expanses of high-resistance habitats, anthropogenic features, and highways. Wolverines avoid areas with winter recreational activities (motorized and non-motorized), which results in habitat loss and functional degradation for the species. In many areas, winter recreation activities are increasing over time (USFWS 2023b). Wolverines, especially their habitat, are threatened by climate change (i.e., phenological changes, shifts in vegetation and vegetation succession, loss of snowpack) (USFWS 2020). They are also threatened by small population sizes and lack of genetic diversity (USFWS 2023a). Wolverine habitat is expected to decrease in some areas and become more fragmented because of climate changes that result in increased temperatures, earlier spring snowmelt, and loss of deep, persistent spring snowpack. Human development may continue to expand in areas between core habitats, furthering fragmentation and potentially causing an increase in winter recreation, which negatively influences wolverine behaviors (USFWS 2023b).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 7.3% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 24). We are unable to parse overlap for this species into on- and off-field components as the EPA did not include this information in the BE. Alfalfa is the use site with the greatest prevalence within the species' range with 3.27% total overlap. However, overlap with other use sites may still contribute to the overall exposure of the species.

Table 24. Overlap and annual usage data (% Range Treated) for the North American wolverine. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Total Overlap (% range)	Total % Range Treated
Alfalfa	3.27	0.5
Citrus	NA	0
Corn[23]	0.46	0

[23] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Use Layer	Total Overlap (% range)	Total % Range Treated
Cotton	0.03	0
Other Grains	1.54	0.1
Other Orchards	0.47	0.5
Other Row Crops	0.1	0
Soybeans	0	0
Vegetables and Ground Fruit	1.03	1
Wheat	0.45	0
Total	**7.35**	**2.1**

Usage

Based on past usage data, we anticipate up to 2.1% of the species' range will be treated with methomyl (Table 24).

Additional Exposure Considerations

The North American wolverine requires large territories in relatively inaccessible landscapes, typically at high elevations (1,800-3,500 meters), access to a variety of food resources, and physical or structural features like talus slopes or rugged terrain. Persistent spring snow is an important predictor of wolverine distribution and density (USFWS 2023). We do not anticipate methomyl use sites are likely to coincide with or be located near areas that wolverines are likely to use as habitat.

Exposure Summary

The North American wolverine has a moderate extent of overlap (7.35% total overlap). Past usage data indicate a low level of usage within the species' range (up to 2.1% range treated annually). While a moderate portion of the species' range may be treated over the duration of the proposed action (especially if the areas treated with methomyl change over time), we expect only a small number of wolverines are likely to be exposed as the species' preferred habitat is not likely to contain, nor be located near, any methomyl use sites.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the North American wolverine. While wolverines are opportunistic foragers that can consume small and large mammals, birds, fish, and even vegetative material. EPA's exposure modeling indicates that wolverine that exclusively consume prey that have recently foraged on contaminated food items on methomyl use sites (i.e., within the last 24 hours) are likely to accumulate high levels of methomyl (up to 10.1 mg/kg-bw), which can result in a high level of mortality (up to 100% of exposed individuals). However, we do not anticipate wolverines are likely to frequently encounter prey that recently foraged on methomyl use sites as their typical habitat (e.g., high elevation rugged terrain with persistent snow cover) are not likely to be near any agricultural areas. EPA's exposure modeling indicates that wolverine that consume prey and food items contaminated through off-site transport (e.g., spray drift) are not likely to accumulate levels of methomyl that are likely to cause mortality or sublethal effects, such as reduced growth.

Indirect Effects

The North American wolverine is an opportunistic forager that can consume a wide variety of animal prey and even plant material. Based on available toxicity data in surrogate species, we anticipate there will be a high level of mortality in these prey items when they consume contaminated food on methomyl use sites. However, given that we anticipate a low prevalence of agricultural areas within the areas wolverine are more likely to occur in (e.g., high elevation rugged terrain), we anticipate the impact of on-field exposure and subsequent mortality of prey species will not result in a substantial reduction in the availability of prey for the wolverine. As such, we anticipate the species is not likely experience more than low levels of indirect adverse effects.

Toxicity Summary

We expect the North American wolverine will experience only low levels of direct adverse effects. While individuals that consume prey species that have recently foraged on methomyl use sites (e.g., within the last 24 hours), we expect individuals are not likely to encounter prey that have recently foraged on agricultural sites as these pesticide use sites are not likely very prevalent within the wolverine's habitat (e.g., high elevation rugged terrain). We do not anticipate consuming prey that have been exposed in areas adjacent to methomyl use sites (e.g., through spray drift) are likely to result in methomyl dosages that will cause any mortality or sublethal adverse effects.

We expect the North American wolverine will experience only low levels of indirect adverse effects. While prey species that forage on methomyl use sites are likely to experience a high level of mortality, we do not anticipate this will result in substantial reductions in the availability of food for the wolverine as methomyl use sites are not likely prevalent within the species' habitat.

Given that we expect only low levels of direct adverse effects and low levels of indirect adverse effects are likely to occur, we assign the North American wolverine a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The North American wolverine has a low exposure ranking. There is a moderate extent of overlap between the species' range and the action area (7.35% total overlap) and a low level of past usage (up to 2.1% range treated annually). While a moderate portion of the species' range may be treated over the duration of the proposed action (especially if the areas treated with methomyl change over time), we expect only a small number of wolverines are likely to be exposed as the species' preferred habitat is not likely to contain, nor be located near, any methomyl use sites.

The North American wolverine has a low toxicity ranking. While individuals that consume prey species that have recently foraged on methomyl use sites (e.g., within the last 24 hours) are likely to die, we expect this scenario is not likely to occur as the species is unlikely to encounter prey that have recently foraged on agricultural sites given that these pesticide use sites are not likely very prevalent within the wolverine's habitat (e.g., high elevation rugged terrain). We do not anticipate wolverines consuming prey that have been exposed in areas adjacent to methomyl use sites (e.g., through spray drift) are likely to result in methomyl dosages that will cause any mortality or sublethal adverse effects. While prey species that forage on methomyl use sites are likely to experience a high level of mortality, we do not anticipate this will result in substantial reductions in the availability of food for the species as individuals are opportunistic foragers and will likely have sufficient food resources available despite the loss of any prey exposed on-field.

Given that we expect only a small number of individuals are likely to be exposed and that exposed individuals are not likely to experience more than low levels of mortality, no sublethal effects, and only small reductions in food resources, we expect, at most, only a small number of individuals will experience any adverse effects from the proposed action. As such, we anticipate the overall risk of adverse effects to the species is low.

Conclusion

The North American wolverine has medium vulnerability based on its declining trends, as described above. They primarily occur in relatively inaccessible landscapes, usually at high elevations (1,800-3,500 m), but their territories are large. We do not anticipate methomyl use sites will coincide or be located near areas that wolverines use as habitat. Therefore, even though methomyl use sites overlap 7.35% of the species range and 2.1% of the range has been treated annually with methomyl in the past, we expect a small number of individuals will be exposed throughout the duration of the action. Wolverines are opportunistic omnivores that consume small and large mammals, birds, fish, and plants. We do not expect wolverines will frequently encounter prey that recently foraged on methomyl use sites because typical wolverine habitat is not near agricultural areas. We expect low levels of adverse effects to wolverines in the form of low levels of mortality (a small number of individuals) and low indirect effects resulting in a small loss of fitness related to growth and reproduction from loss of prey.

Because we expect impacts to be low, a small number of individuals will die and low levels of prey loss, and the species vulnerability is medium, we do not expect the small number of individuals likely to die and minimal prey loss will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the North American wolverine.

References

U.S. Fish and Wildlife Service. 2023a. Endangered and Threatened Wildlife and Plants; Threatened Species Status With Section 4(d) Rule for North American Wolverine. Final rule and interim rule with request for comments. Federal Register 88(229):83726-83772.

U.S. Fish and Wildlife Service. 2023b. Species status assessment addendum for the North American wolverine (*Gulo gulo luscus*). Lakewood, Colorado. 100 pp.

U.S. Fish and Wildlife Service. 2020. Species status assessment for the North American wolverine (*Gulo gulo luscus*). Version 1.2. Lakewood, Colorado. 179 pp.

Integration and Synthesis Summary: Mammals – Pacific sheath-tailed bat

Scientific Name:	Common Name:	Entity ID:
Emballonura semicaudata semicaudata	Pacific sheath-tailed bat	4564

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a medium level of overlap between the action area and the species' range (Figure 19), indicating that a moderate number of individuals is likely to be exposed. Based on the species' life history, we do not anticipate individuals are likely to be exposed on methomyl use sites and individuals are not likely to die or experience any sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Pacific sheath-tailed bat.

Species range

Based on range map dated: 1/24/2024; American Samoa; *States within the range:* AS. Figure 19 depicts a map of the species' range.

Figure 19. Range map of Pacific sheath-tailed bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/3650.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 7/26/2021

Distribution: Unknown

Number of populations: Extirpated

Species trends: Extirpated

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Pacific sheath-tailed bat is small member of Emballonuridae, an Old-World bat family that has an extensive distribution primarily in the tropics. They are insectivorous and cave-dependent (e.g., overhanging cliffs, crevices, lava tubes, and limestone caves) and they prefer mature well-structured forests with a high, dense canopy. The species was once common and widespread in Sāmoa, American Sāmoa, Fiji, Vanuatu, and Tonga, but it is declining throughout its range and is believed to be extirpated from Sāmoa and American Sāmoa. As of 2022, it is believed to only occur on Fiji (USFWS 2022). In 1975, the American Sāmoa population was believed to include 11,000 bats, but by 1988, only 200 were recorded. Pacific sheath-tailed bats were last detected in American Sāmoa in 1998 in the cave at Anapeapea Cove on the north shore of Tutuila, despite several surveys between 2006-2015 (USFWS 2021).

Threats to the species include deforestation (i.e., agriculture and urban development), goat and pig herbivory, predation by non-native mammals (i.e., rats, feral cats), cave disturbance, flooding and tropical storms, climate change, and low genetic diversity. Logging, agriculture, development, and tropical cyclones are the main causes of deforestation of the species habitat. Loss of native plant diversity from conversion of native forests to other land uses has also caused a corresponding decline in flying insects, the Pacific sheath-tailed bat's prey. Overgrazing by non-native goats and feral pigs also destroys and degrades forests. Non-native mammals, including rats and feral cats, capture low-flying bats and wait for them as they emerge from caves. Human disturbance of roosting caves through recreation, harvesting of co-occurring bat species, and guano mining also contributes to the bat's decline. Pesticides may negatively affect the Pacific sheath-tailed bat through direct toxicity and reduction in insect prey availability; based on information as of 2019, we did not believe use of pesticides was a current threat to the species (USFWS 2021). The National Park of American Sāmoa was established to preserve and protect the tropical forest and archaeological and cultural resources, to maintain Pacific sheath-tailed bat habitat, to preserve the ecological balance of the Samoan tropical forest, and, consistent with the preservation of these resources, to provide for the enjoyment of the unique resources of the Samoan tropical forest by visitors from around the world (Public Law 100-571, Public Law 100-336). Under a 50-year lease agreement between local villages, the American Sāmoa government, and the federal government, approximately 8,000 acres of forested habitat on the islands of Tutuila, Tau, and Ofu are protected and managed, including suitable habitat for the Pacific sheath-tailed bat (USFWS 2021). In the species' recovery plan, we recommended conducting surveys in and around caves on Tau and Tutuila, particularly because some of these areas have not been fully assessed. We may consider translocation to increase redundancy in the future (USFWS 2022).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 7.1% of the species' range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 25). We do not expect any on-field exposure is likely to occur as the species' range does not overlap with any methomyl use sites. As such, we only consider off-field exposure in our analysis for the species.

Table 25. Overlap data for the Pacific sheath-tailed bat.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
Cultivated land layer	0.0	7.1	7.1

Usage

Past methomyl usage data in the territories of the United States is unavailable. However, prior usage data in other island territories and Hawai`i indicate that insecticide usage is likely to occur, with methomyl presumably being among those insecticides. While we are not able to use this generic data to adjust overlap estimates, we can broadly use this data as confirmation that methomyl usage likely occurs within the species' range.

Additional Exposure Considerations

The Pacific sheath-tailed bat is currently believed to be extirpated from American Sāmoa, the only portion of its range within the U.S.

Exposure Summary

Even though the species is likely extirpated from the U.S., there is a moderate extent of overlap between the species' range and the action area. If they still occur on American Sāmoa, we expect some individuals are likely to be exposed.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

The Pacific sheath-tailed bat primarily consumes flying insects. EPA's exposure modeling predicts that individuals that feed on-field or forage on insect prey that have recently been exposed to methomyl on use sites will accumulate high levels of methomyl (up to 19.3 mg/kg-bw). This level of exposure will result in a high level of mortality (up to 88.3% of exposed individuals). EPA's exposure modeling indicates that individuals that feed off-field on insects that have not been recently exposed on use-site (i.e., through spray drift only) will accumulate only low levels of methomyl that are not likely to cause any adverse effects. Given that the species prefers to forage in mature well-structured forests with a high, dense canopy, we do not anticipate individuals are likely to forage on insects that have recently been exposed to methomyl applications on use sites (USFWS 2022). As such, we anticipate individuals will accumulate only low levels of methomyl and that exposed individuals are not likely to die or experience sublethal effects (e.g., reduced growth).

Indirect Effects

The Pacific sheath-tailed bat's primary food source is flying insects. Based on available toxicity data in insect species, we anticipate there will be a high level of insect mortality. However, we expect the level of mortality will vary across species because of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire insect community is likely to experience complete mortality and that individual bats will still have sufficient food resources available, particularly in areas away from methomyl use sites (such as the mature forest ecosystems that these bats favor). As such, we do not anticipate more than low levels of indirect adverse effects are likely.

Toxicity Summary

The Pacific sheath-tailed bat is likely to experience only low levels of direct adverse effects. Given that individuals forage in mature, well-structured forest with a high, dense canopy, we anticipate individuals are not likely to consume insects that have recently been exposed on methomyl use sites, indicating that individuals are not likely to accumulate high levels of methomyl and are not likely to experience any direct adverse effects.

We expect the Pacific sheath-tailed bat will not experience more than low levels of indirect adverse effects. While we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we expect there will be a variation of response to methomyl exposure across the insect community and that there will not likely be compete mortality of the entire insect community. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

Given that we anticipate the species will only experience low levels of direct and indirect adverse effects, the Pacific sheath-tailed bat has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Pacific sheath-tailed bat has a low exposure ranking. If the species remains in American Sāmoa (i.e., is not extirpated), we do not expect more than a few individuals are likely to be exposed as the Pacific sheath-tailed bat does not use agricultural lands even though there is a moderate extent of overlap between the species' range and the action area.

The Pacific sheath-tailed bat has a low toxicity ranking. We anticipate individuals are not likely to consume insects that have recently been exposed on methomyl use sites, indicating that individuals are not likely to accumulate high levels of methomyl and are not likely to experience any adverse effects. While we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we expect there will be a variation of response to methomyl exposure across the insect community and that there will not likely be compete mortality of the entire insect community. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

As the species is currently believed to be extirpated from the United States, we do not anticipate more than a few individuals will be exposed to methomyl. Should any individuals exist or repopulate American Sāmoa, we anticipate individuals are not likely to experience more than low levels of mortality, no sublethal effects, and only low levels of indirect effects through small reductions in the availability of prey. Therefore, we expect the overall risk of adverse effects to the species is low.

Conclusion

The Pacific sheath-tailed bat has high vulnerability based on its status (i.e., endangered) and unknown distribution and status, as described above. They are insectivorous and cave-dependent, preferring mature well-structured forests with high and dense canopies. Though they were once common, we believe they may be extirpated from the only location where they previously occurred in the U.S., American Sāmoa. Methomyl use sites overlap 7.1% of the species range and past methomyl usage data is unavailable, therefore it has a medium exposure ranking. Because of their habitat requirements (i.e., dense forests), we do not expect Pacific sheath-tailed bats to feed on insects that were recently exposed to methomyl on use sites. We anticipate individuals will accumulate only low levels of methomyl and that exposed individuals are not likely to die or experience sublethal effects (e.g., reduced growth). We also anticipate only low levels of indirect effects (in the form of small impacts to fitness related to growth and reproduction) as we expect that the response to methomyl exposure will vary across the insect community and there will not likely be compete mortality of the entire insect community. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience mortality.

Therefore, we expect impacts to the species to be low. We do not expect individuals to die or experience appreciable loss of food resources, therefore we do not expect adverse species-level effects from the proposed action. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Pacific sheath-tailed bat.

References

U.S. Fish and Wildlife Service. 2022. Recovery Plan for Five Species from American Sāmoa. Honolulu, Hawaii. 21 pp.

U.S. Fish and Wildlife Service. 2021. Pacific Sheath-tailed Bat (*Emballonura semicaudata semicaudata*). 5-Year Review. Honolulu, Hawaii. 13 pp.

Integration and Synthesis Summary: Mammals - Olympia pocket gopher

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a high level of overlap between the action area and the species' range (Figure 20), and a low level of past usage within the range. Based on the species' life history, we do not anticipate more than a small number of individuals are likely to occur on methomyl use sites, indicating that exposure to the species is low. Based on the species' habitat preferences, we do not anticipate more than a small number of individuals are likely to be exposed on methomyl use sites and die or experience sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Olympia pocket gopher.

Species range

Last updated: 10/20/2022; Wherever found; *States within the range:* WA

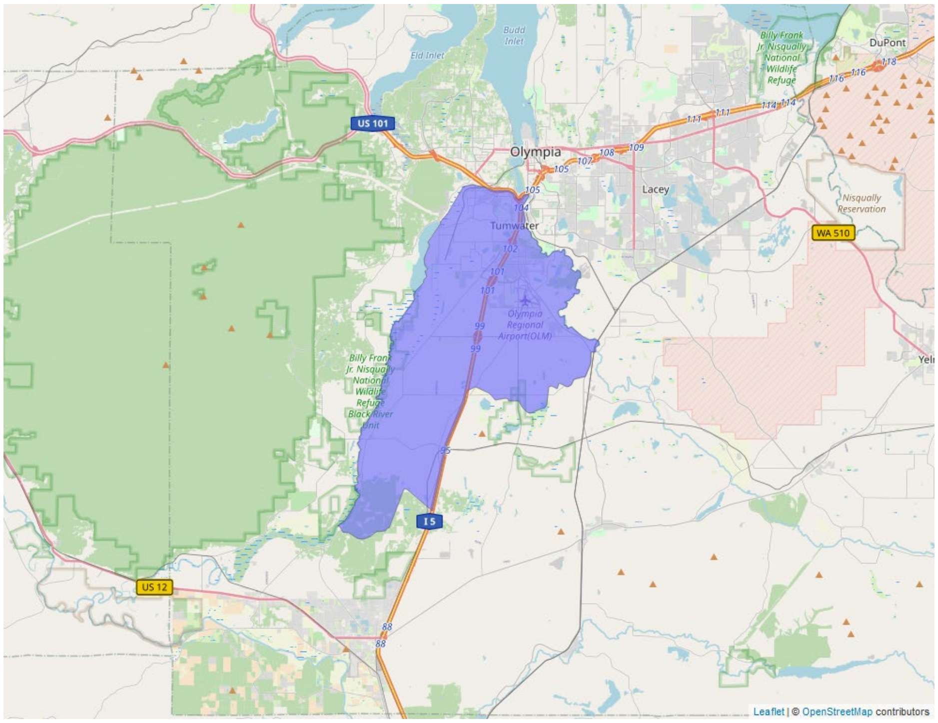

Figure 20. Range map of Olympia pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6713.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Threatened

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 9/28/2020

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

Number of populations: Single population

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

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

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

Olympia pocket gophers are currently threatened by habitat loss, primarily caused by development (e.g., residential, road, and commercial) and woody plant encroachment, throughout the range of the subspecies. The action area is undergoing rapid urbanization. Industrial, light industrial, and residential land uses have steadily increased and this trend is expected to continue. Paved areas, compacted soils, excavations, and encroaching shrubs and trees degrade the habitat value on most of the remaining unbuilt parcels. The result is intensive habitat fragmentation throughout the action area and ongoing habitat loss. Fragmentation reduces the gopher's ability to disperse to the decreasing and shrinking patches of suitable habitat. Fires historically maintained the early-successional habitats required by Olympia pocket gophers, but fire suppression encouraged woody plant encroachment and succession. Predation is a significant population-level and ongoing threat, especially from domestic animals associated with residential development and recreation (i.e., feral cats, dogs). Unlike other pocket gophers, no military training occurs in the range of the Olympia subspecies of the Mazama pocket gopher. Olympia pocket gophers are also at risk of poisoning and trapping as a pest and effects of small and isolated populations (i.e., genetic concerns). Pesticides and herbicides may cause an individual threat to Olympia pocket gophers, but it is not considered a population-level threat (USFWS 2022a).

We delineated Service Areas and Reserve Priority Areas for the Olympia pocket gopher to identify locations where impacts to the subspecies or its habitat may be mitigated or offset. There are thirteen Habitat Conservation Plans in the species range. We are also coordinating with Joint Base Lewis McChord to enhance their Army Compatible Use Buffer Program and south Puget Sound Sentinel Landscapes Program to benefit the species (USFWS 2022b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 11.3% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 26). Up to 1% of the species' range overlaps with methomyl use sites while 10.3% of the range occurs off-field (but may still be exposed to spray drift or runoff.

Table 26. Overlap and annual usage data (% Range Treated) for the Olympia pocket gopher. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	0.4	0.5	<0.1	<0.1	0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[24]	0.1	0.8	1	0	0	0.0
Cotton	0	0	0	0	0	0.0
Other Grains	<0.1	0.2	0.2	0	0	0.0
Other Orchards	0.4	5.5	5.9	0.4	5.5	5.9
Other Row Crops	<0.1	<0.1	<0.1	0	0	0.0
Soybeans	0	0	0	0	0	0.0
Vegetables and Ground Fruit	0.5	3.3	3.8	0.5	3.3	3.8
Wheat	0	0	0	0	0	0.0
Total	**1**	**10.3**	**11.3**	**0.9**	**8.9**	**9.8**

[24] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 9.8% of the species' range will be treated with methomyl (Table 26).

Additional Exposure Considerations

Additional data from USDA's Census of Agriculture indicate only 0.23% of the species' range has been treated with any insecticide. Given that this data is spatially specific to the Olympia pocket gopher's range and includes usage of other insecticides in addition to methomyl, we consider this a conservative metric of past methomyl usage and have high confidence that only small portions of the species' range are likely to be treated annually. However, available information on the species' foraging behavior indicate that individuals occasionally forage on agricultural fields, indicating that exposure is likely to occur despite a low level of usage.

Exposure Summary

There is a high extent of overlap between the action area and the species' range (11.3% total overlap). While past usage data indicate a medium level of usage within the species' range (up to 9.8% of the range treated annually), data from the Census of Agriculture indicate that only 0.23% of the species' range has been treated with any insecticide in the past. Given the additional weight of the Census of Agriculture data, we anticipate only a small portion of the range is likely to be treated. However, available information on the species' foraging behavior indicate that individuals are likely to forage on agricultural fields, indicating that exposure is likely to occur on these small portions of the range.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate the main route of exposure for the Olympia pocket gopher is through dietary exposure (i.e., consuming prey that consumed food contaminated with methomyl). The Olympia pocket gopher is an obligate herbivore. EPA's exposure modeling indicates that individuals that consume plant matter like leaves on contaminated food on methomyl use sites can accumulate levels of methomyl up to 25.3 mg/kg-bw, which can result in up to 99% mortality. We anticipate individuals exposed on-field that do not die will experience high levels of sublethal adverse effects (e.g., reduced growth and reproduction). Exposure modeling indicates that individuals consuming plant matter in off-site areas contaminated by spray drift or runoff will accumulate up to 0.9 mg methomyl/kg-bw, which can cause up to 0.02% mortality of exposed individuals and no more than low levels of sublethal adverse effects to growth. Even though pocket gophers may occasionally forage on agricultural lands, their primary food sources are prairie forbs and grasses that grow in off-field areas, indicating that the species is more likely to experience off-field exposure than on-field exposure. As such, we anticipate a low level of lethal and sublethal effects are likely to occur to the species.

Indirect Effects

Available toxicity data indicate that plants are not likely to experience any adverse effects to survival, growth, or reproduction. As such, we do not anticipate there will be any reductions in the availability of the Olympia pocket gopher's main food resource. As such, we do not anticipate any adverse indirect effects are likely.

Toxicity Summary

We expect a medium level of direct adverse effects will occur. EPA's exposure modeling indicates that individuals that forage on use sites are likely to accumulate high levels of methomyl, resulting in high levels of mortality (up to 99% of exposed individuals) and sublethal adverse effects in exposed individuals that do not die. However, we anticipate low mortality to individuals and no more than low levels of sublethal adverse effects to growth in individuals exposed off-field. We do not anticipate any adverse indirect effects are likely to occur as available toxicity data show no adverse effects to the species' main food resource (i.e., plants).

Given that we expect most individuals will forage off-field, we expect low levels of mortality and sublethal effects, confined to those individuals that forage in agriculture where methomyl has been used. As such, we determine the Olympic pocket gopher has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Olympia pocket gopher has a low exposure ranking. While data from the Census of Agriculture indicate only a very small portion of the range has been treated in the past (up to 0.23%), suggesting only a small portion of the range is likely to be treated, individuals known to occur on agricultural areas to forage, suggesting that exposure is likely to occur in these small portions of the range.

The Olympia pocket gopher has a low toxicity ranking. The species is known to forage on agricultural areas, but they prefer grasses and forbs from prairies and grasslands. A few individuals are likely to be exposed to high levels of methomyl through their diet on agricultural use sites. We expect up to 99% mortality of individuals that have foraged on-field and up to 0.02% mortality in individuals foraging off-field. We expect exposed individuals that do not die from on-field are likely to experience high levels of sublethal effects to growth and/or reproduction. In contrast, we anticipate only low levels of sublethal adverse effects in individuals exposed off-field. We do not anticipate any adverse indirect effects to the species as their main food source is not likely to be adversely affected by methomyl.

Since we anticipate a small number of individuals are likely to be exposed and that only those few individuals that forage on methomyl treated sites are likely to die, we anticipate the risk of adverse effects to the species overall is low.

Conclusion

The Olympia pocket gopher has high vulnerability based on its limited distribution, single population, and declining trends, as described above. Their primary habitat is prairies and grasslands with friable soils, but they also occur on agricultural lands, including crops, pasture, and hay fields, and are known to eat crops. Methomyl use sites overlap 11.3% of the species range, 1% of which is on-field. Up to 9.8% of the range has been treated annually with methomyl in the past (0.9% on-field and 8.9% off-field), and an even smaller area (0.23%) was reported in the USDA Census of Agriculture as having been treated with any insecticide. The Olympic pocket gopher has a low exposure ranking. However, because the species is known to forage on agricultural lands, we expect exposure is likely in these small portions of the range. Pocket gophers consume plant material, which will not be adversely affected by methomyl exposure, thus we do not expect indirect adverse effects to the species from loss of forage. However, the species occasionally eats agricultural crops, and we expect that pocket gophers that consume contaminated vegetation on methomyl use sites are likely to experience mortality or sublethal effects. However, as pocket gophers primarily eat forbs and grasses found in prairies and grasslands, we expect only a few individuals will experience lethal or sublethal effects from foraging on methomyl use sites.

We expect impacts to be low and a small number of individuals will die or experience sublethal adverse effects in the form of small impacts to fitness related to growth and reproduction. Even though the species' vulnerability is high, we do not expect the small number of individuals likely to die or experience sublethal adverse effects will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. 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, OR. 61 pp.

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

Integration and Synthesis Summary: Mammals – Tenino pocket gopher

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a moderate level of overlap between the action area and the species' range (Figure 21) and a low level of past usage within the species range. Based on the species' life history, we do not anticipate more than small numbers of individuals are likely to occur on methomyl use sites, indicating that exposure to the species is low. Based on the species' habitat preferences, we do not anticipate more than a small number of individuals are likely to be exposed on methomyl use sites and die or experience sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Tenino pocket gopher.

Species range

Last updated: 10/15/2021; Wherever found; *States within the range:* WA

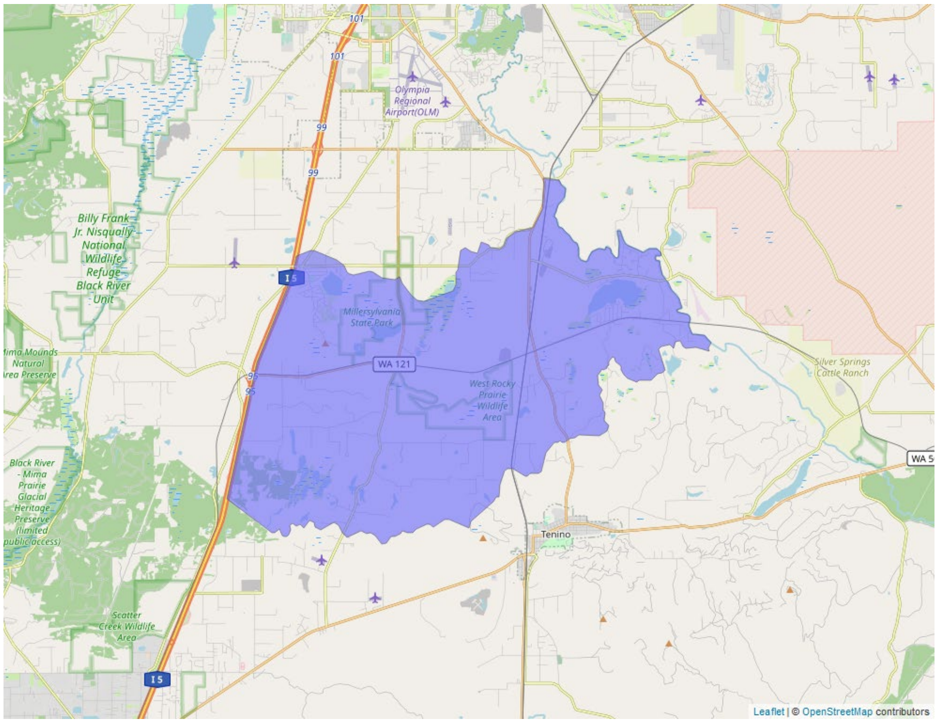

Figure 21. Range map of Tenino pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6290.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

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 land uses, including crop production, pasture, and hay fields (USFWS 2022a). They are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. Pocket gophers are not known to occur where Douglas-fir (*Pseudotsuga menziesii*) or Scotch broom (*Cytisus scoparius*) have invaded. As of 2020, their locations are categorized into two Recovery Units and only one has confirmed occupancy: Rocky Prairie (low resiliency; no population trends available and abundance believed to be low; not managed for pocket gophers) and West Rocky Prairie (low resiliency; pocket gophers are confirmed, but unknown if Teninos are present; some land managed for prairie habitat) (USFWS 2022b).

Tenino pocket gophers are currently threatened by habitat loss, primarily caused by development (e.g., residential, road, and commercial) and woody plant encroachment, throughout the range of the subspecies. The species' range 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 the ranges of other pocket gophers, no military training occurs in the range of the Tenino subspecies of the Mazama pocket gopher. Tenino pocket gophers are at risk of poisoning and trapping as a pest species and effects of small and isolated populations (i.e., genetic concerns). Pesticides and herbicides may cause an individual threat to pocket gophers, but it is not considered a population-level threat (USFWS 2022a).

We delineated one Service area and Reserve Priority Area for the Tenino pocket gopher to identify locations where impacts to the subspecies or its habitat may be mitigated or offset. We are also coordinating with Joint Base Lewis McChord to enhance their Army Compatible Use Buffer Program and south Puget Sound Sentinel Landscapes Program to benefit the species (USFWS 2022b).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 8% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 27). Up to 0.4% of the species' range overlaps with methomyl use sites while 7.6% of the range occurs off-field (but may still be exposed to spray drift or runoff.

Table 27. Overlap and annual usage data (% Range Treated) for the Tenino pocket gopher. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	0.2	0.2	0	0.0	0.0
Citrus	NA	NA	NA	NA	NA	NA
Corn[25]	<0.1	0.1	0.1	0	0.0	0.0
Cotton	0	0	0	0	0.0	0.0
Other Grains	<0.1	<0.1	<0.1	0	0.0	0.0
Other Orchards	0.3	6.4	6.7	0.3	6.4	6.7
Other Row Crops	0	0	0	0	0.0	0.0
Soybeans	0	0	0	0	0.0	0.0
Vegetables and Ground Fruit	<0.1	0.9	0.9	<0.1	0.9	0.9
Wheat	0	0	0	0	0.0	0.0
Total	**0.4**	**7.6**	**8**	**0.4**	**7.2**	**7.6**

[25] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 7.6% of the species' range will be treated with methomyl (0.4% on-field and 7.2% off-field) (Table 27).

Additional Exposure Considerations

Additional data from USDA's Census of Agriculture indicate only 0.15% of the species' range has been treated with any insecticide. Given that this data is spatially specific to the Tenino pocket gopher's range and includes usage of other insecticides in addition to methomyl, we consider this a conservative metric of past methomyl usage and have high confidence that only small portions of the species' range are likely to be treated annually. However, available information on the species' foraging behavior indicate that individuals are likely to forage on agricultural fields, indicating that exposure is likely to occur on these small portions of the range.

Exposure Summary

There is a medium extent of overlap between the action area and the species' range (8% total overlap). While past usage data indicate a medium level of usage within the species' range (up to 7.6% of the range treated annually), data from the Census of Agriculture indicates that only 0.15% of the species' range has been treated annually with any insecticide in the past. Given the additional weight of the Census of Agriculture data, we anticipate only a small portion of the range is likely to be treated. Despite this low level of usage, given that individuals may occasionally forage on agricultural use sites, we anticipate exposure is likely to occur in these small portions of the range.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate the main route of exposure for the Tenino pocket gopher is through dietary exposure (i.e., consuming prey that consumed food contaminated with methomyl). The Tenino pocket gopher is an obligate herbivore. EPA's exposure modeling indicates that individuals that consume plant matter like leaves on contaminated food on methomyl use sites can accumulate levels of methomyl up to 25.3 mg/kg-bw, which can result in up to 99% mortality and high levels of sublethal adverse effects to growth and reproduction in individuals that do not die. Exposure modeling indicates that individuals consuming plant matter in off-site areas contaminated by spray drift or runoff will accumulate up to 0.9 mg methomyl/kg-bw, which can cause up to 0.02% mortality of exposed individuals and no more than low levels of sublethal adverse effects. Even though pocket gophers may occasionally forage on agricultural lands, their primary food sources are prairie forbs and grasses in off-field areas, indicating that the species is more likely to experience off-field exposure than on-field exposure. As such, we anticipate a low level of lethal and sublethal effects are likely to occur to the species.

Indirect Effects

Available toxicity data indicate that plants are not likely to experience any adverse effects to survival, growth, or reproduction. As such, we do not anticipate there will be any reductions in the availability of the Tenino pocket gopher's main food resource. As such, we do not anticipate any adverse indirect effects are likely.

Toxicity Summary

We expect a low level of direct adverse effects will occur. EPA's exposure modeling indicates that individuals that forage on use sites are likely to accumulate high levels of methomyl, resulting in high levels of mortality (up to 99% of exposed individuals) and sublethal adverse effects in individuals that do not die. We anticipate a low level of mortality in individuals foraging off-field in areas exposed by spray drift (up to 0.02% of exposed individuals) and no more than low levels of sublethal adverse effects. We do not anticipate any adverse indirect effects are likely to occur as available toxicity data show no adverse effects to the species' main food resource (i.e., plants).

Given that we expect most individuals will forage off-field, we expect low levels of mortality and sublethal effects, confined to those individuals that forage in agriculture where methomyl has been used. As such. we determine the Tenino pocket gopher has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Tenino pocket gopher has a low exposure ranking. While data from the Census of Agriculture indicate only a very small portion of the range has been treated in the past (up to 0.15%), suggesting only a small portion of the range is likely to be treated, some individuals are likely to occur and forage on agricultural areas. As such, we anticipate exposure to methomyl is likely to occur to individuals in these small portions of the range. The Tenino pocket gopher has a low toxicity ranking. The species occasionally forages on agricultural areas, but they prefer prairie and grassland species like forbs and grasses. A few individuals are likely to be exposed to high levels of methomyl through their diet. We expect up to 99% mortality of individuals that have foraged on-field and up to 5% mortality in individuals foraging off-field. We expect exposed individuals that do not die are likely to experience sublethal effects to growth and/or reproduction. We do not anticipate any adverse indirect effects to the species as their main food source is not likely to be adversely affected by methomyl.

Because we anticipate a small number of individuals are likely to be exposed and that those few individuals that forage on methomyl treated sites are likely to die, we anticipate the risk of adverse effects to the species overall is low.

Conclusion

The Tenino pocket gopher has high vulnerability based on its limited distribution, single population, and declining trends, as described above. Their primary habitat is prairies and grasslands with friable soils, but they also occur on agricultural lands, including crops, pasture, and hay fields, and are known to eat crops. Methomyl use sites overlap 8% of the species range, 0.4% of which is on-field. A medium portion (7.6%) of the range has been treated annually with methomyl in the past (0.4% on-field and 7.2% off-field), and a smaller area (0.15%) was reported in the USDA Census of Agriculture as having been treated with any insecticide. The Tenino pocket gopher has a low exposure ranking. However, because the species is known to forage on agricultural lands, we expect exposure is likely to occur in these small portions of the range. Pocket gophers consume plant material, which will not be directly affected by methomyl exposure, thus we do not expect indirect adverse effects to the species from loss of forage. However, the species occasionally eats agricultural crops, and we expect that pocket gophers that consume contaminated vegetation on methomyl use sites are likely to experience mortality or sublethal adverse effects. However, as pocket gophers primarily eat forbs and grasses found in prairies and grasslands, we expect only a few individuals will experience lethal or sublethal effects from foraging on methomyl use sites.

We expect impacts to be low and a small number of individuals will die or experience sublethal adverse effects in the form of small impacts to fitness related to growth and reproduction. Even though the species' vulnerability is high, we do not expect the small number of individuals likely to die or experience sublethal adverse effects will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. 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.

Integration and Synthesis Summary: Mammals - Yelm pocket gopher

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. We determined there is a high level of overlap between the action area and the species' range (Figure 22) and a low level of usage within the range. Based on the species' life history, we do not anticipate more than a small number of individuals are likely to occur on methomyl use sites, indicating that exposure to the species is low. Based on the species' habitat preferences, we do not expect more than a small number of individuals are likely to be exposed on methomyl use sites and die or experience sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Yelm pocket gopher.

Species range

Last updated: 1/18/2023; Wherever found; *States within the range:* WA

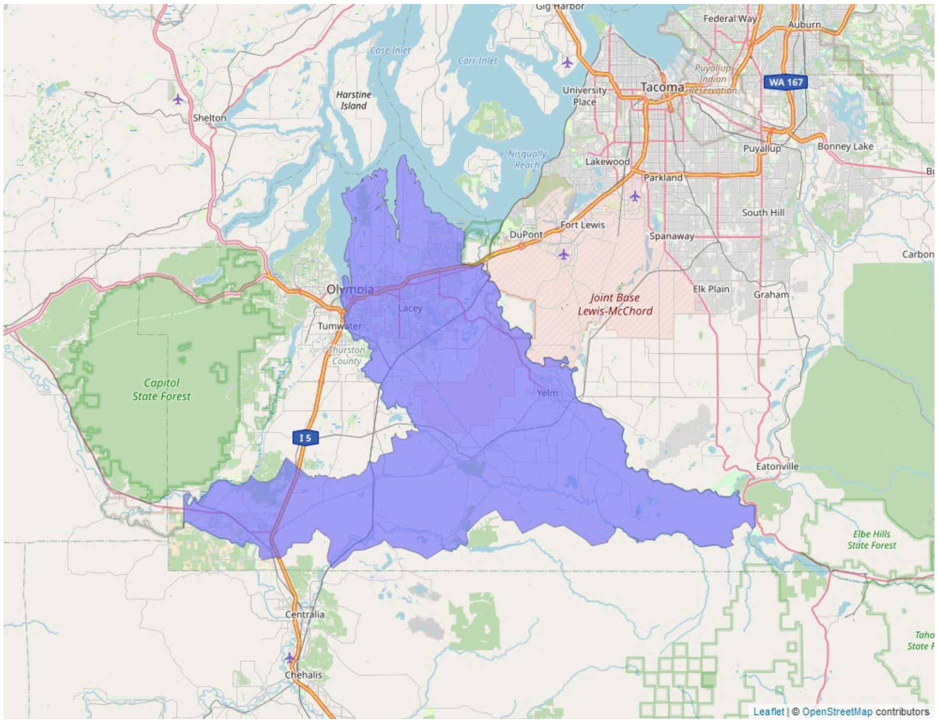

Figure 22. Range map of Yelm pocket gopher (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7257.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Threatened

Most recent 5-Year Review recommendation: No change in Status

Most recently completed 5-Year Review: 9/28/2020

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

Number of populations: Single population

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

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Yelm pocket gophers are a subspecies of Mazama pocket gopher endemic to Thurston County, Washington. They are concentrated in well-drained, friable soils often associated with glacial outwash that form prairies and grasslands. Though they prefer prairie grassland habitats, they may occur on lands with some agricultural land uses, including crop production, pasture, and hay fields (USFWS 2022a). They are generalist herbivores that eat leafy forbs, succulent roots, shoots, and tubers. Pocket gophers are not known to occur where Douglas-fir (*Pseudotsuga menziesii*) or Scotch broom (*Cytisus scoparius*) have invaded. As of 2020, their locations are categorized into three Recovery Units: YPG-North (low resiliency; no population trends available; not managed for pocket gophers), YPG-East (low-high resiliency; no population trends available but believed to be high; some land managed for prairie habitat), and YPG-South (low-moderate resiliency; some survey data available and abundance believed to be high in two areas; some land managed for prairie habitat) (USFWS 2022b). Yelm pocket gophers were translocated to Wolf Haven and West Rocky Prairie Wildlife Area between 2005-2008 from YPG-North.

They are currently threatened by habitat loss, primarily caused by development (e.g., residential, road, and commercial) and woody plant encroachment, throughout the range of the subspecies. The species' range 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 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 (i.e., feral cats, dogs) associated with residential development and recreation. Yelm pocket gophers are also at risk of poisoning and trapping as a pest species, direct mortality and harm from military training, and effects of small and isolated populations (i.e., genetic concerns). Pesticides and herbicides may cause an individual threat to Yelm pocket gophers, but they are not considered population-level threats (USFWS 2022a).

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

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 11.3% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 28). Up to 1% of the species' range overlaps with methomyl use sites while 10.3% of the range occurs off-field (but may still be exposed to spray drift or runoff.

Table 28. Overlap and annual usage data (% Range Treated) for the Yelm pocket gopher. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	0.4	0.5	<0.1	<0.1	0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[26]	0.1	0.8	1	0	0	0.0
Cotton	0	0	0	0	0	0.0
Other Grains	<0.1	0.2	0.2	0	0	0.0
Other Orchards	0.4	5.5	5.9	0.4	5.5	5.9
Other Row Crops	<0.1	<0.1	<0.1	0	0	0.0
Soybeans	0	0	0	0	0	0.0
Vegetables and Ground Fruit	0.5	3.3	3.8	0.5	3.3	3.8
Wheat	0	0	0	0	0	0.0
Total	**1**	**10.3**	**11.3**	**0.9**	**8.9**	**9.8**

[26] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 9.8% of the species' range will be treated with methomyl (0.9% on-field and 8.9% off-field (Table 28).

Additional Exposure Considerations

Additional data from USDA's Census of Agriculture indicate only 0.23% of the species' range has been treated with any insecticide. Given that this data is spatially specific to the Yelm pocket gopher's range and includes usage of other insecticides in addition to methomyl, we consider this a conservative metric of past methomyl usage and have high confidence that only small portions of the species' range are likely to be treated annually. However, available information on the species' foraging behavior indicate that individuals occasionally forage on agricultural fields, indicating that exposure is likely to occur on these small portions of the range.

Exposure Summary

There is a high extent of overlap between the action area and the species' range (11.3% total overlap). While past usage data indicate a medium level of usage within the species' range (up to 9.8% of the range treated annually), data from the Census of Agriculture indicate that only 0.23% of the species' range has been treated with any insecticide in the past. Given the additional weight of the Census of Agriculture data, we anticipate only a small portion of the range is likely to be treated. Despite this low level of usage, given that individuals may occasionally forage on agricultural use sites, we anticipate exposure is likely to occur in these small portions of the range.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects

We anticipate the main route of exposure for the Yelm is through dietary exposure (i.e., consuming prey that consumed food contaminated with methomyl). The Yelm pocket gopher is an obligate herbivore. EPA's exposure modeling indicates that individuals that consume plant matter like leaves on contaminated food on methomyl use sites can accumulate levels of methomyl up to 25.3 mg/kg-bw, which can result in up to 99% mortality and high levels of sublethal adverse effects to growth and reproduction in individuals that do not die. Exposure modeling indicates that individuals consuming plant matter in off-site areas contaminated by spray drift or runoff will accumulate up to 0.9 mg methomyl/kg-bw, which can cause up to 0.02% mortality of exposed individuals and no more than low levels of sublethal adverse effects. Even though pocket gophers may occasionally forage on agricultural lands, their primary food sources are prairie forbs and grasses that grow off-field, indicating that individuals are more likely to be exposed off-field than on-field. As such, we anticipate a low level of lethal and sublethal effects are likely to occur to the species.

Indirect Effects

Available toxicity data indicate that plants are not likely to experience any adverse effects to survival, growth, or reproduction. As such, we do not anticipate there will be any reductions in the availability of the Yelm pocket gopher's main food resource. As such, we do not anticipate any adverse indirect effects are likely.

Toxicity Summary

We expect a low level of direct adverse effects will occur. EPA's exposure modeling indicates that individuals that forage on use sites are likely to accumulate high levels of methomyl, resulting in high levels of mortality (up to 99% of exposed individuals) and high levels of sublethal adverse effects to individuals that do not die. We anticipate a low level of mortality in individuals foraging off-field in areas exposed by spray drift (up to 0.02% of exposed individuals) and no more than low levels of sublethal adverse effects. We do not anticipate any adverse indirect effects are likely to occur as available toxicity data show no adverse effects to the species' main food resource (i.e., plants).

Given that we expect most individuals will forage off-field, we expect low levels of mortality and sublethal effects, confined to those individuals that forage in agriculture where methomyl has been used. As such, we determine the Yelm pocket gopher has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Yelm pocket gopher has a low exposure ranking. While data from the USDA Census of Agriculture indicates only a very small portion of the range has been treated in the past (up to 0.23%), suggesting only a small portion of the range is likely to be treated, individuals can occur on agricultural areas to forage, suggesting that exposure to methomyl is likely to occur to individuals in these small portions of the range The Yelm pocket gopher has a low toxicity ranking. The species is known to occasionally forage on agricultural areas, but they prefer forbs and grasses found in prairie and grassland habitats off-field. A few individuals are likely to be exposed to high levels of methomyl through their diet. We expect up to 99% mortality of individuals that have foraged on-field and up to 0.02% mortality in individuals foraging off-field. We expect exposed individuals exposed on-field that do not die will experience high levels of sublethal adverse effects, while individuals exposed off-field will not experience more than low levels of sublethal adverse effects. We do not anticipate any adverse indirect effects to the species as their main food source is not likely to be adversely affected by methomyl.

Because we anticipate a small number of individuals are likely to be exposed and that only those few individuals that forage on methomyl treated sites are likely to die, we anticipate the risk of adverse effects to the species overall is low.

Conclusion

The Yelm pocket gopher has high vulnerability based on its limited distribution, single population, and declining trends, as described above. Their primary habitat is prairies and grasslands with friable soils, but they also occur on agricultural lands, including crops, pasture, and hay fields, and are known to eat crops. Methomyl use sites overlap 11.3% of the species range, 1% of which is on-field. A medium portion (9.8%) of the range has been treated annually with methomyl in the past (0.9% on-field and 8.9% off-field), and a smaller area (0.23%) was reported in the USDA Census of Agriculture as having been treated with any insecticide annually. The Yelm pocket gopher has a low exposure ranking. However, because the species is known to forage on agricultural lands, we expect that exposure is likely to occur in these small portions of the range. Pocket gophers consume plant material, which will not be directly affected by methomyl exposure, thus we do not expect indirect adverse effects to the species from loss of forage. However, the species occasionally eats agricultural crops, and we expect that pocket gophers that consume contaminated vegetation on methomyl use sites are likely to experience mortality or sublethal effects. However, as pocket gophers primarily eat forbs and grasses found in prairies and grasslands, we expect only a few individuals will experience lethal or sublethal effects from foraging on methomyl use sites.

We expect impacts to be low and a small number of individuals will die or experience sublethal adverse effects in the form of small impacts to fitness related to growth and reproduction. Even though the species' vulnerability is high, we do not expect the small number of individuals likely to die or experience sublethal adverse effects will result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. 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.

Integration and Synthesis Summary: Mammals - Florida bonneted bat

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is high. In our preliminary evaluation of the effects of the proposed action to the species (presented below), we determined there is a high overlap between the action area and the species' range (Figure 23) and a low level of past usage, suggesting a moderate number of individuals are likely to be exposed. Based on the species' habitat preferences, we anticipate only a small number of individuals are likely to be exposed on methomyl use sites and die or experience sublethal adverse effects. However, we anticipate the species will experience high levels of indirect adverse effects resulting from the loss of affected arthropod prey. Because of the effects described in our preliminary evaluation and conclusion, EPA and the applicant agreed to incorporate species-specific conservation measures as part of the action. We now expect exposure for the Florida bonneted bat to be low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Florida bonneted bat.

Species range

Based on range map dated: 2/2/2022; Wherever found; *States within the range:* FL. Figure 20 depicts a map of the species' range.

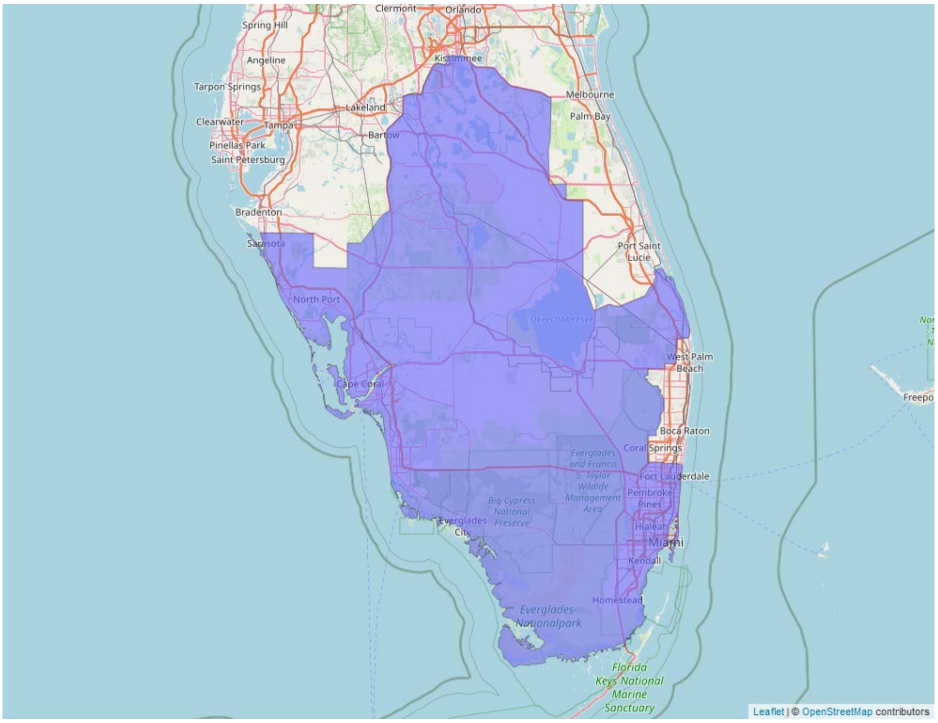

Figure 23. Range map of Florida bonneted bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/8630.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation:

Most recently completed 5-Year Review:

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

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) and are active year-round, thus they likely need a constant and/or multiple sources of prey to support their high metabolism throughout the year (USFWS 2024). 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. The bats are also frequently detected in agricultural areas and golf courses and are known to feed on insects associated with crops (USFWS 2024). 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, though suspected to be small, and no population viability analyses are available (USFWS 2013).

While the species breeds year-round, it has low fecundity (ability to produce offspring), and slow reproduction, with an average litter size of one pup and generation time of 5 to 10 years (average interval between birth of an individual and the birth of its offspring). These factors, together with the species' restricted range and small population size, make it especially vulnerable to threats and capable of slow population recovery (USFWS 2019).

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). Climate change, pesticide use, and environmental stochasticity may also contribute to the species' imperilment (USFWS 2019). More study is needed to fully understand the risk of insecticides to the species, though areas with intensive pesticide activity may not support an adequate food base. Protecting habitats that support high insect diversity and abundance and avoiding the excessive use of pesticides wherever possible is recommended (USFWS 2024).

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, 2019).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 13.8% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 29). Up to 8% of the species' range overlaps with methomyl use sites while 5.8% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 29. Overlap and annual usage data (% Range Treated) for the Florida bonneted bat. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Citrus	NA	NA	NA	NA	NA	NA
Corn[27]	<0.1	0.2	0.2	<0.1	<0.1	<0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	6.2	3.1	9.3	0.3	0.2	0.5
Other Orchards	0.5	0.7	1.2	0.5	0.7	1.2
Other Row Crops	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	1.2	1.7	2.9	1.2	1.7	2.9
Wheat	NA	NA	NA	NA	NA	NA
Total	**8**	**5.8**	**13.8**	**2**	**2.6**	**4.6**

[27] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 4.6% of the species' range will be treated with methomyl (2% on-field and 2.6% off-field) (Table 29).

Exposure Summary

There is a high extent of overlap between the action area and the species' range (13.8% total overlap). While there is a low level of past methomyl usage within the species' range (up to 4.6% range treated annually), we anticipate a moderate portion of the species' range is likely to be treated over the duration of the proposed action, particularly if the areas treated changes each year. As such, we anticipate a moderate number of individuals are likely to be exposed.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

The Florida bonneted bat primarily consumes a diverse range of flying insect species. EPA's exposure modeling predicts that individuals that feed on-field or forage on insect prey that have recently been exposed to methomyl on use sites will accumulate high levels of methomyl (up to 15.3 mg/kg-bw). This level of exposure will result in a high level of mortality (up to 94.1% of exposed individuals) and high levels of sublethal adverse effects (e.g., reduced growth or reproduction) in individuals that do not die. EPA's exposure modeling indicates that individuals that feed on insects that have not been exposed recently on use-site (i.e., through spray drift only) will accumulate only low levels of methomyl that are not likely to cause any adverse effects to survival or other sublethal effects (e.g., reduced growth).

We anticipate most individuals are not likely to consume only insect prey that have been exposed to methomyl on-field. However, given that individuals likely have an expansive home range that contains agricultural areas, we cannot rule out the possibility of this level of consumption and exposure happening. While individuals may occasionally consume only insect prey that have recently been exposed on-field, particularly if foraging near or over an agricultural field, we anticipate this scenario will occur with low frequency as the Florida bonneted bat uses a wide range of foraging habitats (including forests, wetlands, open water, and other natural areas), where they are less likely to forage on prey that have recently been exposed on methomyl use sites. As such, we anticipate only a small number of individuals are likely to experience a high level of direct adverse effect.

Indirect Effects

The Florida bonneted bat's primary food source is flying insects. Based on available toxicity data in insect species, we anticipate there will be a high level of insect mortality. However, we expect the level of mortality will vary across insect prey species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire insect community is likely to experience mortality. However, given the species' high metabolic needs due to year-round activity and breeding, even small reductions in some of the insect prey community may decrease an individual's ability to find sufficient food resources particularly in or around agricultural areas where the species is known to forage. As such, we anticipate high levels of indirect adverse effects are likely in a moderate portion of the range, particularly near agricultural crops.

Toxicity Summary

The Florida bonneted bat is likely to experience low levels of direct adverse effects. While some individuals that only consume insects that have recently been exposed to methomyl on-field are likely to accumulate high levels of methomyl and die or experience sublethal adverse effects to growth or reproduction, we expect this will be limited to a small number of individuals as the species' diverse foraging habitats indicate that individuals are unlikely to only consume prey that have come from on single source (i.e., a methomyl use site).

We expect the Florida bonneted bat will experience high levels of indirect adverse effects. While we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we expect there will be a variation of response to methomyl exposure across the insect community and mortality of the entire insect community is not likely. However, given the species' high metabolic needs due to year-round activity and breeding, even small reductions in some of the insect prey community may decrease an individual's ability to find sufficient food resources particularly in or around agricultural areas where the species is known to forage. Given that we anticipate the species will experience low levels of direct adverse effects but high levels of indirect adverse effects, the Florida bonneted bat has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Florida bonneted bat has a medium exposure ranking. There is a high extent of overlap between the action area and the species' range (13.8% total overlap). While there is a low level of past methomyl usage within the species' range (up to 4.6% range treated annually), we anticipate a moderate portion of the species' range is likely to be treated over the duration of the proposed action, particularly if the areas treated change each year. As such, we anticipate a moderate number of individuals are likely to be exposed.

The Florida bonneted bat has a medium toxicity ranking. While some individuals that only consume insects that have recently been exposed to methomyl on-field are likely to accumulate high levels of methomyl and die or experience sublethal adverse effects to growth or reproduction, we expect this will be limited to a small number of individuals as the species' diverse foraging habitats indicate that individuals are unlikely to only consume prey that have come from one single source (i.e., a methomyl use site). While we expect there will be a variation of response to methomyl exposure across the insect community and mortality of the entire insect community is not likely, given the species' high metabolic needs due to year-round activity and breeding, even small reductions in some of the insect prey community can result in high levels of indirect effect to the species. While we anticipate a moderate number of individuals are likely to be exposed and small numbers of individuals (e.g., those exposed on or near use sites) will die or experience sublethal effects, we anticipate the species will experience high levels of indirect adverse effects through reductions in prey availability. As such, we anticipate a moderate number of individuals are likely to experience adverse effects from the proposed action. We therefore anticipate the overall risk of adverse effects to the species is moderate.

Preliminary Conclusion

The Florida bonneted bat has high vulnerability based on its status (i.e., endangered), single population, and declining trends, as described above. They primarily eat insects and forage in open, fresh water and wetlands, but are also known to feed on insects associated with agricultural crops. They roost in pine and palm trees and man-made structures across urban, suburban, and forested areas. Methomyl use sites overlap 13.8% of the species range, 8% of which is on-field. A small portion (4.6%) of the range has been treated annually with methomyl in the past (2% on-field and 2.6% off-field), therefore the Florida bonneted bat has a medium exposure ranking and we expect that a moderate number of individuals will be exposed throughout the duration of the action.

Even though individuals have large home ranges, given the prevalence of agriculture within the species' range, portions of occupied areas are anticipated to be near agriculture. In addition, agricultural use of pesticides, particularly insecticides, is noted as a potential threat to the species' imperilment. Excessive pesticide use may not support an adequate food base for this species given its high metabolic requirements due to year-round activity and breeding. Thus, even though we expect low levels of indirect adverse effects from prey reduction, given the species' need for a constant source of prey, even small reductions in prey availability could lead to a loss of fitness of individual bats within a moderate portion of the range.

Over the duration of the action, we anticipate that a small number of foraging bats will consume primarily insects that were recently exposed to methomyl on-field, particularly given the species is known to forage near or over agricultural crops, resulting in the death of those individuals. Thus, though we expect this level of contaminated prey consumption and methomyl exposure to be infrequent, the species has low fecundity, and is slow to reproduce. These factors together, along with its restricted range and small, single population, make it especially vulnerable to loss of individuals and is likely to slow population recovery.

We expect a moderate number of individuals to be exposed and a small number of individuals will die. In addition, there will be small reductions in prey availability in a moderate portion of the range. Given the species' high metabolic needs for prey, and high vulnerability due to low fecundity, slow reproduction, restricted range, and low population numbers, we expect even a small loss of prey and loss of a few individuals will result in species-level effects from the proposed action.

Final Conclusion (with Species-Specific Conservation Measures)

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Florida bonneted bat:

1) *Methomyl must be applied using the following buffers: 320 feet for aerial applications, 105 feet for ground applications, and 160 feet for airblast applications. Based on AgDRIFT modeling, the buffers will reduce spray drift from entering habitat for the Buena Vista Lake ornate shrew by >95%. These buffer distances may be reduced using other measures identified as equivalent mitigations (i.e., reducing spray drift by similar magnitude) as specified in EPA's Draft Insecticide Strategy and as described in Appendix A-1 of this Opinion.*

The PULA for the Florida bonneted bat will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action. In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.

After incorporating the specific conservation measure above, we expect exposure for the Florida bonneted bat to be low. As such we anticipate small numbers of individuals of this species will experience mortality or sublethal adverse effects from consuming insect prey contaminated on-field. We also anticipate these measures will reduce prey loss in key areas of the species' range and will reduce indirect adverse effects, in the form of loss of fitness related to growth and reproduction, to the species. After reviewing the current status of the species, environmental baseline for the action area, effects of the proposed action, and species-specific conservation measures, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Florida bonneted bat.

References

U.S. Fish and Wildlife Service. 2024. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Endangered Florida Bonneted Bat. Final Rule. Federal Register 89: 16624-16681.

U.S. Fish and Wildlife Service. 2019. 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: Mammals – Northern long-eared bat

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

Species Overview

In reviewing the status of the species, the environmental baseline for the action area, cumulative effects, and the effects of the action, we determined that the species' vulnerability ranking is medium. We determined there is a high level of overlap between the action area and the species' range (Figure 24) and a moderate level of past usage, suggesting that a large number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate individuals are likely to be exposed to methomyl on use sites and that no more than small numbers of individuals are likely to die or experience sublethal adverse effects, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the northern long-eared bat.

Species range

Based on range map dated: 3/28/2024; 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 21 depicts a map of the species' range.

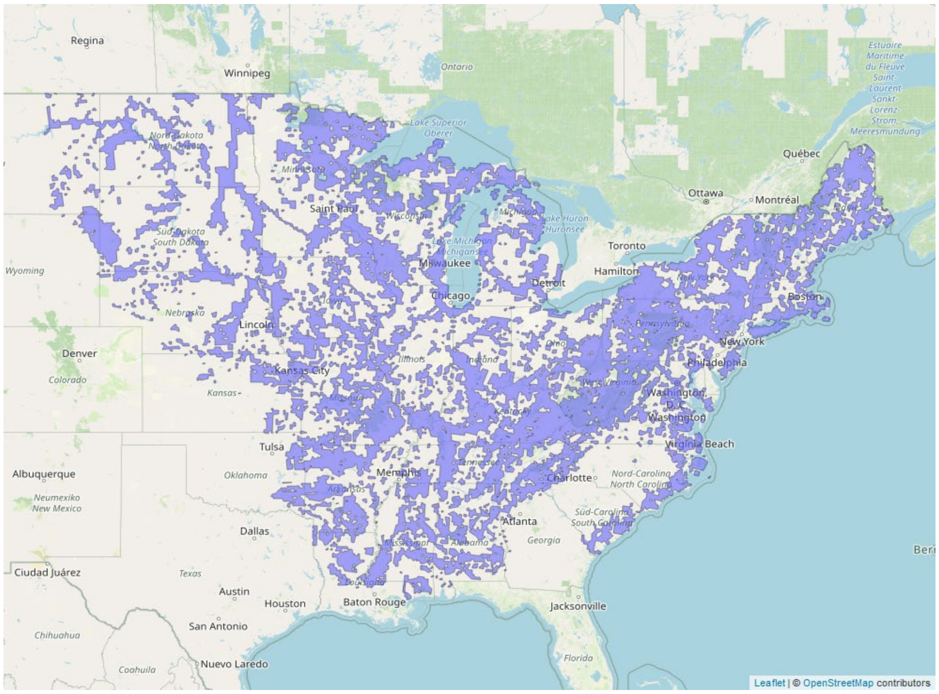

Figure 24. Range map of northern long-eared bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/9045.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Endangered

Most recent 5-Year Review recommendation: Uplist to Endangered

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 overwinters in caves and abandoned mines and uses forests otherwise. They are found in 37 states and eight 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: Medium

Effects of the Action: Exposure

Overlap

We expect 60.3% of the species range will overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 30). Up to 30% of the species' range overlaps with methomyl use sites while 30.6% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 30. Overlap and annual usage data (% Range Treated) for the northern long-eared bat. Where specific crops are not registered for methomyl use in a state where the species is found, rows are designated as NA (not applicable).

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Alfalfa	2.6	7.8	10.4	0.4	1.2	1.6
Citrus	NA	NA	NA	NA	NA	NA
Corn[28]	21.6	12.4	34	1.1	0.6	1.7
Cotton	0.3	0.5	0.8	<0.1	<0.1	<0.1
Other Grains	2.6	5.4	8	0.1	0.3	0.4
Other Orchards	<0.1	0.4	0.5	<0.1	0.4	0.5
Other Row Crops	1.2	1.4	2.6	0.5	0.7	1.2
Soybeans	21.8	11.9	33.7	1.1	0.6	1.7
Vegetables and Ground Fruit	1.4	2.6	4	1.4	2.6	4
Wheat	NA	NA	NA	NA	NA	NA
Total	**30**	**30.6**	**60.3**	**3.6**	**5.8**	**9.4**

[28] We expect corn and soybean use sites are highly redundant with each other and only use the higher of the two layers in our calculation of total percent overlap and total percent treated range.

Usage

Based on past usage data, we anticipate up to 9.4% of the species' range will be treated with methomyl (3.6% on-field and 5.8% off-field) (Table 30).

Exposure Summary

There is a high extent of overlap between the action area and the species' range (60.3% total overlap). Past methomyl usage data indicate a moderate portion of the range is likely to be treated each year (up to 9.4% range treated annually). While the level of usage is less than the total overlap, we anticipate this may still result in a large portion of the range being treated with methomyl over the duration of the proposed action, particularly if the areas treated change each year. As such, we anticipate a large number of individuals are likely to be exposed.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects

The northern long-eared bat primarily consumes flying insects for food. EPA's exposure modeling predicts that individuals that feed on-field or forage on insect prey that have recently (i.e., within the last 24 hours) been exposed to methomyl on use sites will accumulate high levels of methomyl (up to 19.5 mg/kg-bw). This level of exposure will result in a high level of mortality (up to 87.9% of exposed individuals) and sublethal adverse effects (e.g., reduced growth or reproduction) in individuals that do not die. EPA's exposure modeling indicates that individuals that feed off-field on insects that have not been recently exposed on use-site (i.e., through spray drift only) will accumulate only low levels of methomyl that are not likely to cause mortality or sublethal adverse effects.

We anticipate most individuals are not likely to consume only insect prey that have been exposed recently to methomyl on-field. Northern long-eared bats forage in mature forests and occasionally along riparian areas, over small forest clearings and water, and along roads. They prefer intact mixed forests to fragmented habitat. Northern long-eared bats roost in small crevices or cracks on cave or mine walls or ceilings. However, given that the species seems to be a habitat generalist and much of its habitat is fragmented with agricultural lands, we cannot rule out the possibility that an individual may primarily feed on prey that has recently been exposed to methomyl on-field. We anticipate that this scenario will occur infrequently as individuals likely have an expansive home range that covers different habitat types. We expect that most individuals will consume both prey that has recently been exposed to methomyl on-field and prey that has not. As such, we anticipate only a small number of individuals are likely to accumulate high levels of methomyl and experience adverse effects but that the majority of individuals are likely to accumulate lower levels of methomyl that are not likely to cause mortality or sublethal effects.

Indirect Effects

The northern long-eared bat's primary food source is flying insects. Based on available toxicity data in insect species, we anticipate there will be a high level of insect mortality. However, we expect the level of mortality will vary across species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire insect community is likely to experience complete mortality and that individual bats will still have sufficient food resources available, particularly in areas away from methomyl use sites. As such, we do not anticipate more than low levels of indirect adverse effects are likely.

Toxicity Summary

The northern long-eared bat is likely to experience only low levels of direct adverse effects. While some individuals that only consume insects that have recently been exposed to methomyl on-field are likely to accumulate high levels of methomyl and die or experience sublethal adverse effects, we expect this will be limited to a small number of individuals as the species' diverse foraging habitats indicate that individuals are unlikely to only consume prey that have come from treated agricultural sites. We anticipate most individuals will be exposed off-field and will not experience mortality or sublethal effects.

We expect the northern long-eared bat will not experience more than low levels of indirect adverse effects. While we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we expect there will be a variation of response to methomyl exposure across the insect community and that there will not likely be complete mortality of the entire insect community. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

Given that we anticipate the species will only experience low levels of direct and indirect adverse effects, the northern long-eared bat has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The northern long-eared bat has a high exposure ranking. There is a high extent of overlap between the action area and the species' range (60.3% total overlap). While past methomyl usage data indicate only a smaller portion of the range is likely to be treated each year (up to 9.4% range treated annually), we anticipate a large portion of the range will likely be treated with methomyl over the duration of the proposed action, particularly if the areas treated change each year. As such, we anticipate a large number of individuals are likely to be exposed.

The northern long-eared bat has a low toxicity ranking. While individuals that only consume insects that have recently been exposed to methomyl on-field are likely to accumulate high levels of methomyl and die, we expect this will be limited to a small number of individuals as the species' diverse foraging habitats indicate that individuals are unlikely to only consume prey that have come from treated agricultural sites. Similarly, while we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we do not anticipate the entire insect community will die as we expect there are natural variations in sensitivity to methomyl across insect taxa. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

While we anticipate a large number of individuals are likely to be exposed to methomyl, we expect exposed individuals are not likely to experience more than low levels of mortality, not likely to experience any sublethal adverse effects, and will only experience minor losses in prey availability. As such, we anticipate only a small number of individuals are likely to experience any adverse effects from the proposed action. We therefore expect the overall risk of adverse effects to the species is low.

Conclusion

The northern long-eared bat has medium vulnerability based on its status (i.e., endangered), wide-ranging distribution, and declining trends, as described above. They eat insects (e.g., moths, flies, leafhoppers, caddisflies, and beetles), mostly at night. They forage in mature forests and occasionally 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. Methomyl use sites overlap 60.3% of the species range, 30% of which is on-field. A medium portion (9.4%) of the range has been treated annually with methomyl in the past (3.6% on-field and 5.8% off-field). However, while the northern long-eared bat has a high exposure ranking and we expect that a large number of individuals will be exposed if present, the species feeding preferences are strongly skewed to forested habitats. Thus, we do not anticipate more than very infrequent exposure to on-field levels of methomyl to a small number of individuals from consumption of contaminated insects throughout the duration of the action.

Even though individuals have large home ranges, given the prevalence of agriculture within the species' range, portions of occupied areas are anticipated to be near agriculture. Despite this we expect no more than low levels of indirect adverse effects from prey reduction due to varying amounts of mortality across insect prey species, leaving sufficient prey within the range.

As stated above, only a small number of individuals will experience high levels of direct adverse effects from feeding on prey recently exposed on agricultural use sites, as the species is known to primarily feed in forested habitats. A small number of individuals could consume primarily insects that were recently exposed to methomyl on-field and die or experience adverse sublethal effects (in the form of small impacts to fitness related to growth and reproduction), especially depending on the timing of feeding and application, but we anticipate that this will be a rare occurrence. We expect most individual northern long-eared bats will consume a wide variety of insect prey from many foraging habitats (i.e., forests, roadsides, clearings, and other natural areas). Therefore, while we expect a large number of northern long-eared bats will be exposed to methomyl, only a small number will experience adverse impacts (in the form of infrequent mortality and small impacts to fitness related to growth and reproduction) from consumption of contaminated insect prey or loss of prey within the range. In summary, we expect the overall risk to the species to be low, and the proposed action will not lead to adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. 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: Mammals - Texas kangaroo rat

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

Species Overview

In reviewing the status of the species, the environmental baseline and cumulative effects for the action area, the Service has determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, we determine there is high overlap of the action area with the species' range (Figure 25) and high past usage of methomyl within the species' range, suggesting a large number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate individuals will be exposed on methomyl use sites and are not likely to die, experience sublethal adverse effects, or experience indirect adverse effects in off-field areas, indicating that the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Texas kangaroo rat.

Species range

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

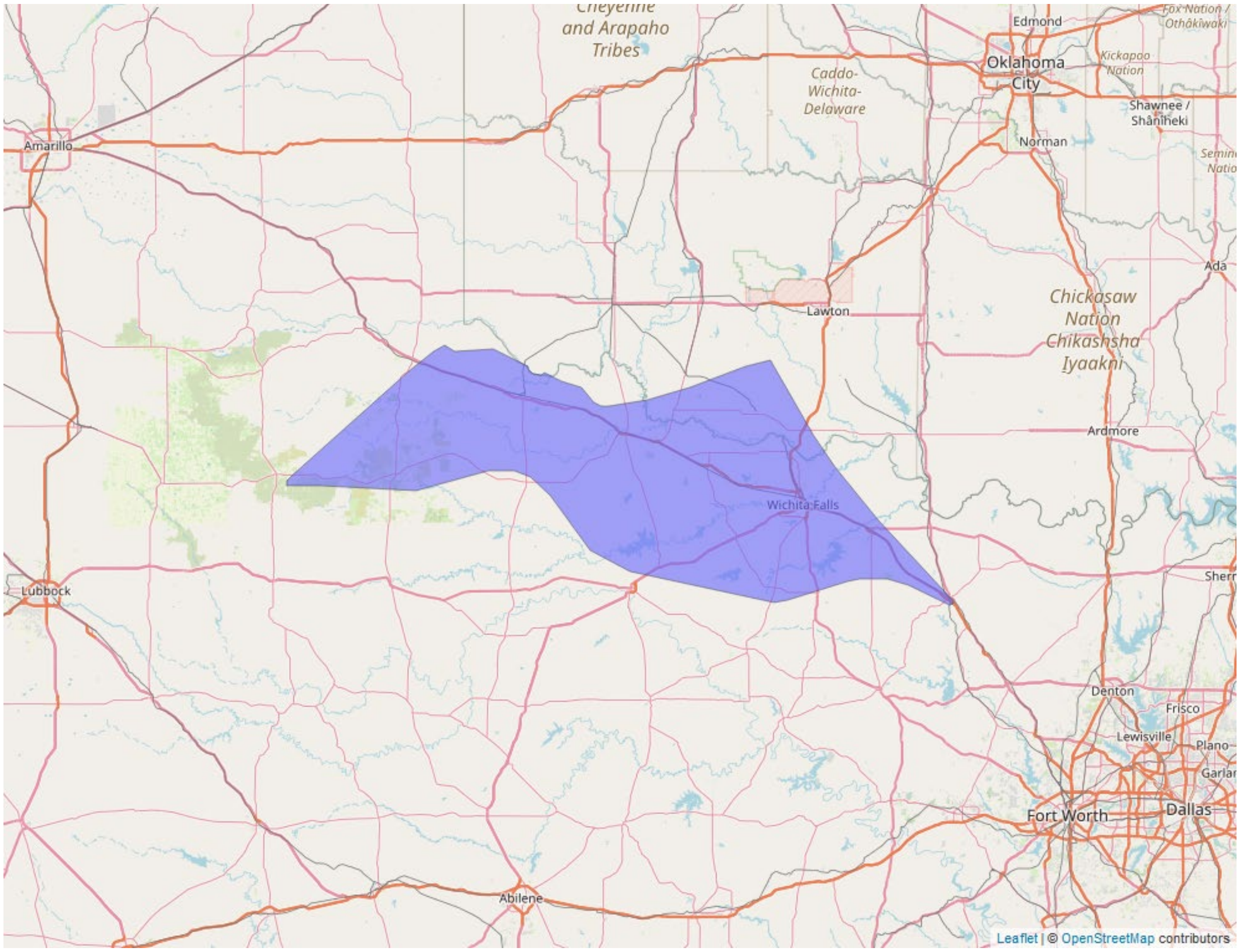

Figure 25. Range map of Texas kangaroo rat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2985.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Proposed Endangered

Most recent 5-Year Status Review recommendation: N/A

Most recently completed 5-Year Status Review: N/A

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

Number of populations: Single population

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

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Texas kangaroo rat is a nocturnal rodent found in Clay County, Texas. Their habitat generally has (1) loose, friable soils associated with mounds or physical supports like shrub and cactus roots, rocks, upturned rootballs, or manmade structures, (2) bare ground, and (3) short grasses. The rat digs a subterranean burrow system within loam/clay-loam soils that are used for shelter, reproduction, and food storage. They are granivores that use their long hind feet and long tail to jump and escape predators. They were historically found in 11 counties in Texas (i.e., Archer, Baylor, Childress, Clay, Cottle, Foard, Hardeman, Montague, Motley, Wichita, Wilbarger) and 2 counties in Oklahoma (Comanche and Cotton). As of 2021, the Texas kangaroo rat is considered extirpated from Oklahoma. During surveys between 2015-2018, they were found across four analysis units (111,000 ha) of habitat in Texas. The current condition of all occupied areas is low or moderate (USFWS 2021).

The primary threat to Texas kangaroo rats is habitat loss and degradation. Their preferred habitat is associated with disturbance, which used to occur from the presence of American bison, black-tailed prairie dogs, and periodic wildfires. Historically, domestic cattle often replaced bison and prairie dogs and changed the disturbance regime. Conversion of native rangeland to row crops also causes direct loss of habitat. Paved roads may create a barrier to rat movement, but unpaved roads provide non-traditional habitat where the species is often found. Woody plant encroachment threatens the persistence of grassland and savanna ecosystems required by this species. Effects of climate change and fire suppression may also affect the species and its habitat (USFWS 2021).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

Data indicate that 19.9% of the species' range overlaps with agricultural use sites and 42.7% of the species' range overlaps with areas adjacent to use sites that are likely exposed through off-site transport (e.g., through spray drift or runoff) (Table 31). In total, there is approximately 62.6% overlap between the species' range and methomyl use areas.

Table 31. Agricultural use overlap and annual usage data (% Range Treated) for the Texas kangaroo rat.

Use Layer	Use Site Overlap (% range)	Off-Site Overlap (% range)	Total Overlap (% range)	% Range Treated On-Site	% Range Treated Off-Site	% Total Range Treated
Alfalfa	0.4	1.9	2.3	0.2	1.3	1.5
Citrus	0	0	0	0	0	0
Corn	1	3	4	1	3	4
Cotton	11.5	16.7	28.2	8.1	14.5	22.6
Other Grains	6.7	18.2	24.9	6.6	18.3	24.9
Other Orchards	0.1	0.9	1	<0.1	0.5	0.6
Other Row Crops	0.1	0.3	0.4	0.1	0.3	0.4
Soybeans	<0.1	0.3	0.4	<0.1	0.3	0.4
Vegetables and Ground Fruit	0.4	1.4	1.8	0.4	1.4	1.8
Wheat	0	0	0	0	0	0
Total	**19.9**	**42.7**	**62.6**	**16.4**	**39.2**	**55.5**

Usage

Past usage data indicate that up to 55.5% of the species' range has been treated with methomyl annually from agricultural uses, 39.2% of which is off-field (Table 31).

Additional Exposure Considerations

The Texas kangaroo rat 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 do not anticipate individuals are likely to occur on agricultural use sites as cultivated agricultural areas do not likely provide the necessary habitat features to support individuals. Thus, we only consider off-field exposures in our analysis for this species.

Exposure Summary

While we do not anticipate the Texas kangaroo rat is likely to occur on agricultural use sites, there is still a high extent of overlap between the species' range and agricultural off-field areas (42.7% off-field overlap) and a high level of past usage (up to 55.5% range treated annually). As such, we anticipate a large number of individuals are likely to be exposed over the duration of the proposed action.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects

We anticipate dietary exposure is the most likely route of exposure for the Texas kangaroo rat. The Texas kangaroo rat is an opportunistic seed gatherer. EPA's exposure modeling indicates that rodents that feed on contaminated seeds on methomyl use sites can accumulate up to 17.5 mg/kg-bw methomyl, which can result in a high level of mortality (up to 97% exposed individuals) and sublethal effects to growth and reproduction in exposed individuals that do not die. Individuals that specifically consume seeds on-field will accumulate much lower levels of methomyl (up to 0.9 mg/kg-bw), which will not likely cause mortality or more than low levels of sublethal adverse effects to individuals. EPA's exposure modeling indicates that rodents that consume seeds in areas off-site that are exposed via spray drift are not likely to accumulate more than low levels of methomyl that are not likely to result in mortality or sublethal adverse effects. Given that we do not anticipate the Texas kangaroo rat is likely to forage on agricultural areas and their preference for seed forage items (which do not accumulate high levels of methomyl), we do not anticipate individuals are likely to experience more than low levels of exposure. As such, we anticipate few individuals are likely to experience mortality or sublethal adverse effects.

Indirect Effects

The Texas kangaroo rat is an obligate herbivore that primarily consumes seeds. Based on available toxicity data in plants, we do not anticipate any adverse effects to plant growth or survival are likely to occur. Thus, we do not anticipate any reductions in the abundance of the kangaroo rat's primary food source are likely to occur with methomyl use. As such, we do not expect any indirect adverse effects are likely to occur.

Toxicity Summary

We expect the Texas kangaroo rat is will experience, at most, low levels of direct adverse effects as individuals are not likely to forage on-field and foraging on their preferred dietary item (seeds) is not likely to result in more than low levels of dietary exposure. As such we do not expect the species will experience more than low levels of mortality or sublethal adverse effects.

We expect the Texas kangaroo rat will not experience any indirect adverse effects. The species is an obligate herbivore and available toxicity studies in plants indicate that methomyl exposure will not cause any mortality or reductions in growth. Thus, there will not likely be any reductions in the availability of plant-based food or habitat resources that the species requires.

Given that we expect only low levels of direct adverse effects and low levels of indirect adverse effects, we assign the Texas kangaroo rat a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Texas kangaroo rat has a high exposure ranking. While we do not expect individuals are likely to occur on agricultural use sites, there is a high extent of overlap between the species' range and agricultural off-field areas that are likely to be exposed through spray drift and runoff. There is a high level of past usage within the species' range, indicating that a significant portion of the species' range is likely to be treated each year. As such, we anticipate a large number of individuals are likely to be exposed to methomyl.

The Texas kangaroo rat has a low toxicity ranking. We do not anticipate individuals will accumulate more than low levels of methomyl from dietary exposure and will not experience more than low levels of mortality or sublethal adverse effects. We do not anticipate any indirect adverse effects will occur as we do not expect methomyl will cause any adverse effects to the plant species that provide food resources for the species.

Thus, while a large number of individuals that are likely to be exposed over the duration of the proposed action, we expect no more than small numbers of individuals will experience more than low levels of adverse effects. As such, we anticipate the overall risk of adverse effects to the species will be low.

Conclusion

The Texas kangaroo rat is proposed for listing as endangered. It is a nocturnal rodent found in a single population in Clay County, Texas. Their habitat consists of loose soils, physical supports like shrubs and cactus roots, bare ground, and short grasses. They burrow subterranean systems that are used for shelter, reproduction, and food storage. They eat grains, including on edges of agricultural lands near their preferred habitats. Row crops are considered poor foraging and sheltering habitat. Threats to the species include habitat loss and degradation (including from agricultural conversion and woody plant encroachment), fire suppression, and effects of climate change.

Methomyl use sites overlap 62.6% of the species range, and because the species prefers natural habitats and not agricultural lands, we considered the off-field portion of the action area in our analyses (42.7%). In addition, a large portion (55.5%) of the range has been treated annually with methomyl in the past (39.2% of which is off-field), therefore the Texas kangaroo rat has a high exposure ranking. We expect a large number of individuals will be exposed throughout the duration of the action. Though the kangaroo rat's range is near agricultural areas and they may forage on edges, agricultural land uses are considered poor habitat for the species. In addition, their diet consists of grains and other plant materials, and we expect low adverse effects to Texas kangaroo rats through dietary exposure. We do not expect indirect adverse effects to occur from loss of forage.

Therefore, while we expect a large number of Texas kangaroo rats will be exposed to methomyl, we expect low levels of mortality and sublethal adverse effects (e.g., reduced growth in the form of small impacts to fitness related to growth and reproduction)to occur to a small number of individuals that forage on agricultural edges. Overall, we expect adverse effects (low levels of mortality and no indirect effects) to the species to be low, and thus the proposed action will not result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. 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 Texas Kangaroo Rat (*Dipodomys elator*). Version 1.1. Arlington, Texas. 122 pp.

Integration and Synthesis Summary: Mammals - Tricolored bat

Scientific Name:	Common Name:	Entity ID:
Perimyotis subflavus	Tricolored bat	11365

Species Overview

In reviewing the status of the species, the environmental baseline and cumulative effects for the action area, the Service has determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, we determine there is high overlap of the action area with the species' range and low past usage of methomyl within the species' range, suggesting a moderate number of individuals are likely to be exposed. Based on the species' life history, we do not anticipate individuals are likely to be exposed on methomyl use sites, we do not anticipate individuals are likely to die, experience sublethal adverse effects, or experience more than low levels of indirect adverse effects through the loss of affected arthropod prey in off-field areas. As such, we anticipate the risk of adverse effects to the species is low. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the tricolored bat.

Species range

Based on range map dated: 7/2/2024; Wherever found; *States within the range:* AL, AR, CO, CT, DC, DE, FL, GA, IA, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, NE, NH, NJ, NM, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, VT, WI, WV, WY

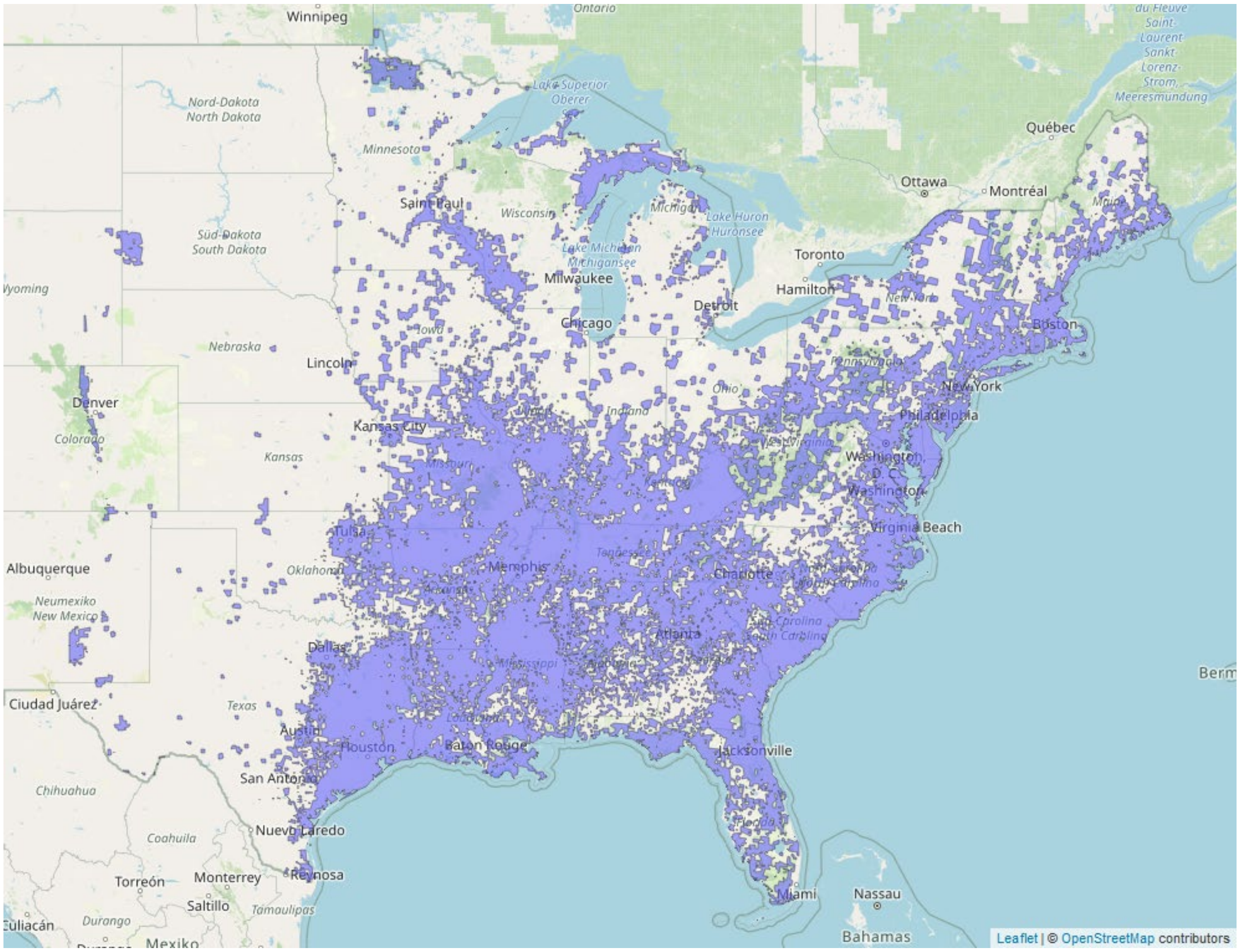

Figure 26. Range map of Tricolored bat (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/10515.

Vulnerability

As mentioned above, vulnerability considers the present condition of the species to determine its vulnerability to additional stressors. Here, 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, as summarized below.

Summary of status

Listing status: Proposed Endangered

Most recent 5 Year Status Review recommendation: N/A

Most recently completed 5 Year Status Review: N/A

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

Tricolored bats are one of the smallest bats in eastern North America and are distinguished by its unique tricolored fur that appears dark at the base, lighter in the middle, and dark at the tip. They are opportunistic feeders and consume small insects including caddisflies (Trichoptera), flying moths (Lepidoptera), small beetles (Coleoptera), small wasps and flying ants (Hymenoptera), true bugs (Homoptera), and flies (Diptera). They are known from 39 states (Alabama, Arkansas, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, Wisconsin, West Virginia, Wyoming), Washington D.C., four Canadian Provinces (Ontario, Quebec, New Brunswick, Nova Scotia), and Guatemala, Honduras, Belize, Nicaragua, and Mexico. The species current distribution in New Mexico, Colorado, Wyoming, South Dakota, and Texas is the result of westward range expansion in recent decades as well as into the Great Lakes basin. This expansion is largely attributed to increases in trees along rivers and increases in suitable winter roosting sites, such as abandoned mines and other human-made structures. During spring, summer, and fall (i.e., non-hibernating seasons), tricolored bats primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees. They will also roost in Spanish moss (*Tillandsia usneoides*) in the southern portions of their range, *Usnea trichodea* lichen in the northern portions of the range, and during summer in pine needles, eastern red cedar (*Juniperus virginiana*), within artificial roosts (e.g., barns, beneath porch roofs, bridges, concrete bunkers), and rarely within caves. Females exhibit high site fidelity and form maternity colonies and switch roost trees regularly. Males roost individually. In winter, tricolored bats hibernate (i.e., reduce their metabolic rates, body temperatures, and heart rate) in caves and mines. Where caves are sparse in the southern U.S., tricolored bats often hibernate in road-associated culverts, tree cavities, and abandoned water wells. They exhibit high site fidelity to hibernacula across years. Hibernating tricolored bats typically roost individually or in small clusters of both sexes away from other bats, as opposed to forming large clusters. They often roost on cave walls and ceilings and are rarely found in cave crevices. Tricolored bats are known to use smaller caves and mines that are not suitable hibernacula for other bat species. All three representation units have shown declining abundance. Abundance has declined 89%, 57%, and 24% in the eastern, northern, and southern units, respectively. The number of winter colonies (i.e., occupied hibernacula) have also decreased 46%, 24%, and 34% in the eastern, northern, and southern units, respectively. Lastly, across all units, the potential for population growth is currently undetectable, i.e., (λ) >1 is 0%. There has also been a noticeable shift towards smaller colony sizes. The magnitude of the winter declines, although widespread, varies spatially (USFWS 2021).

Threats to the tricolored bat include white-nose syndrome, wind-related mortality, climate change, and habitat loss. White-nose syndrome is the foremost stressor, a disease caused by the fungal pathogen Pd. The fungal pathogen is spread primarily via bat-bat and bat-environment-bat movement and interactions. The effect of white-nose syndrome on tricolored bats has been extreme, such that most summer and winter colonies experienced severe declines following the arrival of white-nose syndrome. Just 4 years after the discovery of white-nose, for example, tricolored bats experienced a 75% decline in winter counts across 42 sites in Vermont, New York and Pennsylvania. Similarly, the arrival of white-nose led to a 10–fold decrease in tricolored bat colony size. Most recently, data from 27 states and 2 provinces was used to conclude white-nose syndrome caused estimated population declines of 90–100% across 59% of tricolored bat range. There appear to be differences in how severe effects of white-nose are to tricolored bats in culverts vs. caves. The remarkable potential for bat mortality at wind facilities became known around 2003, when post-construction studies at the Buffalo Mountain, Tennessee, and Mountaineer, West Virginia wind projects documented the highest bat mortalities reported at the time (31.4 bats/MW and 31.7 bats/MW, respectively). Bat fatalities continue to be documented at wind power installations across North America and Europe. Bat fatality varies across facilities, between seasons, and among species. The effectiveness of curtailment at reducing species-specific fatality rates for tricolored bats, however, has not been documented. There is growing concern about impacts to bat populations in response to climate change from changes in hibernation, mortality from extreme drought, cold, or excessive rainfall, cyclones, loss of roosts from sea level rise, and impacts from human responses to climate change (e.g., wind turbines). Changes in landcover may be associated with losses in suitable roosting or foraging habitat, longer flights between suitable roosting and foraging habitats due to habitat fragmentation, fragmentation of maternity colonies, and direct injury or mortality. Adverse impacts of habitat loss are more likely in areas with little forest or highly fragmented forests (e.g., western U.S. and central Midwestern states), as there is a higher probability of removing roosts or causing loss of connectivity between roosting and foraging habitat (USFWS 2021).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

Data indicate that 24.6% of the species' range overlaps with agricultural use sites and 31.2% 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 32). In total, there is approximately 55.8% overlap between the species' range and the agricultural footprint of methomyl.

Table 32. Agricultural use overlap and annual usage data (% Range Treated) for the tricolored 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
Alfalfa	1.7	6	7.5	0.1	0.1	0.2
Citrus	0	0	0	0	0	0
Corn	16.2	11.7	27.9	0.4	0.4	0.8
Cotton	2.2	3.1	5.3	<0.1	0.1	0.1
Other Grains	3.1	6.5	9.6	0.1	0.1	0.2
Other Orchards	0	1.1	1.1	0	0.1	0.1
Other Row Crops	0.8	1.5	2.3	0.8	1.5	2.3
Soybeans	15.1	10	25.1	0.4	0.3	0.7
Vegetables and Ground Fruit	0.6	1.6	2.2	0.1	0.4	0.5
Wheat	0	0	0	0	0	0
Total	**24.6**	**31.2**	**55.8**	**1.6**	**2.7**	**4.2**

Usage

Past usage data indicate that up to 4.2% of the species' range has been treated with methomyl annually from agricultural uses (Table 32).

Additional Exposure Considerations

They are opportunistic feeders and consume small insects including caddisflies (Trichoptera), flying moths (Lepidoptera), small beetles (Coleoptera), small wasps and flying ants (Hymenoptera), true bugs (Homoptera), and flies (Diptera). They emerge early in the evening and forage at treetop level or above but may forage closer to ground later in the evening. Maximal distance traveled from roost areas to foraging grounds was 4.3 km for reproductive (pregnant or lactating) adult females in Indiana and 24.4 km for males in Tennessee.

Tricolored bats are one of the first cave-hibernating species to enter hibernation in the fall and one of the last to leave in the spring. Numbers of hibernating bats peaks in caves and mines in

December or later, suggesting some may use alternative hibernacula and move to caves and mines when it is colder (USFWS 2021).

Available information on the tricolored bat indicate that the species avoids agricultural areas. As such, while there is overlap between the species' range and agricultural use sites, we do not anticipate any individuals are likely to be exposed directly on agricultural use sites.

Exposure Summary

While we do not anticipate individuals are likely to occur on agricultural use sites, there is still a high extent of overlap between the areas action area and the species' range (55.8% overlap with off-site areas) and a low level of past usage within the species' range (up to 4.2% range treated annually). As such, we anticipate a medium number of individuals are likely to be exposed over the duration of the proposed action as there is still a high level of overlap.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects

The tricolored bat primarily consumes flying insects for food. EPA's exposure modeling predicts that individuals that feed on-field or forage on insect prey that have recently (i.e., within the last 24 hours) been exposed to methomyl on use sites will accumulate high levels of methomyl (up to 19.3 mg/kg-bw). This level of exposure will result in a high level of mortality (up to 88% of exposed individuals) and high levels of sublethal effects (e.g., reduced growth or reproduction) in individuals that do not die. EPA's exposure modeling indicates that individuals that feed off-field on insects that have not been recently exposed on use-site (i.e., through spray drift only) will accumulate only low levels of methomyl that are not likely to result in mortality or sublethal effects. Given that the species is unlikely to occur on agricultural use sites, we anticipate individuals will only accumulate low levels of methomyl through dietary exposure. As such, we do not anticipate more than small numbers of individuals will die or experience sublethal adverse effects from methomyl exposure.

Indirect Effects

The tricolored bat's primary food source is flying insects. Based on available toxicity data in insect species, we anticipate there will be a high level of insect mortality. However, we expect the level of mortality will vary across species as a result of natural variability in physiology, exposure, and other factors. As such, we do not expect the entire insect community is likely to experience mortality and that individual bats will still have sufficient food resources available, particularly in areas away from methomyl use sites. As such, we do not anticipate more than low levels of indirect adverse effects are likely.

Toxicity Summary

The tricolored bat is likely to experience only low levels of direct adverse effects. While some individuals that only consume insects that have recently been exposed to methomyl on-field are likely to accumulate high levels of methomyl and die or experience sublethal adverse effects, we expect this will be limited to a small number of individuals as the species' diverse foraging habitats indicate that individuals are unlikely to only consume prey that have come from on single source (i.e., a methomyl use site). We anticipate individuals exposed off-field will not experience mortality or sublethal effects.

We expect the tricolored bat will not experience more than low levels of indirect adverse effects. While we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we expect there will be a variation of response to methomyl exposure across the insect community and that there will not likely be complete mortality of the entire insect community. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

Given that we anticipate the species will only experience low levels of direct and indirect adverse effects, the tricolored bat has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The tricolored bat has a medium exposure ranking. There is a high extent of overlap between the spray drift areas and the species' range (31.2% total overlap). While past methomyl usage data indicate only a smaller portion of the range is likely to be treated each year (up to 2.7% range treated annually), we anticipate a moderate portion of the range will likely be treated with methomyl over the duration of the proposed action, particularly if the areas treated change each year. As such, we anticipate a moderate number of individuals are likely to be exposed.

The tricolored bat has a low toxicity ranking. While individuals that only consume insects that have recently been exposed to methomyl on-field are likely to accumulate high levels of methomyl and die, we expect this will be limited to a small number of individuals as the species' diverse foraging habitats indicate that individuals are unlikely to only consume prey that have come from on single source (i.e., a methomyl use site). Similarly, while we anticipate sensitive insect species that the bat feeds on will experience high levels of mortality with methomyl use, we do not anticipate the entire insect community will die as we expect there are natural variations in sensitivity to methomyl across insect taxa. As such, we anticipate there will likely be sufficient food resources remaining even if sensitive prey species experience high levels of mortality.

While we anticipate a moderate number of individuals are likely to be exposed to methomyl, we expect exposed individuals are not likely to experience more than low levels of mortality, sublethal adverse effects, and will only experience minor losses in prey availability. As such, we anticipate only a small number of individuals are likely to experience adverse effects from the proposed action. We therefore expect the overall risk of adverse effects to the species is low.

Conclusion

The tricolored bat is proposed for listing as endangered. It is an opportunistic feeder that consumes a variety of small insects. Tricolored bats roost in live and dead deciduous hardwood trees, Spanish moss, and artificial roosts like barns and bridges. They hibernate in caves, mines, culverts, water wells, and tree cavities. They occur in 39 states, four Canadian provinces, and several countries in Central America. Their range relatively recently expanded westward to New Mexico and the Great Lakes. All occupied areas and hibernacula have declined in abundance, up to 89% for the eastern representation unit. Threats to the species include white-nose syndrome, wind mortality, habitat loss and degradation, and effects of climate change.

Methomyl use sites overlap 55.8% of the species range. A small portion (4.2%) of the range has been treated annually with methomyl in the past, therefore the tricolored bat has a medium exposure ranking. We expect a moderate number of individuals will be exposed throughout the duration of the action. Though the tricolored bat's range is near agricultural areas, agricultural land uses are considered poor habitat for the species. Their diet consists of small insects, and we expect bat mortality if they consume insects on-field or soon after the insects were exposed to methomyl. Because the species forages primarily off-field at treetop level or higher near forest edges, we do not anticipate mortality or sublethal adverse effects are likely to occur to individuals exposed in off-field areas. We expect methomyl exposure to result in low levels of indirect adverse effects through loss of insect prey that result in small impacts to fitness of the species related to growth and reproduction.

Therefore, while we expect a moderate number of tricolored bats will be exposed to methomyl, we expect mortality will be limited to a small number of individuals (i.e., those that forage on insects on use sites), and small impacts to fitness related to growth and reproduction from the indirect effects of insect prey loss or sublethal adverse effects experienced if individuals consume contaminated prey on field and do not die. As such, we expect the overall risk to the species to be low, and the proposed action will not result in adverse species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not likely to appreciably reduce the survival and recovery of the species. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the tricolored bat.

References

U.S. Fish and Wildlife Service. 2021. Species Status Assessment (SSA) Report for the Tricolored Bat (*Perimyotis subflavus*). Version 1.1. Hadley, Massachusetts. 166 pp.