Integration and Synthesis Summary for Birds

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.

Vulnerability

For the bird species that we or EPA determined are "likely to be adversely affected" by the proposed action, we considered several factors for each bird to summarize the vulnerability of that species. 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, listing rules, 5-year species status reviews, species recovery plans, species status assessments, and other best available sources of information as available 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 or status. This information is reflected in the rationales for conclusion below.

Exposure

We anticipate birds will primarily be exposed to methomyl through dietary exposure by consuming contaminated food items in their habitats. Methomyl degrades quickly (i.e., within a few days) in natural environments and is not likely to persist 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, and any species-specific considerations such as 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. Past methomyl usage data on Pacific or Caribbean islands is unavailable. However, prior reporting data indicate that annual treatment with insecticides occurs on 8-45% of agricultural crops per island on Hawai'i and 20-70% of crops per municipality in Puerto Rico. We use these data broadly as confirmation that insecticide usage occurs on these islands, with methomyl presumably among these insecticides.

We determine the overall exposure ranking by qualitatively considering both the total overlap and total usage, as well as any additional exposure considerations that might modify the level of exposure likely to occur. When overlap and usage scores are the same, we assign the overall exposure ranking the same score (e.g., if both overlap and usage is high, the overall exposure ranking is high). In cases where overlap is high and usage is medium or when overlap is medium and usage is low, we use the overlap score as the overall exposure ranking to maintain conservative exposure assumptions. (As usage is a subset of overlap, the overlap score will always be greater than the usage score.) In cases where overlap is high but usage is low, we anticipate a moderate portion of the range may be treated over the duration of the proposed action even if only a small portion of the range is treated in any given year (particularly if the areas treated occur in different locations each year), leading to an overall exposure ranking of medium. For 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 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 on food items can vary greatly depending on the particular item and whether exposure to methomyl occurs on- or off-field. Based on available toxicity data, we anticipate birds exposed to methomyl may die depending on the species and dosage. 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 before the onset of mortality for birds exposed at concentrations estimated to occur on dietary items because of this action.

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 prey items are exposed to methomyl on- or off-field.

We determine the overall toxicity ranking for birds by qualitatively assessing both the expected levels of direct adverse effects (i.e., mortality) and indirect effects (i.e., prey loss). Given that mortality is the most adverse of direct effects to an individual of a species, we assign the most weight to direct adverse effects resulting in mortality when determining the toxicity ranking. As mentioned previously, available toxicity data indicate birds are sensitive to methomyl and are likely to die, depending on their size and the dietary items they consume. Thus, most birds will

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[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.

have a high or medium toxicity ranking, with few exceptions: wood stork, Everglade snail kite, and red knot.

Summary of Bird 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 likely to jeopardize the continued existence of 3 of 67 bird species in this Appendix. For the other 64 species in this Appendix, we do not expect the registration of methomyl, as proposed, is likely to jeopardize the continued existence of the species in the wild. We provide additional information about each of these species below.

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

Experimental, non-essential populations

The EPA included the experimental, non-essential populations for the following bird species in the consultation: California condor, Guam kingfisher, Guam rail, northern aplomado falcon, and whooping crane. We do not provide separate analyses and make 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 on the survival and recovery of the species and consider this information in our jeopardy analyses as appropriate.

Species proposed for delisting due to extirpation from the U.S. or extinction with low risk

The following species are proposed for delisting (Table 1) due to extirpation from the U.S. or extinction. While we present some specific information about the species in Table 1 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species account can be found in Appendix B.

Table 1. Bird species proposed for delisting.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Change in listing status	Determination
Numenius borealis	Eskimo curlew	High	High	High	likely no longer extant	No Jeopardy
Psittirostra psittacea	\`Ō\`ū (honeycreeper)	High	Low	High	presumed extinct	No Jeopardy

In the Service's 2022 and 2021 5-year status reviews for the \`ō\`ū (honeycreeper) and Eskimo curlew, respectively, we recommended delisting due to extinction. The available information indicates these species are no longer extant in the wild and there are no captive individuals. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the \`o\`u (honeycreeper) or the Eskimo curlew.

References

U.S. Fish and Wildlife Service. 2021. 5-Year Review Eskimo curlew (*Numenius borealis*). Fairbanks, Alaska. 2 pp.

U.S. Fish and Wildlife Service. 2022. 5-Year Review Short Form Summary \`Ō\`ū (*Psittirostra psittacea*). Honolulu, Hawai'i. 13 pp.

Species with low concern of adverse effects

The species in Table 2 are grouped together as they have low concern of adverse effects because they have low exposure with low or medium vulnerability and medium or high toxicity. 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. Bird species with low concern of adverse effects because they have low exposure with low or medium vulnerability and medium or high toxicity

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Draft Determination
Aphelocoma coerulescens	Florida scrub-jay	Medium	Low	High	No Jeopardy
Charadrius nivosus nivosus	Western snowy plover	Low	Low	High	No Jeopardy
Coccyzus americanus	Yellow-billed cuckoo	Medium	Low	High	No Jeopardy
Empidonax traillii extimus	Southwestern willow flycatcher	Medium	Low	High	No Jeopardy
Pipilo crissalis eremophilus	Inyo California towhee	Low	Low	High	No Jeopardy
Polioptila californica californica	Coastal California gnatcatcher	Medium	Low	High	No Jeopardy
Rallus longirostris levipes	Light-footed Ridgway’s rail (Light-footed clapper rail)	Medium	Low	High	No Jeopardy
Sterna antillarum browni	California least tern	Medium	Low	Medium	No Jeopardy
Strix occidentalis lucida	Mexican spotted owl	Medium	Low	High	No Jeopardy

All the species listed in Table 2 have a low or medium vulnerability ranking, indicating that the species may be more robust to adverse effects that occur to individuals. In addition, 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. We expect total overlap is a conservative metric 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 small numbers of individuals of each of these species are likely to experience any exposure to methomyl.

Most species in this group have a high toxicity ranking, indicating that high levels of mortality and/or loss of food items are likely when exposure occurs. However, we anticipate adverse effects are more likely to occur for individuals that primarily occur or 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 as individuals of these species are unlikely to forage on methomyl use sites or exclusively encounter and consume prey species that have recently been exposed to methomyl on-field 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 can still result in mortality to some of these species, but often to a lower proportion of exposed individuals than those that forage on-field. Thus, we anticipate few individuals are likely to experience adverse effects.

For the Inyo California towhee, western snowy plover, California least tern, coastal California gnatcatcher, light-footed Ridgway's rail, southwestern willow flycatcher, yellow-billed cuckoo, Mexican spotted owl, and Florida scrub-jay, we do not expect individuals to occur or forage on agricultural lands. None of the Inyo California towhee's range overlaps with agricultural lands (i.e., methomyl use sites; 0% overlap). They occur in dense, low-growing habitats where we do not expect agriculture to occur (i.e., southern Argus Mountains of the Mojave Desert in California, USFWS 2024). For the western snowy plover, California least tern, and coastal California gnatcatcher, small to medium (3-8%) portions of their ranges overlap with methomyl use sites, but they primarily occur in coastal areas where we do not expect agriculture to occur. In addition, low levels of insecticides have been used in the past in these species' ranges (western snowy plover: 2.9%, California least tern: 0%, and coastal California gnatcatcher: 2.1%), as informed by the California Department of Pesticide Regulation data for the tern and gnatcatcher and informed by the USDA Census of Agriculture for the plover. Therefore, we expect their exposure to methomyl to be very low and effects to the species will be minimal.

Light-footed Ridgway's rails occur in coastal marshes, lagoons, and freshwater habitats in southern California, where we do not expect agriculture to occur. They forage for invertebrates in lower marshes and mudflats during low tide and upper marsh vegetation during high tide (USFWS 2020). The action area overlaps with 4.9% of the species' range and only 0.2% of their range has been treated with any insecticide in the past according to the California Department of Pesticide Regulation's mandatory pesticide reporting, which we consider to be a conservative estimate of past methomyl usage. The southwestern willow flycatcher is found in riparian habitats like riversides, streams, and wetlands and dense shrub thickets (USFWS 2017). The action area overlaps with 6.9% of the species' range, but only 1.3% of the range has been treated with any insecticide in the past according to the USDA Census of Agriculture. Yellow-billed cuckoos winter in South America and breed in North America. In the U.S., they use dense riparian woodlands along low-gradient streams, more arid woodlands, desert scrub, and desert grasslands (USFWS 2019a). Methomyl use sites overlap 10.5% of their range, but only 1.6% of the range has been treated with any insecticide in the past according to Census of Agriculture data. Mexican spotted owls occur in forested mountains and canyonlands (USFWS 2023) where we do not expect agriculture to occur. The action area overlaps 2.8 % of the species' range and 0.2% of the range has been treated with any insecticide in the past according to the USDA Census of Agriculture. Finally, the Florida scrub-jay occurs in scrub and scrubby flatwoods on relict dunes and sand ridges (USFWS 2019b). The action area overlaps 3.9% of the species range and 3.4% has been treated with any insecticide in the past according to USDA Census of Agriculture data. After considering overlap with agriculture and past usage data, we are confident that these species will experience, at most, low exposure to methomyl from the proposed action.

We only anticipate small numbers of individuals of the bird species in Table 2 are likely to be exposed and that most individuals are exposed under conditions that will not result in mortality or loss of food resources. Therefore, we determine the overall risk of adverse effects to these 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 expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the bird species in Table 2.

References:

U.S. Fish and Wildlife Service. 2024. Inyo California Towhee (*Melozone crissalis eremophila* (=*eremophilus*)) 5-Year Review: Summary and Evaluation. Carlsbad, California. 126 pp.

U.S. Fish and Wildlife Service. 2023. Mexican spotted owl (*Strix occidentalis lucida*) 5-Year Review: Summary and Evaluation. Flagstaff, Arizona. 16 pp.

U.S. Fish and Wildlife Service. 2020. Light-footed Ridgway's (=clapper) rail. (*Rallus obsoletus* (=*longirostris*) *levipes*) 5-Year Review: Summary and Evaluation. Carlsbad, California. 67 pp.

U.S. Fish and Wildlife Service. 2019a. Species Assessment and Listing Priority Assignment Form – Yellow-billed Cuckoo. Albuquerque, New Mexico. 28 pp.

U.S. Fish and Wildlife Service. 2019b. Species Status Assessment Florida Scrub-jay (*Aphelocoma corulescens*). Version 1.0. Jacksonville, Florida. 146 pp.

U.S. Fish and Wildlife Service. 2017. Endangered and Threatened Wildlife and Plants; 12-Month Findings on Petitions To List a Species and Remove a Species From the Federal Lists of Endangered and Threatened Wildlife and Plants. Federal Register 82:61725-61727.

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

The species in Table 3 are grouped together as they all have low exposure informed by low overlap with agricultural sites where methomyl is registered for use. 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. Bird species with low exposure (informed by low overlap between the species' range and agriculture), high vulnerability, and medium/high toxicity.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Action Area Overlap	Draft Determination
Accipiter striatus venator	Puerto Rican sharp-shinned hawk	High	Low	High	2.0	No Jeopardy
Acrocephalus luscinia	Nightingale reed warbler (old world warbler)	High	Low	High	4.3	No Jeopardy
Aerodramus vanikorensis bartschi	Mariana gray swiftlet	High	Low	High	2.6	No Jeopardy
Amazona vittata	Puerto Rican parrot	High	Low	High	2.2	No Jeopardy
Buteo platypterus brunnescens	Puerto Rican broad-winged hawk	High	Low	High	3.3	No Jeopardy
Chasiempis ibidis	O'ahu elepaio	High	Low	High	0.0	No Jeopardy
Colinus virginianus ridgwayi	Masked bobwhite (quail)	High	Low	High	0.3	No Jeopardy
Columba inornata wetmorei	Puerto Rican plain pigeon	High	Low	High	0.1	No Jeopardy
Drepanis coccinea	`Iiwi	High	Low	High	0.8	No Jeopardy
Gallicolumba stairi	Friendly ground-dove	High	Low	High	1.3	No Jeopardy
Gallinula chloropus guami	Mariana common moorhen	High	Low	High	2.0	No Jeopardy

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Action Area Overlap	Draft Determination
Halcyon cinnamomina cinnamomina	Guam kingfisher	High	Low	High	2.2	No Jeopardy
Hemignathus wilsoni	Akiapolaau	High	Low	High	0.0	No Jeopardy
Loxioides bailleui	Palila (honeycreeper)	High	Low	High	0.0	No Jeopardy
Loxops caeruleirostris	Akekee	High	Low	High	0.0	No Jeopardy
Loxops coccineus	Hawai'i akepa	High	Low	High	0.0	No Jeopardy
Loxops mana	Hawai'i creeper	High	Low	High	0.0	No Jeopardy
Megapodius laperouse	Micronesian megapode	High	Low	High	2.2	No Jeopardy
Myadestes palmeri	Small Kaua'i (puaiohi) thrush	High	Low	High	0.0	No Jeopardy
Palmeria dolei	Crested honeycreeper	High	Low	High	0.0	No Jeopardy
Pseudonestor xanthophrys	Maui parrotbill (honeycreeper)	High	Low	High	0.0	No Jeopardy
Rallus longirostris obsoletus	California Ridgway's rail (California clapper rail)	High	Low	High	4.4	No Jeopardy
Rallus owstoni	Guam rail	High	Low	High	2.2	No Jeopardy
Setophaga angelae	Elfin-woods warbler	High	Low	High	1.3	No Jeopardy
Strix occidentalis caurina	Northern spotted owl	High	Low	High	1.2	No Jeopardy
Zosterops rotensis	Rota bridled white-eye	High	Low	High	3.9	No Jeopardy

All the species listed in Table 3 have a high vulnerability ranking, indicating that the species may be less robust to adverse effects that occur to individuals. However, 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. As such, we expect that exposure of these species to methomyl will occur in an even smaller portion of the species' ranges. and have high confidence that only small numbers of individuals of each of these species are likely to experience any exposure to methomyl.

Most species in this group have a high toxicity ranking, indicating that high levels of mortality and/or loss of food items are likely when exposure occurs. However, we anticipate adverse effects are most likely to occur for individuals that primarily occur or 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 as individuals of these species are unlikely to forage on methomyl use sites or exclusively encounter and consume prey species that have recently been exposed to methomyl on-field 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 can still result in mortality to some of these species, but to a lower proportion of exposed individuals. Thus, we anticipate few individuals are likely to experience adverse effects.

None of the following species' ranges overlap agriculture or methomyl use sites (0% overlap): akekee, akiapolaau, crested honeycreeper, Hawai'i akepa, Hawai'i creeper, Maui parrotbill, O'ahu elepaio, palila (honeycreeper), and small Kaua'i thrush, so we do not anticipate exposure or effects to these species. The `iiwi and friendly ground-dove are found in Hawaiian or Pacific Island forests where we expect minimal effects from methomyl to occur. Consumption of contaminated prey items or losses of prey items that lead to a reduction in fitness supporting reproductive capacity or growth is anticipated in a very small number of individuals.

Overlaps between the action area and the species' ranges for the species on the Mariana Islands are very low (<3%). In addition, the Guam rail is only found in the wild as a non-essential experimental population on Rota (Entity ID: 4889), which had about 200 birds in 2019, and a population covered by a Safe Harbor Agreement on Cocos (USFWS 2020a). Guam kingfishers are currently only found on Guam in captivity, but we plan to release Guam kingfishers in the future. They feed on aquatic and terrestrial invertebrates and were formerly found on many habitat types, including agricultural lands (USFWS 2020b). We designated a non-essential experimental population for Guam kingfishers in 2023 on Palmyra Atoll (Entity ID: 11728), where agriculture is not expected to occur. Mariana common moorhen occur in permanent freshwater wetlands on four islands of the Mariana archipelago, and the Mariana gray swiftlet is primarily found in caves, sink holes, and forests. The Rota bridled white-eye is found in forests on Rota, and the Micronesian megapode is primarily found in forests on Saipan (reintroduced), Aguiguan, Tinian, and Farallon de Medinilla. Finally, nightingale reed-warblers occur on Saipan and Alamagan in forests, forest edges, and wetlands. We do not expect agriculture to occur in or near these species' habitats, therefore we expect exposure of these species from methomyl use on these species to be extremely low, and adverse effects are not anticipated.

California Ridgway's rail habitat consists of marshes and other wetlands where we expect effects from methomyl to be minimal; the action area overlaps 4.4% of the species' range and 0.9% of the range has been treated with insecticides in the past, according to California Department of Pesticide Registration data. For the masked bobwhite quail, the action area overlaps 0.3% of the species' range, and they occur in the Sonoran Desert and other desert-like habitats where we do not expect agriculture to occur. Northern spotted owls are found in old-growth forests and only 1.2% of their species' range overlaps with the action area. We do not expect agriculture to occur in or near these species' habitats, therefore we do not anticipate adverse effects to these species from methomyl use sites due to the lack of exposure.

Elfin-woods warbler, Puerto Rican broad-winged hawk, Puerto Rican sharp-shinned hawk, and Puerto Rican parrot are found in forests on Puerto Rico where we expect minimal effects from agriculture to occur (i.e., only from adjacent lands). Puerto Rican plain pigeons occur in forests, coastal deserts, mangroves, and swamps, where we also expect methomyl use and exposure will be low. After considering overlap with agriculture, we are confident that these species will experience, at most, low exposure to methomyl from the proposed action. Direct exposure through the consumption of contaminated prey items or losses of prey items that lead to a reduction in fitness supporting reproductive capacity or growth is anticipated in a very small number of individuals.

We only anticipate small numbers of individuals of some of the bird species in Table 3 are likely to be exposed and that most individuals will be exposed under conditions that will not result in mortality or loss of food resources, as described above. 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 expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the bird species in Table 3.

References:

U.S. Fish and Wildlife Service. 2020a. 5-Year Review Short Form Summary Guam rail. Honolulu, Hawai`i. 8 pp.

U.S. Fish and Wildlife Service. 2020b. 5-Year Review Short Form Summary *Halcyon cinnamomina cinnamomina* (Sihek, Guam Micronesian kingfisher). Honolulu, Hawai`i. 7 pp.

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

The species in Table 4 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 4 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 4. Bird species with low exposure (confirmed by low past usage from U.S. Department of Agriculture's Census of Agriculture (CoA)), high vulnerability, and high toxicity

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated	Draft Determination
Ammospiza maritima mirabilis	Cape Sable seaside sparrow	High	Low	High	1.9	No Jeopardy
Falco femoralis septentrionalis	Northern aplomado falcon	High	Low	High	3.5	No Jeopardy
Gymnogyps californianus	California condor	High	Low	High	2.3	No Jeopardy
Setophaga chrysoparia	Golden-cheeked warbler (wood)	High	Low	High	3.1	No Jeopardy

All the species listed in Table 4 have a high vulnerability ranking, indicating that the species may be less robust to adverse effects that occur to individuals. The species in this group have a high toxicity ranking, indicating that high levels of mortality, and/or loss of food items are likely when exposure occurs. However, we anticipate adverse effects are most likely to occur for individuals that primarily occur or 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 as individuals of these species are unlikely to forage on methomyl use sites or exclusively encounter and consume prey species that have recently been exposed to methomyl on-field 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 can still result in mortality to some of these species, but to a lower proportion of exposed individuals. Thus, we anticipate few individuals are likely to experience adverse effects.

However, while these species are highly vulnerable and toxicity is high, we anticipate only a 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 these 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. In addition, we do not expect agriculture to occur in or near these species' habitats. Cape Sable seaside sparrows occur in freshwater marshes, exclusively on public lands managed for the species (i.e., Everglades National Park and Big Cypress National Preserve in Florida; Service 2023) where we expect methomyl use to be minimal. Northern aplomado falcons use open grasslands, small patches of scrub, and woodlands in the Chihuahuan Desert. California condors nest in caves, cliffs, outcrops, and tree cavities, and scavenge for carrion in open grasslands and beaches. There are two non-essential experimental populations for California condor (Entity ID: 1737 and 11570) and northern aplomado falcon (Entity ID: 9122). Finally, the golden-cheeked warbler breeds in mixed Ashe juniper/deciduous woodlands in central Texas. They migrate through Mexico to winter in mountains of southern Mexico and Central America.

In summary, after considering habitat requirements and past insecticide usage data within the range of these four species, we are confident that they will experience, at most, low exposure to methomyl from the proposed action. As such, we anticipate only small numbers of individuals of the bird species in Table 4 are likely to be exposed and that most individuals are exposed under conditions that will not result in mortality or loss of food resources that would result in reductions in fitness that would impact reproductive success or growth. Therefore, we determine the overall risk of adverse effects to these 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 that the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the bird species in Table 4.

References:

U.S. Fish and Wildlife Service. 2023. Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 39 pp.

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

The species in Table 5 are grouped together because they all occur completely within California and have low exposure confirmed by low levels of past methomyl usage within their ranges (% range treated), as informed by the California Department of Pesticide Regulation Pesticide Use Reporting (CalPUR) data. While we present some specific information about the species in Table 5 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 5. Bird species 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
Vireo bellii pusillus	Least Bell's vireo	High	Low	High	1	No Jeopardy

Least Bell's vireos are found in 12 counties in central and southern California, and most populations increased in abundance in the years before the last 5-year review in 2006. Most least Bell's vireos are in southern California (USFWS 2006). They occur in riparian habitat, particularly structurally diverse woodlands along watercourses, cottonwood-willow forests, oak woodlands, and mule fat scrub. They may winter in mesquite scrub vegetation in arroyos, palm groves, and hedgerows associated with agricultural fields and rural residential areas. They eat insects, spiders, and berries (USFWS 1998).

While this species has relatively higher percent overlap between the action area and its range (6%), mandatory pesticide usage reporting data collected by the state of California indicates very little methomyl has been used in the agricultural sections where least Bell's vireos occur. Given that this usage data is mandated by the state of California and that this data is reported with relatively high spatial resolution, we have high confidence that the species likelihood of exposure to methomyl as a result of the proposed action is low. As such, direct exposure through the consumption of contaminated prey and losses of food resources that lead to impacts to growth or reproduction are anticipated in a very small number of individuals.

Given that we only anticipate small numbers of individual least Bell's vireos are likely to be exposed or affected by prey losses, we determine the overall risk of adverse effects to this 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 that the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the least Bell's vireo.

References:

U.S. Fish and Wildlife Service. 2006. Least Bell's vireo (*Vireo bellii pusillus*) 5-Year Review Summary and Evaluation. Carlsbad, California. 27 pp.

U.S. Fish and Wildlife Service. 1998. Draft Recovery Plan for the Least Bell's vireo (*Vireo bellii pusillus*). Portland, Oregon. 154 pp.

Species proposed for delisting due to recovery with moderate risk

The following species is proposed for delisting due to extirpation from the U.S. or extinction (Table 6) and has medium vulnerability, high exposure, and low toxicity rankings. While we present some specific information about the species in Table 6 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species account can be found in Appendix B.

Table 6. Bird species with low or medium vulnerability rankings and medium exposure and toxicity rankings.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Additional Considerations	Determination
Mycteria americana	Wood stork	Medium	High	Low	proposed for delisting	No Jeopardy

Wood storks breed in the southeastern U.S., Mexico, Central America, and South America. In the U.S., they colonially nest in bald cypress, sweetgum, and mangroves in wetlands. According to satellite telemetry studies, wood storks are positively correlated with agriculture. They feed on fish and crustaceans in natural and artificial wetlands, including both freshwater and saltwater habitats (USFWS 2021). In 2023, we proposed the wood stork for delisting due to recovery (i.e., population increases and habitat loss mitigations) (USFWS 2023).

The wood stork has a large percent overlap between the action area and its range (36.8%) and medium levels of past methomyl usage based on state-level data (up to 8.6% annually). They eat aquatic prey, and we do not anticipate any direct impacts to wood storks that consume prey exposed to methomyl off-field. We expect indirect impacts to the wood stork from losses of some sensitive prey items (i.e., fish and crustaceans) that are exposed in habitats where methomyl concentrations will be high enough to cause mortality, such as in shallow or low volume wetland areas. We anticipate these prey losses will result in reduced reproduction or growth of a small number of individuals, but we anticipate most individuals will be able to locate alternative prey because they are known to travel 75+ km in search of prey (USFWS 2021). Therefore, even with high overlap and medium usage levels in the range, methomyl likely poses low risk to the wood stork.

Given that we do not anticipate mortality of wood storks, and prey losses are anticipated to lead to reductions in growth and reproductive success in only a small number of individuals, we determine the overall risk of adverse effects to this species from the proposed action is low. Additionally, the status of the species has improved such that we have proposed delisting of the species. We do not expect these effects from the proposed action will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the wood stork.

References:

U.S. Fish and Wildlife Service. 2023. Endangered and Threatened Wildlife and Plants; Removal of the Southeast U.S. Distinct Population Segment of the Wood Stork From the List of Endangered and Threatened Wildlife. Proposed Rule. Federal Register 88(31): 9830-9850.

U.S. Fish and Wildlife Service. 2021. Species status assessment report for the wood stork (*Mycteria americana*) U.S. breeding population Distinct Population Segment. Version 1.0. Atlanta, GA. 181 pp.

Species with Individual Integration and Synthesis summaries

For the species in Table 7, 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 7. Bird species with high risk of adverse effects.

Scientific Name	Common Name	Draft Determination
Grus americana	Whooping crane	No Jeopardy
Anas wyvilliana	Hawaiian (koloa) duck	No Jeopardy
Branta (=Nesochen) sandvicensis	Hawaiian goose	No Jeopardy
Gallinula galeata sandvicensis	Hawaiian common gallinule	No Jeopardy
Tympanuchus cupido attwateri	Attwater's greater prairie-chicken	No Jeopardy
Rallus obsoletus yumanensis	Yuma Ridgway's rail (Yuma clapper rail)	No Jeopardy
Paroreomyza maculata	O'ahu creeper	No Jeopardy
Himantopus mexicanus knudseni	Hawaiian stilt	No Jeopardy
Myadestes lanaiensis rutha	Molokai thrush	No Jeopardy
Picoides borealis	Red-cockaded woodpecker	No Jeopardy
Fulica alai	Hawaiian coot	No Jeopardy
Grus canadensis pulla	Mississippi sandhill crane	No Jeopardy
Caprimulgus noctitherus	Puerto Rican nightjar	No Jeopardy
Agelaius xanthomus	Yellow-shouldered blackbird	No Jeopardy
Corvus kubaryi	Mariana (aga) crow	No Jeopardy
Polyborus plancus audubonii	Audubon's crested caracara	No Jeopardy
Charadrius melodus	Piping plover (Great Lakes DPS)	No Jeopardy
Charadrius melodus	Piping plover	No Jeopardy
Ammodramus savannarum floridanus	Florida grasshopper sparrow	No Jeopardy
Rostrhamus sociabilis plumbeus	Everglade snail kite	No Jeopardy
Centrocercus minimus	Gunnison sage grouse	No Jeopardy
Eremophila alpestris strigata	Streaked horned lark	No Jeopardy
Calidris canutus rufa	Red knot	No Jeopardy
Laterallus jamaicensis ssp. jamaicensis	Eastern black rail	No Jeopardy

Integration and Synthesis Summary: Birds - Whooping crane

Scientific Name:	Common Name:	Entity ID:
Grus americana	Whooping crane	67

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the whooping crane. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 4/15/2022; Wherever found, except where listed as an experimental population; *States within the range:* CO, KS, LA, MT, ND, NE, OK, SD, TX, WY. Figure 1 depicts a map of the species' range.

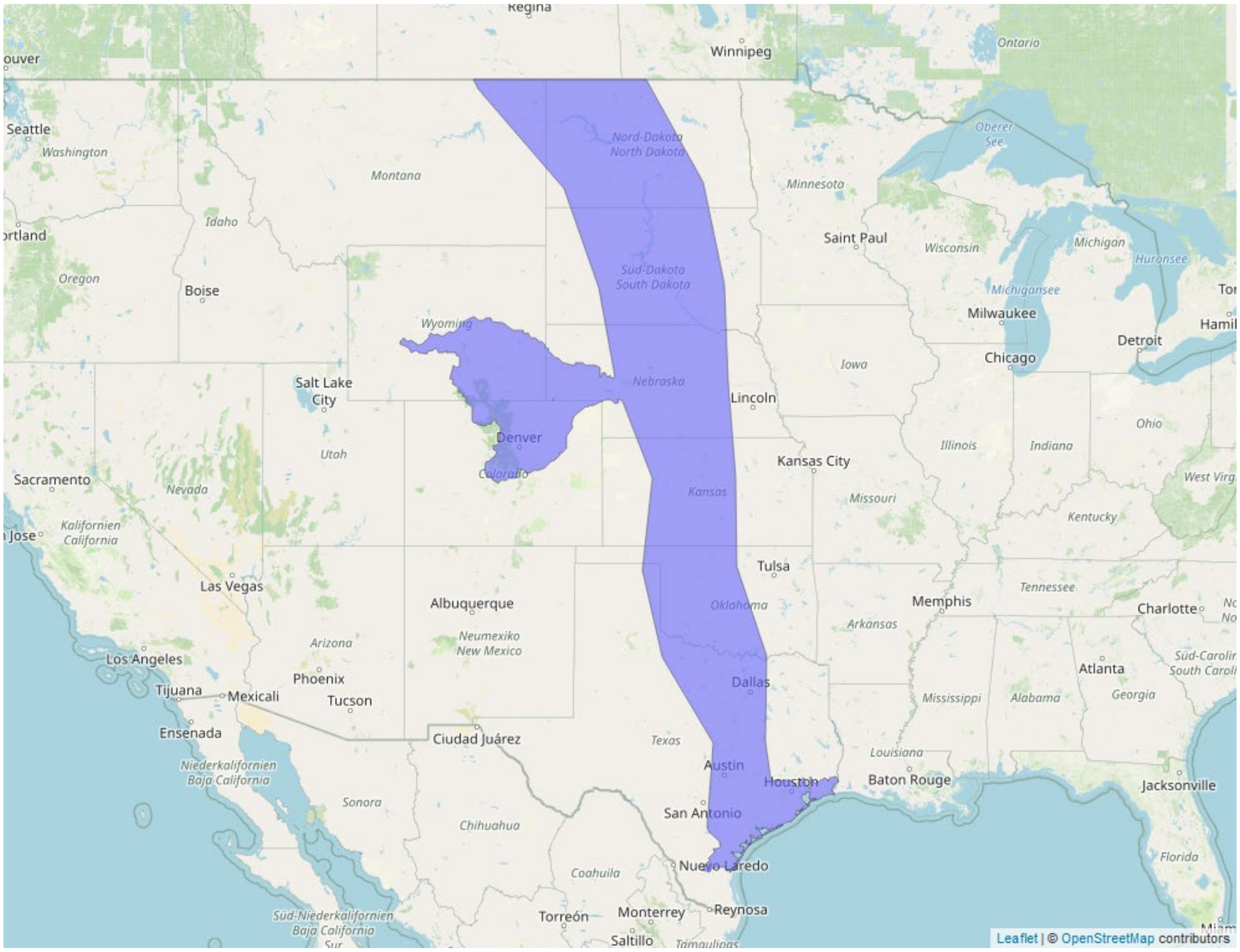

Figure 1. Range map of whooping crane (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/758.

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: 2/13/2012

Distribution: Species/Populations neither constrained nor widespread

Number of populations: Multiple populations (few)

Species trends: Unknown population trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Historically, over 10,000 whooping cranes once populated North America, ranging east of the Rocky Mountains from Canada to Mexico and the Rocky Mountains to the East Coast. Population declines were caused primarily by shooting and destruction of habitat in the prairies from agricultural development (CWS and Service 2007). By the mid-1800s, only an estimated 1,400 whooping cranes survived in North America. By the mid-1900s, only a few birds remained that nested in Aransas-Wood Buffalo National Park (WBNP) and wintered in South Texas at what is now the Aransas National Wildlife Refuge (ANWR). Since then, the Aransas-Wood Buffalo Park population has slowly increased due to conservation efforts. These have included a combination of strict legal protection, habitat preservation, and continuous international cooperation between Canada and the United States that has allowed the only remaining wild population to increase steadily to an estimated 279 individuals by April 2011. Four geographically distinct populations exist in the wild; the only natural population at ANWR (n=279), a reintroduced experimental non-migratory population in central Florida (n=20), an experimental population that migrates between Wisconsin and Florida (n=106), and a non-migratory flock in Louisiana (n=4, with an additional 2 individuals of unknown status). None of the reintroduced populations are self-sustaining. Approximately 2/3 of the genetic material of the species was lost when the whooping crane went through the bottleneck of only 15 birds in 1941. (Note: This species has three non-essential experimental populations: Entity IDs 4679, 7342, and 10124).

Significant portions of the migratory corridor have been impacted by development, conversion to non-compatible land uses, or on-going land management resulting in habitat loss, degradation and fragmentation caused by draining of wetlands for conversion to croplands, urbanization, construction of roads and power lines, and most recently wind farms. A big problem for reintroduced whooping crane flocks may be the lack of large blocks of suitable habitat in which the species seems to prosper. Collisions with power lines are a substantial cause of whooping crane mortality in migration (Brown et al. 1987, Lewis et al. 1992b). Wetland loss in the U.S. has been staggering. Population growth on the Texas coast resulting from an increase in development is encroaching on salt marsh habitat used by the wintering whooping cranes. If development continues, it will limit the expansion of the species winter range and very shortly preclude recovery. There are currently five housing canal-lot developers applying for permits on lands which whooping cranes have used. Threats are growing as developers build houses on lands needed for whooping crane survival and expansion, and power lines, cell towers and roads are all increasing. Currently, 60 percent of wintering whooping cranes use the ANWR and Matagorda Island NWRs. With development occurring on private lands as people move to the coast, the potential for future flock expansion may soon be limited unless there is a large effort to protect additional lands.

Freshwater inflows starting hundreds of kilometers inland from the Guadalupe and San Antonio rivers flow into whooping crane habitat and critical habitat at and adjacent to ANWR. Inflows are needed to maintain proper salinity gradients, nutrient loadings, and sediments that produce an ecologically healthy and productive estuary (TPWD 1998). Inflows are essential to produce foods used by whooping cranes, especially blue crab populations that do well when inflows are high (Houston Advanced Research Center 2006).

Global warming and associated climate changes constitute a potential threat to whooping crane recovery. Rising temperatures could increase evaporation and dry up wetlands that whooping cranes use throughout the year. If the warmer temperatures are not counter-balanced by increased precipitation, the species will struggle facing increased drought-like conditions. Warming temperatures that could reduce the number and severity of winter freezes at ANWR could allow black mangrove (*Avicennia germinans*) to spread its range northward into the crane area, an event that has been occurring over the past decade (T. Stehn, USFWS, pers. comm., 2010). The dense mangrove shrubs will reduce visibility for the cranes and will make much crane habitat unusable. Sea level rise and flooding of coastal wetlands is a major threat. Since whooping cranes mostly only use water < 20 inches deep, a projected sea level rise that could exceed 39 inches (0.99 m) by the end of the century announced by climate scientists meeting in Copenhagen in March 2009 will make the current whooping crane winter range unusable.

There is no evidence that pesticide contamination has ever been a significant threat to whooping cranes. Whooping crane egg and tissue specimens examined for pesticide residues have shown concentrations well below those encountered in most other migratory birds (Robinson et al. 1965, Lamont and Reichel 1970, Anderson and Kreitzer 1971, Lewis et al. 1992b). Eggshell thickness, a measure of contaminant exposure, has been measured in eggs taken from the wild and those in captivity from the 1970s to the present; no evidence of shell thinning has been detected. In recent years, one confirmed whooping crane chick and potentially other cases of acetylcholinesterase inhibition were associated with the experimental Eastern Migratory Population on Necedah National Wildlife Refuge. Acetylcholinesterase inhibition is suggestive of organophosphate exposure, though pesticides were not tested for in these cases. The refuge is downstream of cranberry bogs, and runoff from these sites is a suspected cause of any pesticide exposure (Pers. comm. 2020 with Sarah Warner, USFWS). As methomyl is not registered for use on cranberry bogs, we do not suspect methomyl exposure in these cases.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

The species range map presented above represents migratory and wintering grounds of the Aransas-Wood Buffalo National Park population of the whooping crane; no individuals from this population breed in the action area. We expect 71.8% of this portion 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). Up to 33.7% of the species' range overlaps with methomyl use sites while 38% of the range occurs off-field (but may still be exposed to spray drift or runoff). As the species winters in the Aransas and Matagorda Island National Wildlife Refuges and surrounding areas, most of this overlap represents the migratory pathway.

Table 8. Overlap and usage data for the whooping crane.

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	2.3	6.8	9.1	0.3	1.1	1.4
Citrus	NA	NA	NA	NA	NA	NA
Corn[2]	14.5	10.1	24.6	0.7	0.5	1.2
Cotton	1.6	1.7	3.3	<0.1	0.1	0.2
Other Grains	10.6	13.7	24.3	0.5	0.7	1.2
Other Orchards	<0.1	0.2	0.3	<0.1	0.2	0.3
Other Row Crops	2.4	2.7	5.1	1.1	1.2	2.3
Soybeans	12.1	7.8	19.9	0.6	0.4	1
Vegetables and Ground Fruit	2.3	2.8	5.1	2.3	2.8	5.1
Wheat	NA	NA	NA	NA	NA	NA
Total	**33.7**	**38**	**71.8**	**5.1**	**6.6**	**11.7**

[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.

Usage

Based on past usage data, we anticipate up to 11.7% of the species' range will be treated with methomyl annually (Table 8).

Additional Exposure Considerations

During winter, we expect that exposure to methomyl use sites and adjacent areas will be minimal, as most foraging occurs in the brackish bays, marshes, and salt flats on the edge of the mainland and on barrier islands. The winter diet consists predominately of animal foods, especially blue crabs, clams, and the plant wolfberry. Furthermore, 60 percent of whooping cranes winter within the Aransas and Matagorda Island NWRs. Some whooping cranes use upland sites frequently in most years, but agricultural croplands adjacent to Aransas National Wildlife Refuge are rarely visited.

Agricultural areas, including corn and grain fields, are important stopover sites for whooping cranes during migration. Cranes have been known consume seeds from recently planted fields in spring, and forage in agricultural fields after harvest during the fall and winter forage. Corn, wheat, barley, rice, and sunflower seeds are desirable foods. However, given the timing of migration during spring and fall, we expect that exposure to methomyl will be low given that foraging is most likely to occur prior to planting or after harvest.

Exposure Summary

While there is a high extent of overlap between the action area and the species' range, and a high level of usage within the species' migratory pathway, we expect methomyl exposure to be low based on life history characteristics of the species. Whooping cranes wintering on roosting sites in coastal Texas are unlikely to forage on or near agriculture sites. Though migrating whooping cranes are likely to forage in agricultural areas during stopovers, the timing of migration is unlikely to coincide with methomyl usage. As such, we expect a small number of individuals will experience exposure from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to whooping cranes. Exposure to methomyl is expected to result in mortality to whooping cranes depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. Consumption of animal prey items that have been exposed to on-field concentrations of methomyl is expected to result in mortality only if individuals consume exposed items exclusively on the day of methomyl application. However, consumption of seeds on treated fields is not expected to result in mortality to whooping cranes as we expect lower levels of methomyl to occur on these items. We do not expect dietary dosages from consuming contaminated food items off-field to result in mortality of whooping cranes as we expect lower levels of methomyl will occur in these items. We do not expect sublethal effects are likely to occur at predicted exposure levels whether exposed on-field or off-field.

Indirect Effects:

The whooping crane relies on amphibians, small mammals, arthropods, birds, fruit, seeds, benthic invertebrates, and fish for food resources. While no effects to plants are expected, we anticipate effects to the prey base from methomyl exposure on or near use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but some prey will be available after exposure and any losses will likely only be temporary. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. Given its association with agricultural areas during migration, we expect a greater effect during this period of the whooping crane life cycle. However, as a generalist feeder, we anticipate that whooping cranes will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

Consumption of animal prey items that have been exposed to on-field concentrations of methomyl is expected to result in mortality only if individuals consume exposed items exclusively on the day of methomyl application. Given the varied diet of the whooping crane and the low likelihood that it will forage on or near fields recently treated with methomyl, we expect the likelihood of this exposure to be low. Seeds are known to be a preferred dietary item in treated fields. Concentrations of methomyl on seeds are not expected to reach levels likely to cause adverse effects to whooping cranes. We do not expect sublethal effects are likely to occur at predicted exposure levels. Though we anticipate methomyl exposure will cause a high level of mortality to some organisms that act as food resources for the whooping crane, we expect as a generalist feeder, the whooping crane will be less affected by the loss of any specific dietary item. As such, we determine the whooping crane has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

Though overlap and usage are high within the species' range, the whooping crane has a low exposure ranking due to the low likelihood of exposure to methomyl. Whooping cranes are unlikely to forage on or near agriculture sites near their wintering sites in coastal Texas. While migrating whooping cranes are expected to forage in agricultural areas during stopovers, the timing of migration is unlikely to coincide with methomyl usage. As such, we expect a small number of individuals will experience exposure from the proposed action.

The whooping crane has a medium toxicity ranking. While consumption of prey exposed to on-field concentrations of methomyl could result in mortality, the likelihood of this occurring is expected to be low. We do not expect that concentrations of methomyl ingested from dietary items exposed off-field will result in adverse effects to the whooping crane. Though some prey species are expected to die as a result of methomyl concentrations on- and off-field, we anticipate a medium level of indirect adverse effects as whooping cranes are generalist feeders that are likely to switch between available food resources.

Given that we expect a small number of individuals are likely to experience exposure and that we expect a moderate level of direct and indirect adverse effects, we determine the overall risk of adverse effects to the species is low.

Conclusion

The whooping crane historically once numbered over 10,000 individuals. It is currently comprised of four geographically distinct populations in the wild. Only one is a natural population numbering 279 individuals in 2011, located at the ANWR. There are also three experimental non-migratory populations. One was reintroduced to an area in central Florida (n=20), one migrates between Wisconsin and Florida (n=106), and on is a non-migratory flock in Louisiana (n=4, with an additional 2 individuals of unknown status). None of the reintroduced populations are self-sustaining. Threats to the species include impacts to significant portions of the migratory corridor from habitat degradation and fragmentation caused by draining of wetlands for conversion to croplands, urbanization, construction of roads and power lines, and more recently wind farms. Collisions with power lines are a substantial cause of crane mortality during migration. A big problem for reintroduced whooping crane flocks may be the lack of large blocks of suitable habitat. With development continuing on private lands, the potential for future flock expansion may become more limited unless there is a large effort to protect additional lands. The species has a high vulnerability ranking.

The whooping crane has a low exposure ranking. While we expect 71.8% of the migratory and wintering grounds of the ANWR population (the non-experimental population) to overlap with methomyl use sites and off-site transport areas, and we anticipate up to 11.7% of this portion of the species' range will be treated with methomyl, we expect methomyl exposure to be low. Whooping cranes wintering in coastal Texas are unlikely to forage on or near agriculture sites. Though migrating whooping cranes are likely to forage in agricultural areas during stopovers, the timing of migration is unlikely to coincide with methomyl usage. As such, we expect a small number of individuals will experience exposure from the proposed action.

The whooping crane has a medium toxicity ranking. Consumption of prey exposed to on-field concentrations of methomyl could result in mortality. However, we do not anticipate this is likely to occur. We do not expect that concentrations of methomyl ingested from dietary items exposed off-field will result in adverse effects to the whooping crane. Though some prey species are expected to die as a result of methomyl concentrations on- and off-field, we anticipate a medium level of indirect adverse effects as whooping cranes are generalist feeders that will likely be able to switch between different available food resources. We expect prey losses will lead to a reduction in fitness supporting reproductive capacity or growth in a small number of individuals.

In summary, we expect effects to a small number of individuals over the project duration. Even though the species is highly vulnerable, the overlap with methomyl use sites is high, and the percent of the species range and migratory pathway treated annually is high, we expect exposure of whooping cranes will be low. Migrating whooping cranes are not expected to forage in areas during times when exposure will be most likely. Additionally, while consumption of prey exposed on field could result in crane mortality, we do not expect on-field foraging, and adverse effects are not anticipated from the consumption of prey items exposed off-field due to low methomyl concentrations. While there may be losses of some prey items, the species is a generalist feeder, and we expect most individuals will be able to find adequate prey availability in the vicinity with minimal impacts to fitness and growth. We do not expect these effects from the proposed action will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause species-level effects. Therefore, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the whooping crane.

References

U.S. Fish and Wildlife Service. 2012. Whooping Crane (*Grus americana*) 5-Year Review: Summary and Evaluation. Aransas National Wildlife Refuge, Austwell, Texas and Corpus Christi Ecological Service Field Office, Texas. 44 pp.

Integration and Synthesis Summary: Birds - Hawaiian (koloa) Duck

Scientific Name:	Common Name:	Entity ID:
Anas wyvilliana	Hawaiian (koloa) Duck	69

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian duck. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 4/6/2022; Wherever found; *States within the range:* HI. Figure 2 depicts a map of the species' range.

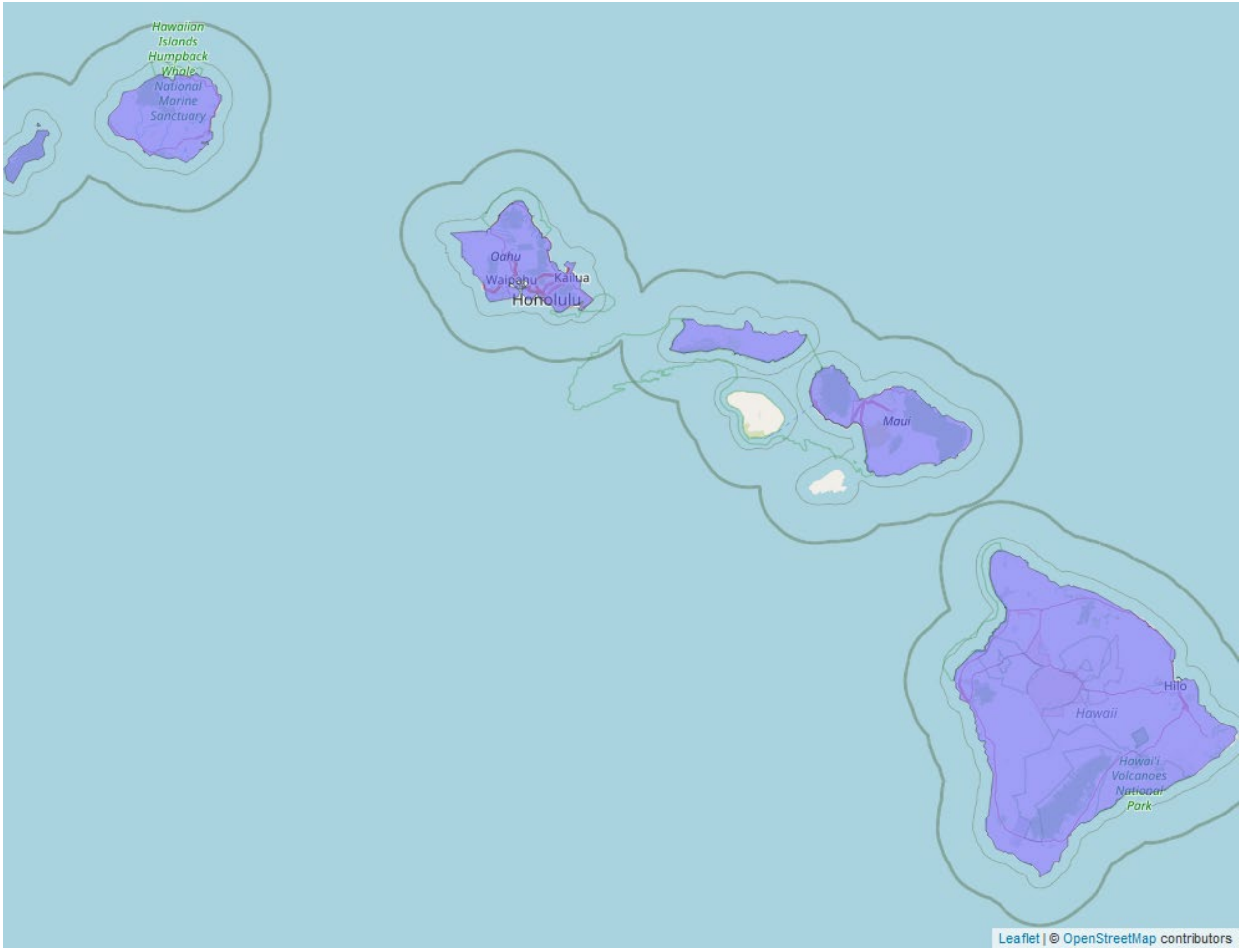

Figure 2. Range map of Hawaiian duck (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7712.

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: 8/27/2021

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

Number of populations: Unknown number of populations

Species trends: Unknown population trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Hawaiian ducks (koloa maoli) are ducks endemic to Hawai'i. They are found in a variety of wetland habitats including freshwater marshes and ponds, coastal estuaries and ponds, artificial reservoirs, kalo or taro (*Colocasia esculenta*) loi or patches, irrigation ditches, sewage treatment ponds, and montane streams and marshlands. The Hawaiian duck is an opportunistic feeder. Foods consumed include snails, insect larvae, earthworms, tadpoles, crayfish, mosquito larvae, mosquito fish (*Gambusia affinis*), aquatic invertebrates (including water boatmen, family Corixiae), grass seeds and leaf parts of wetland plants. Historically, the Hawaiian duck was known on all main Hawaiian Islands except Lānai and Kahoolawe. Currently, the Hawaiian duck is found on Niihau, Kaua'i, O'ahu, Maui, and Hawai'i.

The Hawaiian duck is difficult to distinguish from feral mallards (*Anas platyrhynchos*) and hybrids, making it difficult to assess the species status. There are no population estimates prior to 1940, but it was considered fairly common in the 1800s in natural and farmed wetlands. The Hawaiian duck was noted to occur on the hottest coasts with suitable ponds and in the mountains as high as 2,100 meters. The arrival of the Polynesian people in Hawai'i about 1,600 years ago and their cultivation of kalo or taro (*Colocasia esculenta*), an agricultural crop grown in a pond-like environment, considerably changed wetland habitat in the islands, including plant composition, water levels, and human disturbance. In the early 2000s, the population of pure Hawaiian ducks was estimated to be 2,200 birds, with 2,000 on Kaua'i and 200 on Hawai'i. Biannual waterbird counts yielded lower numbers (averaging 360 based on winter counts from 2000 through 2007), primarily because winter surveys do not include montane streams that are believed to harbor much of the Hawaiian duck population on Kaua'i and Hawai'i (USFWS 2011).

As of 2021, there were believed to be fewer than 2,000 pure Hawaiian ducks remaining, with most occurring on Kaua'i (USFWS 2021). The most important causes of decline for this species were loss and degradation of wetland habitat, predation by introduced animals, and hunting in the late 1800s and early 1900s. Other factors that contributed to population declines and continue to affect the species include hydrology modification, alteration of habitat structure and vegetation composition by invasive non-native plants, loss of riparian vegetation, water quality degradation due to grazing, disease, and environmental contaminants. Contamination of wetlands with toxic substances from human development or from agricultural/aquacultural practices (e.g., oil, pesticides, and herbicides) is also a potential threat (USFWS 2011, 2021). In 2011, hybridization with feral mallards was considered the most serious current threat to the Hawaiian duck (USFWS 2011). Conservation efforts are in place for the Hawaiian duck, including restoration efforts for some wetlands, predator control measures in some wetlands, wetland monitoring and removal of carcasses for botulism, education efforts to help distinguish between hybrids and pure Hawaiian ducks, and habitat restoration to increase population size. As of 2021, there were no conservation efforts listed for contaminants or climate change/sea level rise (USFWS 2021).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 6.5% of the species' range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 9). Data indicate that 3% of the species' range occurs on methomyl use sites while 3.5% of the range occurs off-field but may still be exposed through spray drift and/or runoff.

Table 9. Overlap data for the Hawaiian (koloa) duck.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
HI state agriculture layer	3.0	3.5	6.5

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 among these insecticides. As these data are island-wide and not spatially explicit, we cannot determine the percent of the species range treated. However, we can broadly use this data as confirmation that methomyl usage likely occurs on the islands where this species resides.

Additional Exposure Considerations

We do not expect methomyl to be applied aerially in Hawai'i. As such, we expect off-field overlap to be lower as spray drift from ground applications will not travel as far off the field. Based on ground applications only, we expect 4.1% of the species' range to overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area. Data indicate that 3% of the species' range occurs on methomyl use sites while 1.1% of the range occurs off-field but may still be exposed through spray drift and/or runoff.

In addition, the Hawaiian duck is associated almost exclusively with wetlands, ponds, and other water features, which occur predominately at low elevation. Hawaiian ducks also rely on montane streams for breeding, with a significant percentage of the Hawaiian duck population breeding in upland streams on Kaua'i. While agricultural wetlands (i.e., taro fields) represent key habitat for waterbird species in Hawai'i, methomyl is not registered for use on this crop. The Hawaiian duck is not expected to be exposed to methomyl directly in other agricultural crops but could be found in suitable wetland areas that are adjacent to or traverse to these sites.

Exposure Summary

We expect a low level of exposure of the Hawaiian duck to methomyl. We do not anticipate that Hawaiian ducks will occur on-field, and only 1.1% of the range is expected to be exposed via spray drift or runoff from ground applications. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in areas adjacent to agricultural fields to be the primary route of methomyl exposure to Hawaiian ducks. Hawaiian ducks are omnivorous birds, consuming mainly aquatic plants and animals such snails, insect larvae, earthworms, tadpoles, crayfish, mosquito larvae, mosquito fish, grass seeds, rice, and green algae. We do not expect any adverse effects to Hawaiian ducks from consuming aquatic dietary items. Consumption of grass and leaves that have been contaminated off-field from spray drift is expected to result in dosages of up to 1.2 mg/kg-bw, with mortality in up to 39% of exposed individuals. However, based on the feeding habits of this species, we expect this will occur rarely, if ever. We do not expect sublethal effects to occur from exposure to methomyl at estimated environmental concentrations. As such, we anticipate a low level of direct adverse effects to the Hawaiian duck.

Indirect Effects:

The Hawaiian duck relies on aquatic plants and animals such snails, insect larvae, earthworms, tadpoles, crayfish, mosquito larvae, mosquito fish, grass seeds, rice, and green algae. While no effects to plants are expected, we anticipate effects to the prey base from methomyl exposure near use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but some prey will be available after exposure and any losses will likely only be temporary. However, as a generalist feeder, we anticipate that Hawaiian ducks will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We expect a low level of direct adverse effects will occur as Hawaiian ducks are unlikely to forage on dietary items that will result in mortality. We do not expect sublethal effects are likely to occur at predicted exposure levels. We anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species. However, as the Hawaiian duck is a generalist feeder expected to adapt to reductions in specific dietary items, we expect a medium level of indirect adverse effects. As such, we determine the Hawaiian duck has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Hawaiian duck has a low exposure ranking. Hawaiian ducks are associated with wetlands, ponds, and other water features, and not anticipated to occur on-field. Only 1.1% of the range is expected to be exposed via spray drift or runoff from ground applications. As such, we expect a small number of individuals are likely to be exposed to methomyl from the proposed action.

The Hawaiian duck has a medium toxicity ranking. We expect a low level of direct adverse effects will occur as Hawaiian ducks are unlikely to forage on dietary items that will result in mortality. We do not expect sublethal effects are likely to occur at predicted exposure levels. We anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species. However, as the Hawaiian duck is a generalist feeder expected to adapt to reductions in specific dietary items, we expect a medium level of indirect adverse effects. As such, we determine the Hawaiian duck has a medium toxicity ranking.

Given that we expect a small number of individuals are likely to experience exposure and a medium level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Hawaiian duck is endemic to Hawai'i. They are found in a variety of wetland and other aquatic habitats and are opportunistic feeders that eat a variety of invertebrates, fish, grass seeds and leaf parts of wetland plants. Historically, the Hawaiian duck was known on all main Hawaiian Islands except Lānai and Kahoolawe. Currently, the Hawaiian duck is found on Niihau, Kaua'i, O'ahu, Maui, and Hawai'i. As of 2021, there were believed to be fewer than 2,000 pure (non-hybrid) Hawaiian ducks remaining, with most occurring on Kaua'i. The most important causes of decline for this species were loss and degradation of wetland habitat, predation by introduced animals, and hunting in the late 1800s and early 1900s. Other factors that contributed to population declines and continue to affect the species include hydrological modifications, alteration of habitat structure and vegetation composition by invasive non-native plants, loss of riparian vegetation, water quality degradation due to grazing, disease, hybridization with feral mallards, and environmental contaminants, likely including pesticides and herbicides from agricultural practices. The species has a high vulnerability ranking.

The Hawaiian duck has a low exposure ranking. We expect 4.1% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area (based on ground applications only as aerial applications are not expected in Hawai'i). However, we do not anticipate that Hawaiian ducks will occur on-field, and only 1.1% of the range off-field is expected to be exposed via spray drift or runoff. Past methomyl usage data in Hawai'i is unavailable, but prior usage data indicate that 8-45% of agricultural crops in Hawai'i have been treated with insecticides annually, with methomyl presumably among these insecticides. Hawaiian ducks are unlikely to forage on dietary items that will result in mortality or sublethal effects at predicted exposure levels. We anticipate the loss of some prey items. However, the Hawaiian duck is a generalist feeder that is likely to forage on plants and other available prey after localized prey losses, and we expect most individuals will be able to find adequate food availability in the vicinity with minimal impacts to fitness and growth. As such, we expect a small number of individuals and prey items are likely to experience exposure and a medium level of direct and indirect adverse effects are likely. While the toxicity effects are medium, considering the low anticipated exposure level, we determine the overall risk of adverse effects to the species is low.

In summary, even though the species has a high vulnerability, the overall risk to the species is low. We expect losses of prey items over the duration of the proposed action that may lead to reduced fitness supporting reproductive capacity or growth in a small number of individuals. However, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of the Hawaiian duck in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian duck.

References

U.S. Fish and Wildlife Service. 2021. Hawaiian Duck 5-Year Review Short Form Summary. Honolulu, Hawai'i. 10 pp.

U.S. Fish and Wildlife Service. 2011. Recovery Plan for Hawaiian Waterbirds, Second Revision. Portland, Oregon. 233 pp.

Integration and Synthesis Summary: Birds - Hawaiian goose

Scientific Name:	Common Name:	Entity ID:
Branta (=Nesochen) sandvicensis	Hawaiian goose	73

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian goose. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 2/10/2022; Wherever found; *States within the range:* HI. Figure 3 depicts a map of the species' range.

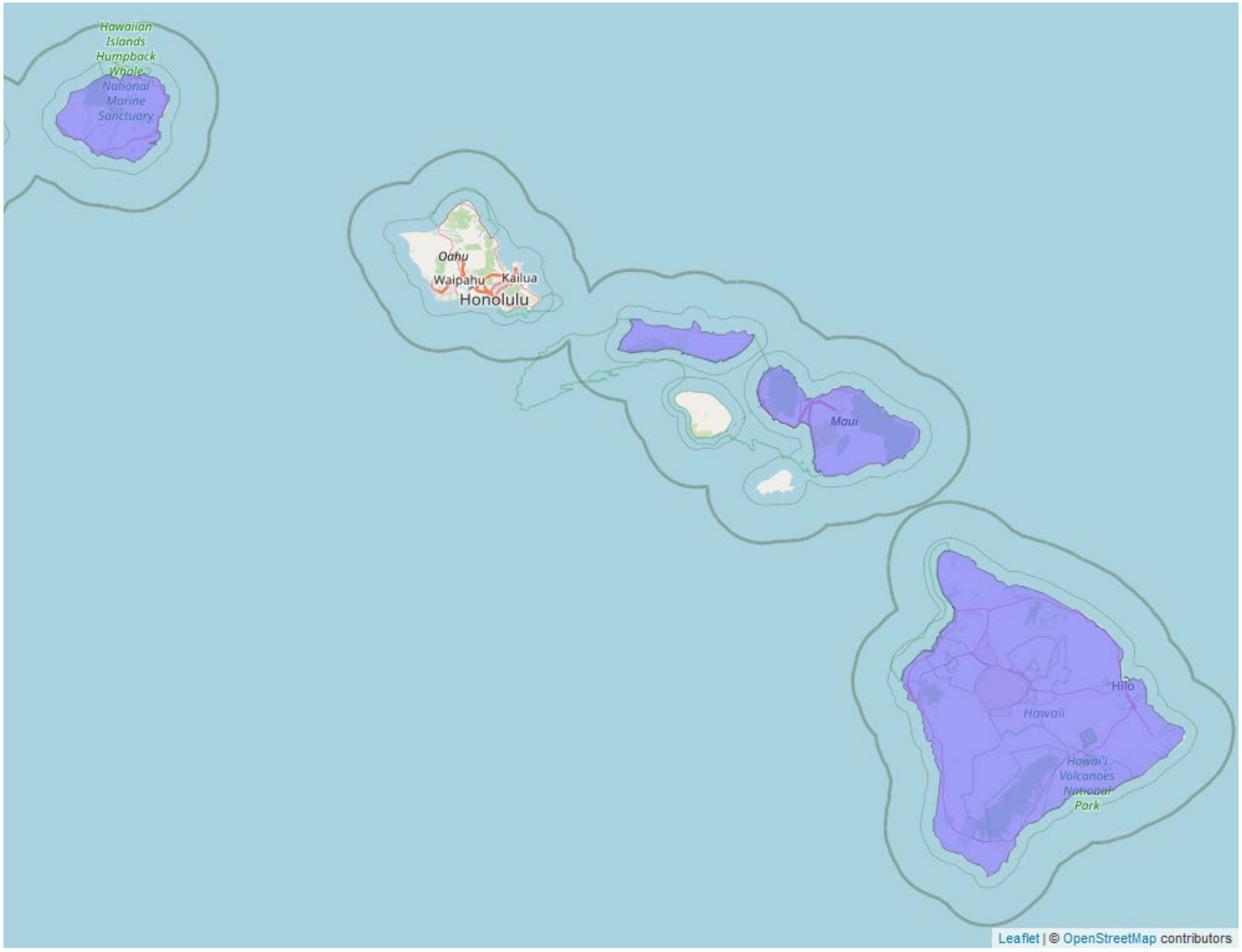

Figure 3. Range map of Hawaiian goose (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/1627.

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: Downlist to Threatened

Most recently completed 5-Year Review: 12/19/2019

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

Number of populations: Multiple populations (numerous)

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

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Hawaiian geese (nēnē) are highly terrestrial and nest primarily in leeward lowlands. Fossil records indicate that their range used to be very broad, including grasslands, grassy shrublands, and dryland forests. Hawaiian geese seem to be adaptable because after translocations, they are now found in a variety of habitats (non-native grasslands, sparsely vegetated, high elevation lava flows, cinder deserts, native alpine grasslands and shrublands, open native and non-native alpine shrubland-woodland interfaces, mid-elevation native and non-native shrubland, and early successional cinderfall).

Studies have shown that Hawaiian geese went through a prehistoric population bottleneck and have very low genetic diversity, which may impact breeding success and juvenile survival (USFWS 2004). Hawaiian goose numbers apparently increased between 2006-2007, with slight declines in 2008 and 2009 corresponding with El Nino (i.e., droughts). Population estimates in 2010 were between 1,888-1,978 birds total across Maui (386), Molokai (112), Kaua'i (910-1000), and Hawai'i (480). In 2011, the Hawaiian goose was stable on most islands and increasing on Kaua'i. Hawaiian geese fair best on Kaua'i Island due to lack of an established mongoose population and greater lowland breeding habitat. Finding lowland sites for breeding on Maui and Hawai'i is difficult for Hawaiian geese. In 2017, the statewide population was estimated from the Hawai'i Department of Land and Natural Resources at 3,252 individuals, comprised of 1,104 individuals on Hawai'i, 1,482 individuals on Kaua'i, 627 individuals on Maui, 37 individuals on Molokai, and 2 individuals on O'ahu. These 2017 estimates include 646 translocations made from Kaua'i to Hawai'i (598) and Maui (48) between 2011 and 2016. Captive propagation occurred for the Hawaiian goose in the past, but that program discontinued and now birds are translocated from Kaua'i to other islands when available (USFWS 2019, 2011).

The primary historical threat to the species was habitat destruction and degradation due to urban development and land conversion for agriculture. Predation by mongooses, rats, pigs, dogs, cats, and ants also greatly reduced the population and limited recruitment. The expansion of existing populations is limited by the lack of suitable breeding and flocking habitat due to continuing urbanization, agricultural activities, and potential conflicts with human activities (USFWS 2011). As of 2019, habitat degradation and destruction, direct mortality from collisions with fences and vehicles, habitat degradation by feral ungulates and non-native plants, and drought were considered threats (USFWS 2019). The Hawaiian goose may be impacted by pesticides and other contaminants, ingestion of plastics and lead, entanglement in fishing nets, disturbance at nest and roost sites, attraction to hazardous areas through human feeding and other activities, and mortality or disruption of family groups through direct and indirect human activities. Vehicle-related mortality occurs at Hawai'i Volcanoes National Park and where roads pass though Hawaiian goose habitat, which forces birds, including families with unfledged goslings, to cross roads. Low genetic variation may limit reproductive success and survival (USFWS 2004). Some studies indicate that inadequate nutrition is a factor limiting Hawaiian goose reproduction and gosling survival, especially on Hawai'i and Maui, and in harsh conditions (USFWS 2004, 2011). At least six Hawaiian geese were killed at the West Maui wind farm site by 2011 and wind farms were considered a new threat (USFWS 2011). Though a variety of predator control programs were initiated in areas occupied by the Hawaiian goose and local populations have increased, we expect predation threats to continue indefinitely because the main Hawaiian Islands are too large for complete eradication of nonnative predators to be feasible. Environmental effects from climate change are likely to exacerbate impacts of drought, hurricanes, and flooding associated with storms and hurricanes, as well as causing flooding of portions of Hawaiian goose habitat due to sea-level rise. Effects of climate change are expected to increase in the future. The species was downlisted to threatened in 2019 because the species' status improved through years of captive breeding, translocation, and other recovery efforts (USFWS 2019).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 6.2% of the species' range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area (Table 10). Data indicate that 2.7% 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 10. Overlap data for the Hawaiian goose.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
HI state agriculture layer	2.7	3.4	6.2

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 among these insecticides. As these data are island-wide and not spatially explicit, we cannot determine the percent of the species range treated. However, we can broadly use this data as confirmation that methomyl usage likely occurs on the islands where this species resides.

Additional Exposure Considerations

We do not expect methomyl to be applied aerially in Hawai'i. As such, we expect off-field overlap to be lower as spray drift from ground applications will not travel as far off the field. Based on ground applications only, we expect 3.8% of the species' range to overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area. Data indicate that 2.7% of the species' range occurs on methomyl use sites while 1.1% of the range occurs off-field but may still be exposed through spray drift and/or runoff.

The Hawaiian goose occurs from high-elevation dry scrub and grasslands on Maui and Hawai'i to pastures and golf courses on these two islands, as well as Molokai and Kaua'i; although they are also found in wetlands as well. The Hawaiian goose could be exposed directly to methomyl from grazing on pasture (i.e., alfalfa). The diet of the Hawaiian goose consists of seeds of grasses and herbs as well as leaves, buds, flowers, and fruits of various plants.

Exposure Summary

There is a low extent of overlap between the action area and the species' range, with 2.7% of the species' range overlapping with methomyl use sites and 1.1% overlapping with areas that may be exposed through spray drift and/or runoff. The Hawaiian goose is expected to forage in some methomyl use sites, such as alfalfa, but unlikely all. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to Hawaiian geese. Exposure to methomyl is expected to result in mortality to Hawaiian geese depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. Consumption of grass, leaves, flowers, and fruit on-field can result in dosages up to 21.7 mg/kg-bw methomyl, which we expect to result in mortality to all exposed individuals. However, consumption of seeds on treated fields is not expected to result in mortality as we expect lower levels of methomyl on these items. Consumption of grass, leaves, and flowers off-field is expected to result in concentrations up to 0.9 mg/kg-bw methomyl, with mortality in up to 15% of exposed individuals. Consumption of seeds and fruit off-field is not expected to result in mortality. Sublethal effects are not expected from the consumption of dietary items contaminated by methomyl.

Indirect Effects:

The Hawaiian goose relies on leaves, flowers, grass, fruit, and seeds for food resources. We do not anticipate any reductions in the abundance of these food items. As such, we do not anticipate any indirect adverse effects are likely to occur.

Toxicity Summary

We expect a medium level of direct adverse effects will occur as mortality is likely to occur for individuals foraging on leaves, grass, or flowers on-field, as well as off-field, but to a lesser degree. However, individuals foraging on seeds either on-field or off-field are not expected to die. We do not expect sublethal effects are likely to occur at predicted exposure levels. We do not expect indirect effects are likely to occur as no adverse effects are expected for plant resources. As such, we determine the Hawaiian goose has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Hawaiian goose has a low exposure ranking as 2.7% of the species' range overlaps with methomyl use sites, and 1.1% overlaps with areas that may be exposed through spray drift and/or runoff. On-field exposure is likely even lower than 2.7% as the Hawaiian goose is expected to forage in some methomyl use sites, such as alfalfa, but unlikely others. As such, we expect a small number of individuals are likely to be exposed to methomyl.

We expect that Hawaiian geese that exclusively consume grass or leaves on-field will die. Mortality is also expected to occur in a small percentage of geese that consume grass and leaves off-field. However, individuals foraging on seeds either on-field or off-field are not expected to die. We do not expect indirect effects are likely to occur as no adverse effects are expected for plant resources. As such, we determine the Hawaiian goose has a medium toxicity ranking.

Given that we expect a small number of individuals are likely to experience exposure and a moderate level of direct adverse effects, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Hawaiian goose is endemic to Hawai'i. They are found in a wide variety of terrestrial habitats. Their diet consists of seeds of grasses and herbs as well as leaves, buds, flowers, and fruits of various plants. In 2017, the statewide population was estimated from the Hawai'i Department of Land and Natural Resources at 3,252 individuals on Hawai'i, Kaua'i, Maui, Molokai, and O'ahu, including 646 that were translocated from Kaua'i to Hawai'i and Maui. Captive propagation occurred for the Hawaiian goose in the past, but the program was discontinued and now birds are translocated from Kaua'i to other islands when available. Current threats to the species include habitat degradation and destruction, direct mortality from collisions with fences and vehicles, habitat degradation by feral ungulates and non-native plants, and drought. The Hawaiian goose may also be impacted by pesticides and other contaminants, various hazards, low genetic variation, inadequate nutrition, predators, and environmental effects. While many of these threats are ongoing or increasing, the species has been moving toward recovery and was downlisted to threatened because the species' status improved through years of captive breeding, translocation, and other recovery efforts. The species has a medium vulnerability ranking.

The Hawaiian goose has a low exposure ranking. We expect 3.8% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area (based on ground applications only as aerial applications are not expected in Hawai'i). Past methomyl usage data in Hawai'i is unavailable, but prior usage data indicate that 8-45% of agricultural crops in Hawai'i have been treated with insecticides annually, with methomyl presumably among these insecticides. The Hawaiian goose is expected to forage in some methomyl use sites, such as alfalfa, but unlikely all use sites. We expect a medium level of direct adverse effects will occur as mortality is likely for individuals foraging on leaves, grass, or flowers on-field, as well as off-field, but to a lesser degree. However, individuals foraging on seeds either on-field or off-field are not expected to die. We do not expect sublethal effects are likely to occur at predicted exposure levels. We do not expect indirect effects are likely to occur as no adverse effects are expected for plant resources. As such, we determine the Hawaiian goose has a medium toxicity ranking. While the toxicity effects are medium, considering the low anticipated exposure level, we determine the overall risk of adverse effects to the species is low.

In summary, even though the species has a high vulnerability, the overall risk to the species is low. We expect the loss of a small number of individuals over the project duration. We do not anticipate the loss of food resources, as the species forages on plants, which will not be adversely affected. We do not expect the adverse effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian goose.

References

U.S. Fish and Wildlife Service. 2019. Endangered and Threatened Wildlife and Plants; Reclassifying the Hawaiian Goose From Endangered to Threatened With a Section 4(d) Rule. Federal Register 84(244):69918-69947.

U.S. Fish and Wildlife Service. 2011. Nēnē or Hawaiian Goose (*Branta sandvicensis*) 5-Year Review Summary and Evaluation. Honolulu, Hawai'i. 16 pp.

U.S. Fish and Wildlife Service. 2004. Draft Revised Recovery Plan for the nēnē or Hawaiian Goose (*Branta sandvicensis*). Portland, Oregon. 148 + xi pp.

Integration and Synthesis Summary: Birds - Hawaiian common gallinule

Scientific Name:	Common Name:	Entity ID:
Gallinula galeata sandvicensis	Hawaiian common gallinule	76

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian common gallinule. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 2/14/2022; Wherever found; *States within the range:* HI. Figure 4 depicts a map of the species' range.

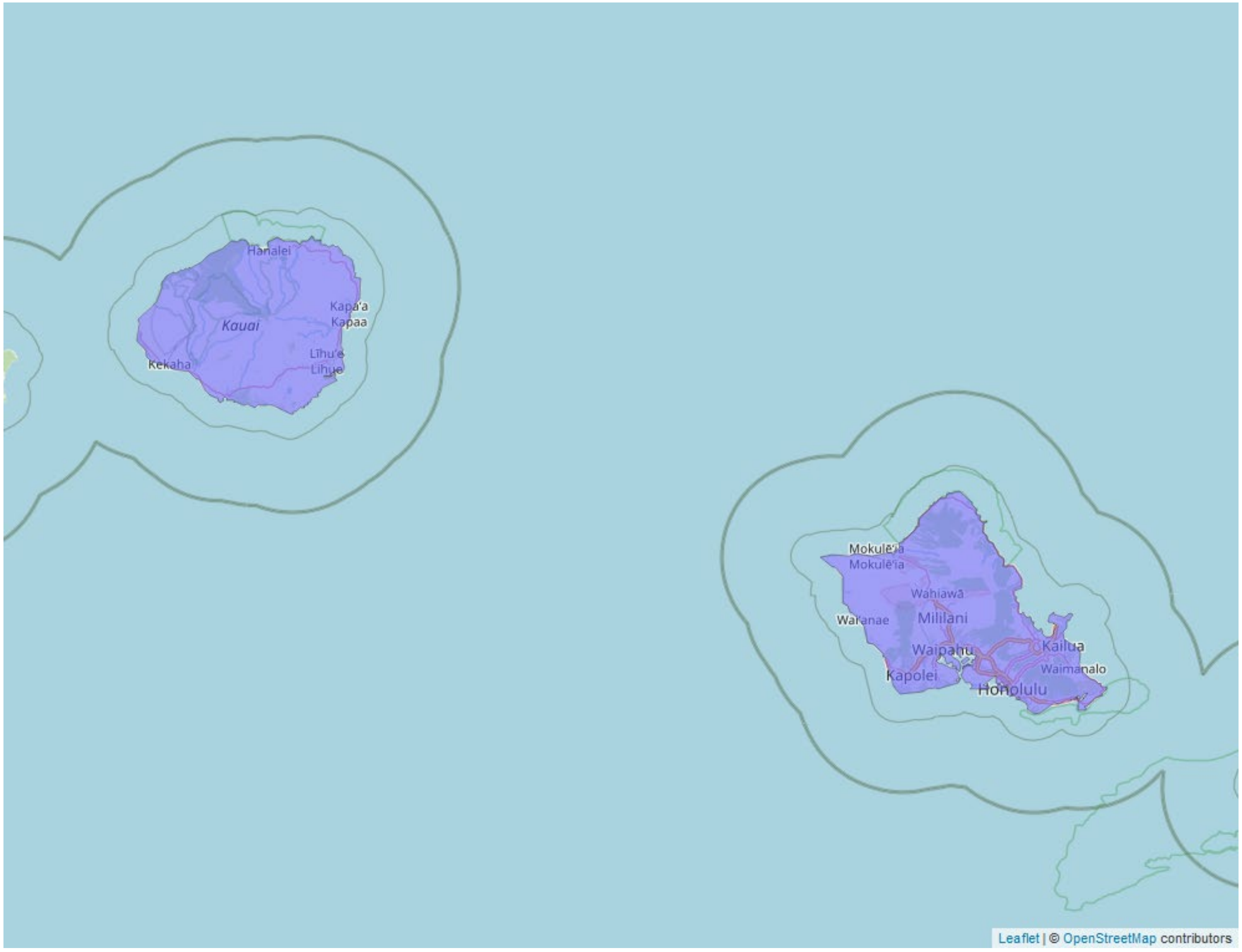

Figure 4. Range map of Hawaiian common gallinule (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6612.

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: 8/25/2021

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

Number of populations: Multiple populations (numerous)

Species trends: Unknown population trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Hawaiian common gallinule (alaeula) currently occurs only on the islands of Kaua'i and O'ahu, having been extirpated from Molokai (sometime after the 1940s), Maui (after the late 1940s) and Hawai'i in 1887 (USFWS 2011 p. 35, as cited in USFWS 2021). One of the main priorities in the revised recovery plan is to reintroduce this species to at least two additional islands (USFWS 2011, p. 133, as cited in USFWS 2021). Because this species is so secretive and difficult to census, current survey data are considered inadequate (USFWS 2021). The state-wide biannual waterbird counts provide a rough idea of recent population trends, but an accurate population estimate is not available (Hawai'i Division of Forestry and Wildlife 1976-2008, entire; USFWS 2011, p. 37 as cited in USFWS 2021). Usage data from the State of Hawai'i Department of Land and Natural Resources 2017 – 2021 was unavailable. The most recent minimum population estimate of the gallinule is a 5-yr average of 927 (678 – 1,235) individuals from surveys between 2012 to 2016 (Paxton et al. 2021, p. 12 as cited in USFWS 2021). Threats to the species continue, including predation, degradation of wetlands, and avian disease. Contamination of wetlands with toxic substances from human development or from agricultural/aquacultural practices (e.g., oil, pesticides, and herbicides) is also a potential threat (USFWS 2011). Counts of gallinules have been stable, but remain low, with average totals of 287 birds over 10 years from 1998 to 2007 (HDOFAW 1976-2008, USFWS 2011, 2015). The inaccuracy of current methodology used in the statewide waterbird counts for this species is demonstrated by the extreme differences in numbers between summer and winter counts of lotus fields on O'ahu. Updating and increasing the accuracy of surveys for this species is an important action in the recovery plan (USFWS 2011, 2015).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 10.4% 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 6.3% of the species' range occurs on methomyl use sites while 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 common gallinule.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
HI state agriculture layer	6.3	4.0	10.4

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 among these insecticides. As these data are island-wide and not spatially explicit, we cannot determine the percent of the species range treated. However, we can broadly use this data as confirmation that methomyl usage likely occurs on the islands where this species resides.

Additional Exposure Considerations

We do not expect methomyl to be applied aerially in Hawai'i. As such, we expect off-field overlap to be lower as spray drift from ground applications will not travel as far off the field. Based on ground applications only, we expect 7.6% of the species' range to overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area. Data indicate that 6.3% of the species' range occurs on methomyl use sites while 1.3% of the range occurs off-field but may still be exposed through spray drift and/or runoff.

In addition, the Hawaiian common gallinule is associated almost exclusively with wetlands, ponds, and other water features, which occur predominately at low elevation. While agricultural wetlands (i.e., taro fields) represent key habitat for waterbird species in Hawai'i, methomyl is not registered for use on this crop. The Hawaiian common gallinule is not expected to be exposed to methomyl directly in other agricultural crops but could be found in suitable wetland areas that are adjacent to or traverse these sites.

Exposure Summary

We expect a low level of exposure of the Hawaiian common gallinule to methomyl. We do not anticipate that Hawaiian common gallinule will occur on-field, and only 1.3% of the range is expected to be exposed via spray drift or runoff from ground applications. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items adjacent to agricultural fields to be the primary route of methomyl exposure. Hawaiian common gallinules are omnivorous, and dietary items include algae, aquatic insects, mollusks, seeds, and other plant materials. We do not expect any adverse effects to Hawaiian common gallinules from consuming aquatic dietary items. Consumption of grass and leaves that have been contaminated off-field from spray drift is expected to result in dosages of methomyl up to 1.4 mg/kg-bw, with mortality in up to 53% of exposed individuals. We do not expect sublethal effects to occur from exposure to methomyl at estimated environmental concentrations. As such, we anticipate a medium level of direct adverse effects to the Hawaiian common gallinule.

Indirect Effects:

The Hawaiian common gallinule relies on aquatic plants and animals such as algae, aquatic insects, mollusks, seeds, and other plant materials. While no effects to plants are expected, we anticipate effects to the prey base from methomyl exposure near use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but some prey will be available after exposure and any losses will likely only be temporary. However, as a generalist feeder, we anticipate that Hawaiian common gallinules will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We expect a medium level of direct adverse effects will occur as some Hawaiian common gallinules that consume contaminated grass and leaves off-field are likely to die. We do not expect sublethal effects are likely to occur at predicted exposure levels. We do not anticipate methomyl exposure to affect plant resources used as food, but we expect mortality to prey items exposed via spray drift. However, as the Hawaiian common gallinule is a generalist feeder expected to adapt to reductions in specific dietary items, we expect a medium level of indirect adverse effects. As such, we determine the Hawaiian common gallinule has a medium exposure ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Hawaiian common gallinule has a low exposure ranking. We do not anticipate that Hawaiian common gallinule will occur on-field, and only 1.3% of the range is expected to be exposed via spray drift or runoff from ground applications. This indicates that a small portion of the species' range is likely to be treated overall. As such, we expect a small number of individuals are likely to be exposed to methomyl.

The Hawaiian common gallinule has a medium toxicity ranking. We expect a medium level of mortality off-field from consumption of contaminated grass and leaves. However, as the Hawaiian common gallinule typically feeds on aquatic food items, we do not expect this species will consume these items frequently. We do not anticipate adverse effects from consuming aquatic prey. We expect a medium level of indirect adverse effects as the Hawaiian common gallinule is an omnivorous feeder able to adapt from loss of prey species to methomyl exposure.

Given that we expect a small number of individuals are likely to experience exposure, and medium level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Hawaiian common gallinule occurs only on the islands of Kaua'i and O'ahu, having been extirpated from Molokai, Maui, and Hawai'i. An accurate population estimate is not available but estimates from surveys from 2012 to 2016 indicate a 5-year average of 927 (678 – 1,235) individuals. Threats to the species are ongoing, including predation, degradation of wetlands, and avian disease. Contamination of wetlands with toxic substances from human development or from agricultural/aquacultural practices (e.g., oil, pesticides, and herbicides) is also a potential threat. The species has a high vulnerability ranking.

The Hawaiian common gallinule has a low exposure ranking. Past methomyl usage data in Hawai'i is unavailable, but prior usage data indicate that 8-45% of agricultural crops in Hawai'i have been treated with insecticides annually, with methomyl presumably among these insecticides. We do not anticipate that Hawaiian common gallinule will occur on-field, and only 1.3% of the range is expected to be exposed through off-site transport within the action area (based on ground applications only as aerial applications are not expected in Hawai'i). This indicates that a small portion of the species' range is likely to be treated overall. As such, we expect a small number of individuals are likely to be exposed to methomyl.

The Hawaiian common gallinule has a medium toxicity ranking. We expect a medium level of mortality off-field from consumption of contaminated grass and leaves, although the species primarily feeds on aquatic food items and we do not expect this species will consume these items frequently. We do not anticipate adverse effects from consuming aquatic prey. We do not anticipate methomyl exposure to affect plant resources used as food, but we expect mortality to prey items exposed via spray drift. The Hawaiian common gallinule is a generalist omnivore and most will likely find adequate food items, although we expect a reduction in reproductive success or growth in a very small number of individuals. As such, we expect a small number of individuals and prey items are likely to experience exposure, and a medium level of direct and indirect adverse effects are likely. While the toxicity effects are medium, considering the low anticipated exposure level, we determine the overall risk of adverse effects to the species is low.

In summary, even though the species has a high vulnerability, the overall risk to the species is low. We expect the loss of a small number of individuals from consuming contaminated food, as well as losses of prey items over the duration of the proposed action that lead to reduced fitness or growth in a small number of individuals. However, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian common gallinule.

References

U.S. Fish and Wildlife Service. 2011. Recovery Plan for Hawaiian Waterbirds, Second Revision. Portland, Oregon. xx + 233 pp.

U. S. Fish and Wildlife Service. 2015. Hawaiian Common Gallinule (Moorhen, *Gallinula chloropus sandvicensis*) 5-Year Review. Honolulu, Hawai'i. 8 pp.

U. S. Fish and Wildlife Service. 2021. Hawaiian Common Gallinule (Moorhen, *Gallinula chloropus sandvicensis*) 5-Year Review Short Form Summary. Honolulu, Hawai'i. 10 pp.

Integration and Synthesis Summary: Birds - Attwater's greater prairie-chicken

Scientific Name:	Common Name:	Entity ID:
Tympanuchus cupido attwateri	Attwater's greater prairie-chicken	83

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we initially determined the risk of adverse effects to the species was 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. 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 Attwater's greater prairie chicken. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 3/19/2018; Wherever found; *States within the range:* TX. Figure 5 depicts a map of the species' range.

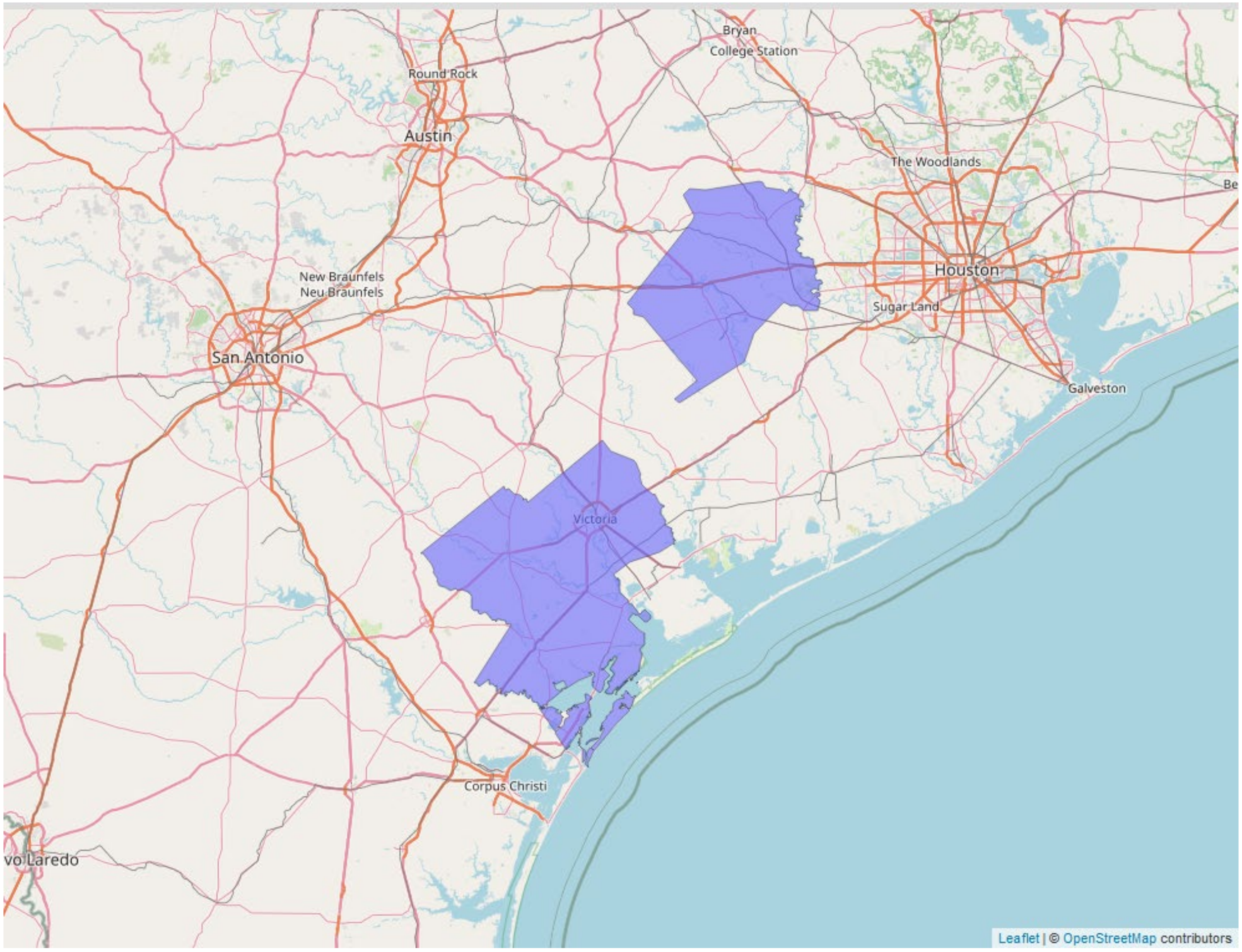

Figure 5. Range map of Attwater's greater prairie-chicken (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7259.

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: 6/1/2021

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 Attwater's prairie-chicken represents the southern-most subspecies of *Tympanuchus cupido*, and currently occurs in the wild at only two locations - the Attwater Prairie Chicken National Wildlife Refuge (Colorado County, Texas) and on private ranchlands in Goliad County, Texas. Free-ranging Attwater's prairie-chicken populations have remained on the precipice of extinction since 1996 following years of population declines. While considerable progress has been made in identifying factors limiting progress toward recovery, Attwater's prairie-chicken numbers remain well below recovery criteria for downlisting or delisting.

Considerable grassland restoration and maintenance has been accomplished, particularly in Goliad County. However, habitat availability also remains below recovery thresholds. The Goliad County Study Site retains the greatest extent of potential high-quality habitat to evaluate as potential future introduction sites. Loss of grassland habitat from woody species encroachment and expansion of urban centers remain very serious threats. Cultural removal of grassland fire as an accepted management tool leaves woody encroachment unchecked throughout most of the Attwater's prairie-chicken's historic range. Currently, considerable habitat thought to be suitable for occupancy by prairie-chickens still exists, but not enough to sustain full recovery as outlined in the Attwater's prairie-chicken recovery plan.

Only continued supplementation of wild populations with releases of captive-reared stock from a breeding program established in 1992 has kept the Attwater's prairie-chicken from extinction in the wild. Over the last five years (as of 2021), breeding facilities produced an average of over 300 captive reared prairie-chickens for release back into the wild. Populations at the Attwater Prairie Chicken National Wildlife Refuge and private ranchlands in Goliad County continue to be supplemented with captive-reared birds. Captive birds have also been released at the Texas City Prairie Preserve, but none have been released since 2010 and Attwater's prairie-chickens have not been observed at this site since 2012.

Despite good nest success, survival of chicks has been consistently poor across release sites. Poor survival of chicks produced by released captive-reared Attwater's prairie-chickens was found to be the single-most factor limiting significant progress toward recovery in the 2010 revision of the Attwater's Prairie-Chicken Recovery Plan. Morrow et al. (2015) concluded that invertebrate abundance at Attwater's prairie-chicken brood sites was directly related to brood survival during the critical first two weeks post-hatch. These authors also demonstrated that invasive red imported fire ants (*Solenopsis invicta*) reduced invertebrate abundance by 26–27%.

It is likely that invasion by this species contributed, at least in part, to the precipitous declines of Attwater's prairie-chicken populations which resulted in their near extinction. Biological control agents for the fire ant and fire ant disease vectors have been identified for use in management efforts. The ubiquitous distribution and rapid colonization potential of fire ants means that annual control measures are necessary to maintain suppression. The availability of funding to maintain suppression at the landscape scale necessary to achieve recovery is a major limitation for the foreseeable future.

Periods of population growth between 2007-2011 and 2012-2016 were ended by a near-historic drought and catastrophic flooding followed by impacts of hurricane Harvey, respectively. However, while numbers remain low, populations have shown continued growth since 2017, and in 2021 reached numbers not seen since 1993. Analyses point to invertebrate abundance and fire ant treatment, along with favorable rainfall conditions, particularly in May when most chicks hatch, for recent population growth.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 40.3% 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 12). Up to 17.3% of the species' range overlaps with methomyl use sites while 23% of the range occurs off-field (but may still be exposed to spray drift or runoff). While Attwater's greater prairie-chickens are known to forage on agricultural land, information solicited from species experts indicate that individuals are not likely to use cotton fields at all as these fields do not match preferred foraging areas. Thus, we expect that on-field exposure for this species based on overlap with use sites will be reduced by up to 11.7% of the range, reducing the total anticipated overlap to 34.7%.

Table 12. Overlap and usage data for the Attwater's greater prairie-chicken.

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[3]	5.2	8.3	13.5	0.3	0.4	0.7

[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.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Cotton	5.6	6.4	12	0.3	0.3	0.6
Other Grains	6.2	7.2	13.4	0.3	0.4	0.7
Other Orchards	0.2	0.6	0.8	0.2	0.6	0.8
Other Row Crops	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soybeans	1.2	3.2	4.3	<0.1	0.1	0.2
Vegetables and Ground Fruit	0.1	0.5	0.6	0.1	0.5	0.6
Wheat	NA	NA	NA	NA	NA	NA
Total	**17.3**	**23**	**40.3**	**1.2**	**2.2**	**3.4**

Usage

Based on past usage data, we anticipate up to 3.4% of the species' range will be treated with methomyl annually. Exclusion of cotton, as discussed above, reduces the percent of the species range treated to 3.1% (Table 12).

Additional Exposure Considerations

We expect some individuals of the Attwater's greater prairie-chicken will occur and forage on agricultural fields, and thus, are at risk of dietary exposure to methomyl through ingestion of contaminated food items.

Exposure Summary

There is a high extent of overlap between the action area and the species' range. Based on past usage data, we expect a low level of annual usage within the species' range. Given that the extent of overlap is high and that expected annual usage is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to Attwater's greater prairie-chickens. Exposure to methomyl is expected to result in mortality depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. We expect individuals that exclusively consume arthropods or plants that have been exposed to methomyl on-field will die, with dosages up to 30 mg/kg-bw. However, consumption of seeds on treated fields is not expected to result in mortality. Off-field exposure can result in dosages up to 1.1 mg/kg-bw, which can occur when individuals exclusively consume leaves. This level of off-field exposure can cause mortality in up to 30% of exposed individuals. Consumption of arthropods and seeds exposed off-field is not expected to cause mortality. We do not expect sublethal effects to occur from exposure to methomyl at estimated environmental concentrations.

Indirect Effects:

Attwater's greater prairie-chicken relies on plants, arthropods, and seeds for food resources. While no effects to plant resources are expected, we anticipate mortality to arthropods from methomyl exposure on or near use sites. Because arthropods taken as food exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but some prey will be available after exposure and any losses will likely only be temporary. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. As a generalist feeder, we anticipate that Attwater's greater prairie-chickens will be less affected by any specific loss of prey items and can consume other available dietary items. As such, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We do not expect individuals will be present on-field during spray application, however, some individuals are likely to be exposed to contaminated food sources as the species is known to forage on-field. Of those individuals that forage on-field, an individual Attwater's greater prairie-chicken feeding exclusively on leaves or arthropods from treated crops for even a short period of time, such as a single day, may accumulate sufficient residues of methomyl to die. Consumption of plants in areas off-field is expected to result in mortality in up to 30% of individuals. We do not expect sublethal effects are likely to occur at predicted exposure levels. Though we anticipate methomyl exposure will cause mortality to some organisms that act as food resources for this species, we expect as a generalist feeder, the Attwater's greater prairie-chicken will be less affected by the loss of any specific dietary item. Still, given the high level of direct effects and medium level of indirect effects, we determine the Attwater's greater prairie-chicken has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Attwater's greater prairie-chicken has a medium exposure ranking. Based on past methomyl usage data, we expect up to 3.1% of the range where the species is likely to forage will be treated annually but may potentially cover up to 28.3% of potential foraging areas (overlapping use sites, except cotton) within the range over the duration of the proposed action depending how usage patterns may change over time. As such, we expect a moderate number of individuals are likely to be exposed to methomyl.

The Attwater's greater prairie-chicken has a high toxicity ranking. We expect mortality will occur on-field as a result of dietary exposure through the consumption of contaminated food items. Off-field mortality is expected for a subset of prairie-chickens consuming contaminated leaves. Though we expect mortality for arthropods exposed to methomyl concentrations on- and off-field, we anticipate a medium level of indirect adverse effects as Attwater's greater prairie-chickens are generalist feeders that are likely to switch to available food resources. However, invertebrate prey reductions are a known concern that may be impacting the reproductive success of this species.

Given that we expect a moderate number of individuals are likely to experience exposure, and a high level of direct and indirect adverse effects, we determine the overall risk of adverse effects to the species is high.

Preliminary Conclusion

The Attwater's greater prairie chicken has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects. The species currently occurs in the wild at only two locations - the Attwater Prairie Chicken National Wildlife Refuge (Colorado County, Texas) and on private ranchlands in Goliad County, Texas. They have been near extinction since 1996 following years of population declines, although there has been more recent population growth since 2017. Numbers are still low, but recovery efforts have included releases of captive-reared stock that have kept the species from extinction. Poor survival of chicks produced by released captive-reared Attwater's prairie-chickens was found to be the single-most factor limiting significant progress toward recovery in the 2010 revision of the Attwater's Prairie-Chicken Recovery Plan. It was concluded that invertebrate abundance at Attwater's prairie-chicken brood sites was directly related to brood survival during the critical first two weeks post-hatch. Spray drift from pesticides used on surrounding agricultural lands is noted as a potential threat to the species due to a reduction in the availability of insects, particularly as a food source for chicks.

We anticipate losses of insect prey that are exposed to methomyl. Exposure is anticipated to be medium due to the high extent of overlap of uses sites within the species range, and low amount of usage (up to 3.1% of the species range treated annually, excluding cotton). We anticipate high toxicity for this species, with mortality both on- and off-field from consuming contaminated food resources. The loss of arthropod prey is also expected to impact the species since insects are an important, limited resource for the species, particularly during the breeding season. We expect prey losses will lead to reduced fitness and starvation in adults, and the survival and growth of chicks in exposed areas over the duration of the proposed action. The risk to the species posed by methomyl uses across the range is anticipated to be high.

Although the recent population trend has shown some improvement, numbers remain low and the Attwater's greater prairie-chicken remains on the brink of extinction. We will expect any methomyl usage on the Attwater Prairie Chicken National Wildlife Refuge to be minimal if there is any usage on the refuge at all. However, based on our assessment, we expected exposure on use sites or from spray drift in other parts of the range to result in the loss of a moderate number of individuals and their insect prey, affecting population numbers due to reduced fitness and reduced survival of chicks and adults needed for recovery.

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 Attwater's prairie chicken:

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 terrestrial habitat for Attwater's prairie chicken 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 Attwater's prairie chicken 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 these conservation measures, we expect these pathways of exposure will be greatly limited over the course of the action. Therefore, we expect impacts to be low, with adverse effects limited to a very small number of individuals due to losses of invertebrate prey that lead to minor reductions in fitness supporting reproductive capacity or growth of chicks. However, effects will not likely reduce the reproduction, numbers, and distribution of the species. After adding the effects of the action (including the species-specific conservation measures) and cumulative effects to the environmental baseline and in light of the status of the species, we do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of the Attwater's prairie chicken in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Attwater's prairie-chicken.

References

U.S. Fish and Wildlife Service. 2010. Attwater's Prairie-Chicken Recovery Plan, Second Revision. Albuquerque, New Mexico. 117 pp.

U.S. Fish and Wildlife Service. 2021. Attwater's greater prairie-chicken (*Tympanuchus cupido attwateri*) 5-year review: Summary and evaluation. Attwater Prairie Chicken National Wildlife Refuge, Eagle Lake, Texas and Texas Coastal Ecological Services, Houston, Texas. 20 pp.

Integration and Synthesis Summary: Birds - Yuma Ridgway's rail

Scientific Name:	Common Name:	Entity ID:
Rallus obsoletus yumanensis	Yuma Ridgway's rail (Yuma clapper rail)	84

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Yuma Ridgway's rail. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 8/25/2022; Wherever found; *States within the range:* AZ, CA, NV. Figure 6 depicts a map of the species' range.

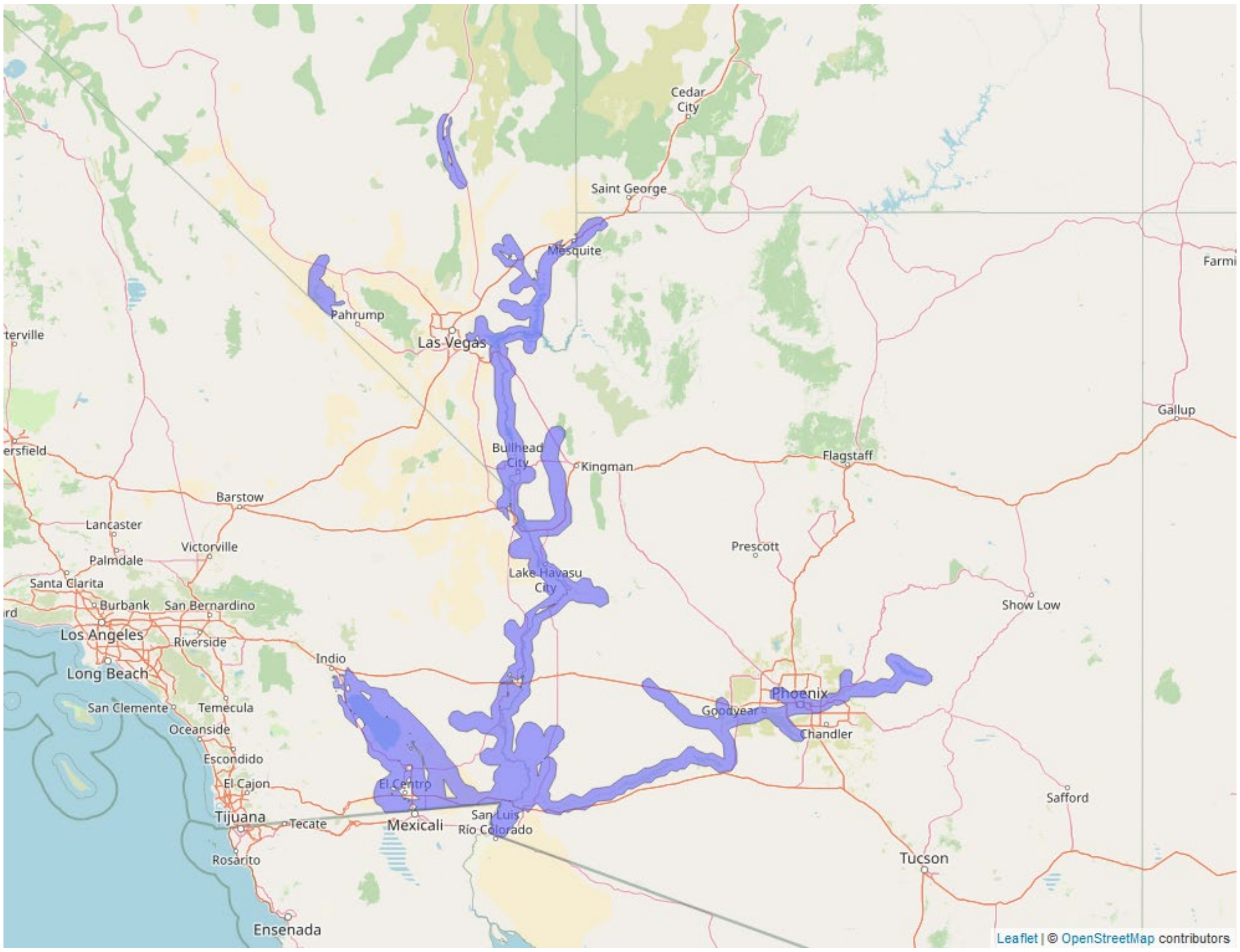

Figure 6. Range map of Yuma Ridgway's rail (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/3505.

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: 9/11/2006

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

Number of populations: Single population

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

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The species is only listed in the United States (in Arizona and California) although the majority of the population is found in Mexico. The Yuma Ridgway's rail is the only subspecies of clapper rail found in freshwater marshes. Existing habitats are primarily either human-made, as are the managed ponds at Salton Sea or the effluent-supported marshes at the Cienega de Santa Clara, or formed behind dams and diversions on the Lower Colorado River at the time those structures were created. The species uses dense herbaceous or woody vegetation associated with aquatic habitats for nesting and foraging. This entire habitat is subject to natural successional processes that reduce habitat value over time without also being subject to natural restorative events generated by a natural hydrograph.

The greatest threat to the Yuma Ridgway's rail is that without active management and protection of water sources supporting the habitat, these habitat areas will be permanently lost. Other threats to this species include continuing land use changes in floodplains, human activities, environmental contaminants (particularly increases in selenium levels), and reductions in connectivity between core habitat areas. The most recent estimate of potentially suitable Yuma Ridgway's rail habitat currently present on the Lower Colorado River is 3,653 hectares (9,041 acres]) with 1,083 hectares (4,457 acres) of that on four National Wildlife Refuges (Havasu, Bill Williams River, Cibola, and Imperial) (USBR 6 2007). Over the 2000-2008 period, the numbers of birds has fluctuated between 503 and 890, reaching the minimum recovery population size of over 700 (USFWS 1983) in 5 of those 9 years. The diet of Yuma Ridgway's rails is dominated by crayfish, with small fish, tadpoles, clams, and other aquatic invertebrates also utilized (Ohmart and Tomlinson 1977, Anderson and Ohmart 1985, Todd 1986, Eddleman 1989, Conway 1990). The current levels of selenium at the Salton Sea, Lower Colorado River, and the Cienega de Santa Clara are a source of concern for the Yuma Ridgway's rail populations in those important habitats. These levels may, or may not, be a threat to the Yuma Ridgway's rail. Ongoing and future proposed research looking at selenium levels in adults and eggs at the Salton Sea and Lower Colorado River will assist in determining the amount of risk posed to the Yuma Ridgway's rail from selenium to assess if this is a threat that requires action be taken. Other contaminants, including heavy metals and pesticides have not been identified as significant threats.

While it appears reasonable to assume that Yuma Ridgway's rails may be affected by climate change, we lack sufficient certainty to know how such changes will affect the subspecies. We believe the effects will likely be related to water availability to support the three core habitat areas. Due to the limited population size and restricted range, this species is potentially at risk from stochastic events. However, pesticides have not yet been identified as a potential stressor and more research is needed.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 33.9% 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 13). Though up to 16.2% of the species' range overlaps with methomyl use sites, no dietary exposure is expected on-field, as the Yuma Ridgway's rail forages for crayfish, small fish, tadpoles, clams, and other aquatic invertebrates in the freshwater and brackish marshes it inhabits. Up to 17.7% of the range occurs in off-field areas that may be exposed to spray drift or runoff.

Table 13. Overlap and usage data for the Yuma Ridgway's rail.

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	7.5	5.6	13.1	1.1	0.9	2
Citrus	NA	NA	NA	NA	NA	NA
Corn[4]	0.6	1	1.7	<0.1	<0.1	0.1
Cotton	1.9	2	3.9	<0.1	0.1	0.2
Other Grains	0.9	2	2.9	<0.1	<0.1	0.1
Other Orchards	0.7	1.8	2.6	0.7	1.9	2.6
Other Row Crops	0.8	1.1	1.9	0.4	0.5	0.9
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	3.8	4.1	7.9	3.8	4.1	7.9

[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.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Wheat	NA	NA	NA	NA	NA	NA
Total	**16.2**	**17.7**	**33.9**	**6.2**	**7.6**	**13.8**

Usage

Based on past usage data, we anticipate up to 13.8% of the species' range will be treated with methomyl annually. Since the Yuma Ridgway's rail is not expected to forage on-field, we consider the 7.6% of the range that may be exposed to spray drift or runoff (Table 13).

Exposure Summary

There is a high extent of overlap between the action area and potential foraging areas within the species' range, totaling up to 17.7% in areas adjacent to methomyl use sites. Based on past usage data, we expect a medium level of usage in potential foraging areas within the species' range, with usage on up to 7.6% of the range annually. Given that the extent of overlap is high and the expected usage is medium, we expect a high number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects:

The Yuma Ridgway's rail forages for crayfish, small fish, tadpoles, clams, and other aquatic invertebrates, which are not expected to occur on agricultural fields. Spray drift or run off may enter the freshwater and brackish marshes where the species feeds. However, no direct adverse effects are expected to the Yuma Ridgway's rail from foraging on these dietary items if exposed to methomyl.

Indirect Effects:

The Yuma Ridgway's rail relies on benthic invertebrates, filter feeders, and fish for food resources. Based on available toxicity data, we expect individuals of these prey species will likely die with exposure to methomyl in areas where spray drift or runoff enter their habitats. However, we expect these species to exhibit a range of sensitivities to methomyl. As such, we expect exposure will reduce the abundance of some prey items in areas subject to methomyl spray drift or runoff, but some prey will be available after exposure and any losses will likely only be temporary. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

No direct adverse effects are expected for Yuma Ridgway's rails consuming dietary items exposed to methomyl from spray drift or runoff. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will reduce the abundance in areas subject to spray drift or runoff, but some prey will be available after exposure and any losses will likely only be temporary. As such, we determine the Yuma Ridgway's rail has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Yuma Ridgway's rail has a high exposure ranking. Though this species is not expected to forage on-field, based on past methomyl usage data, we expect up to 7.6% of the range subject to spray drift or runoff may be treated annually, but may potentially cover up to 17.7% of the range over the duration of the proposed action depending how usage patterns change over time. This indicates that a large portion of the species' range is likely to be treated overall. As such, we expect a large number of individuals are likely to be exposed to methomyl, but we do not anticipate direct adverse effects to individuals.

The Yuma Ridgway's rail has a medium toxicity ranking. While we do not expect adverse effects to Yuma Ridgway's rails through the consumption of contaminated food items, we expect a medium level of indirect adverse effects are likely to occur as we expect methomyl exposure will reduce the abundance of prey species in areas subject to spray drift or runoff.

Given that we expect a high number of individuals are likely to experience exposure, and a moderate level of indirect adverse effects, we determine the overall risk of adverse effects to the species is medium.

Conclusion

The Yuma Ridgway's rail occurs in Arizona and California. The species is currently found in freshwater marshes that are primarily either human-made, such as the managed ponds at Salton Sea or the effluent-supported marshes at the Cienega de Santa Clara, or formed behind dams and diversions on the Lower Colorado River. The species uses dense herbaceous or woody vegetation associated with these aquatic habitats for nesting and foraging. The greatest threat to the Yuma clapper rail is that without active management and protection of water sources supporting the habitat, these habitat areas will be permanently lost. Other threats include a variety of issues, including environmental contaminants such as increases in selenium levels in their habitats. Due to the limited population size and restricted range, this species is potentially at risk from stochastic events. The species has a high vulnerability ranking.

The Yuma Ridgway's rail has a high exposure ranking. The rail's diet is dominated by crayfish, with small fish, tadpoles, clams, and other aquatic invertebrates. We expect 17.7% of foraging areas in the species range overlaps with areas near methomyl use sites that are likely to be exposed through off-site transport within the action area. Based on past usage data, we expect a usage in up to 7.6% of potential foraging areas within the species' range annually. We do not anticipate direct effects to the rail from foraging on dietary items exposed to methomyl. However, we expect losses of prey items due to mortality after exposure to methomyl. We expect prey species used by the rail will exhibit a range of sensitivities to methomyl, such that some prey will be available after exposure and any losses will likely only be temporary. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects to the rail are likely to occur. While we expect some alternative resources will remain available for the rail after exposure in the vicinity, and rails will likely be able to travel to unexposed foraging sites if needed to find sufficient prey, we expect losses of prey will lead to a reduction in fitness supporting reproductive capacity or growth in a small number of individuals due to inadequate food resources.

In summary, the species has a high vulnerability. The overall risk of the proposed action to the species is moderate. We expect the impacts to a small number of individuals over the project duration from lack of adequate resources for fitness supporting reproductive capacity and growth due to losses of prey items, but no impacts from exposure through dietary items over the duration of the proposed action. We do not expect the effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause species-level effects. After adding the effects of the action (including the species-specific conservation measures) and cumulative effects to the environmental baseline and in light of the status of the species, we do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Yuma Ridgway's rail.

References

U.S. Fish and Wildlife Service. 2009. Yuma Clapper Rail (*Rallus longirostris yumanensis*) Recovery Plan. Draft First Revision. Albuquerque, New Mexico.

Integration and Synthesis Summary: Birds - O‘ahu creeper

Scientific Name:	Common Name:	Entity ID:
Paroreomyza maculata	O‘ahu creeper	99

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species’ vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species’ range, past annual usage of methomyl within the species’ range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the O‘ahu creeper. We discuss our rationale for this conclusion for the species in the sections below.

Species range

States within the range: HI

No species range shapefile was available at the time of analysis.

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 Five -Year Status Review recommendation: No change in status

Most recently completed 5-Year Review: 11/8/2019

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

Number of populations: Population size/location(s) unknown

Species trends: Unknown population trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Oʻahu creeper is a small sexually dichromatic (males and females are different colors) Hawaiian honeycreeper endemic to the island of Oʻahu. Female and immature birds are gray to grayish green above and yellowish white below, and usually have two prominent white wing bars. Males are olive-green above and golden yellow below, with a yellow forehead and superciliary line, a dark eye line and do not have wing bars (USFWS 2010). The downlisting goals for this species have not been met since it is not yet known whether the O'ahu creeper still exists and all threats within known and potential suitable habitat are not being sufficiently managed. We cannot assume that it is extinct since no monitoring efforts have occurred to determine if a population still exists. Small populations of ''iwi (another endemic Hawaiian honeycreeper) have been rediscovered recently on Oʻahu in both the Waianae and Koolau Mountains, (and it is possible that isolated populations of the Oʻahu creeper also still exist in remote areas of the island (USFWS 2019). Lack of survey effort indicates that the species status is best described as "unknown" rather than "presumed extinct." The last well-documented observation of the Oʻahu creeper was of two birds on December 12, 1985, during the Waipio Christmas Bird Count. There have been several reports from different areas since 1985; however, details of the observations have been inconclusive, and the birds were never relocated (USFWS 2010).

The preferred habitat of the O'ahu creeper is thought to be mid-elevation koa/ōhia (*Acacia koa*/*Metrosideros polymorpha*) forests in valleys or on side ridges at elevations from 300 to 600 meters (USFWS 2019). Habitat loss and degradation by agriculture, urbanization, cattle grazing, browsing by feral ungulate species, timber harvesting, and invasion of nonnative plant species into native-dominated plant communities have been some of the primary threats to this species. Feral pigs, and goats to a lesser degree, have had a long-term damaging effect upon native forests in the remaining O`ahu creeper range by consuming and damaging understory vegetation, creating openings on the forest floor for weeds, transporting weed seeds into the forest, and causing soil erosion and disruption of seedling regeneration of native plants. Predation by alien mammals such as black rats (*Rattus rattus*) and Polynesian rats (*Rattus exulans*) and diseases such as avian malaria (*Plasmodium relictum*) and avian pox (*Poxvirus avium*) carried by alien mosquitoes have also been primary threats to this species (USFWS 2006).

This species now occurs in such low numbers and in such restricted ranges, if it exists at all, that it is threatened by natural processes, such as inbreeding depression and demographic stochasticity, and by natural and man-made factors such as hurricanes, wildfires, and periodic vegetation die-back (USFWS 2006). Impacts of alien birds are not well understood, but include aggressive behavior towards native bird species, possible competition for food, nest sites, and roosting sites, and possibly supporting elevated predator population levels. Hawai'i honeycreepers are known to be highly susceptible to introduced avian disease, particularly avian malaria (*Plasmodium relictum*) (USFWS 2010). According to some climate change projections, temperature increases could present an additional threat specific to Hawaiian forest birds by causing an increase in the elevation below which regular transmission of avian malaria occurs, potentially reducing the remaining suitable habitat for these species. One study assessed how global climate change will affect future malaria risk for native Hawaiian bird populations and expect high elevation areas to remain mosquito free only to mid-century due to combined factors of increased rainfall and increasing temperatures (USFWS 2019).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

No current range map is available to calculate overlap.

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 among these insecticides. As these data are island-wide and not spatially explicit, we cannot determine the percent of the species range treated. However, we can broadly use this data as confirmation that methomyl usage likely occurs on the island where this species resides.

Additional Exposure Considerations

The O'ahu creeper is restricted to mid- to upper-elevation forests, and therefore not expected to be exposed in agricultural areas. In addition, we do not expect methomyl to be applied aerially in Hawai'i and therefore any spray drift generated from ground applications will be minimal, and not expected to penetrate the forested habitats where the O'ahu creeper resides.

Exposure Summary

Though no range map is available for this species, past observations have found birds within mid- to upper-elevation forests of O'ahu. These forest birds are not expected to use agricultural fields, nor be exposed via spray drift, which is unlikely to penetrate the forested habitats where they reside. As such, we do not expect that individuals are likely to experience exposure in their forested habitats from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to the species. The O‘ahu creeper is insectivorous and forages on trunks and branches of large trees, probing the bark for insects. It rarely forages in foliage. Reported food items include caterpillars, spiders, and beetles. We expect O‘ahu creepers consuming insects that have been contaminated by methomyl on-field or via spray drift will die. Sublethal effects are not expected from consumption of methomyl contaminated food resources.

Indirect Effects:

The O’ahu creeper relies on a variety of insects for food resources. Because we expect insects taken as food items to exhibit a range of sensitivities to methomyl, we expect methomyl exposure will reduce the abundance in areas where its used, but some prey will be available after exposure and any losses will likely only be temporary. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

As individuals consuming contaminated insects will die both on-field and off-field, we expect a high level of direct adverse effects. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur as we expect methomyl exposure will reduce the abundance of insects in areas where its used, but some prey will be available after exposure and any losses will likely only be temporary. As such, we determine the O‘ahu creeper has a high ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The O‘ahu creeper has a high toxicity ranking as we expect concentrations on insects both on- and off-field will be high enough to cause mortality to both the species and its prey base if exposed. However, we do not anticipate that individuals of this species will be exposed to methomyl as they do not forage in agricultural fields, nor be exposed via spray drift within the forested habitats where they reside. As such, we determine the overall risk of adverse effects to the species is low.

Conclusion

The O‘ahu creeper is a small Hawaiian honeycreeper endemic to mid-elevation forested valleys and ridges on the island of O‘ahu. The last well-documented observation of the O‘ahu creeper was of two birds on December 12, 1985. There have been several reports from different areas since 1985; however, details of the observations have been inconclusive, and the birds were never relocated. It is possible that isolated populations of the O‘ahu creeper still exist in remote areas of the island. Lack of survey effort indicates that the species status is best described as “unknown” rather than “presumed extinct” (USFWS 2010; USFWS 2019). As such, we determined the species has a high vulnerability ranking.

The O`ahu creeper is insectivorous and forages by creeping methodically up and down the trunks and branches of large trees, probing the bark for insects. It rarely forages in foliage and does not visit flowers. It may feed largely on caterpillars and spiders, and the stomach contents of specimens collected in the past included large numbers of Carabid beetles (USFWS 2013). Habitat loss and degradation by agriculture, urbanization, cattle grazing, browsing by feral ungulate species, timber harvesting, and invasion of nonnative plant species into native-dominated plant communities have been some of the primary threats to this species (USFWS 2006).

The O’ahu creeper has a high toxicity ranking due to the sensitivity of its insect prey, and the species itself if it consumes contaminated insects. However, though no range map is available for this species, past observations have found birds within mid- to upper-elevation forests. These forest birds are not expected to use agricultural fields, nor be exposed via spray drift, which is unlikely to penetrate the forested habitats where they reside. As such, we do not expect that individuals or prey in their foraging areas are likely to experience exposure from the proposed action. Therefore, we do not expect individual birds or an appreciable number of prey items are likely to experience exposure, and a low level of adverse effects is likely.

In summary, even though the species has high vulnerability and toxicity rankings, the overall risk of adverse effects to the species is low. We expect a minimal loss of prey items, but not in primary foraging areas, and individuals are unlikely to be exposed to methomyl from consuming contaminated prey. As such, we do not anticipate exposure that is likely to lead to a loss of individuals or sublethal effects over the duration of the proposed action. As a result, we do not expect these effects will likely reduce the reproduction, numbers, or distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the O‘ahu creeper.

References

U.S. Fish and Wildlife Service. 2006. Revised Recovery Plan for Hawaiian Forest Birds. Portland, Oregon. 622 pp.

U.S. Fish and Wildlife Service. 2009. O'ahu creeper (*Paroreomyza maculate*) 5-Year Summary and Evaluation. Honolulu, Hawaii. 12 pp.

U.S. Fish and Wildlife Service. 2019. O'ahu creeper (*Paroreomyza maculata*) 5-Year Review Short Form Summary. Honolulu, Hawaii. 9 pp.

Integration and Synthesis Summary: Birds - Hawaiian stilt

Scientific Name:	Common Name:	Entity ID:
Himantopus mexicanus knudseni	Hawaiian stilt	104

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian stilt. We discuss our rationale for this conclusion for the species in the sections below.

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.

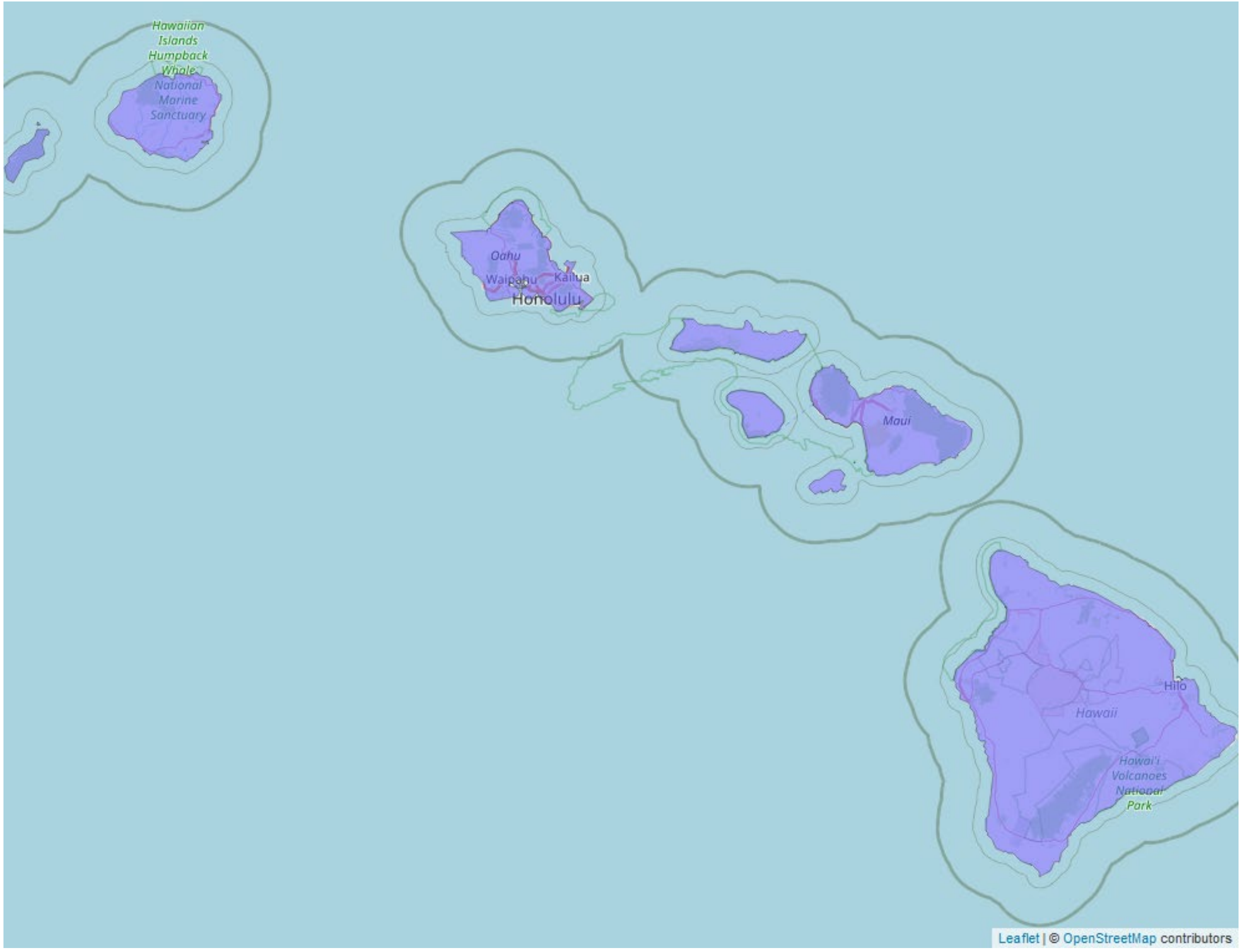

Figure 7. Range map of Hawaiian stilt (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/2082.

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: 3/19/2020

Distribution: Species/Populations neither constrained nor widespread

Number of populations: Multiple populations (few)

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

The Hawaiian stilt (ae'o) is a slender wading bird historically and currently found on all major islands of Hawai'i except for Kaho'olawe. They primarily use wetlands and lands under aquatic agriculture. Hawaiian stilts are opportunistic feeders that eat a wide variety of invertebrates and other aquatic organisms in shallow water and mudflats (i.e., midges, water boatmen (*Corixidae* spp.), beetles (*Coleoptera* spp.), possibly brine fly (*Ephydra riparia*) larvae, polychaete worms, small crabs, fish (e.g., Mozambique tilapia (*Oreochromis mossambica*), mosquito fish (*Gambusia affinis*)), and tadpoles (*Bufo* spp.). Feeding typically occurs in shallow (i.e., 13 cm or less) flooded wetlands that are ephemeral in nature and primarily available in winter. Intra- and inter-island movement is an important strategy for exploiting food resources; movement between Oʻahu and Maui has been documented by statewide waterbird survey data and banding studies (USFWS 2011). Considerable movement occurs between the Kaua'i and Niihau populations, apparently in response to rainfall patterns and the flooding and drying of Niihau's ephemeral lakes. On Kaua'i, Hawaiian stilts are numerous in large river valleys such as Hanalei, Wailua, and Lumahai, and on the Mānā Plain. Hawaiian stilts also frequent Kaua'i's reservoirs, particularly during drawdown periods, as well as sugarcane effluent ponds in Līhue and Waimea.

The O'ahu population supports the largest number (35-50%), primarily at the James Campbell National Wildlife Refuge, the Kahuku aquaculture ponds, the Honouliuli and Waiawa units of the Pearl Harbor National Wildlife Refuge, and on Nuupia Ponds in Kāneohe. Populations also exist at the Chevron Refinery, the fishponds at Kualoa Beach Park, Salt Lake District Park, and scattered locations along the northern and eastern coasts. The Maui, Molokai, and Lānai (Maui Nui) populations support a significant number of Hawaiian stilts. Monthly counts indicate that birds freely move between two coastal wetlands on Maui (Kanahā and Keālia), apparently in search of optimal foraging habitat. Molokai's south coastal wetlands and playa lakes are important habitats for Hawaiian stilts, with large concentrations at the Kaunakakai Wastewater Reclamation Facility. Since 1968, surveys have shown a significant increase in Hawaiian stilts on Molokai. There is some evidence of periodic movements of birds between Maui and Molokai, again probably in response to available foraging habitat. The species was first discovered on Lāna'i in 1989 at the city's wastewater treatment ponds and they have been recorded there with numbers sometimes exceeding 100 birds. The Hawai'i population from the Kona Coast from Kawaihae Harbor south to Kailua supports the largest number of Hawaiian stilts on Hawai'i Island, with Ōpaeula and Aimakapā Ponds being key breeding areas. These two ponds anchor the continuous network of wetlands along the Kona Coast and together have maintained 95% of the

Hawaiian stilts for Hawai'i Island. Until 2003, the Cyanotech Ponds were a key breeding area because management focused on providing adequate breeding habitat for Hawaiian stilts to minimize nesting attempts in hazardous areas; they are no longer managed as breeding habitat for Hawaiian stilts, but Cyanotech, the Service, and partners are providing suitable habitat for displaced stilts. The anchialine pools north of the harbor in Kona are also important Hawaiian stilt feeding habitat. Hawaiian stilts can also be found along the Hāmākua Coast and in the Kohala River valleys of Waipio, Waimanu, and Pololū (USFWS 2011).

Based on biannual Hawaiian waterbird surveys from 1998-2007, the Hawaiian stilt population averaged 1,484 birds but fluctuated between approximately 1,100 and 2,100 birds. Long-term census data indicate statewide populations were relatively stable or slightly increasing from the 1990s to 2010s, even with low numbers counted during surveys (USFWS 2011, 2020). Hunting contributed to local population declines of the Hawaiian stilt until waterbird hunting was prohibited in 1939. The most important causes of decline were loss and degradation of wetland habitat and predation by introduced animals. Predators include mongooses, black rats (*Rattus rattus*), feral cats, feral dogs, black-crowned night herons, cattle egrets, Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*), and common mynas (*Acridotheres tristis*). Because of exposed nest sites, Hawaiian stilts appear to be more susceptible to avian predators than are other Hawaiian waterbirds. Other factors that have contributed to waterbird population declines, and that continue to be detrimental, include modification of hydrology, alteration of habitat structure and vegetation composition by invasive non-native plants, loss of riparian vegetation and water quality degradation due to grazing, disease (i.e., avian botulism (*Clostridium botulinum* type C)), and possibly environmental contaminants. Some wetlands have been identified as flood control basins, such as Kawai Nui marsh, are expected to accumulate contaminants from urban runoff. Contaminants in wetlands can enter the diet of waterbirds, resulting in accumulation of toxins (USFWS 2020). Because Hawaiian stilts are coastal waterbirds, increasing sea-level rise may cause inundation of existing habitat and result in establishment of new habitat upslope in areas that are not protected by conservation efforts (USFWS 2020).

Overall Vulnerability: Medium

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 14). 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 14. Overlap data for the Hawaiian stilt.

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 among these insecticides. As these data are island-wide and not spatially explicit, we cannot determine the percent of the species range treated. However, we can broadly use this data as confirmation that methomyl usage likely occurs on the islands where this species resides.

Additional Exposure Considerations

We do not expect methomyl to be applied aerially in Hawai'i. As such, we expect off-field overlap to be lower as spray drift from ground applications will not travel as far off the field. Based on ground applications only, we expect 4% of the species' range to overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area. Data indicate that 2.9% of the species' range occurs on methomyl use sites while 1.1% of the range occurs off-field but may still be exposed through spray drift and/or runoff.

In addition, the Hawaiian stilt is associated almost exclusively with wetlands, ponds, and other water features, which occur predominately at low elevation. While agricultural wetlands (i.e., taro fields) represent key habitat for waterbird species in Hawai'i, methomyl is not registered for use on this crop. The Hawaiian stilt is not expected to be exposed to methomyl directly in other agricultural crops but could be found in suitable wetland areas that are adjacent to or traverse these sites.

Exposure Summary

We expect a low level of exposure of the Hawaiian stilt to methomyl. We do not anticipate that Hawaiian stilts will occur on-field, and only 1.1% of the range is expected to be exposed via spray drift or runoff from ground applications. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

The Hawaiian stilt forages on invertebrates and other aquatic organisms which are not expected to occur on agricultural fields where methomyl is registered for use. Spray drift or run off may enter the wetland areas where the species feed. However, no direct adverse effects are expected to the Hawaiian stilt from foraging on these dietary items if exposed to methomyl.

Indirect Effects:

The Hawaiian stilt is an opportunistic feeder that will eat a wide variety of invertebrates and other aquatic organisms. Based on available toxicity data, we expect individuals of these prey species will likely die in areas where spray drift or runoff enter their habitats off-field. However, we expect these species to exhibit a range of sensitivities to methomyl such that exposure will reduce the abundance in areas subject to methomyl spray drift or runoff, but some prey will be available after exposure and any losses will likely only be temporary. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

No direct adverse effects are expected for Hawaiian stilts consuming dietary items exposed to methomyl from spray drift or runoff. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will reduce the abundance in areas subject to spray drift or runoff, but some prey will be available after exposure and any losses will likely only be temporary. As such, we determine the Hawaiian stilt has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Hawaiian stilt has a low exposure ranking. We do not anticipate that Hawaiian stilts will occur on-field, and only 1.1% of the range is expected to be exposed via spray drift or runoff from ground applications. This indicates that a small portion of the species' range is likely to be treated overall. As such, we expect a small number of individuals are likely to be exposed to methomyl. The Hawaiian stilt has a medium toxicity ranking. Though no direct adverse effects are expected for Hawaiian stilts consuming dietary items exposed to methomyl from spray drift or runoff, we expect methomyl exposure to reduce the abundance of prey in areas subject to spray drift or runoff. Given that we expect a small number of individuals are likely to experience exposure but will not be affected, and a medium level of indirect adverse effects are likely from losses of prey, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Hawaiian stilt is a slender wading bird historically and currently found on all major islands of Hawai'i except for Kaho'olawe. They primarily use wetlands and lands under aquatic agriculture. Hawaiian stilts are opportunistic feeders that eat a wide variety of invertebrates and other aquatic organisms in shallow water and mudflats. Feeding typically occurs in shallow flooded wetlands that are ephemeral in nature and primarily available in winter. Intra- and inter-island movement is an important strategy for exploiting food resources.

The Hawaiian stilt is a conservation-reliant species, which means that it will require active management in perpetuity. However, based on survey data, the stilt shows a stable to increasing population index. In addition, the best available information shows most threats have been managed sufficiently over the past several decades such that reproductive success in managed sites supports a stable to increasing statewide population. As such, the species was proposed for downlisting to threatened in 2021 (86 FR 15855). Population estimates have intermittently exceeded the target level of 2,000 individuals identified in the recovery plan, although they have not done so for 5 consecutive years as recommended. Moreover, because PVA results indicate that the actual statewide carrying capacity is likely to be lower than 2,000 individuals, reevaluation of this target is warranted (USFWS 2020). As such, we determined the species has medium vulnerability.

Though no direct adverse effects are expected for Hawaiian stilts consuming dietary items exposed to methomyl from spray drift or runoff, we expect methomyl exposure to reduce the abundance of prey in areas subject to spray drift or runoff. However, we expect these invertebrate prey species to exhibit a range of sensitivities to methomyl such that exposure will reduce the abundance of the most sensitive species in areas subject to methomyl spray drift or runoff, but some prey will be available after exposure and any losses will likely only be temporary. Additionally, Hawaiian stilts are highly mobile, and we expect most individuals will move to alternate areas with more sufficient prey for foraging if needed due to prey losses in localized areas. As such, we anticipate that the Hawaiian stilt, an opportunistic feeder with a varied diet of invertebrates and other aquatic organisms, will experience minimal adverse effects to its fitness or likelihood of survival from loss of invertebrate prey in a small portion of the range.

In summary, the species has been proposed for downlisting and has a medium vulnerability, and the overall risk of adverse effects to the species from methomyl use is low. We expect losses of prey items that lead to a reduction in fitness supporting reproductive capacity or growth in a small number of individuals within a small portion of the range over the duration of the proposed action. We do not expect these effects will likely reduce the reproduction, numbers, or distribution of the species and cause species-level effects. After adding the effects of the action (including the species-specific conservation measures) and cumulative effects to the environmental baseline and in light of the status of the species, we do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian stilt.

References

U.S. Fish and Wildlife Service. 2011. Recovery Plan for Hawaiian Waterbirds, Second Revision. Portland, Oregon. xx + 233 pp.

U.S. Fish and Wildlife Service. 2020. Hawaiian stilt (*Himantopus mexicanus knudseni*) 5-Year Review. Honolulu, Hawai'i. 26 pp.

Integration and Synthesis Summary: Birds - Molokai thrush

Scientific Name:	Common Name:	Entity ID:
Myadestes lanaiensis rutha	Molokai thrush	106

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Molokai thrush. We discuss our rationale for this conclusion for the species in the sections below.

Species range

States within the range: HI

No species range shapefile was available at the time of analysis.

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: 6/25/2018

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

Number of populations: Population size/location(s) unknown

Species trends: Unknown population trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The breeding biology of the Molokai thrush (olomao) is largely unknown but may be similar to that of the closely related ōmao. The Molokai thrush consumes a variety of small fruits that they swallow whole and insects are taken at all levels in the forest (Rothschild 1893 to 1900, Perkins 1903, Bryan 1908; as cited in USFWS 2006). The diet of the ōmao is essentially the same, and these foods are also fed to nestlings (Perkins 1903, van Riper and Scott 1979, Wakelee et al. 1999; as cited in USFWS 2006). Molokai thrush prefer closed forest; if in open forest, they stay close to cover (Bryan 1908; as cited in USFWS 2006). Originally, they were ubiquitous throughout wet and dry forests on Molokai and Lānai, in the lowlands as well as at the highest elevations (Rothschild 1893 to 1900, Perkins 1903; as cited in USFWS 2006). The most recent records have all been from dense rainforest above 1,000 meters (3,300 feet) elevation adjacent to the steep pali (cliff) of Pelekunu (Scott et al. 1986; as cited in USFWS 2006).

Currently, there are no known Molokai thrush populations, and whether the species remains extant is unknown. Survey efforts for this species have been relatively low, due in part to the difficulty of accessing some of its best remaining habitat. An unconfirmed sighting in 2005 provided some hope that the species may still survive (G. Hughes, in litt. 2005; as cited in USFWS 2006). Additional searches are needed to ascertain the current status of the Molokai thrush with greater confidence, particularly of the Olokui Plateau. The last confirmed detection of oloma‘o was in 1980 (Reynolds and Snetsinger 2001, p. 136; as cited in USFWS 2006). However, during biological survey of the Oloku‘i Plateau in 2015 there were several unconfirmed sightings of oloma‘o near ‘Ōhi‘alele in The Nature Conservancy Pelekunu Preserve (Oppenheimer et al. 2015, p. 8; as cited in USFWS 2018). We believe the status of the oloma‘o is “unknown,” based on conclusion of the Hawai‘i Rare Bird Search 1994-1996 the species could still be potentially extant (Reynolds and Snetsinger, 2001, pp. 141-142; as cited in USFWS 2006), the low survey effort for oloma‘o subsequent to this (see Table 1), and the recent unconfirmed sightings of oloma‘o in 2015. There are instances where rare Hawaiian birds have been rediscovered after they were presumed extinct or have been found in larger populations than expected (Reynolds and Snetsinger 2001, p. 142; as cited in USFWS 2006). The large area of the Oloku‘i Plateau, an area of 656 hectares (1,616 aces) that was not surveyed during the Hawai‘i Rare Bird Search, and the many remote areas within this that are only rarely visited by qualified observers, increase the potential that a small population of oloma‘o could still exist on Moloka‘i. The extremely rough terrain on Moloka‘i and frequent wet weather make surveys difficult, and numerous steep valleys create small pockets of habitat where the species could still persist.

Hawaiian honeycreepers are known to be highly susceptible to introduced avian disease, particularly avian malaria (Plasmodium relictum) (Atkinson et al. 1995; Atkinson et al. 2000; Yorinks and Atkinson 2000; Banko and Banko 2009; as cited in USFWS 2018). According to some climate change projections, temperature increases could present an additional threat specific to Hawaiian forest birds by causing an increase in the elevation below which regular transmission of avian malaria occurs, potentially reducing the remaining suitable habitat for these species.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

No current range map is available to calculate overlap.

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 among these insecticides. As these data are island-wide and not spatially explicit, we cannot determine the percent of the species range treated. However, we can broadly use this data as confirmation that methomyl usage likely occurs on the island where this species resides.

Additional Exposure Considerations

The Molokai thrush is restricted to mid- to upper-elevation forests, and therefore not expected to be exposed in agricultural areas. In addition, we do not expect methomyl to be applied aerially in Hawai'i and therefore any spray drift generated from ground applications will be minimal, and not expected to penetrate the forested habitats where the Molokai thrush resides.

Exposure Summary

Though no range map is available for this species, past observations have found birds within mid- to upper-elevation forests of Molokai. These forest birds are not expected to use agricultural fields, nor be exposed via spray drift, which is unlikely to penetrate the forested habitats where they reside. As such, we do not expect that individuals are likely to experience exposure in their forested habitats from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route to methomyl exposure. The Molokai thrush consumes a variety of small fruits and insects taken at all levels in the forest. We expect that the consumption of insects contaminated either on-field or via spray drift will result in mortality, while consumption of fruit will only result in mortality if exposed to methomyl on-field. Sublethal effects are not expected from consumption of methomyl contaminated food resources.

Indirect Effects:

We expect the Molokai thrush to rely on a variety of insects and fruit for food resources. While no effects to plant resources are expected, we anticipate mortality to insects from methomyl exposure on or near use sites. However, because we expect insects taken as food items to exhibit a range of sensitivities to methomyl, we expect methomyl exposure will reduce the abundance in areas where it used, but some prey will be available after exposure and any losses will likely only be temporary. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

As individuals consuming contaminated insects will die both on-field and off-field, we expect a high level of direct adverse effects. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur as we expect methomyl exposure will reduce the abundance of insects in areas where it used, but some prey will be available after exposure and any losses will likely only be temporary. As such, we determine the Molokai thrush has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Molokai thrush has a high toxicity ranking as we expect concentrations of methomyl both on- and off-field will be high enough to cause mortality to both the species and its prey base. However, we do not anticipate that individuals of this species will be exposed to methomyl as they do not forage in agricultural fields, nor will they be exposed via spray drift within the forested habitats where they reside. As such, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Molokai thrush was historically ubiquitous throughout wet and dry forests on Molokai and Lānai, in the lowlands as well as at the highest elevations. The most recent records have all been from dense rainforest above 1,000 meters (3,300 feet) elevation adjacent to steep cliffs. Currently, there are no known Molokai thrush populations, and whether the species remains extant is unknown. However, survey efforts for this species have been relatively low, due in part to the difficulty of accessing some of its best remaining habitat, and there have been unconfirmed sightings as recently as 2015. Pesticides are not a known threat for this species. The species has a high vulnerability ranking.

Exposure from consumption of methomyl contaminated food resources will likely result in mortality to individuals, and there will be losses of their insect prey in exposed areas. However, the Molokai thrush is restricted to mid- to upper-elevation forests, and therefore is not expected to be exposed in agricultural areas. In addition, we do not expect methomyl to be applied aerially in Hawai'i, and therefore any spray drift generated from ground applications will be minimal, and not expected to penetrate the forested habitats where the Molokai thrush resides. As such, we do not expect that individuals that are still extant in their forested habitats are likely to experience methomyl exposure, although it is possible that dispersing individuals may experience exposure from nearby agricultural use sites or losses of prey, leading to the loss of or effects to fitness or growth in a very small number of individuals in limited areas over the duration of the Action.

In summary, even though the species has a high vulnerability, the overall risk to the species is low. We expect impacts to a very small number of dispersing individuals from consuming exposed prey or due to a lack of sufficient prey availability that leads to mortality or a reduction in fitness supporting reproductive capacity or growth over the duration of the proposed action. However, we do not expect these effects will likely reduce the reproduction, numbers and distribution of the species and cause species-level effects. After adding the effects of the action (including the species-specific conservation measures) and cumulative effects to the environmental baseline and in light of the status of the species, we do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Molokai thrush.

References

U.S. Fish and Wildlife Service. 2006. Revised Recovery Plan for Hawaiian Forest Birds. Portland, Oregon. 622 pp.

U.S. Fish and Wildlife Service. 2018. 5-year review for the oloma‘o or Moloka‘i thrush (*Myadestes lanaiensis rutha*). Honolulu, Hawai'i. 8 pp.

Integration and Synthesis Summary: Birds - Red-cockaded woodpecker

Scientific Name:	Common Name:	Entity ID:
Picoides borealis	Red-cockaded woodpecker	107

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the woodpecker. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 1/28/2022; Wherever found; *States within the range:* AL, AR, FL, GA, LA, MS, NC, OK, SC, TX, VA. Figure 8 depicts a map of the species' range.

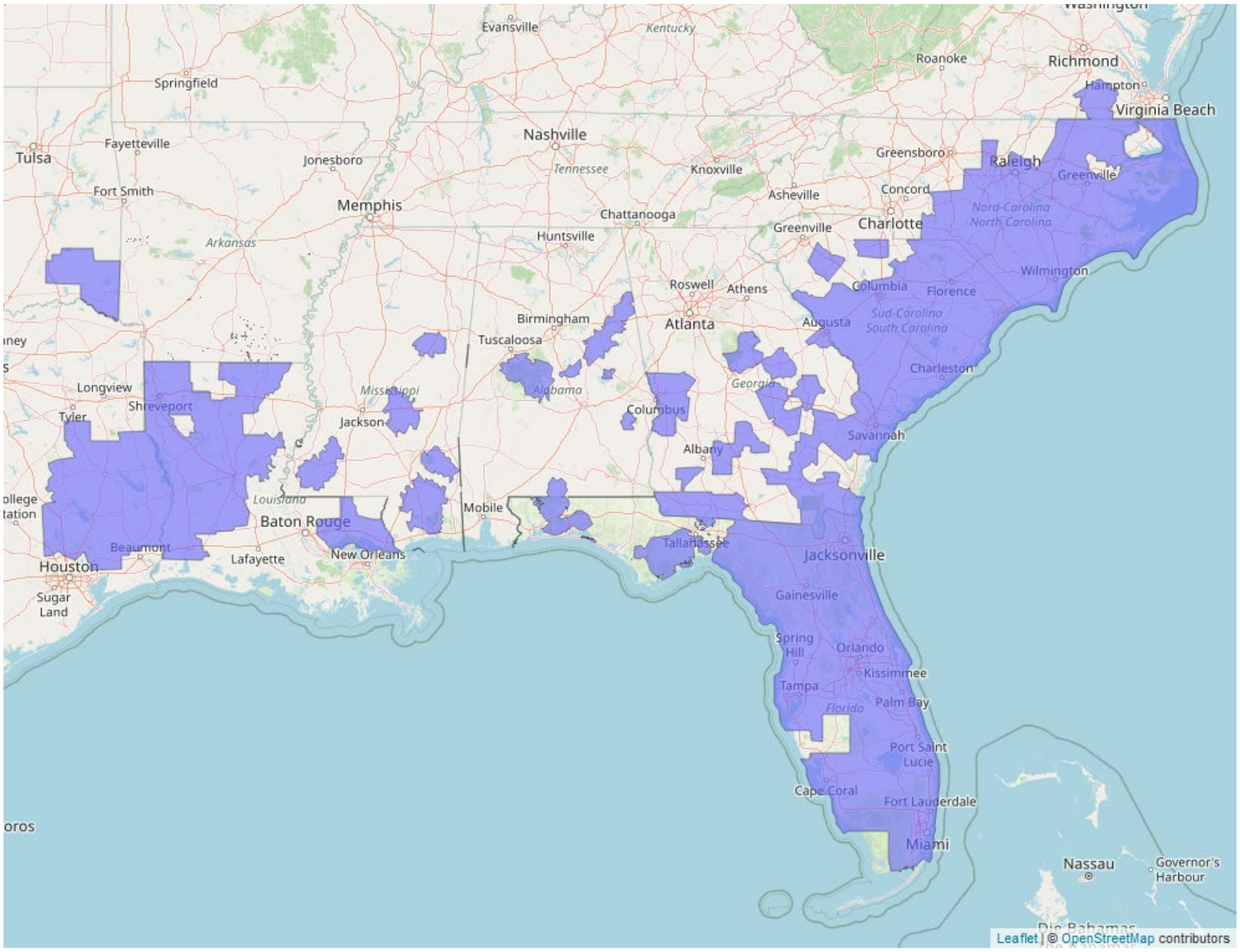

Figure 8. Range map of red-cockaded woodpecker (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7614.

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: Downlist to Threatened

Most recently completed 5-Year Review: 10/8/2020

Distribution: Species/Populations widespread or wide-ranging

Number of populations: Multiple populations (numerous)

Species trends: Increasing population(s)

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Red-cockaded woodpeckers were once considered a common bird across the southeastern U.S. At the time of listing in 1970, the species was severely threatened by lack of adequate habitat due to historical logging, incompatible forest management, and conversion of forests to urban and agricultural uses. Fire-maintained old growth pine savannahs, on which the species depends, were extremely rare. What little habitat remained was mostly degraded due to fire suppression and silvicultural practices that hindered the development of older, larger trees needed by the species for cavity development and foraging. Even after listing, the species continued to decline. However, new restoration techniques, such as artificial cavities, along with changes in silvicultural practices and wider use of prescribed fire to recreate open pine parkland structure, has led to stabilization of the species' viability and resulted in an increase in the number and distribution of populations.

While most populations are still small and vulnerable to stochastic events, the majority of populations for which we were able to determine trends are stable or increasing, and 13 percent are declining. There are currently at least 124 populations across 13 ecoregions. The Service recommended reclassification from endangered to threatened in a proposed rule published on October 8, 2020. Based on our analysis of the species' resiliency, representation, and redundancy (as further described in the proposed rule), the red-cockaded demonstrates some degree of stability in all three factors. The species' viability is reduced over historical levels, but habitat conditions and population numbers are improving. In terms of resiliency, most of the populations are still quite small, but the vast majority are stable or even growing. The species has not lost any representative populations since the 2003 revised recovery plan, and while a few ecoregions still only contain one or two populations, most of these populations are stable or growing. Finally, there is a fair degree of redundancy within ecosystems across the range of the species, although most populations are still quite small and are isolated from each other. The improving viability of the red-cockaded woodpecker has been largely due to intensive, extensive management, including actions immediately after large storm events to offset cavity loss and reduce hazardous extirpated.

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 33.6% 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 15). Up to 11.8% of the species' range overlaps with methomyl use sites and up to 21.9% of the range occurs in off-field areas that may be exposed to spray drift or runoff.

Table 15. Overlap and usage data for the red-cockaded woodpecker.

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	3.7	6.5	10.2	0.2	0.3	0.5
Cotton	2.7	4.7	7.4	0.1	0.3	0.4
Other Grains	1.3	3.5	4.8	<0.1	0.1	0.2
Other Orchards	0.4	1.9	2.2	0.3	1.9	2.2
Other Row Crops	1.7	3.2	4.9	0.8	1.4	2.2
Soybeans[5]	5.2	6.7	11.9	0.3	0.3	0.6
Vegetables and Ground Fruit	0.6	1.8	2.4	0.6	1.8	2.4
Wheat	NA	NA	NA	NA	NA	NA
Total	**11.8**	**21.9**	**33.6**	**2.2**	**5.8**	**8**

Usage

Based on past usage data, up to 8% of the species' range will be treated with methomyl annually (Table 15).

[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.

Additional Exposure Considerations

The red-cockaded woodpecker is endemic to open, mature, and old growth pine ecosystems and is not expected to forage or roost in agricultural fields, row crops, or orchards and vineyards. (pers. comm. 2016 co-occurrence information, USFWS field office request). Though methomyl can enter these habitats via spray drift, given the broad nature of the range map for this species, it is unlikely that the entire area of overlap adjacent to agriculture represents red-cockaded woodpecker habitat. Therefore, it is expected the area of red cockaded woodpecker habitat exposed to spray drift is lower than the 21.9% overlap and 5.8% treated. In addition, though red-cockaded woodpeckers prefer open pine systems, spray drift is still expected to be reduced to some extent by interception with the forested habitat, further lowering the extent of habitat likely to be exposed.

Exposure Summary

The red-cocked woodpecker is not expected to forage in agricultural use sites. Given that all areas adjacent to agriculture in the species' range are unlikely to be red-cockaded woodpecker habitat and the expectation that the forested habitat will reduce spray drift, we anticipate a high extent of overlap between the action area and the species' range that could be exposed via spray drift, with a medium extent of usage in these areas. As such, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items that have been exposed to spray drift near agricultural fields to be the primary route of methomyl exposure to red-cockaded woodpeckers. We anticipate dietary dosages of methomyl to reach 0.8 mg/kg-bw, resulting in mortality in up to 24% of individuals exclusively consuming contaminated prey. We expect methomyl concentrations on fruit and seeds will be lower and not significantly contribute to adverse effects. We do not expect sublethal effects to occur from exposure to methomyl at estimated environmental concentrations.

Red-cockaded woodpeckers generally capture arthropods on and under the outer bark of live pines and in dead branches of live pines. While it is possible that some individuals will consume enough insects contaminated from a nearby methomyl application to cause mortality, we expect this to be rare due to the lower likelihood of spray drift penetrating forested areas and the foraging habits of red-cockaded woodpeckers that includes consumption of insects under bark, where they are less likely to be exposed to spray drift.

Indirect Effects:

The red-cockaded woodpecker relies on arthropods, fruit, and seeds for food resources. Over 75% of the diet of red-cockaded woodpeckers consists of arthropods, especially ants and roaches, but also beetles, spiders, centipedes, true bugs, crickets, and moths. Though red-cocked woodpeckers capture arthropods on and under bark, most prey are not exclusively bark residents, so drift into their habitat can broadly expose prey (Hanula and Horn 2004). Based on available toxicity data, we expect that exposure from spray drift is likely to cause mortality of these prey species. However, because arthropods taken as food items exhibit a range of sensitivities to methomyl, we that expect that to exposure to methomyl from spray drift will reduce the abundance, but some prey will be available after exposure and any losses will likely only be temporary. Studies of red-cockaded woodpeckers found prey selection is related to abundance, as opposed to preference for particular species (Hanula and Horn 2004). Therefore, as a generalist feeder of arthropods, we anticipate that red-cockaded woodpeckers will be less affected by the loss of specific species and will consume other available dietary items.

Toxicity Summary

Red-cockaded woodpeckers are not expected to forage in agricultural fields, and we expect mortality will occur rarely from foraging off-field in areas where spray drift may penetrate the forest. We do not expect sublethal effects are likely to occur at predicted exposure levels. As arthropods are the primary dietary item of red-cockaded woodpeckers, we expect a reduction of the prey base where exposure to methomyl from spray drift occurs. However, because not all species of arthropods are expected to die from spray drift exposure, we expect the red-cockaded woodpecker, as a generalist feeder, will be able to consume available dietary items. As such, we determine the red-cockaded woodpecker has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The red-cockaded woodpecker has a medium exposure ranking. Given that all areas adjacent to agriculture in the species' range are unlikely to be red-cockaded woodpecker habitat, we anticipate that exposure will be less than the 21.9% of spray drift areas that overlap with the species' range and the 5.8% of the species' range that is likely to be treated. In addition, we expect that the forested habitat of the red-cockaded woodpecker will result in interception of spray drift, thus further reducing the extent of the species' habitat exposed to methomyl. As such, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

The red-cockaded woodpecker has a medium toxicity ranking. Red-cockaded woodpeckers are not expected to forage in agricultural fields, and we expect mortality only rarely from individuals foraging in areas where spray drift may penetrate the forest. As arthropods are the primary dietary item of red-cockaded woodpeckers, we expect a reduction of the prey base where exposure to methomyl from spray drift occurs. However, because not all species of arthropods are expected to die from spray drift exposure, we expect the red-cockaded woodpecker will be able to consume available dietary items.

Given that we expect a moderate number of individuals are likely to experience exposure and given that we expect a moderate level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is medium.

Conclusion

The red-cockaded woodpecker was once considered a common bird across the southeastern U.S. At the time of listing in 1970, the species was severely threatened by lack of adequate habitat due to historical logging, incompatible forest management, and conversion of forests to urban and agricultural uses. However, new restoration techniques, such as artificial cavities, along with changes in silvicultural practices and wider use of prescribed fire to recreate open pine parkland structure, has led to stabilization of the species' viability and resulted in an increase in the number and distribution of populations. This species continues to have a wide distribution. There are currently at least 124 populations across 13 ecoregions. While most populations are still small and vulnerable to stochastic events, the majority seem to be stable or increasing, with 13 percent declining. The species has a medium vulnerability ranking.

The red-cockaded woodpecker has a medium exposure ranking. While we expect 33.6% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area, and usage is anticipated to expose 8% of these areas annually, exposure is only likely in off-site areas only where there is 21.9% overlap, of which 5.8% is likely to be exposed annually. This is because the species occurs in old growth pine savannahs and is not expected to forage in agricultural use sites. Given that areas adjacent to agriculture in the species' range are unlikely to be red-cockaded woodpecker habitat, and we expect that the species' forested habitat will reduce spray drift, we expect a small number of individuals and their prey are likely to experience exposure from the proposed action. We expect mortality of woodpeckers will occur rarely from foraging off-field in areas where spray drift may penetrate the forest. Arthropods are the primary dietary item of red-cockaded woodpeckers, and we expect a reduction of the prey base where exposure to methomyl from spray drift occurs. Not all species of arthropods are expected to die from spray drift exposure, and we expect most red-cockaded woodpeckers, as generalist feeders that are highly mobile, will be able to find available dietary items to consume. However, we expect mortality or reduced fitness or growth in a small number of individuals as a consequence of consumption of contaminated prey or losses of prey items over the duration of the proposed action. Given that we expect a moderate number of individuals are likely to experience exposure and given that we expect a moderate level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is medium.

In summary, the species has a medium vulnerability, and the overall risk to the species is medium. While overlap with use sites and usage in the range are high, this species is not expected to occur on agricultural sites. Therefore, the most likely route of exposure to the species is from spray drift. We expect the loss of a small number of individuals and reduced fitness supporting reproductive capacity or growth over the project duration from exposure through the consumption of contaminated prey, as well as losses of prey items over the duration of the proposed action. However, this species has a wide distribution with multiple populations, and we do not anticipate large segments of the population will be affected by consuming exposed prey at any given site. We also anticipate most individuals will be able to move to alternative sites to forage as needed to find sufficient prey after losses in localized areas. While we anticipate impacts to a moderate number of individuals, we do not expect the adverse effects from the proposed action will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the red-cockaded woodpecker.

References

Hanula, J. L, and S. Horn. 2004. Availability and abundance of prey for the red-cockaded woodpecker. In: Costa, Ralph; Daniels, Susan J., eds. Red-cockaded woodpecker: Road to recovery. Blaine, WA: Hancock House Publishers: 633-645.

U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Reclassification of the Red-Cockaded Woodpecker from Endangered to Threatened with a Section 4(d) Rule, Proposed Rule. Federal Register 85:63474-63499.

Integration and Synthesis Summary: Birds - Hawaiian coot

Scientific Name:	Common Name:	Entity ID:
Fulica alai	Hawaiian coot	108

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian coot. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 2/14/2022; Wherever found; *States within the range:* HI. Figure 9 depicts a map of the species' range.

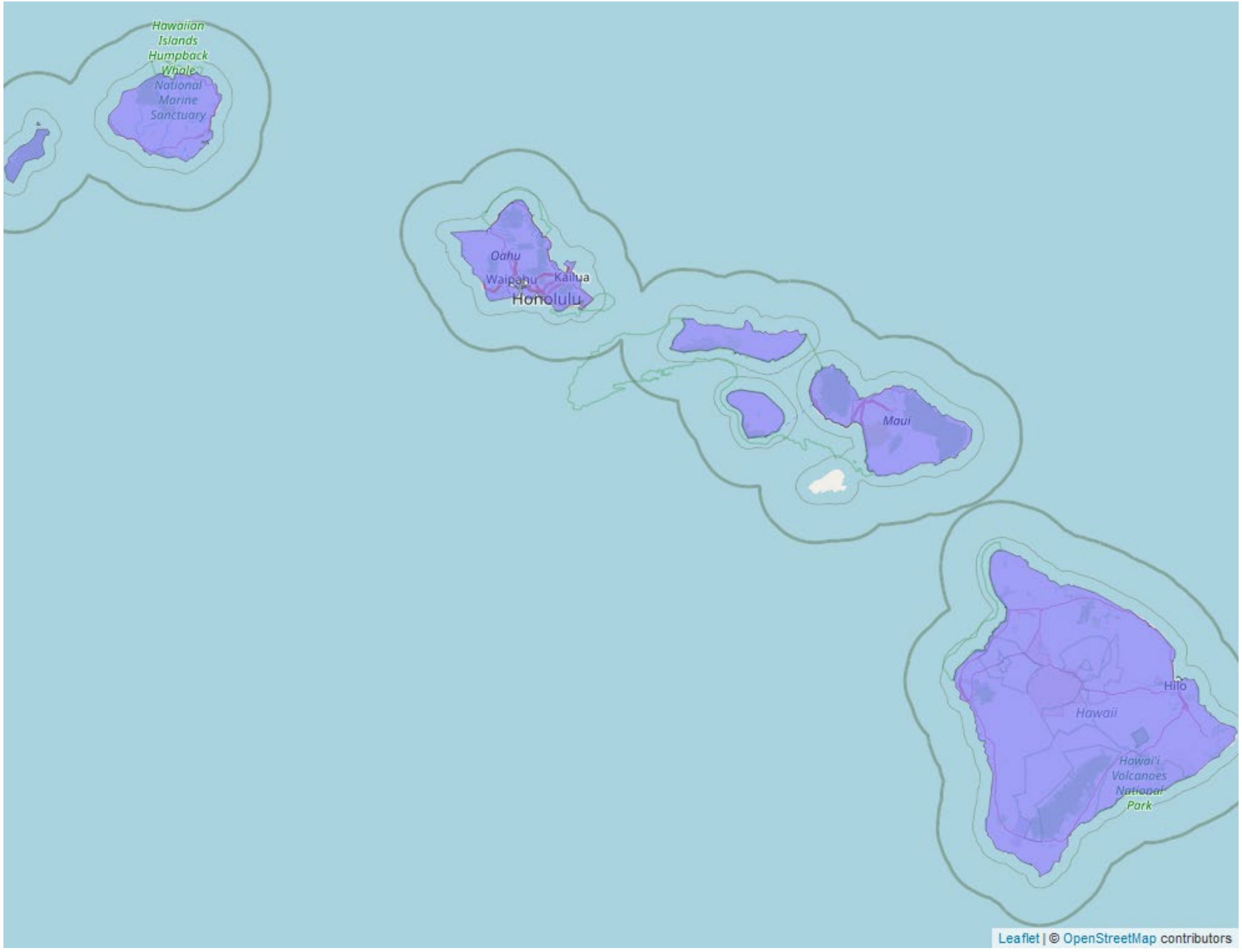

Figure 9. Range map of Hawaiian coot (alae keokeo) (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7233.

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: 8/27/2021

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

Number of populations: Multiple populations (few)

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

The Hawaiian coot, or ’alae ke’oke’o, is endemic to Hawai’i and non-migratory. The Hawaiian coot historically occurred on all the main Hawaiian Islands except Lāna’i and Kaho’olawe, which lacked suitable wetland habitat. They are now found in artificial “wetlands” on Lāna’i (i.e., water treatment sites). Kaua’i, O’ahu, and Maui collectively support 80% of birds detected during annual waterbird surveys between 1876-2008 (USFWS 2011). Hawaiian coots disperse readily and exploit seasonally flooded wetlands, and their populations naturally fluctuate according to climactic and hydrologic conditions. The total population fluctuates between 1,500-2,800 birds, and in 2021, there were an estimated 1,815 (1,248-2,577) individuals (USFWS 2021). Threats to the species continue and include predation, degradation of wetlands, and avian disease. Contamination of wetlands with toxic substances from human development or from agricultural/aquacultural practices (e.g., oil, pesticides, and herbicides) is also a potential threat (USFWS 2011). Avian botulism (Clostridium botulinum) impacts were increasing by the 2021 5-Year Review. Climate change could affect this species through changes in precipitation, groundwater dynamics, and weather patterns. Specifically, climate change is expected to change streamflow throughout the 21st century, which will affect the species (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 16). Data indicate that 3% of the species’ range occurs on methomyl use sites while 3.5% of the range occurs off-field but may still be exposed through spray drift and/or runoff.

Table 16. Overlap data for the Hawaiian coot.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
HI state agriculture layer	3.0	3.5	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 among these insecticides. As these data are island-wide and not spatially explicit, we cannot determine the percent of the species range treated. However, we can broadly use this data as confirmation that methomyl usage likely occurs on the islands where this species resides.

Additional Exposure Considerations

We do not expect methomyl to be applied aerially in Hawai'i. As such, we expect off-field overlap to be lower as spray drift from ground applications will not travel as far off the field. Based on ground applications only, we expect 4% of the species' range to overlap with methomyl use sites or is likely to be exposed through off-site transport within the action area. Data indicate that 3% of the species' range occurs on methomyl use sites while 1% of the range occurs off-field but may still be exposed through spray drift and/or runoff considering ground applications only.

In addition, the Hawaiian coot is associated almost exclusively with wetlands, ponds, and other water features, which occur predominately at low elevation. While agricultural wetlands (i.e., taro fields) represent key habitat for waterbird species in Hawai'i, methomyl is not registered for use on this crop. The Hawaiian coot is not expected to be exposed to methomyl directly in other agricultural crops but could be found in suitable wetland areas that are adjacent to or traverse to these sites.

Exposure Summary

We expect a low level of exposure of the Hawaiian coot to methomyl. We do not anticipate that Hawaiian coots will occur on-field and only 1% of the range is expected to be exposed via spray drift or runoff from ground applications. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items adjacent to agricultural fields to be the primary route of methomyl exposure to Hawaiian coots. Dietary items include aquatic plants, arthropods, benthic invertebrates, and fish. We do not expect any direct adverse effects (i.e., mortality or sublethal effects) from consumption of these food items.

Indirect Effects:

The Hawaiian coot relies on aquatic plants, arthropods, benthic invertebrates, and fish. While no effects to plants are expected, we anticipate effects to the prey base from methomyl exposure near use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, 3we expect exposure will reduce the abundance in these areas, but some prey will be available after exposure and any losses will likely only be temporary. However, as a generalist feeder, we anticipate that Hawaiian coot will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We do not expect any direct adverse effects to Hawaiian coots from the consumption of methomyl contaminated dietary items. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure to cause mortality to organisms that act as food resources for the species. However, as a generalist feeder, we anticipate that Hawaiian coots will be able to consume available food resources. As such, we determine the Hawaiian coot has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Hawaiian coot has a low exposure ranking. We do not anticipate that Hawaiian coots will occur on-field, and only 1% of the range is expected to be exposed via spray drift or runoff from ground applications. This indicates that a small portion of the species' range is likely to be treated overall. As such, we expect a small number of individuals are likely to be exposed to methomyl.

The Hawaiian coot has a medium toxicity ranking. We do not expect direct adverse effects (i.e., mortality or sublethal effects) from consumption of methomyl contaminated dietary items adjacent to use sites. We expect a medium level of indirect adverse effects as the Hawaiian coot is a generalist feeder able to adapt from loss of prey species to methomyl exposure.

Given that we expect a small number of individuals are likely to experience exposure, and medium level of indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Hawaiian coot is endemic to Hawai'i. They occur in natural and artificial wetlands. They disperse readily and exploit seasonally flooded wetlands, and their populations naturally fluctuate according to climactic and hydrologic conditions. The total population fluctuates between 1,500-2,800 birds. Continuing threats to the species continue include wetland degradation, as well as predation and avian disease. Contamination of wetlands with toxic substances, including from agricultural practices (e.g., pesticides, and herbicides) is also a potential threat. The species has a high vulnerability ranking.

We expect a low level of exposure of the Hawaiian coot to methomyl. We do not anticipate that Hawaiian coots will occur on-field, and only 1% of the range is expected to be exposed via spray drift or runoff from ground applications. Aerial applications are not expected in Hawai'i. Past methomyl usage data in Hawai'i is unavailable, but prior usage data indicate that 8-45% of agricultural crops in Hawai'i have been treated with insecticides annually, with methomyl presumably among these insecticides. We expect consumption of food items adjacent to agricultural fields to be the primary route of methomyl exposure to Hawaiian coots. Dietary items include aquatic plants, arthropods, benthic invertebrates, and fish. We do not expect any direct adverse effects (i.e., mortality or sublethal effects) from consumption of these food items. The Hawaiian coot relies on aquatic plants, arthropods, benthic invertebrates, and fish. While no effects to plants are expected, we anticipate effects to the sensitive species that are part of the prey base from methomyl exposure near use sites. However, we anticipate that most individuals will have the ability to consume other available dietary items that remain in the area or travel to other sites to forage. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur to the coot. As such, we expect a small number of individuals will be affected by losses of prey items that lead to reduced fitness supporting reproductive capacity or growth.

In summary, even though the species has a high vulnerability, the overall risk to the species is low. We do not expect the loss of individuals from exposure through dietary items. However, we anticipate losses of prey items will cause adverse effects to a small number of individuals over the project duration due to reduced growth or fitness. However, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Hawaiian coot.

References

U.S. Fish and Wildlife Service. 2021. Hawaiian Coot (*Fulia alai*) 5-Year Review Short Form Summary. Honolulu, Hawai'i. 9 pp.

U.S. Fish and Wildlife Service. 2011. Recovery Plan for Hawaiian Waterbirds, Second Revision. Portland, Oregon. xx + 233 pp.

U.S. Fish and Wildlife Service. 2010. Hawaiian Coot (*Fulia alai*) 5-Year Review. Honolulu, Hawai'i. 11 pp.

Integration and Synthesis Summary: Birds - Mississippi sandhill crane

Scientific Name:	Common Name:	Entity ID:
Antigone canadensis pulla	Mississippi sandhill crane	110

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Mississippi sandhill crane. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 1/11/2022; Wherever found; *States within the range:* MS. Figure 10 depicts a map of the species' range.

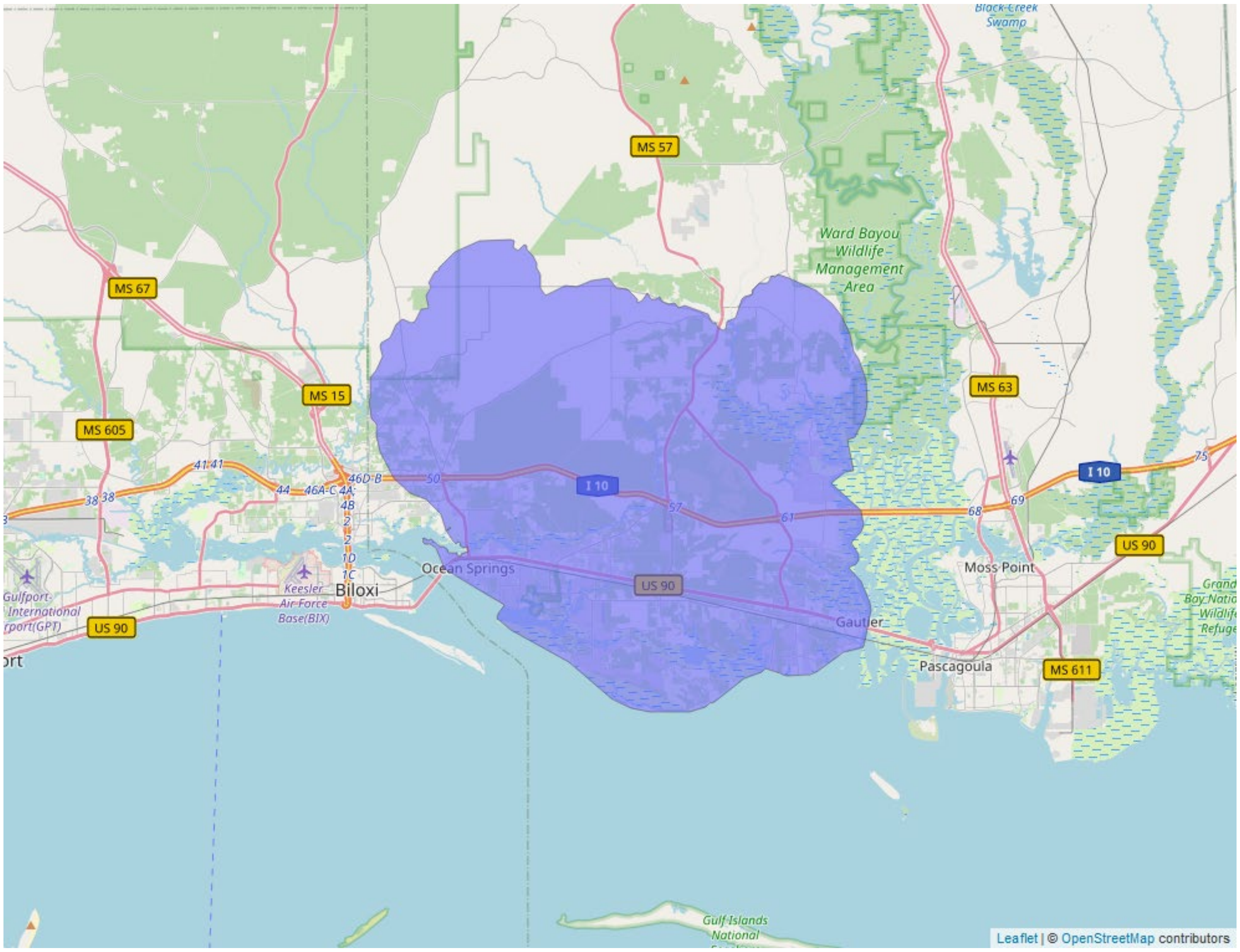

Figure 11. Range map of Mississippi sandhill crane (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/1222.

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: 8/30/2019

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: Yes

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Mississippi sandhill cranes are long-lived, monogamous wading birds that provide extended parent care and subsequently have low annual reproductive potential. They occur on wet pine savanna grasslands dominated by wiregrass (*Aristida* spp.) with scattered longleaf pine (*Pinus palustris*), slash pine (*Pinus elliotti*), and pond cypress (*Taxodium ascendens*) trees, and they nest in open, shallow herbaceous wetlands. There used to be non-migratory sandhill crane populations continuously along the Gulf coasts of the United States from Florida to Texas. It is believed that these populations shared genes; the only remaining population is in Mississippi. The Mississippi sandhill crane likely survived the urban development that extirpated other populations of sandhill cranes in the region because of its relative isolation and occupation of an area with soils unsuited for agriculture. They are now restricted to the Mississippi Sandhill Crane National Wildlife Refuge and its immediate environs in southern Jackson County, Mississippi, between the cities of Ocean Springs and Gautier. While most nesting occurs on the refuge due to limited habitat availability off the refuge, Mississippi sandhill cranes frequently use off-refuge areas such as fields and pastures for foraging, especially in autumn, winter, and early spring (USFWS 2019). They eat insects, earthworms, crayfish, small reptiles, amphibians, and possibly small birds and small mammals. They also eat roots, tubers, seeds, nuts, fruits, and leaves of wetland plants (USFWS 1991). Approximately 30% of the crane observations recorded in 2018 were off the refuge.

The Mississippi sandhill crane experienced a minimum population of 30 wild birds in 1981, the same year captive-reared juvenile cranes began being released at the refuge. In 2000, the population was estimated at 110-120 individuals and in 2019, the wild population was estimated at 129 birds. The wild Mississippi sandhill crane population has remained relatively stable since 1993, ranging from 110-140 individuals each year, primarily due to augmentation from annual releases of captive-bred juveniles, and the age distribution of the population is skewed towards younger birds. While the number of breeding pairs has increased, recruitment remains low (below replacement) and releases need to continue for the foreseeable future. As of 2019, the numbers of fledged chicks were not sufficient to maintain the crane population, but the natural nest success rate improved from 2013 through 2018. After decades of habitat restoration work and release of captive-bred juveniles, the status of the Mississippi sandhill crane population has reached a level of stability. Preliminary estimates suggest the refuge population may require a minimum of about 130 to 170 cranes, consisting of about 60 nesting cranes per breeding season, for a continuous period of at least 10 years to meet the recovery criterion of attaining a free-living, stable, and self-sustaining standing population (USFWS 2019).

Habitat destruction from railroad and other development is the primary cause for the species decline. Wet savanna habitat in the eastern Gulf Coastal Prairie is nearly gone. The human population in southeastern Mississippi, especially along the coast, increased dramatically. Construction of railroads, roads, power lines, and commercial and residential development accompanied the increased human population. In the mid-1950s, timber companies acquired or leased lands for pine tree production. Slash pine was planted on thousands of acres during the 1950s and 1960s. To encourage tree growth in wet situations, savannas were drained, and seedlings were bedded and furrowed. Access roads and fire breaks were constructed, and wildfires were suppressed. The pine plantations formed dense stands that precluded nesting and feeding by cranes. Additional threats to cranes and their habitat include hurricanes/flooding, drought, pesticide use, disease, predation, environmental toxins, and collisions with man-made structures. Hurricanes occur about once every 3 to 5 years in this area. Crane mortality caused by the hurricane winds and rains has not been documented but loss of birds, eggs, and nests are possible. Flash floods regularly occur and nests in low lying areas have been flooded. Lack of drinking water could cause chick mortality. Conversely, spring and summer droughts are common.

Fire ant eradication with Mirex was common before it was banned in 1977. A crane found dead in 1974 contained 0.14 parts per million (ppm) of Mirex in the breast muscle and 0.22 ppm in the brain. Roadsides were often treated with herbicides. Since 1981, eighteen cranes have been necropsied by the National Wildlife Health Research Center and six birds were diagnosed with biliary hyperplasia, five of which had adenocarcinomas, and four could have died from their tumors. Similar tumors are very rare among wild birds and tumors have not been documented among the USGS Patuxent Wildlife Research Center cranes. Although the causative agent was not established, a toxin was considered the cause. The susceptibility of the Mississippi sandhill crane to toxins may be increased by the loss of genetic variability. Avian tuberculosis and salmonella potentially affect cranes, as do eastern equine encephalitis virus and West Nile virus. An incident of mycotoxin-induced disease from their grain-based diet was observed in the captive cranes at Patuxent Wildlife Research Center in the 1990s. Other captive or recently-released birds died from disseminated visceral coccidiosis, nematodes, and *Ascaridia* spp. parasites. Predation by coyotes, raccoons, foxes, domestic dogs, and bobcats is the primary factor affecting egg and chick mortality in the wild population. Predation attempts were also observed by barred owls, crows, alligators, and snakes. Environmental toxins like polychlorinated dibenzo-p¬-dioxins and dibenzofurans have been found in nonviable Mississippi sandhill crane eggs. Crane mortality has occurred from collisions with fences, cell towers, powerlines, and motor vehicles. Effects of climate change, including drought, variations in seasonal timing of precipitation, and heavy rains, are expected to influence breeding behavior and recruitment of the wild Mississippi sandhill crane population (USFWS 2019).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 3.2% 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). Up to 0.2% of the species' range overlaps with methomyl use sites while 2.9% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 17. Overlap and usage data for the Mississippi sandhill crane.

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	<0.1	0.2	0.2	<0.1	<0.1	<0.1
Cotton	<0.1	0.8	0.9	<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	0.6	0.7	<0.1	0.3	0.3
Soybeans[6]	<0.1	1.2	1.2	<0.1	<0.1	0.1
Vegetables and Ground Fruit	<0.1	0.3	0.3	<0.1	0.3	0.3
Wheat	NA	NA	NA	NA	NA	NA
Total	**0.2**	**2.9**	**3.2**	**<0.1**	**0.6**	**0.7**

Usage

Based on past usage data, up to 0.7% of the species' range will be treated with methomyl annually (<0.1% on-field and 0.6% off-field).

[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.

Additional Exposure Considerations

During summer months, cranes forage in savannas, swamps, and open forest land habitats. During the fall, winter, and early spring, most cranes feed on small corn and chufa (*Cyperus esculentus*) fields, pastures, and orchards found near their nesting range. While we do not anticipate methomyl applications are likely to be made in the time periods when cranes forage on agricultural lands, we cannot rule out the possibility of on-field exposure.

Exposure Summary

There is a low extent of overlap between the action area and the species' range (3.2% total overlap) and a low level of past methomyl usage (up to 0.7% range treated annually). While the species is known to forage on agricultural fields, including possible methomyl use sites, we do not anticipate the time period when individuals use these fields (from fall to early spring) likely aligns with typical periods of methomyl application, though we cannot completely rule out the possibility of on-field exposure occurring. Given the small footprint of methomyl use sites and off-site transport areas within the species' range and the difference in when individuals are likely to be on-field and when methomyl applications are made, we expect only a small number of individuals are likely to be exposed and that the overall exposure ranking is low.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect the consumption of food items in and around agricultural fields is the primary route of methomyl exposure to the Mississippi sandhill crane. The crane is an opportunistic forager and can consume a wide variety of food items including vegetation, arthropods, benthic invertebrates, and small terrestrial vertebrates (including small mammals, birds, amphibians, and reptiles). Consumption of contaminated food items on methomyl use sites shortly after applications are made can result in dosages up to 22.1 mg/kg-bw methomyl in vegetative food resources (e.g., leaves and flowers), resulting in mortality of Mississippi sandhill crane individuals that exclusively consume these items. However, on-field foraging behaviors typically occur between fall and early spring when methomyl applications are not likely to be made, we do not expect this level of exposure and adverse effect to occur. Dietary items exposed off-field will result in lower dosages of methomyl (up to 0.8 mg/kg-bw methomyl), resulting in no mortality of exposed individuals. We do not anticipate sublethal effects are likely to occur at predicted levels off-field.

Indirect Effects:

Available toxicity data suggest that there will be high levels of mortality of arthropod prey species (such as insects and crustaceans). Similarly, available toxicity data indicate that small mammal and bird prey species (and presumably amphibian and reptile prey) are also likely to experience high levels of mortality, but only those individuals that consume contaminated food items on methomyl use sites soon after methomyl applications. As such, we expect the loss of vertebrate prey will be restricted to just areas in and around agricultural areas. We do not anticipate any adverse effects to vegetative food resources will occur. While we expect there will be large reductions in the abundance of sensitive prey species (particularly arthropod prey), as an opportunistic forager, we anticipate individual cranes will be able to easily take advantage of food resources that are not as sensitive to methomyl. Thus, we do not expect more than low levels of indirect effects are likely to occur.

Toxicity Summary

We expect low levels of direct adverse effects to the Mississippi sandhill crane because they predominantly forage on agricultural lands during times of year when we do not expect methomyl applications to occur. However, high levels of direct adverse effects could occur if individuals consume food resources on-field soon after methomyl exposure. We expect the high toxicity scenario to be rare. We do not anticipate sublethal effects are likely to occur at predicted exposure levels. We expect only low levels of indirect effects are likely to occur as the species is an opportunistic forager, suggesting that individuals can switch to using more abundant food resources when there are large reductions in the abundance of sensitive prey species. Given the low level of expected on-field mortality, the overall toxicity ranking for the Mississippi sandhill crane is low.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Mississippi sandhill crane has a low exposure ranking. There is a low extent of overlap between the action area and the species' range (3.2% total overlap) and a low level of past methomyl usage (up to 0.7% has been treated annually). While individuals are likely to forage on agricultural fields (including methomyl use sites), we anticipate their presence on-field (i.e., from fall to early spring) is not likely to coincide with typical periods of methomyl application. In addition, the species' range primarily occurs on Mississippi Sandhill Crane National Wildlife Refuge where we do not expect methomyl to be used. As such, we expect a small number of individuals are likely to be exposed.

The Mississippi sandhill crane has a low toxicity ranking. We anticipate individuals that consume contaminated food items off-field are not likely to experience any mortality or sublethal effects to growth or reproduction and we anticipate the species (as an opportunistic forager) will only experience low levels of adverse indirect effects from prey loss. However, we anticipate a high level of mortality of individuals if they forage exclusively on methomyl use sites. We expect this level of toxicity to be rare because the species' forages on agricultural lands at times of year when we do not expect methomyl application to occur (fall to early spring).

Because we expect exposure will result in a low level of adverse effects, we anticipate only a small number of individuals are likely to be exposed. In addition, we expect exposed individuals to experience low levels of adverse effects. As such, we expect the overall risk of adverse effects to the species is low.

Conclusion

The Mississippi sandhill crane has high vulnerability because of its single population, limited distribution, declining trends, specific habitat requirements, and reliance on augmented populations for recovery. It is a non-migratory, endangered crane that occurs on the Gulf Coast of Mississippi. They use wet pine savanna grasslands and open, shallow herbaceous wetlands, both of which were decimated in the species' historical range for agriculture and development. As of 2019, the species was restricted to the Mississippi Sandhill Crane National Wildlife Refuge and its immediate vicinity in Jackson County. They are opportunistic foragers that eat insects, crustaceans, reptiles, small mammals, amphibians, and plant material. Mississippi sandhill cranes are threatened by habitat loss and fragmentation, hurricanes and flooding, drought, disease, predation, environmental toxins, and collisions with man-made structures. Methomyl use sites overlap 3.2% of the species range, 0.2% of which is on-field. A low portion (0.7%) of the range has been treated annually with methomyl in the past (<0.1% on-field and 0.6% off-field). Mississippi sandhill cranes are known to forage on agricultural lands, including corn and chufa fields, pastures, and orchards. However, we do not expect that the time period when cranes use these fields (fall to early spring) will align with typical periods of methomyl application. In addition, most of the species' range is on federal lands (i.e., Mississippi Sandhill Crane National Wildlife Refuge) where we do not expect methomyl to be used. We cannot rule out the possibility of on-fields exposure, but we expect only a small number of individuals will be exposed throughout the duration of the action.

We expect high levels of mortality for cranes that exclusively consume contaminated food items (e.g., leaves and flowers) from methomyl use sites, but we expect this scenario to be rare. We anticipate only a small number of individuals will die from the proposed action. We do not anticipate sublethal effects are likely to occur at predicted levels off-field. We anticipate losses of prey items, but because the cranes are opportunistic foragers and have the ability to travel to alternate foraging sites, we expect they will find sufficient prey as losses occur in localized areas. However, we anticipate prey losses may lead to a reduction in fitness supporting reproductive capacity or growth in a small number of individuals. The overall risk to the species is low.

In summary, the species has high vulnerability, but it primarily occurs on a refuge and forages on nearby agricultural lands during times of year when we do not expect methomyl will be used.

We expect a small number of individuals will be exposed. Because they are opportunistic foragers and we only expect mortality of individuals that eat exclusively from methomyl use sites soon after methomyl application, which is not anticipated during the time of year the cranes would be foraging on agricultural use sites except on rare occasions, we expect mortality for a very small number of individuals. Low levels of indirect effects are anticipated due to losses of exposed prey that lead to reductions in fitness or growth in a small number of individual cranes. However, we expect most individuals will be able to find alternative prey and foraging sites if needed, as the species is a highly mobile opportunistic forager. We do not expect these effects will reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Mississippi sandhill crane.

References

U.S. Fish and Wildlife Service. 2019. Mississippi Sandhill Crane (*Grus Canadensis pulla*) 5-Year Review: Summary and Evaluation. Jackson, Mississippi. 46 pp.

U.S. Fish and Wildlife Service. 1991. Recovery Plan Mississippi Sandhill Crane. Third Revision. Atlanta, Georgia. 48 pp.

Integration and Synthesis Summary: Birds – Puerto Rican nightjar

Scientific Name:	Common Name:	Entity ID:
Caprimulgus noctitherus	Puerto Rican nightjar	111

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Puerto Rican nightjar. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 6/12/2018; Wherever found; *States within the range:* PR. Figure 11 depicts a map of the species' range.

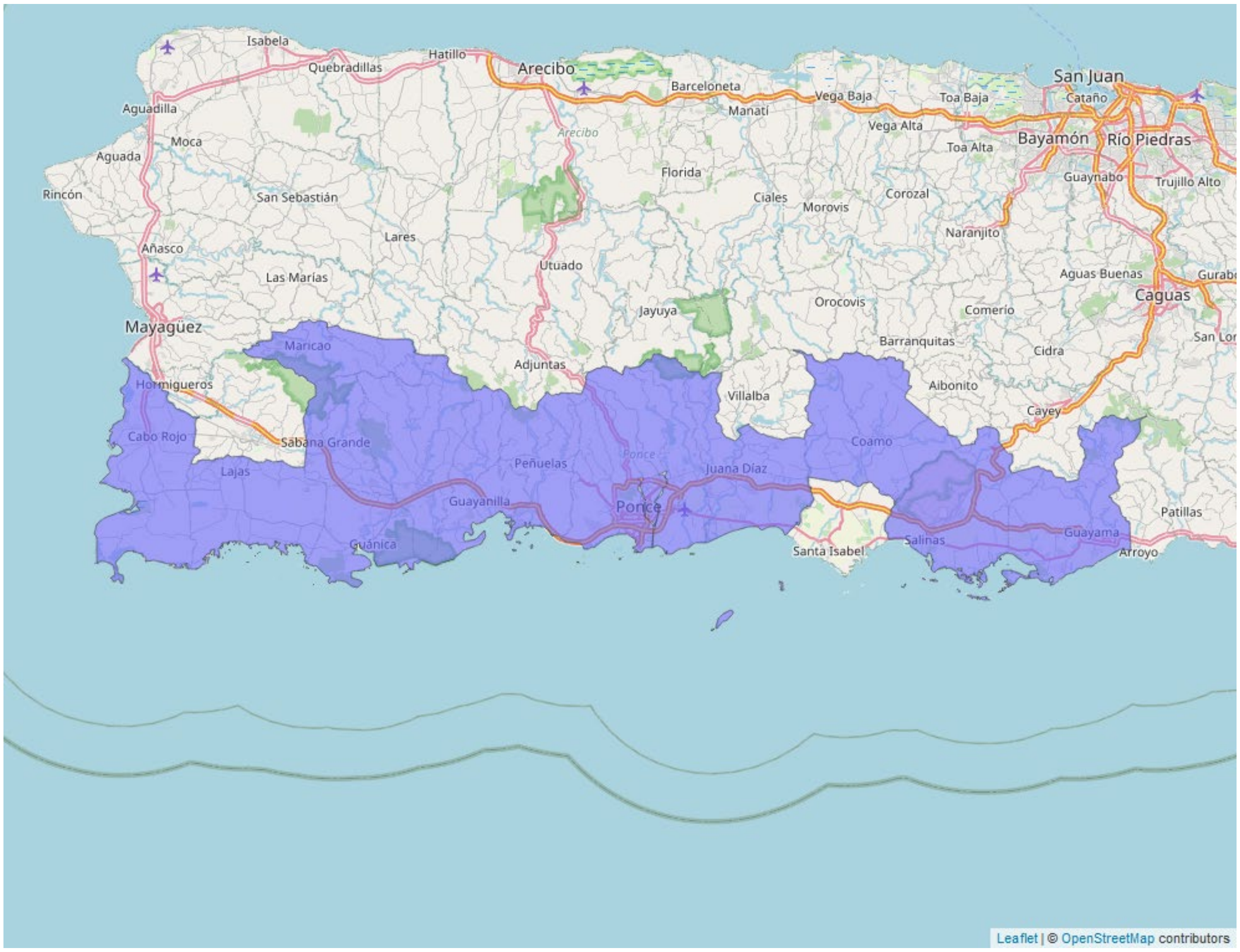

Figure 12. Range map of Puerto Rican nightjar (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6972.

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: 12/22/2017

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

Number of populations: Unknown number of populations

Species trends: Unknown population trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

While no information exists to estimate population trends for the nightjar, information collected in Guánica and Susúa Commonwealth Forests over the years (Kepler and Kepler 1973, Wiley 1985, Vilella and Zwank 1993a, Gonzalez 2010) suggests the number of nightjars detected along survey routes has remained fairly constant. Vilella and Zwank (1993a) reported approximately 1,400–2,000 male nightjars were distributed across some 10,000 hectares in southwest Puerto Rico. Thus, assuming each singing nightjar may represent a potential breeding pair; nightjar estimates by Vilella and Zwank (1993a) represent 2,800 to 4,000 individuals across southwestern Puerto Rico. No information exists on genetic structure of the nightjar.

The recent rapid development (urbanization and industrialization) of most municipalities of southwestern Puerto Rico during the last decades is the most serious threat to the species' survival because it promotes fragmentation of remaining nightjar habitat and may result in declines and local extinctions of isolated nightjar populations (Thomas 1990). Extensive clearing of forests in Puerto Rico began early in the nineteenth century, and by 1828 about one-third of the island had been cleared for agriculture (Wadsworth 1950). Deforestation peaked in the early 1930s when forest cover reached a low of approximately 81,000 ha, representing about 9% of the Island (Birdsey and Weaver 1987). By late 1940s, forest cover reached a low of about 6%. However, forest recovery following cessation of intensive land-use has progressed in time and space (Lugo et al. 1996). By the 1980s, forest cover, including coffee shade, occupied about 280,000 hectares or about 31.5% of the island's land area (Birdsey and Weaver 1987), and about 32 to 42% of the island's area by 1990 (Gould et al. 2007). The economic shift away from agriculture resulted in agricultural lands reverting to forests, but urban expansion and land development have led to the loss of agricultural and forest land and their associated wildlife (Birdsey and Weaver 1987).

Predation of breeding nightjars and their nests by exotic mammals has been documented (Vilella 1995). The mongoose was introduced into the West Indies during the 1870's with the intention of controlling rat populations (*Rattus* spp.) on sugar-cane plantations. Avian predators have been reported to take eggs from Puerto Rican nightjar nests (Vilella 1995). Ants can also overwhelm nightjar chicks while hatching. Two species of exotic primates established in southwestern Puerto Rico, the patas monkeys (*Erythrocebus patas*) and rhesus macaques (*Macaca mulatta*), may also represent a threat to the nightjar. These monkeys are considered omnivorous with diets consisting primarily of vegetative matter but will feed on small mammals and birds opportunistically (USDA 2008).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 5.5% 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 18). Up to 3.9% of the species' range occurs on methomyl use sites while 1.6% of the range occurs off-field but may still be exposed through spray drift and runoff.

Table 18**. Overlap data for the Puerto Rican nightjar.**

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
Cultivated land layer	3.9	1.6	5.5

Usage

Past methomyl usage data in Puerto Rico is unavailable. However, prior usage data indicate that 20-70% of agricultural crops per municipality in Puerto Rico have been treated with insecticides annually, with methomyl presumably among these insecticides. We broadly use this data as confirmation that methomyl usage likely occurs on these islands.

Additional Exposure Considerations

The Puerto Rican nightjar inhabits coastal dry and lower cordillera forests of southwestern Puerto Rico. The Puerto Rican nightjar is nocturnal and insectivorous. It sleeps perched on tree branches during the day but is unlikely to be exposed to direct pesticide spray while foraging at night. An aerial feeder, the nightjar feeds on nocturnal moths and other flying insects at night.

Based on their preference for forested habitats, Puerto Rican nightjars are not expected to enter methomyl use sites. Some individuals of the species are anticipated to feed on insects that have been exposed via spray drift. The area susceptible to spray drift is expected to account for 1.6% of the species range. However, due to the landcover data available for Puerto Rico, the extent of overlap between the species range and the action area is based on any cultivated land, not just those crops where methomyl is registered for use. As such, overlap values may overestimate the extent of methomyl use sites on the island. In addition, we expect the area exposed to spray drift will be minimized to some extent due to intercept with the forested habitats where the Puerto Rican nightjar resides. As such, we expect the extent of methomyl exposure will be low.

Exposure Summary

There is a low extent of overlap between the action area and the species' range. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items that have been exposed to spray drift near agricultural fields to be the primary route of methomyl exposure to Puerto Rican nightjars. We anticipate that dietary dosage of methomyl from consuming arthropods off-field is expected to reach 0.8 mg/kg-bw and to cause mortality in up to 25% of individuals exclusively consuming contaminated prey. We expect methomyl concentrations on fruit and seeds will be lower and not significantly contribute to adverse effects. While it is possible that some individuals will consume enough insects contaminated from a nearby methomyl application to cause mortality, we expect this to occur infrequently due to the lower likelihood of spray drift penetrating forested areas. We do not expect sublethal effects to occur from exposure to methomyl at estimated environmental concentrations.

Indirect Effects:

The Puerto Rican nightjar in insectivorous, feeding on flying insects during crepuscular hours and throughout the night. Based on available toxicity data, we expect that exposure from spray drift is like to cause mortality of these prey species. However, because arthropods taken as food items exhibit a range of sensitivities to methomyl, we that expect that to exposure to methomyl from spray drift will reduce the abundance, but some prey will be available after exposure and any losses will likely only be temporary. Therefore, as a generalist feeder of arthropods, we anticipate that Puerto Rican nightjars will be less affected by the loss of specific species and will consume other available dietary items.

Toxicity Summary

Puerto Rican nightjars are not expected to forage in agricultural fields, and we expect mortality will occur rarely from foraging off-field in areas where spray drift may penetrate the forest. We do not expect sublethal effects are likely to occur at predicted exposure levels. As arthropods are the primary dietary item of Puerto Rican nightjars, we expect a reduction of the prey base where exposure to methomyl from spray drift occurs. However, because not all species of arthropods are expected to die from spray drift exposure, we expect the Puerto Rican nightjar, as a generalist feeder, will be able to consume available dietary items. As such, we determine the Puerto Rican nightjar has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Puerto Rican nightjar has a low exposure ranking. This species is not expected to forage in agricultural areas, and less than 1.6% of the range is expected to be exposed to spray drift. In addition, we expect that the forested habitat of the Puerto Rican nightjar will result in interception of spray drift, thus further reducing the extent of the species' habitat exposed to methomyl. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

The Puerto Rican nightjar has a medium toxicity ranking. Puerto Rican nightjars are not expected to forage in agricultural fields, and we expect mortality only rarely from individuals foraging off-field in areas where spray drift may penetrate the forest. As arthropods are the primary dietary item of Puerto Rican nightjar, we expect a reduction of the prey base where exposure to methomyl from spray drift occurs. However, because not all species of arthropods are expected to die from spray drift exposure, we expect the Puerto Rican nightjar will be able to consume available dietary items.

Given that we expect a small number of individuals are likely to experience exposure and given that we expect a moderate level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Puerto Rican nightjar occurs in forested habitats in southwestern Puerto Rico. Information is not available to estimate population trends for the nightjar, but information collected in the Guánica and Susúa Commonwealth Forests over the years suggests the number of nightjars detected along survey routes has remained fairly constant. Threats include land use changes and deforestation, including from development that has resulted in fragmentation of remaining nightjar habitat and may result in declines and local extinctions of isolated nightjar populations. Predation by exotic mammals and avian predators also threaten the species. The species has a high vulnerability ranking. The nightjar has a medium exposure ranking. We expect 5.5% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. Past methomyl usage data in Puerto Rico is unavailable. However, prior usage data indicate that 20-70% of agricultural crops per municipality in Puerto Rico have been treated with insecticides annually, with methomyl presumably among these insecticides. However, based on their preference for forested habitats, Puerto Rican nightjars are not expected to enter methomyl use sites. Some individuals of the species are anticipated to feed on insects that have been exposed via spray drift. The area susceptible to spray drift is expected be on less than 1.6% of the species range. We expect the area exposed to spray drift will be minimized to some extent due to intercept with the forested habitats where the Puerto Rican nightjar resides. Additionally, the nightjar forages at night when there will be a low likelihood of exposure from spray drift. As such, we expect the extent of methomyl exposure will be low. We expect mortality only rarely from individuals foraging off-field in areas where spray drift may penetrate the forest. As arthropods are the primary dietary item of nightjar, we expect a reduction in the prey base where exposure to methomyl from spray drift occurs. However, because not all species of arthropods are expected to die from spray drift exposure, and nightjars will likely be able to move to other foraging sites, we expect most nightjars will be able find adequate dietary items to consume, although we expect prey reductions will lead to reduced fitness supporting reproductive capacity or growth in a small number of individuals. We determine the overall risk of adverse effects to the species is low.

In summary, although the Puerto Rican nightjar has a high vulnerability, the overall risk to the species is low. We expect the loss of a very small number of individuals, as well as losses of prey items that lead to reduced fitness or growth in a small number of individuals over the duration of the proposed action. However, we anticipate exposure from consuming contaminated prey will be rare, and most individuals will be able to move to alternative sites to forage as needed to find sufficient prey if losses occur in localized areas. Therefore, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Puerto Rican nightjar.

References

U.S. Fish and Wildlife Service. 2012. Puerto Rican Nightjar or guabairo (*Caprimulgus noctitherus*) 5-Year Review: Summary and Evaluation. Boquerón, Puerto Rico.

Integration and Synthesis Summary: Birds – Yellow-shouldered blackbird

Scientific Name:	Common Name:	Entity ID:
Agelaius xanthomus	Yellow-shouldered blackbird	117

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we initially determined the risk of adverse effects to the species is medium. 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. 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 yellow-shouldered blackbird. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 6/6/2018; Wherever found; *States within the range:* PR. Figure 12 depicts a map of the species' range.

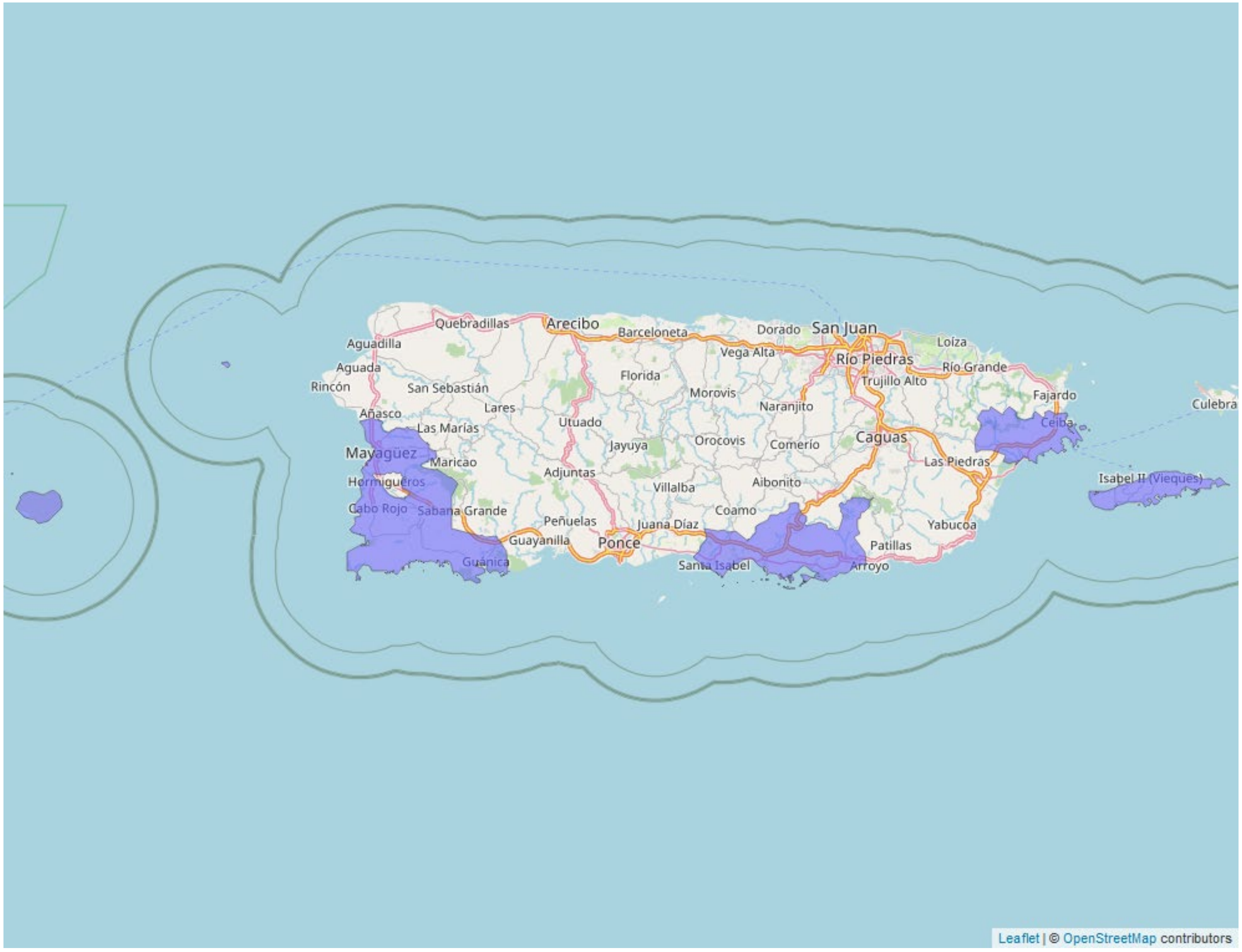

Figure 13. Range map of yellow-shouldered blackbird (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7383.

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: 8/22/2023

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 yellow-shouldered blackbird (mariquita) is endemic to Puerto Rico and the adjacent Mona and Monito islands. The species was once common in the coastal forests, but during the early 20th century most Puerto Rico's coastal forests were replaced by agriculture and development. Currently, the species is mainly limited to four areas: Mona and Monito islands, and three small disjunct populations in eastern, southern, and southwestern Puerto Rico. The size of individual disjunct populations continues to remain relatively low. Data gathered during a post-breeding census in August 2007 showed approximately 994 yellow-shouldered blackbirds in southwestern Puerto Rico (municipalities of Cabo Rojo and Lajas), an increase from 2004 (759 individuals). In Salinas (southeastern Puerto Rico), 113 individuals were observed during the post-breeding census of 2005, a slight increase from 2004 (97 individuals). According to the most recent surveys, the greatest numbers of the yellow-shouldered blackbirds occur in the southwestern population, ranging annually between approximately 100-500 individuals. This is followed by the Mona and Monito Island population, with approximately 100 individuals. The southern and eastern populations have approximately 55 and 12 individuals, respectively. The primary stressors to the yellow-shouldered blackbird are ongoing and include habitat loss and degradation due to human activities, opportunistic predators, a restricted distribution, low population numbers, climate change, hurricane impacts, invasive species, and nest parasitism by shiny cowbirds. Destruction of foraging, roosting, and nesting habitat from residential and tourist development, as well as agricultural activities, is a major threat to the species. The cumulative effects of hurricane impacts (i.e., habitat destruction, reduction of food sources, some direct impacts to individuals) and persistently low yellow-shouldered blackbird population numbers could be detrimental to the species. Additionally, nesting areas are extremely vulnerable to storm surges caused by hurricanes and sea level rise due to their proximity to the sea, and recent studies on climate change predict a reduction in land cover of coastal wetlands due to sea-level rise in response to global warming.

Although variable from year to year, yellow-shouldered blackbird natural nesting attempts have generally declined since 1999, likely driven by the lack of natural nesting opportunities since the early 2000’s and other threats that have reduced nesting success and breeding population size (USFWS 2023). Since the 1980s, the Puerto Rico Department of Natural and Environmental Resources has implemented actions to improve the breeding success of the yellow-shouldered blackbirds, which have helped the species to persist. However, the number of yellow-shouldered blackbirds produced during each breeding season does not appear to be enough to augment the overall species' population (i.e., in any given span of years, the number of young surviving to adulthood are not more than losses of adults). Artificial nest structures have been introduced to reduce parasitism by shiny cowbirds, and shiny cowbird eggs have been removed from yellow-shouldered blackbird nests to improve nesting success. Although nesting in natural substrates is occurring, it appears the primary nesting for the species is now within the artificial nesting structures, likely because of the loss of habitat.

Studies have shown major causes of egg failure were disappearance, not hatched, abandoned, and punctured, likely due to a wide variety of avian and mammalian predators. Natural nests and fledglings that have poor flight abilities are both particularly vulnerable to predation (USFWS 2023). Yellow-shouldered blackbirds may also face competition for nest-sites with other bird species such as grackles and rock doves (USFWS 1996, USFWS 2018). Nest infestation by two species of blood-feeding mites may lead to nest abandonment by adult yellow-shouldered blackbirds and premature nest desertion by young birds. Lice may also affect nesting yellow-shouldered blackbirds, particularly those in cavity (covered) nests and re-used nests from the previous breeding event. Avian pox has also been identified as a potential problem for the yellow-shouldered blackbird, as blackbirds infected with avian pox had significantly lower survival rates than uninfected birds (USFWS 1996).

In addition to the loss of breeding habitat, food availability seems to be another major factor affecting the survival and breeding success of the yellow-shouldered blackbird. Yellow-shouldered blackbirds are omnivorous, but some scientists consider the species as arboreal insectivores since the majority of their diet consists of insects. They also eat arachnids, unidentified mollusks, and plant matter including fruits, seeds, and nectar from various plant species. The species also consumes processed foods such as cattle ration, human food (cooked rice and sugar), dog food, and monkey chow, among others. Lack of food availability is worst during the dry season when food resources are limited and competition for food between siblings can increase. This situation may be exacerbated if shiny cowbird chicks are present in the yellow-shouldered blackbird nest because they can also outcompete yellow-shouldered blackbird chicks for food resources, further exacerbating the species' struggle to maintain its population. A study to determine yellow-shouldered blackbird survival during the post-fledging period confirmed that there is strong competition for food between nestlings, which directly affects post-fledgling survival rate. The study also found that carcasses of fledglings within the first five days post-fledging were in areas with dead mangroves and minimal cover, indicating that if fledglings are not able to reach adequate cover, they face dehydration and possible death during their juvenile stage. Yellow-shouldered blackbirds have been observed foraging in cultivated fields where insecticides are commonly applied to the crops. Therefore, some authors believe that yellow-shouldered blackbird may also be negatively affected by such insecticides (Lewis et al. 1999, as cited in USFWS 2018).

Overall Vulnerability: High

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 19). Up to 5.3% of the species' range occurs on methomyl use sites while 2% of the range occurs off-field but may still be exposed through spray drift and runoff.

Table 19. Overlap data for the yellow-shouldered blackbird.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
Cultivated land layer	5.3	2.0	7.3

Usage

Past methomyl usage data in Puerto Rico is unavailable. However, prior usage data indicate that 20-70% of agricultural crops per municipality in Puerto Rico have been treated with insecticides annually, with methomyl presumably among these insecticides. We broadly use this data as confirmation that methomyl usage likely occurs on these islands.

Additional Exposure Considerations

The yellow-shouldered blackbird, although omnivorous, can be basically characterized as an arboreal insectivore. During the nesting season the young's diet is about 90% arthropod material. At urban bird feeders and around domestic animals, this blackbird has been observed to take cattle feed, dog food, nectar, fruit, cooked rice, and granulated sugar.

Due to the landcover data available for Puerto Rico, the extent of overlap between the species range and the action area is based on any cultivated land, not just those crops where methomyl is registered for use. As such, overlap values may overestimate the extent of methomyl use sites on these islands.

Exposure Summary

There is a medium extent of overlap between the action area and the species' range. As such, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to yellow-shouldered blackbirds. The yellow-shouldered blackbird is primarily an arboreal insectivore but will opportunistically take other food items as available. Exposure to methomyl is expected to result in mortality to yellow-shouldered blackbird depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. We expect that dosages up to 41.4 mg/kg-bw methomyl in plant resources and insects that have been exposed to on-field concentrations of methomyl, resulting in mortality of yellow-shouldered blackbirds that exclusively consume these items. Dietary items exposed off-field are expected to contain lower dosages of methomyl, but still up to 1.5 mg/kg-bw in arthropods, resulting in mortality of 71% of exposed individuals. Consumption of fruit and seeds that have been exposed off-field is not expected to result in mortality to yellow-shouldered blackbirds. We do not expect sublethal effects are likely to occur at predicted exposure levels.

Indirect Effects:

The yellow-shouldered blackbird is primarily an insectivore but is opportunistic as other food items are available. While no effects to plants are expected, we anticipate effects to terrestrial invertebrates from methomyl exposure on or near use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but some prey will be available after exposure and any losses will likely only be temporary. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. However, as a generalist feeder, we anticipate that the yellow-shouldered blackbird will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to invertebrates is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We expect a high level of direct adverse effects as mortality is expected when yellow-shouldered blackbirds consume food resources both on-field or in the spray drift area off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but we expect that the yellow-shouldered blackbird will be able to consume available resources. As such, we determine the yellow-shouldered blackbird has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

Though the yellow-shouldered blackbird has a medium exposure ranking with up 7.3% of the range overlapping with cultivated areas, we expect the extent of exposure to be somewhat lower when considering only areas where methomyl is registered for use. As such, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

The yellow-shouldered blackbird has a high toxicity ranking. We expect a high level of direct adverse effects as mortality is expected when yellow-shouldered blackbirds consume food resources both on-field or in the spray drift area off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but we expect that the opportunistic nature of the yellow-shouldered blackbird will result in individuals consuming available resources.

Given that we expect a moderate number of individuals are likely to experience exposure and a high level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is medium.

Preliminary Conclusion

The yellow-shouldered blackbird occurs in forested habitats in southwestern Puerto Rico. A post-breeding census in 2007 found approximately 994 blackbirds, which was an increase from 759 found in 2004. Threats include the invasion of nesting areas by avian and mammalian predators; the destruction of feeding, roosting, and nesting habitat due to development, and agricultural activities; uses of waters, cays, and shoreline that are incompatible with the needs of the species for roosting and nesting; nest infestation by blood-feeding mites and lice; and avian pox. Additionally, the blackbird has been observed foraging in cultivated fields where insecticides are commonly applied to the crops, and some studies indicate that the species may be negatively affected by such insecticides. The species has a high vulnerability ranking.

The yellow-shouldered blackbird has a medium exposure ranking. We expect 7.3% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. Past methomyl usage data in Puerto Rico is unavailable. However, prior usage data indicate that 20-70% of agricultural crops per municipality in Puerto Rico have been treated with insecticides annually, with methomyl presumably among these insecticides. Due to the landcover data available for Puerto Rico, the extent of overlap between the species range and the action area is based on any cultivated land, not just those crops where methomyl is registered for use. As such, overlap values may overestimate the extent of methomyl use sites in Puerto Rico. We anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but we expect that most yellow-shouldered blackbird will be able to consume other available resources as the species is highly mobile and eats a wide variety of food items. However, we expect losses of prey items will lead to starvation or reduced fitness in a small number of individuals, and a high level of direct adverse effects as mortality is expected when yellow-shouldered blackbirds consume food resources both on-field or in the spray drift area off-field. In all, we anticipate a moderate number of individuals are likely to experience exposure, and direct and indirect adverse effects are likely in exposed areas. We determine the overall risk of adverse effects to the species is medium.

In summary, the yellow-shouldered blackbird has a high vulnerability, and the overall risk to the species is medium. The species has been observed foraging in cultivated fields, and studies indicate insecticides may be causing negative effects to the species. We expect the loss of individuals that consume contaminated prey, as well as losses of prey items over the duration of the proposed action. We anticipate exposure from consuming contaminated prey will be limited to a medium portion of the range (7.2%) where there is methomyl is usage and spray drift. While individuals eat a wide variety of dietary items and most will likely travel to alternative sites to forage as needed to find sufficient prey as needed when losses occur in localized areas, we anticipate mortality and reduced fitness in some individuals, as food availability seems to be a major factor affecting the survival and breeding success of yellow-shouldered blackbird. With these impacts based on our assessment, we anticipated mortality and reduced fitness in a moderate number of individuals over the project duration. While data indicates populations are currently stable, there are many ongoing threats to the species. We expected the effects to the species would likely reduce the reproduction, numbers, and distribution of the species.

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 yellow-shouldered blackbird:

1. *Methomyl will not be applied.*

The PULA for the yellow-shouldered blackbird 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 these conservation measures, we expect these pathways of exposure will be greatly limited over the course of the action. Therefore, we expect impacts to be low, with adverse effects limited to a small number of individuals due to losses of invertebrate prey that lead to minor reductions in fitness supporting reproductive capacity or the growth and survival of chicks. However, effects will not likely reduce the reproduction, numbers, and distribution of the species. After adding the effects of the action (including the species-specific conservation measures) and cumulative effects to the environmental baseline and in light of the status of the species, we do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the yellow-shouldered blackbird.

References

U.S. Fish and Wildlife Service. 1996. Yellow-shouldered blackbird (*Agelaius xanthomus*) revised recovery plan. Atlanta, Georgia. 77 pp.

U.S. Fish and Wildlife Service. 2011. Mariquita or yellow-shouldered blackbird (*Agelaius xanthomus*) 5-Year Review: Summary and Evaluation. Boquerón, Puerto Rico.

U.S. Fish and Wildlife Service. 2023. Yellow-shouldered blackbird or mariquita (*Agelaius xanthomus*) 5-year status review: Summary and evaluation. Caribbean Ecological Services Field Office, Mayaguez, Puerto Rico. 19 pp.

Integration and Synthesis Summary: Birds – Mariana (aga) crow

Scientific Name:	Common Name:	Entity ID:
Corvus kubaryi	Mariana (aga) crow	118

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Mariana crow. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 8/10/2021; Wherever found; *States within the range:* **Figure 13** depicts a map of the species' range.

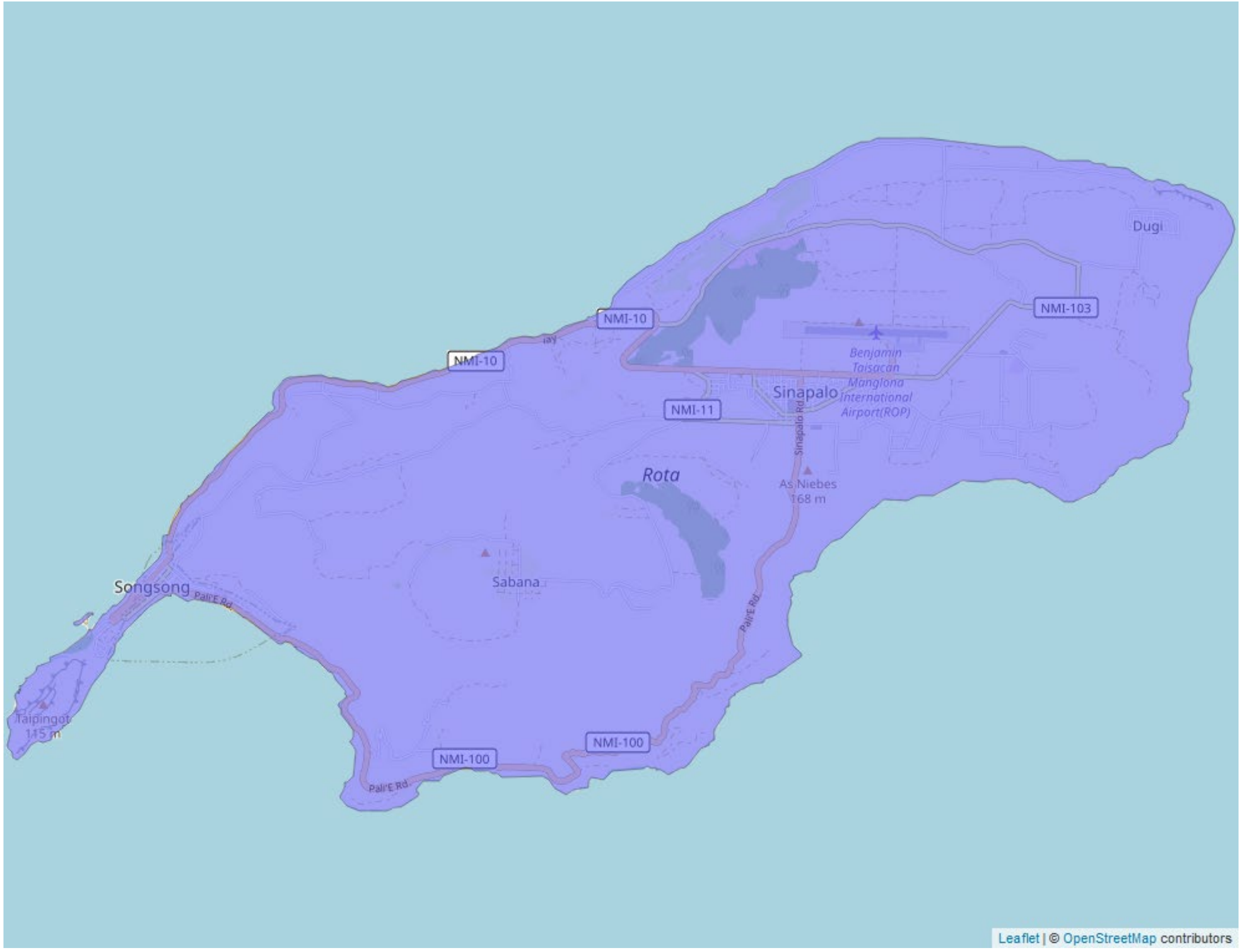

Figure 14. Range map of Mariana (=aga) crow (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/4744.

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: 9/28/2020

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

Number of populations: Single population

Species trends: Stable

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Mariana crow population continued to decline on Guam from about 10 individuals in 2006, to three individuals in 2008, to one male in 2011 (SWCA 2012 as cited in USFWS 2020). The Mariana crow is now extirpated from Guam. The last known Mariana crow of Guam origin was observed in 2001, and the last known wild Mariana crow that was captive-reared from Rota and released on Guam was observed in 2012 (J. Quitugua, Guam Division of Aquatic and Wildlife Resources, pers. comm. 2014 as cited in USFWS 2020). The Mariana crow population on Rota has stabilized or slightly increased since the last review, from 46 breeding pairs documented in 2013 to 50 breeding pairs in 2019. During the 2019 breeding season, 24 of the 48 pairs that nested (50%) successfully fledged young (R. Ha, unpublished data), which is similar to the 48% average pair success rate from 1996 – 2009 (Zarones et al. 2015, as cited in USFWS 2020).

Cat predation was recently identified as a mortality factor, but control efforts have just begun and plans to intensify the effort will begin by the end of 2014. Other unknown factors are suspected to contribute to Mariana crow mortality, but intensive monitoring and management actions are required to identify and control those threats. Researchers studying the impacts of pesticides on native forest birds in the 1980's did not believe that pesticides played a major role in the continuing decline of the aga and other endangered birds in the Mariana Islands (Grue 1985; Engbring 1989; as cited in USFWS 2005). However, Drahos (2002, as cited in USFWS 2005) believed that impacts of pesticides on native bird populations prior to the 1980's have been underestimated and that pesticide use may have played an important role in the decline of forest birds in Guam, especially southern Guam. Maben (1980, as cited in USFWS 1990) reported that the organophosphate insecticide malathion was applied by the military around beaches and buildings up to three times a week. Malathion was also aerially applied over approximately a third of the island of Guam over 4 days in 1975 to prevent the potential outbreak of dengue fever (Haddock et al. 1979, as cited in USFWS 2005). On Rota, malathion was used on to control insect pests in 1988 and 1989 (Engbring 1989, as cited in USFWS 2005).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 4.9 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 20). Up to 1% of the species' range occurs on methomyl use sites while 3.9% of the range occurs off-field but may still be exposed through spray drift and runoff.

Table 20. Overlap data for the Mariana (aga) crow.

Use Layer	On-field Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)
Cultivated land layer	1.0	3.9	4.9

Usage

Information regarding past usage of insecticides is not available for the Mariana Islands. However, prior usage data indicate that 8-45% of agricultural crops in Hawai'i have been treated with insecticides annually, with methomyl presumably among these insecticides. We broadly use this data as confirmation that methomyl usage likely occurs on the island where this species resides.

Additional Exposure Considerations

Mariana crows can utilize a variety of habitats, but only nest in the native limestone forests. Based on this information the crow could have some exposure to methomyl when feeding in non-forested habitats near or within use sites. However, due to the landcover data available for these islands, the extent of overlap between the species range and the action area is based on any cultivated land, not just those crops where methomyl is registered for use. As such, overlap values may overestimate the extent of methomyl use sites on the island.

Exposure Summary

There is a low extent of overlap between the action area and the species' range. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Low

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to Mariana crows. The crow is an opportunistic omnivore and known dietary items include lizards, grasshoppers, crickets, praying mantis, earwigs, hermit crabs, foliage, fruits, seeds, and buds. Exposure to methomyl is expected to result in mortality to Mariana crows depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. Consumption of plants and animal prey items that have been exposed to on-field concentrations of methomyl is expected to contain dosages up to 73.4 mg/kg-bw, resulting in mortality for Mariana crows that forage exclusively on these items. Consumption of dietary items that have been contaminated off-field from spray drift is expected to result in lower dosages of methomyl, up to 2.7 mg/kg-bw, though mortality is still expected from consumption of some dietary items, particularly plant resources. We do not expect sublethal effects are likely to occur at predicted exposure levels.

Indirect Effects:

The Mariana crow is an omnivore and may consume amphibians, small mammals, arthropods, birds, fruit, seeds, benthic invertebrates, and fish for food resources. While no effects to plants are expected, we anticipate effects to the prey base from methomyl exposure on or near use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas but some prey will be available after exposure and any losses will likely only be temporary. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. However, as a generalist feeder, we anticipate that Mariana crow will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We expect a high level of direct adverse effects as mortality is expected when Mariana crows consume food resources both on-field or in the spray drift area off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but we expect that the omnivorous Mariana crow will be able to consume available resources. As such, we determine the Mariana crow has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Mariana crow has a low exposure ranking. We expect 4.9% of the species range will overlap with cultivated areas, but that only a portion of this overlap will contain agricultural areas where methomyl is registered for use. As such, we expect a small number of individuals are likely to experience exposure from the proposed action.

The Mariana crow has a high toxicity ranking. We expect a high level of direct adverse effects as mortality is expected when Mariana crows consume food resources both on-field or in the spray drift area off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but we expect that the omnivorous Mariana crow will be able to consume available resources.

Given that we expect a high level of direct and indirect adverse effects are likely, but a low number of individuals are likely to experience adverse effects due to exposure or losses of prey, we determine the overall risk of adverse effects to the species is low.

Conclusion

The Mariana crow occurs on Guam and Rota. The population on Guam was extirpated. Captive-reared individuals were released back on the island but were last observed in 2012. The population on Rota has stabilized or slightly increased, with 50 breeding pairs in 2019, 50% of which successfully fledged young. Threats include cat predation, and unknown factors. Insecticides were likely a factor prior to the 1980s, but do not appear to be playing a major role at this time. With a single, small population, the species has a high vulnerability ranking.

The Mariana crow has a low exposure ranking. We expect 4.9% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. Past methomyl usage data on Rota, or other islands in the Marianas, 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 among these insecticides. Mariana crows can utilize a variety of habitats, but only nest in the native limestone forests. The crow could have some exposure to methomyl when feeding in non-forested habitats near or within use sites. However, due to the landcover data available for these islands, the extent of overlap between the species range and the action area (4.9%) is based on any cultivated land, not just those crops where methomyl is registered for use. As such, overlap values likely overestimate the extent of methomyl use sites on the island, and we expect a small number of individuals are likely to experience exposure from the proposed action. We expect Mariana crows that consume food resources both on-field or in the spray drift area off-field are likely to die. We also anticipate there will be mortality of prey items for the species. Although we expect that the omnivorous, mobile Mariana crow will be able find alternative foraging areas with adequate food resources in most cases, we expect a small number are likely to experience a reduction in fitness supporting reproductive capacity or growth from prey losses in localized areas. While high levels of direct and indirect adverse effects are likely from exposure, we determine the overall risk of adverse effects to the species is low. This is based on the low number of individuals likely to experience exposure from consuming contaminated prey, and the likely availability of alternative prey when losses occur in localized areas.

In summary, although the Mariana crow has a high vulnerability, the overall risk to the species is low. We expect the loss of a very small number of individuals from consuming exposed prey, as well as losses of prey items that lead to reduced fitness or growth in a small number of individuals over the duration of the proposed action. We anticipate exposure from consuming contaminated prey will affect low numbers of crows in less than 4.9% of the range, and most individuals will be able to continue to find food resources even after losses of prey occur in localized areas. Therefore, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Mariana crow.

References

U.S. Fish and Wildlife Service. 2020. Mariana Crow 5-Year Review. Honolulu, Hawai'i.11 pp.

U.S. Fish and Wildlife Service. 2014. Mariana Crow 5-Year Review. Honolulu, Hawai'i. 10 pp.

U.S. Fish and Wildlife Service. 2005. Draft Revised Recovery Plan for the Aga or Mariana Crow, *Corvus kubaryi*. Portland, Oregon. x + 147 pp.

U.S. Fish and Wildlife Service. 1990. Native Forest Birds of Guam and Rota of the Commonwealth of the Northern Mariana Islands Recovery Plan. Portland, Oregon. 86 pp.

Integration and Synthesis Summary: Birds – Audubon's crested caracara

Scientific Name:	Common Name:	Entity ID:
Polyborus plancus audubonii	Audubon's crested caracara	125

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Audubon's crested caracara. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 4/26/2022; U.S.A. (FL); *States within the range:* FL. Figure 14 depicts a map of the species' range.

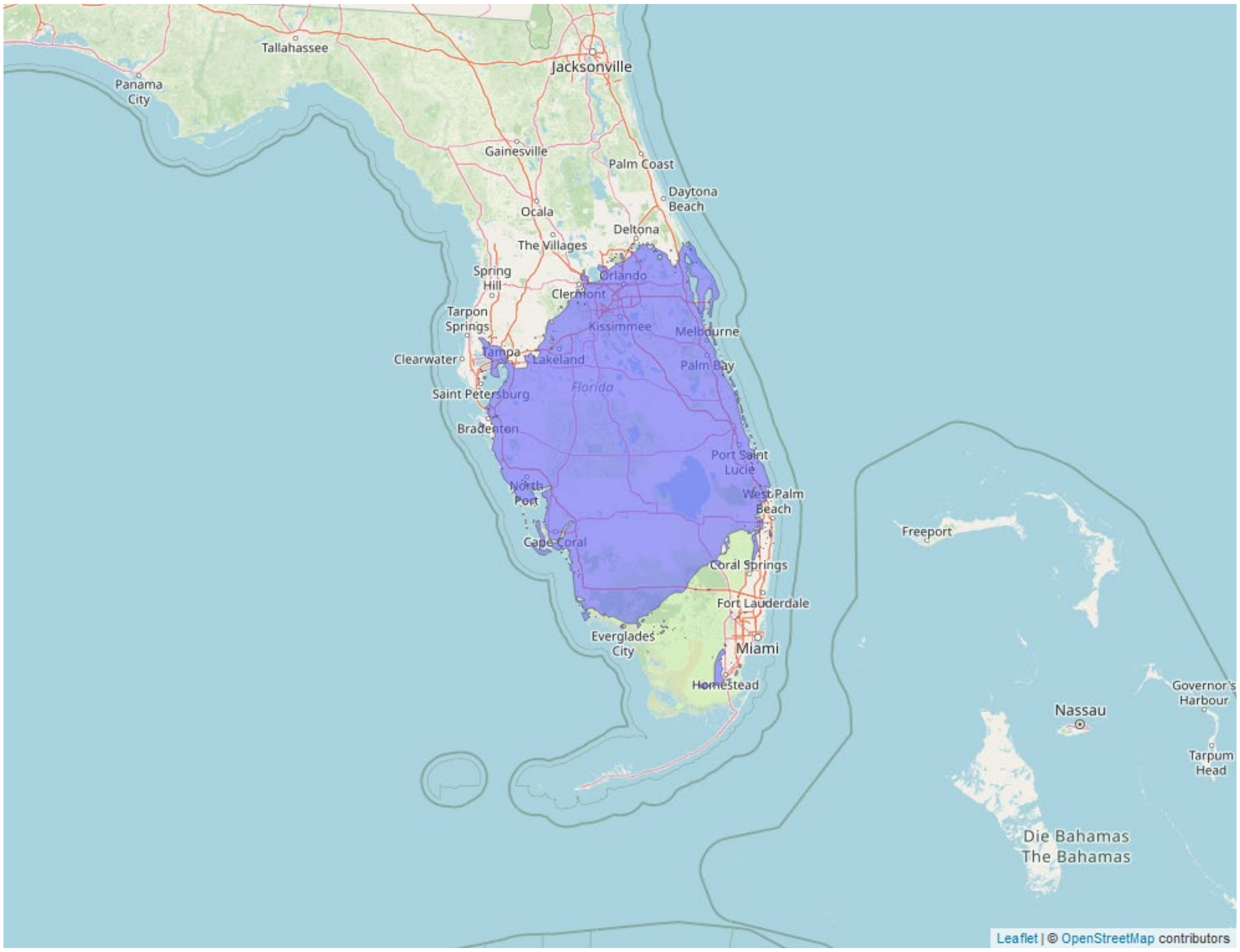

Figure 15. Range map of Audubon's crested caracara (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/8250.

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: 8/14/2009

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

Number of populations: Single population

Species trends: Unknown population trends

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

The Audubon's crested caracara exists as a relatively small, isolated population in Florida. Based on current knowledge of over 150 nest sites within a limited portion of the bird's range in Florida, over 500 individuals inhabit Florida (Morrison 2009). Most occupied territories are inaccessible to surveyors, as the caracaras occur on private land. Consequently, monitoring the caracara population or detecting changes in habitat, population size, or distribution is difficult.

Results from continuing research initiated in 2006 suggest all territories identified in the 1990s remain occupied, but breeding success has not been evaluated and caracara may exhibit site fidelity regardless of degraded habitat quality and low nesting success. A population viability analysis demonstrated that while it may be stable under present conditions, the caracara population in Florida is sensitive to even modest habitat loss (Root and Barnes 2007). Habitat loss modeled within core habitat was particularly devastating. Cattle ranching appears to be compatible with caracara survival, but conversion of improved pasture to citrus, sugarcane, or residential development will clearly be unsuitable (Humphrey and Morrison 1997; Service 1999; Morrison 2006). Analyses by Zwick and Carr (2006) indicate that the central Florida region is expected to experience "explosive" growth, with continuous urban development from Ocala to Sebring; virtually all the natural systems and wildlife corridors in this region will be fragmented, if not replaced, by urban development.

The 5-year review makes no mention of pesticides or contaminants being a threat to this species. Caracaras are highly opportunistic in their feeding habits, eating carrion and capturing live prey. Their diets include insects and other invertebrates, fish, snakes, turtles, birds, and mammals (Layne 1978). Live prey also includes rabbits, skunks, prairie dogs, opossums, rats, mice, squirrels, frogs, lizards, young alligators, crabs, crayfish, fish, young birds, cattle egrets, beetles, grasshoppers, maggots, and worms (Bent 1961, Layne et al. 1977).

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 13.7% 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 21). Up to 7.5% of the species' range overlaps with methomyl use sites while 6.2% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 21. Overlap and usage data for the Audubon's crested caracara.

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[7]	0.1	0.3	0.5	<0.1	<0.1	<0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	6.1	3.8	9.9	0.3	0.2	0.5
Other Orchards	<0.1	0.2	0.2	<0.1	0.2	0.2
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	1.1	1.8	2.9	1.1	1.8	2.9
Wheat	NA	NA	NA	NA	NA	NA
Total	**7.5**	**6.2**	**13.7**	**1.5**	**2.2**	**3.7**

Usage

Based on past usage data, we anticipate up to 3.7% of the species' range will be treated with methomyl annually (Table 21).

[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.

Additional Exposure Considerations

While the species' range map encompasses a large portion of the state, the fragmentation and degradation of habitat from land use changes has resulted in patchy suitable areas where individuals occur in a clustered distribution. Core habitat lies within the Kissimmee Prairie, located northwest of Lake Okeechobee, and includes less than 1000 km^2 of suitable habitat. However, non-breeding caracaras range more widely than breeding caracaras and may occur more broadly through the range.

Primary crested caracara habitat in Florida consists of prairies interspersed with marshes and cabbage palm hammocks. Current habitat use includes (ranked highest to lowest proportion): improved pasture, dry prairie, freshwater marsh, mixed upland hardwoods, shrub swamp, shrub and brushland, grassland, pinelands, bare soil, urban, other agriculture, citrus, and scrub. The Audubon's crested caracara could enter agricultural areas, including orchards, to forage, roost, or breed (Pers. comm. 2016 co-occurrence information, USFWS field office request). Though these areas represent a smaller proportion of use by caracaras than other habitats, non-breeding caracaras have been shown to use citrus groves more than expected based on availability, particularly those adjacent to pasture (Dwyer et al., 2013). However, methomyl cannot be used on citrus in Florida, thus we do not expect exposure in citrus groves.

As stated above, caracaras are highly opportunistic in their feeding habits. Several authors have noted that caracaras may consume unusual items, including turtle and other eggs as well as coconut meat. Caracaras are diurnal and hunt on the wing, from perches, and on the ground. In pastures, caracaras forage on foot, which typically support small vertebrate prey as well as invertebrates associated with cattle, including those under cattle feces. They will also regularly patrol sections of highway in search of carrion.

Audubon's crested caracaras are resident and non-migratory. Home ranges may encompass an area of up to 2,389 ha with an average of 1,552 ha. However, in recent years, more observations of caracara are occurring along the Atlantic Coast as far north as Nova Scotia; it is unclear if this is a new phenomenon or not. If these are Florida birds, then they will still be protected under the ESA. The assumption is that these birds are transitory and may return to Florida annually (Pers. comm. 2016 biological information, USFWS field office request).

Exposure Summary

There is a high extent of overlap between the action area and the species' range. However, based on habitat preference, we expect that caracaras will use agricultural areas where methomyl is registered less than will be indicated by overlap alone. Based on past usage data, we expect a low level of usage within the species' range. Given that the extent of overlap is high and that expected usage is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to Audubon's crested caracara. Exposure to methomyl is expected to result in mortality to caracaras depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. Consumption of prey items that have been exposed to methomyl on-field is expected to result in dosages up to 21.2 mg/kg-bw, which we expect to result in mortality if consumed exclusively by the caracara. We expect concentrations of methomyl on prey exposed off-field will be much lower, up to 0.6 mg/kg-bw, and that caracaras are unlikely to achieve doses high enough to cause mortality from consuming these items. We do not expect sublethal effects to occur from exposure to methomyl at estimated environmental concentrations.

Indirect Effects:

Audubon's crested caracara relies on a wide variety of animal species including benthic invertebrates, soil invertebrates, amphibians, reptiles, small mammals, arthropods, birds, and fish for food resources. Based on available toxicity data, we expect individuals of these prey species will likely die with exposure to methomyl, both on- and off-field. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but some prey will be available after exposure and any losses will likely only be temporary. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift or runoff. However, due to the highly opportunistic nature of Audubon's crested caracara and its ability to feed on both live prey and carrion, we expect a low level of indirect adverse effects are likely to occur.

Toxicity Summary

We expect that mortality will occur from exclusively consuming prey that has been exposed to methomyl on-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We do not anticipate any adverse effects in individuals that consume prey that have been exposed to methomyl from spray drift or runoff. We expect a low level of indirect effects are likely to occur. Though the Audubon's crested caracara consumes species that are expected to die following exposure to methomyl on- and off-field, the highly opportunistic nature of the caracara, including its ability to scavenge, results in a low likelihood that individuals will be affected by any reduction in prey from methomyl exposure. Taken together, we determine the Audubon's crested caracara has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Audubon's crested caracara has a medium exposure ranking. Based on past methomyl usage data, we expect up to 3.7% of the range may be treated annually but may potentially cover up to 13.7% of the range over the duration of the proposed action depending how usage patterns may change over time. However, based on habitat preference, we expect that caracaras will use agricultural areas where methomyl is registered less than will be indicated by overlap alone. This indicates that a moderate portion of the species' range where we expect individuals to forage is likely to be treated overall. As such, we expect a moderate number of individuals are likely to be exposed to methomyl.

The Audubon's crested caracara has a medium toxicity ranking. We expect mortality will occur on-field as a result of dietary exposure through the consumption of contaminated food items. We do not expect sublethal effects are likely to occur at predicted exposure levels. We do not anticipate any adverse effects in individuals that consume prey that have been exposed to methomyl from spray drift or runoff. Reduction in prey abundance is unlikely to result in adverse effects to crested caracara due to their highly opportunistic feeding style and ability to scavenge of carrion, thus indirect adverse effects are expected to be low.

Given that we expect a moderate number of individuals to experience exposure and given that we expect a moderate level of adverse effects, we determine the overall risk of adverse effects to the species is medium.

Conclusion

The Audubon's crested caracara exists as a relatively small, isolated population in Florida. Based on recent knowledge of over 150 nest sites within a limited portion of the bird's range in Florida, it is estimated that over 500 individuals inhabit Florida. Most occupied territories are inaccessible to surveyors, as the caracaras occur on private land. A population viability analysis demonstrated that while it may be stable under present conditions, the population is sensitive to even modest habitat loss. The central Florida region is expected to experience "explosive" growth, with extensive urban development that will likely replace and fragment the natural systems and wildlife corridors in the region. Caracaras are highly opportunistic in their feeding habits, eating carrion and capturing live prey. Their diets include insects and other invertebrates, fish, amphibians, reptiles, birds, and mammals. The species has a high vulnerability ranking.

The caracara has a medium exposure ranking. We expect 13.7% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. Within these overlapping areas, we anticipate 3.7% will be exposed to methomyl annually. The Audubon's crested caracara could enter agricultural areas, including orchards, to forage, roost, or breed. Though these areas represent a smaller proportion of use by caracaras than other habitats, non-breeding caracaras have been shown to use citrus groves more than expected based on availability. However, methomyl cannot be used on citrus in Florida, thus we do not expect exposure in citrus groves. Given that the extent of overlap is high and expected usage is low, we expect a moderate number of individuals, and their prey are likely to experience exposure from the proposed action. We expect mortality will occur on-field as a result of dietary exposure through the consumption of contaminated food items (7.5% of the range is on-field), but we do not anticipate any adverse effects in individuals that consume prey that have been exposed to methomyl from spray drift or runoff (6.2% of the range may be exposed off-field). Reduction in prey abundance is unlikely to result in adverse effects to the caracara due to their highly opportunistic feeding style and high mobility, indicating they will be able to find alternate prey and foraging sites to compensate for localized losses. Given that we expect a moderate number of individuals to experience exposure, and given that we expect a moderate level of adverse effects, we determine the overall risk of adverse effects to the species is medium.

In summary, the Audubon's crested caracara has a high vulnerability, and the overall risk to the species is medium. We expect the loss of a moderate number of individuals over the project duration, as well as losses of prey items over the duration of the proposed action. However, while the population is small and somewhat fragmented, the range is fairly large and not all areas overlap with areas that will be exposed to methomyl, and those areas that overlap are not likely to be exposed at the same time. Additionally, we do not expect individuals will frequently be found on use sites where there will be losses of individuals consuming contaminated prey due to their habitat preferences, making it unlikely there will be impacts in all on-field portions of the range over the project duration. Also, while prey losses are anticipated, we expect individuals will be able to move to alternative sites to forage as needed to find sufficient prey. While we anticipate losses of a moderate number of individuals and their prey, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Audubon's crested caracara.

References

U.S. Fish and Wildlife Service. 2009. Florida Population of the Audubon's Crested Caracara *(Polyborus plancus audubonii*) = Northern Crested Caracara (*Caracara cheriway*), 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 17 pp.

Integration and Synthesis Summary: Birds - Piping plover

Scientific Name:	Common Name:	Entity ID:
Charadrius melodus	Piping plover (Great Lakes DPS)	130

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the piping plover (Great Lakes DPS. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 7/30/2021; [Great Lakes watershed DPS] - Great Lakes, watershed in States of IL, IN, MI, MN, NY, OH, PA, and WI and Canada (Ont.); *States within the range:* IL, IN, MI, MN, NY, OH, PA, WI. Figure 15 depicts a map of the species' range.

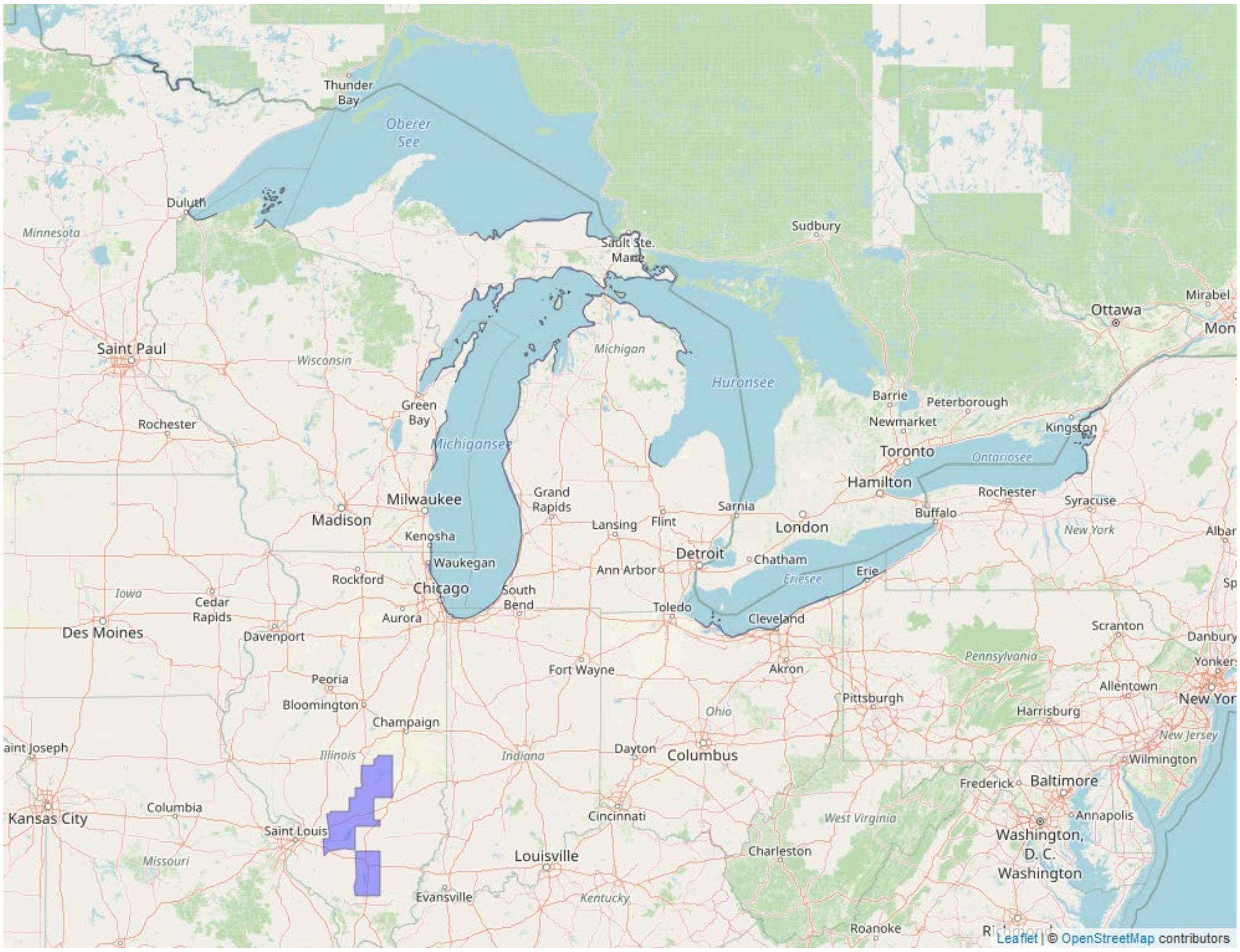

Figure 16. Range map of piping plover (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6039.

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: 3/26/2020

Distribution: Species/Populations widespread or wide-ranging

Number of populations: Population size/location(s) unknown

Species trends: Increasing population(s)

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Shoreline development continues as the leading cause of habitat destruction in the Great Lakes. Habitat improvement and protection through acquisition has occurred, but not at rates which offset the impacts of development. Overall, disease has emerged as a potential new threat in the Great Lakes population, although currently the threat level remains low. This could change rapidly, however, as disease outbreaks in the vicinity of piping plover breeding areas are increasing. Predation remains a major threat to the Great Lakes distinct population segment (DPS). Predation of piping plover adults by predatory birds has increased in recent years. Overall, the magnitude of the threats regarding climate change is yet unknown, but the impact of regional changes will have to be monitored closely to ensure the piping plover's persistence.

The population has shown significant growth, from approximately 17 pairs at the time of listing in 1986 to 76 pairs in 2017, representing just over 50% of the current recovery goal of 150 breeding pairs for the Great Lakes population. However, they dropped to 67 pairs in 2018. The average fledging rate has been 1.7, above the recovery goal of 1.5 fledglings per breeding pair, although analysis of banded plovers suggests that after-hatch year survival (adult) rates may be declining (Saunders et al. 2014, Saunders et al. 2018). Data indicates they remain vulnerable to major threats that remain persistent and pervasive, including habitat degradation, predation, and human disturbance. Piping plover populations, including the Great Lakes population, are inherently vulnerable to even small declines in their most sensitive vital rates, i.e., survival of adults and fledged juveniles. The survival and recovery of breeding populations of piping plovers in the Great Lakes DPS is fundamentally dependent on the continued availability of sufficient habitat in their coastal migration and wintering range, where the species spends more than two-thirds of its annual life cycle. Progress towards recovery, attained primarily through intensive protections to increase productivity on the breeding grounds, will be quickly slowed or reversed by even small, sustained decreases in survival rates during migration and wintering.

Review of threats to piping plovers and their habitat in their migration and wintering range indicates a continuing loss and degradation of habitat due to sand placement projects, inlet stabilization, sand mining, groins, seawalls and revetments, exotic and invasive vegetation, and wrack removal. This cumulative habitat loss is, by itself, of grave concern for piping plovers. However, artificial shoreline stabilization also impedes the processes by which coastal habitats adapt to accelerating sea-level rise, thus setting the stage for compounding future losses. While the Great Lakes DPS of piping plovers is few in number, they are spread out over a relatively large geographic area and were never very abundant. Though potentially vulnerable to stochastic events due to low population numbers, the current status of the DPS suggests they are increasing in number and expanding their current range.

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 84.1% 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 22). Up to 9.6% of the species' range overlaps with methomyl use sites while 24.5% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 22. Overlap and usage data for the piping plover (Great Lakes DPS).

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	0.7	3.2	3.9	0.1	0.5	0.6
Citrus	NA	NA	NA	NA	NA	NA
Corn	54.8	18.4	73.2	2.7	0.9	3.6
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	0.2	1.5	1.7	<0.1	0.1	0.1
Other Orchards	<0.1	0.5	0.5	<0.1	0.5	0.5
Other Row Crops	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Soybeans[8]	58.7	18.1	76.8	2.9	0.9	3.8
Vegetables and Ground Fruit	<0.1	0.8	0.8	<0.1	0.8	0.8
Wheat	NA	NA	NA	NA	NA	NA
Total	**59.6**	**24.5**	**84.1**	**3.0**	**2.8**	**5.8**

[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 5.8% of the species' range will be treated with methomyl annually (Table 22).

Additional Exposure Considerations

Piping plovers forage by gleaning invertebrates from the substrate or running and pecking on the substrate with short runs between pecks. Piping plovers utilize numerous areas within breeding and wintering habitats for foraging, including wet sand in the wash zone, intertidal ocean beach, wrack lines, washover passes, mud, sand and algal flats, and shorelines of streams, ephemeral ponds, lagoons, and salt marshes. Primary prey for wintering plovers includes polychaete marine worms, various crustaceans, insects, and occasionally bivalve mollusks. Several studies on the Atlantic Coast indicate that foraging habitat and food resources ultimately affect piping plover survival.

Piping plovers return to their breeding grounds in late April to early May and initiate nesting by mid- to late May. Hatching begins in late May to early June, generally peaking in June and early July. The young leave the nest within hours of hatch and begin to forage almost immediately. Piping plovers migrate July through September in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the. Piping plovers spend three to five months on the breeding grounds annually, and the rest of the year on the wintering or in migration. Piping plovers are sparsely distributed across their Atlantic Coast breeding range.

Piping plovers are unlikely to enter agricultural sites during breeding but may migrate through these areas (Pers. Comm. 2016 co-occurrence information, USFWS field office request). Overlap values for this species do not include the migratory corridor. As such, we consider exposure only from the 24.5% of the breeding range that overlaps with areas subject to spray drift, and we consider exposure within the migratory corridor qualitatively.

Exposure Summary

There is a high extent of extent of overlap between the action area and the species' range, particularly areas that may be subject to exposure via spray drift or runoff. Based on past usage data, we expect a low level of usage within these areas of the species' range. Given that the extent of overlap is high and that expected usage in these areas is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to piping plovers. The piping plover is an insectivore, consuming arthropods and benthic invertebrates. Exposure to methomyl is expected to result in mortality to piping plovers depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. Consumption of arthropods that have been exposed on-field can result in dosages up to 21.7 mg/kg-bw methomyl, which we expect to result in mortality to all exposed individuals. Consumption of arthropods that have been contaminated off-field from spray drift is expected to result in lower dosages of methomyl, up to 0.8 mg/kg-bw, with mortality in up to 24% of exposed individuals. Consumption of benthic invertebrates is not expected to result in adverse effects. We do not expect sublethal effects are likely to occur at predicted exposure levels.

Indirect Effects:

The piping plover relies on benthic invertebrates and arthropods for food resources, gleaning prey from the substrate or running and pecking on the substrate. Based on available toxicity data, we expect that exposure on-field or from spray drift is like to cause mortality of these prey species. However, because arthropods taken as food items exhibit a range of sensitivities to methomyl, we that expect that exposure to methomyl will reduce the abundance, but not completely eliminate the prey base. Therefore, as a generalist feeder of invertebrates, we anticipate that piping plovers will be less affected by the loss of specific species and will consume other available dietary items.

Toxicity Summary

Piping plovers are only expected to use agricultural fields during migration. While we expect mortality of all piping plovers feeding in agricultural fields treated with methomyl, we anticipate that the incidence of plovers arriving in fields that both provide suitable habitat for this species and have been recently treated with methomyl will be rare. We expect mortality in up to 24% of piping plovers consuming arthropods exposed via spray drift. However, we do not expect that consumption of contaminated benthic invertebrates will lead to adverse effects. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a reduction of the prey base where exposure to methomyl from spray drift occurs. However, because not all species of arthropods are expected to die from spray drift exposure, we expect the piping plover, as a generalist feeder, will be able to consume available dietary items. As such, we determine the piping plover has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The piping plover has a medium exposure ranking. Based on past methomyl usage data, we expect up to 5.8% of the range may be treated annually but may potentially cover up to 24.5% of the range over the duration of the proposed action depending how usage patterns change over time. This indicates that a moderate portion of the species' range is likely to be treated overall. As such, we expect a moderate number of individuals are likely to be exposed to methomyl.

The piping plover has a medium toxicity ranking. While we expect a high level of mortality on-field as a result of dietary exposure through the consumption of contaminated arthropods, we expect migrating plovers stopping at agricultural fields that have been recently treated with methomyl to be a rare occurrence. We expect mortality in up to 24% of individuals consuming arthropods exposed to methomyl from spray drift, but no adverse effects from the consumption of benthic invertebrates. We expect a medium level of indirect adverse effects are likely to occur from reductions in the prey base as a result of spray drift.

Given that we expect a moderate number of individuals are likely to experience exposure, and given that we expect a medium level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is medium.

Conclusion

The piping plover (Great Lakes DPS) population has increased from approximately 17 pairs at the time of listing in 1986 to 76 pairs in 2017 and 67 pairs in 2018. Data indicates they remain vulnerable to major threats that remain persistent and pervasive, including habitat degradation, predation, and human disturbance. The piping plover DPS is inherently vulnerable to even small declines in their most sensitive vital rates, i.e., survival of adults and fledged juveniles. The survival and recovery of breeding populations of piping plovers in the Great Lakes DPS is fundamentally dependent on the continued availability of sufficient habitat in their coastal migration and wintering range, where the species spends more than two-thirds of its annual life cycle. While the population in the DPS is few in number, they are spread out over a relatively large geographic area and were never very abundant. The species has a medium vulnerability ranking.

The piping plover DPS has a medium exposure ranking. We expect 84.1% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. Within these overlapping areas, we anticipate 5.8% will be exposed to methomyl annually. Piping plovers are only expected to use agricultural fields during migration. While we expect mortality of all piping plovers feeding on prey exposed to methomyl in agricultural fields, we anticipate that the incidence of plovers arriving in fields that both provide suitable habitat for this species and have been recently treated with methomyl will be rare. We expect mortality in up to 24% of piping plovers consuming arthropods exposed via spray drift. While we expect the loss of some individuals as a result, we do not expect that exposure from consuming benthic invertebrate prey along shorelines where the majority of the plover's foraging occurs will lead to adverse effects. We expect a reduction of the prey base where exposure to methomyl from spray drift occurs. Most plovers will likely be able to locate other dietary items to compensate for localized prey losses because not all species of arthropods are expected to die from spray drift exposure, and the piping plover is a highly mobile, generalist feeder that will be able to travel to other areas to forage as needed. However, we expect starvation or reduced fitness supporting reproductive capacity or growth in a small number of plovers as a consequence of losses of prey items over the duration of the proposed action.

In summary, the species DPS has a medium vulnerability, and the overall risk to the species is medium. We expect reduced fitness or growth and the loss of a small number of individuals due to methomyl exposure and losses of prey items over the duration of the proposed action. However, because this species DPS has a wide distribution with low levels of annual usage in overlapping areas, and individuals will be able to move to alternative sites to forage as needed to find sufficient prey, will not experience adverse effects from consuming many of their exposed prey items when foraging in benthic environments, and may migrate through agricultural areas but will not be likely to enter agricultural sites during the breeding season, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the piping plover (Great Lakes DPS).

References

U.S. Fish and Wildlife Service. 2020. Piping plover (*Charadrius melodus*) 5-year review: Summary and evaluation. Hadley, Massachusetts. 169 pp.

U.S. Fish and Wildlife Service. 2009. Piping plover (*Charadrius melodus*) 5-year review: Summary and evaluation. Hadley, Massachusetts. 214 pp.

Integration and Synthesis Summary: Birds - Piping plover

Scientific Name:	Common Name:	Entity ID:
Charadrius melodus	Piping plover (Atlantic Coast and Northern Great Plains populations)	131

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the piping plover (Atlantic Coast and Northern Great Plains populations). We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 5/26/2023; [Atlantic Coast and Northern Great Plains populations] - Wherever found, except those areas where listed as endangered.; *States within the range:* AL, AR, CO, CT, DE, FL, GA, IA, KS, LA, MA, MD, ME, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NY, OK, RI, SC, SD, TN, TX, VA, WY. Figure 16 depicts a map of the species' range.

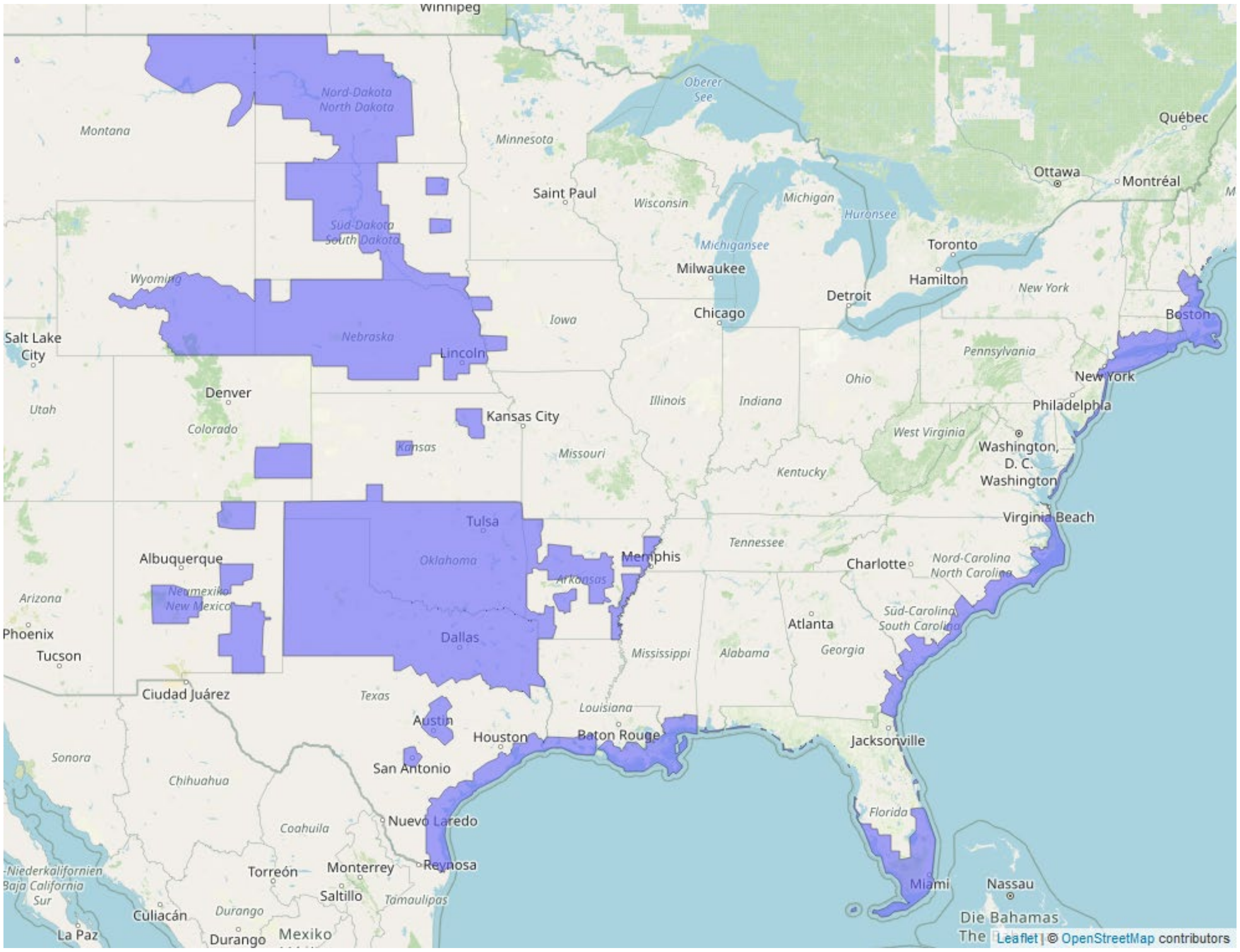

Figure 17. Range map of piping plover (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6039.

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: 3/26/2020

Distribution: Species/Populations widespread or wide-ranging

Number of populations: Multiple populations (few)

Species trends: Increasing population(s)

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

Environmental Baseline/Cumulative Effects (EB/CE) Summary

Endangered Species Act (ESA) actions have consistently recognized three separate breeding populations of piping plovers, on the Atlantic Coast (threatened), Great Lakes (endangered), and Northern Great Plains (threatened). The survival and recovery of all breeding populations of piping plovers are fundamentally dependent on the continued availability of sufficient habitat in their coastal migration and wintering range, where the species spends more than two-thirds of its annual cycle. All piping plover populations are inherently vulnerable to even small declines in their most sensitive vital rates, i.e., survival of adults and fledged juveniles. Progress towards recovery, attained primarily through intensive protections to increase productivity on the breeding grounds, will be quickly slowed or reversed by even small, sustained decreases in survival rates during migration and wintering.

Recent information confirms that assessing the importance of a site to nonbreeding piping plovers requires multiple surveys conducted across several migration and wintering seasons. Although there is no exclusive partitioning of the wintering range, piping plovers from the Atlantic Coast (i.e., eastern Canada) and the Great Lakes are most prevalent during migration and winter along the southern Atlantic Coast; while those breeding on the Northern Great Plains predominate in coastal Mississippi, Louisiana, and Texas; wintering ranges of all three breeding populations overlap on the Gulf Coast of Florida. Piping plovers demonstrate high fidelity to winter regions where they use a mosaic of habitats within their home ranges. Efforts to further improve understanding of factors affecting survival of migrating and wintering piping plovers merit high priority.

Review of threats to piping plovers and their habitat in their migration and wintering range indicates a continuing loss and degradation of habitat due to sand placement projects, inlet stabilization, sand mining, groins, seawalls and revetments, exotic and invasive vegetation, and wrack removal. This cumulative habitat loss is, by itself, of grave concern for piping plovers, as well as the many other shorebird species competing with them for foraging resources and roosting habitats in their nonbreeding range. However, artificial shoreline stabilization also impedes the processes by which coastal habitats adapt to accelerating sea-level rise, thus setting the stage for compounding future losses. Furthermore, inadequate management of increasing numbers of beach recreationists reduces the functional suitability of habitat and increase pressure on piping plovers and other shorebirds depending upon a shrinking habitat base. At piping plover sites with moderate or high levels of human disturbance, increased management of disturbance should be a high priority action. Notwithstanding the difficulties associated with measuring the effects of stressors that affect piping plovers during migration and wintering, efforts to reduce habitat loss and degradation and human disturbance must be accelerated. Indeed, allowing continued habitat loss until reductions in survival are evident poses a high risk of irreversible effects that could preclude piping plover recovery.

Increased focus on conservation actions in the migration and wintering range is a high priority for all three piping plover breeding populations. The various piping plover recovery plans identify contaminants, particularly oil spills, as a threat. The Great Lakes plan also states that concentration levels of polychlorinated biphenyl (PCB) detected in Michigan piping plover eggs have the potential to cause reproductive harm. Contaminants have the potential to cause direct toxicity to individual birds or negatively impact their invertebrate prey base (Rattner and Ackerson 2008). Neither the final listing rule nor the recovery plans specifically identified pesticides as a threat to piping plovers on the wintering grounds. In 2000, mortality of large numbers of wading birds and shorebirds, including one piping plover, at Audubon's Rookery Bay Sanctuary on Marco Island, Florida, occurred following the county's aerial application of the organophosphate pesticide Fenthion for mosquito control purposes (Williams 2001). Fenthion, a known toxin to birds, was registered for use as an avicide by Bayer chemical manufacturer. Subsequent to a lawsuit being filed against the Environmental Protection Agency (EPA) in 2002, the manufacturer withdrew Fenthion from the market, and EPA declared all uses were to end by November 30, 2004. This threat to piping plovers in the U.S. appeared low at the time of our 5-year review in 2009, and as of the time of our 2020 5-year review, we did not have any additional information to indicate the threat level pesticides pose to nonbreeding piping plovers had changed.

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 47.9% 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 23). Up to 23.1% of the species' range overlaps with methomyl use sites while 24.8% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 23. Overlap and usage data for the piping plover.

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	4.2	5.8	0.2	0.7	0.9
Citrus	NA	NA	NA	NA	NA	NA

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Corn[9]	9.2	6	15.2	0.5	0.3	0.8
Cotton	3.3	2.1	5.4	0.2	0.1	0.3
Other Grains	5.9	8.5	14.3	0.3	0.4	0.7
Other Orchards	<0.1	0.2	0.2	<0.1	0.2	0.2
Other Row Crops	1.4	1.7	3	0.6	0.8	1.4
Soybeans	8.1	4.4	12.5	0.4	0.2	0.6
Vegetables and Ground Fruit	1.7	2.2	3.9	1.7	2.2	3.9
Wheat	NA	NA	NA	NA	NA	NA
Total	**23.1**	**24.8**	**47.9**	**3.5**	**4.7**	**8.2**

Usage

Based on past usage data, we anticipate up to 8.2% of the species' range will be treated with methomyl annually (Table 23).

Additional Exposure Considerations

Piping plovers forage by gleaning invertebrates from the substrate or running and pecking on the substrate with short runs between pecks. Piping plovers utilize numerous areas within breeding and wintering habitats for foraging, including wet sand in the wash zone, intertidal ocean beach, wrack lines, washover passes, mud, sand and algal flats, and shorelines of streams, ephemeral ponds, lagoons, and salt marshes. Primary prey for wintering plovers includes polychaete marine worms, various crustaceans, insects, and occasionally bivalve mollusks. Several studies on the Atlantic Coast indicate that foraging habitat and food resources ultimately affect piping plover survival.

Piping plovers return to their breeding grounds in late April to early May and initiate nesting by mid- to late May. Hatching begins in late May to early June, generally peaking in June and early

[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.

July. The young leave the nest within hours of hatch and begin to forage almost immediately. Piping plovers migrate July through September in coastal areas of the U.S. from North Carolina to Texas and in portions of Mexico and the. Piping plovers spend three to five months on the breeding grounds annually, and the rest of the year on the wintering or in migration. Piping plovers are sparsely distributed across their Atlantic Coast breeding range.

Piping plovers are unlikely to enter agricultural sites during breeding but may migrate through these areas (USFWS field office request, pers. comm. 2016 co-occurrence information). Given the broad nature of the range map for this species in certain areas, it is unlikely that the entire area of overlap adjacent to agriculture represents piping plover habitat.

Exposure Summary

There is a high extent of overlap between the action area and the species' range. While the piping plover could enter certain agricultural fields during migration, the most likely route of exposure for this species is from spray drift entering their preferred habitat from use on adjacent crops. Based on past usage data, we expect a low level of usage within these areas of the species' range. Given that the extent of overlap is high and that expected usage is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to piping plovers. The piping plover is an insectivore, consuming arthropods and benthic invertebrates. Exposure to methomyl is expected to result in mortality to piping plovers depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. Consumption of arthropods that have been exposed on-field can result in dosages up to 21.7 mg/kg-bw methomyl, which we expect to result in mortality to all exposed individuals. Consumption of arthropods that have been contaminated off-field from spray drift is expected to result in lower dosages of methomyl, up to 0.8 mg/kg-bw, with mortality in up to 24% of exposed individuals. Consumption of benthic invertebrates is not expected to result in adverse effects. We do not expect sublethal effects are likely to occur at predicted exposure levels.

Indirect Effects:

The piping plover relies on benthic invertebrates and arthropods for food resources, gleaning prey from the substrate or running and pecking on the substrate. Based on available toxicity data, we expect that exposure on-field or from spray drift is likely to cause mortality of these prey species. However, because arthropods taken as food items exhibit a range of sensitivities to methomyl, we that expect that exposure to methomyl will reduce the abundance, but not completely eliminate the prey base. Therefore, as a generalist feeder of invertebrates, we anticipate that piping plovers will be less affected by the loss of specific species and will consume other available dietary items.

Toxicity Summary

Piping plovers are only expected to use agricultural fields during migration. While we expect mortality of all piping plovers feeding in agricultural fields treated with methomyl, we anticipate that the incidence of plovers arriving in fields that both provide suitable habitat for this species and have been recently treated with methomyl will be rare. We expect mortality in up to 24% of piping plovers consuming arthropods exposed via spray drift. However, we do not expect that exposure to benthic invertebrates will lead to adverse effects. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a reduction of the prey base where exposure to methomyl from spray drift occurs. However, because not all species of arthropods are expected to die from spray drift exposure, we expect the piping plover, as a generalist feeder, will be able to consume available dietary items. As such, we determine the piping plover has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The piping plover has a medium exposure ranking. Based on past methomyl usage data, we expect up to 4.7% of the range may be treated annually in areas adjacent to methomyl use sites but may potentially cover up to 24.8% of the range over the duration of the proposed action depending how usage patterns change over time. This indicates that a moderate portion of the species' range is likely to be treated overall. As such, we expect a moderate number of individuals are likely to be exposed to methomyl.

The piping plover has a medium toxicity ranking. While we expect a high level of mortality on-field as a result of dietary exposure through the consumption of contaminated arthropods, we expect migrating plovers stopping at agricultural fields that have been recently treated with methomyl to be a rare occurrence. We expect mortality in up to 24% of individuals consuming arthropods exposed to methomyl from spray drift, but no adverse effects from the consumption of benthic invertebrates. We expect a medium level of indirect adverse effects are likely to occur from reductions in the prey base as a result of spray drift.

Given that we expect a moderate number of individuals are likely to experience exposure, and given that we expect a medium level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is medium.

Conclusion

The piping plover Atlantic Coast and Northern Great Plains populations are widely distributed across many states (see figure 16). All piping plover populations are inherently vulnerable to even small declines in their most sensitive vital rates, i.e., survival of adults and fledged juveniles. A review of threats to piping plovers and their habitat in their migration and wintering range indicates a continuing loss and degradation of habitat due to sand placement projects, inlet stabilization, sand mining, groins, seawalls and revetments, exotic and invasive vegetation, and wrack removal, as well as other threats. Several studies on the Atlantic Coast indicate that foraging habitat and food resources ultimately affect piping plover survival. The species has a medium vulnerability ranking.

The piping plover has a medium exposure ranking. We expect 24.8% of the species range where the species occurs overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. Piping plovers are only expected to use agricultural fields during migration. While we expect mortality of all piping plovers feeding in agricultural fields treated with methomyl, we anticipate that the incidence of plovers arriving in fields that both provide suitable habitat for this species and have been recently treated with methomyl will be rare. The most likely route of exposure for this species is from spray drift entering their preferred habitat from use on adjacent crops. Based on past usage data, we expect a medium level of overlap with off-site areas where the species is likely to be exposed from usage in the species' range (4.7% annually). We expect a moderate number of individuals are likely to experience exposure from the proposed action.

We expect mortality in up to 24% of piping plovers consuming arthropods exposed via spray drift. While we expect the loss of some individuals as a result, we do not expect that exposure from consuming benthic invertebrate prey along shorelines where the majority of the plover's foraging occurs will lead to adverse effects. We expect a reduction of the prey base where exposure to methomyl from spray drift occurs. Most plovers will likely be able to locate other dietary items to compensate for localized prey losses because not all species of arthropods are expected to die from spray drift exposure, and the piping plover is a highly mobile, generalist feeder that will be able to travel to other areas to forage as needed. However, we expect starvation or reduced fitness supporting reproductive capacity or growth in a small number of plovers as a consequence of losses of prey items over the duration of the proposed action.

In summary, the species has a medium vulnerability, and the overall risk to the species is medium. We expect reduced fitness or growth and the loss of a small number of individuals due to methomyl exposure and losses of prey items over the duration of the proposed action. Individuals may migrate through agricultural areas, but will not be likely to enter agricultural sites during the breeding season. The most likely route of exposure to the species is from spray drift. However, we do not expect individuals will experience adverse effects from consuming many of their exposed prey items when foraging in benthic environments. Additionally, this species has a wide distribution, and we do not anticipate large segments of the population will be affected at any given site or at any given time. We also anticipate most individuals will be able to move to alternative sites to forage as needed to find sufficient prey. While we anticipate impacts to individuals and their prey, we do not expect the adverse effects from the proposed action will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the piping plover (Atlantic Coast and Northern Great Plains populations).

References

U.S. Fish and Wildlife Service. 2020. Piping plover (*Charadrius melodus*) 5-year review: Summary and evaluation. Hadley, Massachusetts. 169 pp.

U.S. Fish and Wildlife Service. 2009. Piping plover (*Charadrius melodus*) 5-year review: Summary and evaluation. Hadley, Massachusetts. 214 pp.

Integration and Synthesis Summary: Birds - Florida grasshopper sparrow

Scientific Name:	Common Name:	Entity ID:
Ammodramus savannarum floridanus	Florida grasshopper sparrow	133

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we initially determined the risk of adverse effects to the species was medium. 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. 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 grasshopper sparrow. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 3/24/2023; Wherever found; *States within the range:* FL. Figure 17 depicts a map of the species' range.

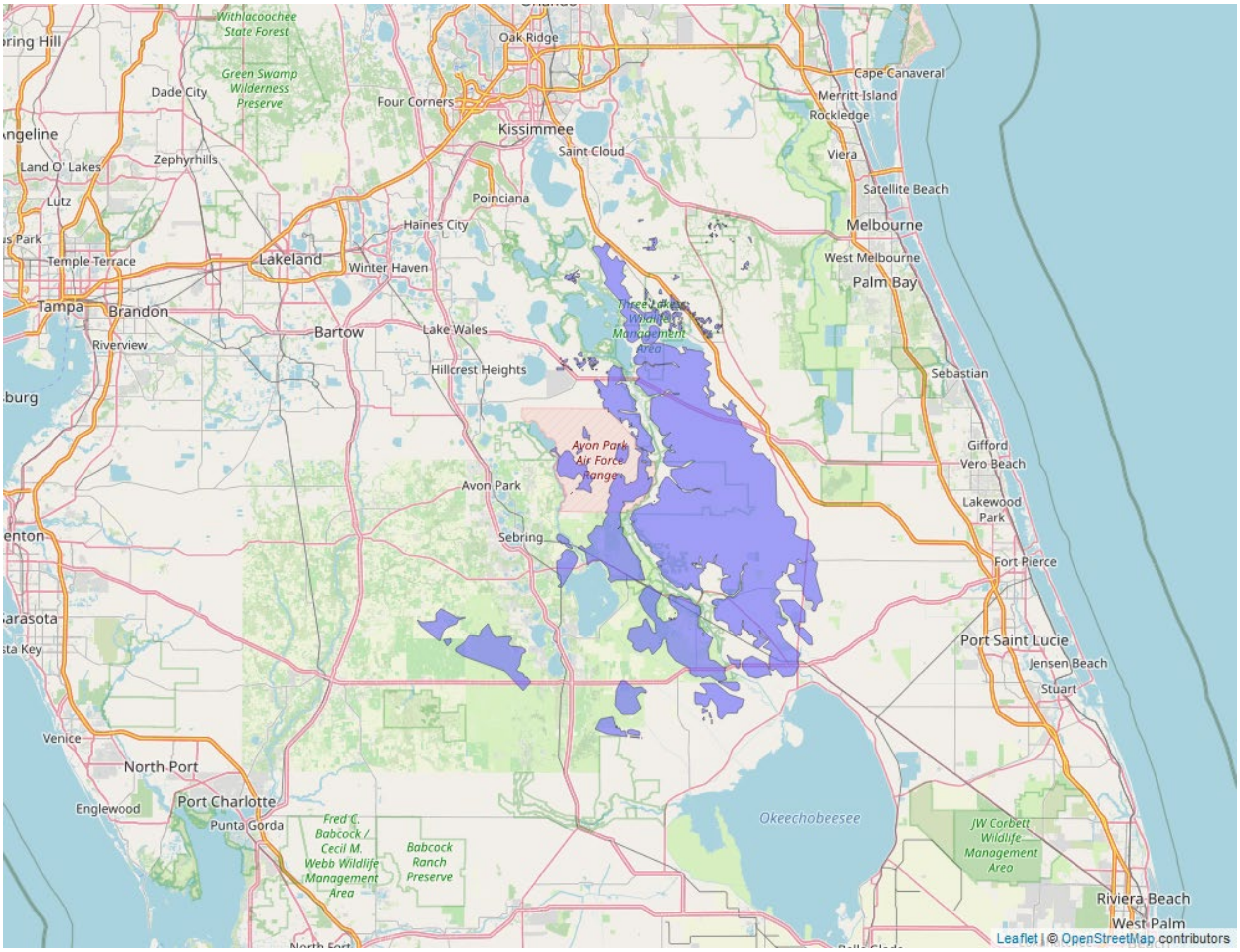

Figure 18. Range map of Florida grasshopper sparrow (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/32.

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: 9/30/2008

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

Unlike the migratory Eastern grasshopper sparrow (*Ammodramus savannarum pratensis*) that overwinters in Florida, the Florida grasshopper sparrow is non-migratory, and is limited to the prairie region of south-central Florida. The historical range of the Florida grasshopper sparrow is not known with certainty, but there are records from Collier, Miami-Dade, DeSoto, Glades, Hendry, Highlands, Polk, Okeechobee, and Osceola counties (USFWS 1999). The range of the Florida grasshopper sparrow is now generally restricted to three management units under public ownership – the Avon Park Air Force Range (APAFR), Kissimmee Prairie Preserve State Park (KPPSP) and Three Lakes Wildlife Management Area (TLWMA) – and three known private ranches. This is a decline from the eight occupied locations documented by Delany et al. (2007) during their 2000 – 2004 surveys, around the time the sparrow began declining at most sites.

The Florida grasshopper sparrow was listed as endangered in 1986 (51 FR 27492) due to habitat loss and degradation resulting from conversion of native vegetation to improved pasture and agriculture. The sparrow requires relatively large tracts of treeless prairie. Appropriate hydrology and frequent fire are necessary to maintain open prairie habitat and prevent encroachment of trees and overgrowth of woody vegetation (Platt et al. 2006). Delany et al. (2007) estimated that less than 45,000 hectares (111,197 acres) of potential sparrow habitat exists, which represents a 95 percent loss from pre-settlement estimates (Kautz et al. 1993). Loss of habitat was certainly a factor in the subspecies' decline to endangered status; however, habitat availability is not believed to currently limit population growth as populations have declined to low levels while large areas of seemingly high quality habitat are not currently occupied. Nevertheless, it remains possible that the quality of the current available habitat is suboptimal for the sparrow in ways that we are not presently detecting. Further research is necessary to reveal the subtleties of habitat quality, its response to past and present land management, and its effects on sparrow habitat selection and recruitment.

Florida grasshopper sparrows at the two state-managed properties (TLWMA and KPPSP) and the one federally-managed property (APAFR) are sufficiently protected under existing state and federal regulations. While the sparrows on the private ranches are vulnerable to threats of habitat loss or degradation through lack of management practices that maintain sparrow habitat, predation from non-native, red-imported fire ants, or through conversion to other land uses, one of the private ranches (Ranch) with the second largest known Florida grasshopper sparrow population is currently implementing a management plan drafted by the Service that includes actions to benefit the sparrow.

Populations have declined to historic lows at all known sites, and as of 2018, there were only 23 estimated wild breeding pairs at sites where the sparrow is being monitored (Hewett-Ragheb et al. 2018). The population is at high risk of extinction due to environmental, demographic, and genetic stochasticity (Shaffer 1981). Low population densities can lead to inbreeding and loss of genetic diversity, biased sex ratios, difficulty locating mates, and increased susceptibility to diseases (Dale 2001, Redford et al. 2011). Especially when coupled with events such as flooding, reduced food availability, and/or reduced reproductive success, small and isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The 2008 5-year review stated that the metapopulation may be too small to ensure against extinction, and currently protected areas are not enough to meet recovery goals. Habitat enhancement and expansion and demographic improvements at existing locations may restore some Florida grasshopper sparrow populations (Delany et al. 2007). Land acquisition, habitat restoration, translocations, and further research focused on management strategies are warranted future tasks to conserve this declining subspecies.

Due to the severe population decline, the Service initiated a captive propagation program in 2015. The captive population was intended to boost productivity with the goal of releasing captive-reared Florida grasshopper sparrows to supplement the wild population. At the end of the 2019 breeding season, there were 102 sparrows in captivity. Due to the remarkable success of the captive propagation program, the Service, Florida Fish and Wildlife Commission, and conservation partners began releasing captive-reared birds to the wild at TLWMA in 2019. A total of 105 birds (43 females, 52 males, 10 unknown sex) were released between May and September of 2019 with the majority (88) of the birds being independent juveniles that were hatched in captivity in 2019.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 9.7% 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 24). Up to 4.1% of the species' range overlaps with methomyl use sites while 5.6% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 24. Overlap and usage data for the Florida grasshopper sparrow.

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

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Corn[10]	<0.1	0.1	0.2	<0.1	<0.1	<0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	2.4	3.1	5.5	0.1	0.2	0.3
Other Orchards	0.7	0.8	1.5	0.7	0.8	1.5
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	0.9	1.5	2.4	0.9	1.5	2.4
Wheat	NA	NA	NA	NA	NA	NA
Total	**4.1**	**5.6**	**9.7**	**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 annually (Table 24).

Additional Exposure Considerations

Florida grasshopper sparrows are endemic to dry prairie habitats within central and southern Florida, and are strongly habitat-specific, occupying native, treeless fire-maintained dry prairie vegetation communities and some semi-improved pasture sites that were presumably dry prairie prior to conversion to pasture. Restrictions to movement include forested edges and even sparsely stocked pine flatwoods. These habitat restrictions make the Florida grasshopper sparrow less likely to frequent agricultural areas where methomyl is registered for use. As such, we expected exposure will primarily occur as a result of spray drift into Florida grasshopper sparrow habitat from adjacent agricultural areas.

[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.

Exposure Summary

There is a medium extent of overlap between the action area and the species' range. While we expect up to 9.7% of the species range to overlap with methomyl use sites, exposure is mostly likely within the 5.6% of the range that may be exposed to spray drift. Based on past usage data, we expect a low level of usage within the species' range, up to 4.2% of the range total, but 2.5% in off-field areas. Given that the extent of overlap is medium and that expected usage is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to Florida grasshopper sparrows. Exposure to methomyl is expected to result in mortality to Florida grasshopper sparrow depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. The Florida grasshopper sparrow consumes a mixture of insects and plant matter. During non-nesting season, individuals switch to a seed-dominated diet, but still consume some animal matter. Consumption of seeds and insects that have been exposed to on-field concentrations of methomyl is expected to result in mortality, with dosages of arthropods up to 52.9 mg/kg-bw. Consumption of insects that have been contaminated off-field from spray drift is also expected to result in lower dosages of methomyl (up to 2.0 mg/kg-bw) but still result in mortality. However, we do not anticipate adverse effects for Florida grasshopper sparrows that consume seeds off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels.

Indirect Effects:

The Florida grasshopper sparrow relies on arthropods and seeds for food resources. While no effects to plants are expected, we anticipate effects to arthropods from methomyl exposure on or near use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. However, as a generalist feeder, we anticipate that the Florida grasshopper sparrow will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to arthropods items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We expect a high level of direct adverse effects as mortality is expected when Florida grasshopper sparrows consume food resources both on-field and in the spray drift area off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but we expect that individuals will be able to consume available resources. As such, we determine the Florida grasshopper sparrow has a high toxicity ranking.

Overall Toxicity Ranking: High

Effects of the Action Summary

The Florida grasshopper sparrow has a medium exposure ranking. Based on past methomyl usage data, we expect up to 4.2% of the range may be treated annually but may potentially cover up to 9.7% of the range over the duration of the proposed action depending how usage patterns change over time. However, we expect that exposure is most likely to occur in off-field areas adjacent to methomyl use sites, which account for 5.6% of the range, with 2.5% treated in the past. This indicates that a moderate portion of the species' range is likely to be treated overall. As such, we expect a moderate number of individuals are likely to be exposed to methomyl.

The Florida grasshopper sparrow has a high toxicity ranking. We expect a high level of mortality will occur on-field as a result of dietary exposure through the consumption of contaminated food items. We expect a high level of mortality will occur off-field, which is also a result of dietary exposure from the consumption of contaminated food items. We expect a high level of indirect adverse effects are likely to occur as we expect prey species will experience a high level of mortality with exposure to predicted concentrations of methomyl.

The Florida grasshopper sparrow has a high toxicity ranking We expect a high level of direct adverse effects as mortality is expected when Florida grasshopper sparrows consume food resources both on-field or in the spray drift area off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but we expect that the Florida grasshopper sparrow will be able to consume available resources.

Given that we expect a moderate number of individuals are likely to experience exposure and we expect a high level of direct and indirect adverse effects, we determine the overall risk of adverse effects to the species is medium.

Preliminary Conclusion

The Florida grasshopper sparrow is limited to the prairie region of south-central Florida. The was listed as endangered in 1986 due to habitat loss and degradation resulting from conversion of native vegetation to improved pasture and agriculture. The sparrow requires relatively large tracts of treeless prairie, with appropriate hydrology and frequent fire to maintain open prairie habitat and prevent encroachment of woody vegetation. Estimates of potential sparrow habitat in 2007 indicate a 95 percent loss from pre-settlement estimates. The current range of sparrow is now generally restricted to three management units under public ownership where habitat is sufficiently protected, and three known private ranches, one of which supports that second largest population and is being managed under a plan developed in partnership with the Service. The number of known sites is a decline from eight occupied locations documented in 2000 - 2004 surveys. Populations have declined to historic lows at all known sites, and as of 2018, there were only 23 estimated wild breeding pairs at sites where the sparrow is being monitored. The population is at high risk of extinction due to environmental, demographic, and genetic stochasticity. Especially when coupled with events such as flooding, reduced food availability, and/or reduced reproductive success, small and isolated populations may experience severe declines or extirpation. Due to the severe population decline, the Service initiated a captive propagation program in 2015. A total of 105 birds (43 females, 52 males, 10 unknown sex) were released in 2019. The species has a high vulnerability ranking.

The Florida grasshopper sparrow has a medium exposure ranking. We expect 9.7% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. However, we anticipate that the sparrow will primarily occur in on-field areas. We expect 5.6% of the range off-field will be exposed via spray drift or runoff. Past methomyl usage data in off-field areas indicate 2.5% will be exposed from methomyl usage annually. We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to Florida grasshopper sparrows. The sparrow consumes a mixture of insects and plant matter. During non-nesting season, individuals switch to a seed-dominated diet, but still consume some animal matter. Consumption of insects that have been exposed to methomyl on- and off-field are expected to result in mortality. Consumption of seeds exposed on-field are also expected to result in mortality. However, we do not anticipate adverse effects for Florida grasshopper sparrows that consume seeds off-field. We anticipate the loss of insect prey where exposed. However, based on the varied diet and mobility of this species, we expect that individuals will be able to forage on other available resources in the vicinity. Based on the extent of overlap and methomyl usage in the range, and particularly within off-field areas, we expect a moderate number of individuals are likely to experience a high level of direct and indirect adverse effects. Thus, we determine the overall risk of adverse effects to the species is medium.

In summary, the Florida grasshopper sparrow has a high vulnerability, and the overall risk to the species is medium. We expect the loss of a moderate number of individuals, as well as losses of prey items over the duration of the proposed action. We expect the loss of individuals that consume contaminated food items, as well as losses of insect prey items over the duration of the proposed action. We anticipate exposure from individuals consuming contaminated insects will primarily occur in off-field areas where spray drift and runoff are anticipated. These areas overlap with the 5.6% of the range. We anticipate 2.5% of the range within these off-field areas will be exposed from methomyl usage annually. Additionally, we anticipate insect prey will be lost in exposed areas. The Florida grasshopper sparrow eats both insects and seeds. We anticipate individuals will generally be able to forage on seeds and less sensitive or unaffected insects, or travel to alternative sites to forage as needed to find sufficient prey as losses occur in localized areas, although we anticipate prey losses will lead to a reduction in fitness or survival in a small number of individuals. In all, we anticipate the loss of a moderate number of individuals, primarily due to mortality from the consumption of exposed insect prey. Data indicates sparrow populations have been declining, with low numbers of wild individuals at six known sites. Four of these sites are protected or managed in part for the conservation of the sparrow. Captive breeding and reintroduction efforts are underway to improve the status of the species.

Due to the small and isolated populations, the species is at high risk of extinction due to stochastic events. Higher population numbers, increasing population trends, and additional sites are needed to meet recovery goals. Based on our assessment, we anticipated reduced fitness and mortality of a moderate number of individuals that would likely reduce the reproduction, numbers, and distribution of the species to an extent that 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 Florida grasshopper sparrow:

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 terrestrial habitat for the Florida grasshopper sparrow 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 grasshopper sparrow 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 these conservation measures, we expect these pathways of exposure will be greatly limited over the course of the action. Therefore, we expect impacts to be low, with adverse effects limited to a very small number of individuals due to loses invertebrate prey that lead to minor reductions in fitness supporting reproductive capacity or growth. However, effects will not likely reduce the reproduction, numbers, and distribution of the species. After adding the effects of the action (including the species-specific conservation measures) and cumulative effects to the environmental baseline and in light of the status of the species, we do not anticipate the registration of methomyl will appreciably reduce the survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Florida grasshopper sparrow.

References

U. S. Fish and Wildlife Service. 2008. Florida grasshopper sparrow (*Ammodramus savannarum floridanus*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 19 pp.

U.S. Fish and Wildlife Service. 2019. Recovery Plan for Florida grasshopper sparrow (*Ammodramus savannarum floridanus*), Amendment 1. Atlanta, Georgia. 14 pp.

Integration and Synthesis Summary: Birds - Everglade snail kite

Scientific Name:	Common Name:	Entity ID:
Rostrhamus sociabilis plumbeus	Everglade snail kite	1221

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Everglade snail kite. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 11/4/2022; Wherever found; *States within the range:* FL. Figure 18 depicts a map of the species' range.

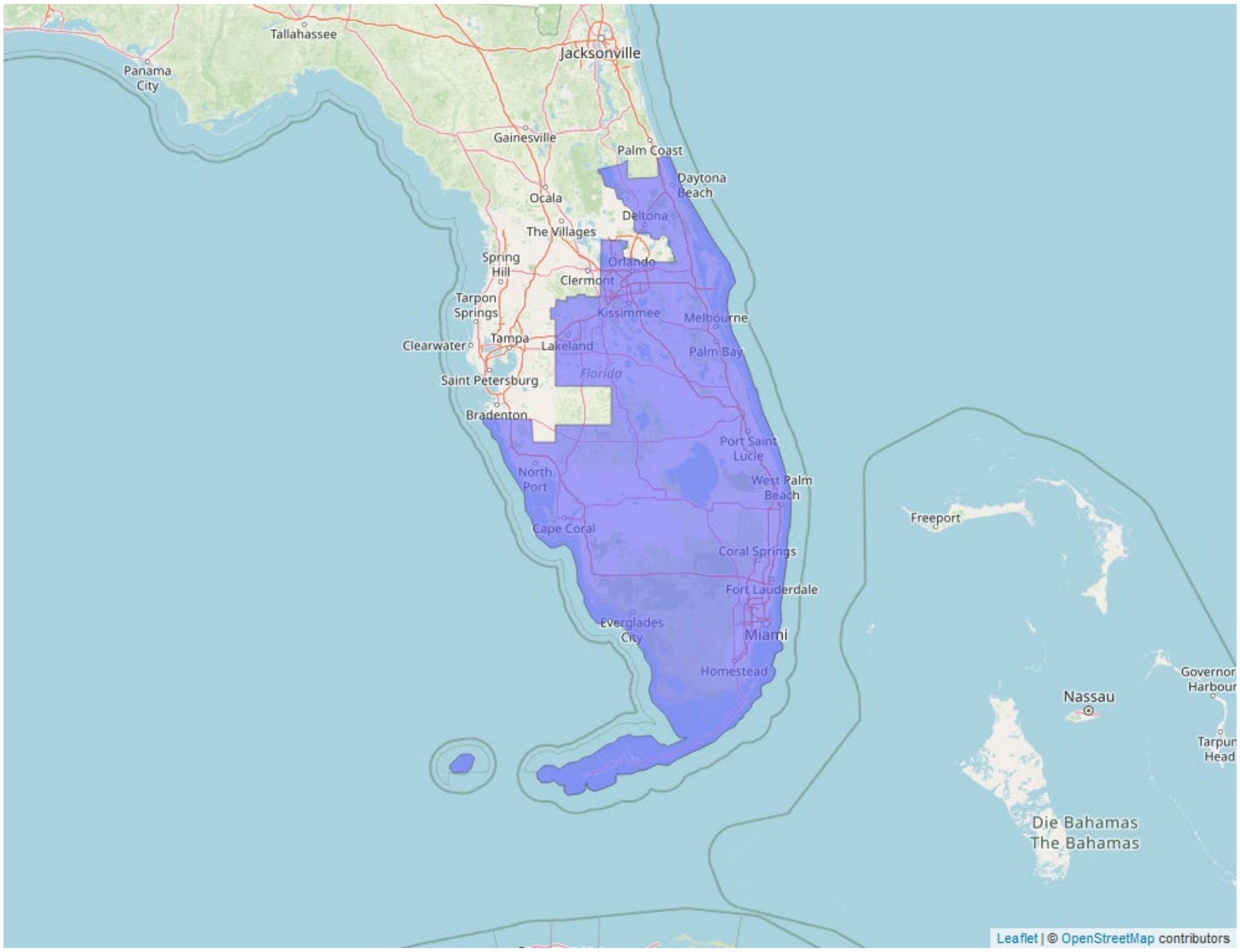

Figure 19. Range map of Everglade snail kite (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7713.

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: 9/27/2007

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 2007 5-year status review indicated that the snail kite population declined by approximately 50 percent over the prior 10 years and has shown little sign of recovery. The decline from 1999 to 2003 was due in large part to a regional drought that affected southern Florida during 2000 and 2001. Under favorable environmental conditions, kites can achieve high reproductive rates (Beissinger 1986). The 2019 draft amendment to the recovery plan discusses a new method of estimating populations that showed the overall snail kite population exhibited steep declines from 1999 to 2002 and from 2006 to 2008, but rebounded slightly starting in 2010. In 2014, the population estimate was significantly higher (1,754 birds), although it was also noted that from 2010 to present, juvenile survival has been trending downwards (Fletcher et al. 2017).

The distribution of the snail kite is limited to central and southern portions of Florida, though a kite may occasionally be reported outside of this area. The principal threat to the snail kite is the loss or degradation of wetlands in central and southern Florida. Nearly half of the Everglades have been drained for agriculture and urban development (Davis and Ogden 1994). In addition to controlling invasive plant species, which is beneficial to snail kites, application of herbicides often causes detrimental impacts to non-target species. Inadvertent application of herbicides to snail kite nesting substrates has occurred, and herbicide treatments within kite foraging habitat has caused impacts to many native littoral vegetation species. Hydrilla control activities have similarly caused temporary impacts to vegetation in areas where kites forage. Herbicides can also kill submerged aquatic plants, resulting in reduced suitability for apple snails.

Nest predation is a common cause of snail kite nest failure. While the occurrence of nest predation has increased, this is largely a result of hydrologic management in areas where kites nest. Studies of apple snail abundance within traditional snail kite nesting areas indicate reduced snail abundance in recent years. Data on changes in snail abundance (Darby 2007) support the conclusion that availability of apple snails to kites may be declining, and snail densities may be lower than those that are favorable for kite foraging (Darby et al. 2006). The 2019 amendment to the recovery plan calls for threats to the snail kite's native prey, the Florida apple snail, to be reduced or eliminated to a degree that the snail kite is viable for the foreseeable future. The spread of non-native apple snails (*Pomacea insularum* was the species noted) (Rawlings et al. 2007) may also represent a reduction in the suitability of habitat for kites. While they can feed on this and other introduced apple snail species, the non-native species may not be as available as a prey item to kites (e.g., juveniles) due to the snail's larger sizes. This may result in food limitation and lower survival, particularly for juvenile kites (Kitchens 2007, Fletcher pers. comm. 2018).

In addition to the overall population decline of the snail kite, documented declines in habitat amount and suitability and declines in abundance of native apple snails have occurred throughout many portions of the kite's range. Water management has affected and will continue to affect these habitat characteristics, as well as others. As Everglades restoration plans are developed and implemented, more favorable hydrologic regimes are likely. Despite the fact that many of the observed habitat declines are reversible under favorable conditions and are expected to recover over time, these factors appear likely to continue to limit the snail kite population growth in the near future. Threats resulting from increasing development, exotic and invasive species, and human disturbance also appear likely to continue to affect the kite population, and these threats may continue to increase. Although Everglades restoration projects are currently being planned that may improve hydrologic conditions for the kite, various threats continue to affect the snail kite and its habitat, and the degree of threat posed is stable or increasing.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 11.4% 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). Up to 5.8% of the species' range overlaps with methomyl use sites while 5.6% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 25. Overlap and usage data for the Everglade snail kite.

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[11]	0.1	0.3	0.4	<0.1	<0.1	<0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	4.5	3.2	7.7	0.2	0.2	0.4

[11] 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	0.4	0.6	0.9	0.4	0.5	0.9
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	0.8	1.5	2.3	0.8	1.5	2.3
Wheat	NA	NA	NA	NA	NA	NA
Total	**5.8**	**5.6**	**11.4**	**1.4**	**2.2**	**3.6**

Usage

Based on past usage data, we anticipate up to 3.6% of the species' range will be treated with methomyl annually (Table 25).

Additional Exposure Considerations

Everglade snail kites may use nearly any wetland within southern Florida. Snail kite habitat consists of freshwater marshes and the shallow vegetated edges of lakes (natural and man-made) where apple snails can be found. Non-breeding snail kites use communal roosts throughout the year in association with other birds, particularly anhingas (*Anhinga anhinga*), herons, and vultures. Roosting sites are also almost always located over water. Suitable foraging habitat for the snail kite is typically a combination of low-profile marsh with an interdigitated matrix of shallow open water, which is relatively clear and calm. As such, we do not expect the Everglade snail kit to forage in agricultural sites where methomyl is registered for use, but these habitats may be exposed by spray drift or runoff.

Exposure Summary

Everglade snail kites are not expected to forage on agricultural sites where methomyl is registered for use. There is a medium extent of overlap, up to 5.6%, between the action area and the species' range that may be exposed from spray drift or runoff. Based on past usage data, we expect a low level of usage within these areas at 2.2% of the species' range. Given that the extent of overlap is medium and that expected usage is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

The Everglade snail kite has a highly specific diet composed almost entirely of apple snails (*Pomacea paludosa*). We do not expect the Everglade snail kite to experience any direct adverse effects from the consumption of apple snails or other aquatic prey species.

Indirect Effects:

Since the snail kite feeds almost exclusively on snails, effects to the snail prey base were calculated using a taxa-specific toxicity value, consistent with our analysis of effects to listed snails. As snails have been determined to be tolerant of methomyl in laboratory studies, effects to the snail prey base are not anticipated at estimated environmental concentrations. However, some effects are anticipated to crayfish and fish, which the snail kite takes on rare occasions. Because aquatic invertebrates and fish exhibit a range of sensitivities to methomyl, their abundance is expected to be reduced where exposure occurs, but not completely eliminated. As the Everglade snail kite relies primarily on apple snails, we expect that indirect effects will be low.

Toxicity Summary

We do not expect direct adverse effects to Everglade snail kites from consumption of apple snails or other aquatic prey species. We expect a low level of indirect effects as we do not anticipate that methomyl exposure will cause direct adverse effects to apple snails but may cause mortality to other aquatic prey species exposed from spray drift or runoff. As such, we determine the Everglade snail kite has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The Everglade snail kite has a medium exposure ranking. Based on past methomyl usage data, we expect up to 2.2% of the range may be treated annually and exposed to spray drift or runoff, but may potentially cover up to 5.6% of the range over the duration of the proposed action depending how usage patterns change over time. This indicates that a moderate portion of the species' range is likely to be treated overall. As such, we expect a moderate number of individuals are likely to be exposed to methomyl.

The Everglade snail kite has a low toxicity ranking. We do not direct adverse effects to snail kites from consuming apple snails or other aquatic prey items that have been exposed to methomyl through spray drift or runoff. We expect a low level of indirect effects as apple snails are not expected to be adversely affected by methomyl exposure, but abundance of other aquatic prey items could be reduced from exposure to spray drift or runoff.

Given that we expect a moderate number of individuals are likely to experience exposure and a low level of indirect adverse effects, we determine the overall risk of adverse effects to the species is low.

Conclusion

The distribution of the Everglade snail kite is limited to central and southern portions of Florida, though a kite may occasionally be reported outside of this area. The principal threat to the snail kite is the loss or degradation of wetlands. Nearly half of the Everglades have been drained for agriculture and urban development. Based on the 2007 5-year status review, the snail kite population declined by approximately 50 percent over the prior 10 years and has shown little sign of recovery. In 2014, the population estimate was significantly higher (1,754 birds), although it was also noted that juvenile survival had been trending downwards. In addition to the overall population decline of the snail kite, documented declines in habitat amount and suitability and declines in abundance of native apple snails (the primary prey of the kite) have occurred throughout many portions of the kite's range. Threats resulting from increasing development, exotic and invasive species, and human disturbance have impacted the kite population. Various threats continue to affect the snail kite and its habitat, and the degree of threats posed to the kite is stable or increasing. The species has a high vulnerability ranking.

The Everglade snail kite has a medium exposure ranking. We do not expect the kites will forage on agricultural sites where methomyl is registered for use. There is a medium extent of overlap, with up to 5.6% of the species' range that may be exposed to methomyl from spray drift or runoff off-field where individuals may forage. Based on past usage data, we expect a low level of usage within these areas, with usage on 2.2% of the species' range annually. Given that the extent of overlap is medium and that expected usage is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action. However, we do not expect direct adverse effects to Everglade snail kites from consumption of exposed apple snails or other aquatic prey species. We also do not anticipate losses of apple snails, the kite's primary prey, from methomyl exposure, although methomyl may cause mortality to other aquatic prey species exposed from spray drift or runoff. As such, we determine the Everglade snail kite has a low toxicity ranking. Given that we expect a moderate number of individuals and their prey are likely to experience exposure, but that we anticipate a low level of adverse effects, we determine the overall risk of adverse effects to the species is low.

In summary, while the Everglade snail kite has a high vulnerability, the overall risk to the species is low. We anticipate exposure is likely to occur in 5.6% of the range where the species forages, but we do not expect direct adverse effects from individuals consuming prey. Although we expect losses of some prey in exposed areas over the project duration, we do not expect losses of the kite's preferred food item, which are apple snails. We anticipate some individuals will need to find alternative resources due to prey losses in localized areas, which is likely to lead to a reduction in fitness supporting reproductive capacity or growth in a very small number of individuals. However, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Everglade snail kite.

References

U.S. Fish and Wildlife Service. 2007. Everglade Snail Kite (*Rostrhamus sociabilis plumbeus*), 5-Year Review: Summary and Evaluation. Vero Beach, Florida.

U.S. Fish and Wildlife Service. 2019. Recovery Plan for the Endangered Everglade Snail Kite (*Rostrhamus sociabilis plumbeus*), Draft Amendment 1. Vero Beach, Florida.

Integration and Synthesis Summary: Birds - Gunnison sage-grouse

Scientific Name:	Common Name:	Entity ID:
Centrocercus minimus	Gunnison sage-grouse	4064

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Gunnison sage-grouse. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 2/1/2024; Wherever found; *States within the range:* CO, UT. Figure 19 depicts a map of the species' range.

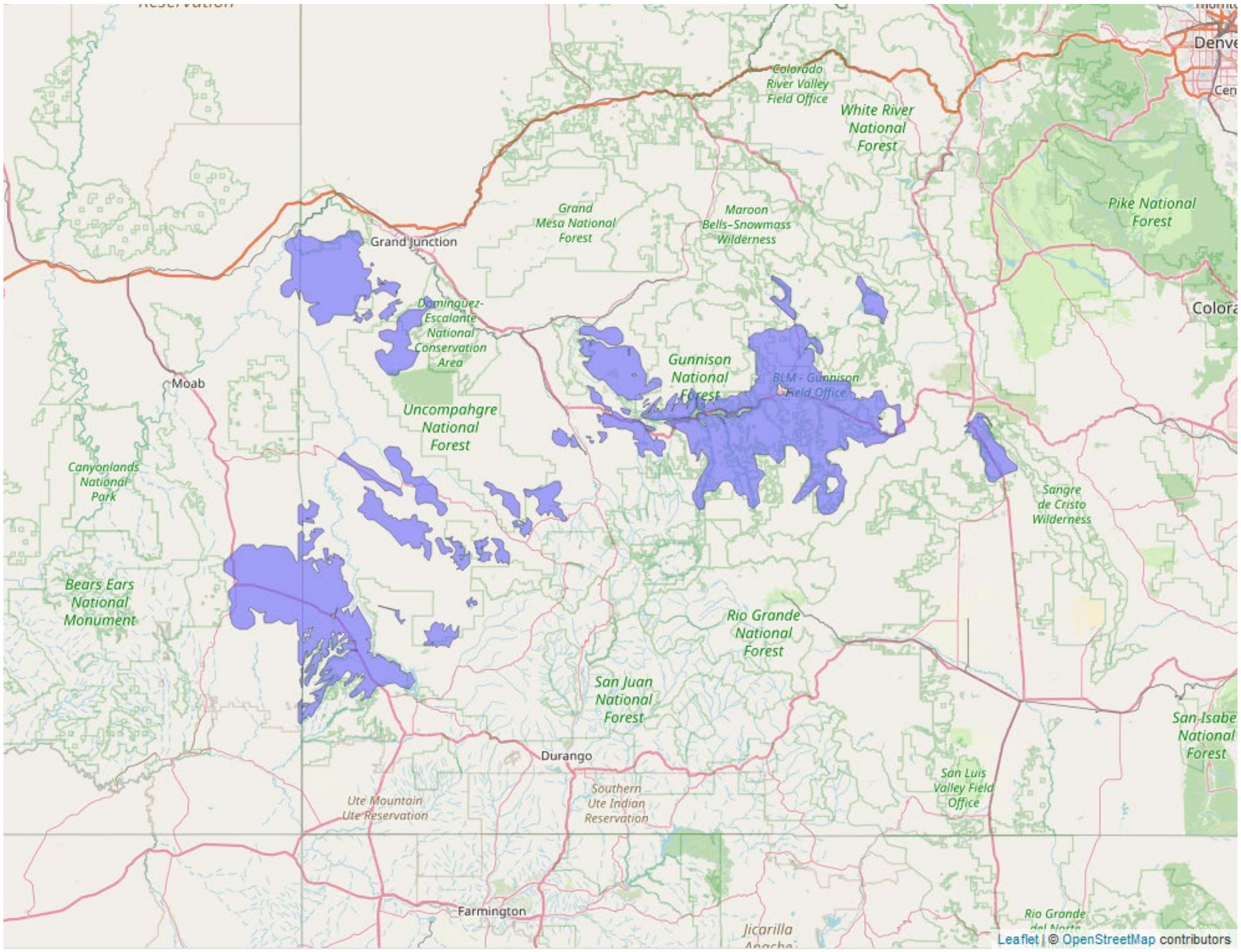

Figure 21. Range map of Gunnison sage-grouse (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/6040.

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: 8/26/2019

Distribution: Species/Populations widespread or wide-ranging

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

Throughout their life cycle, grouse depend on a variety of shrub-steppe habitats and are obligate users of several sagebrush species to breed, feed, and shelter. They feed on invertebrates and forbs in their sagebrush habitats. Gunnison sage-grouse were formerly native to southwestern Colorado, northern New Mexico, southeastern Utah, and possibly northeastern Arizona. Since the 1900s, the species' occupied range contracted, and it now occupies an estimated 10% of its historical range. Currently occupied habitat is managed by the Bureau of Land Management (42%), private landowners (43%), the U.S. Forest Service (10%), the National Park Service (2%), and the states of Colorado and Utah (2%). As of 2019, Gunnison sage-grouse are found in seven populations in western Colorado (Gunnison Basin, Poncha Pass, Crawford, Cerro Summit-Cimarron-Sims Mesa (Cerro Summit), Piñon Mesa, San Miguel Basin, and Dove Creek) and one population in Utah (Monticello). The eight Gunnison sage-grouse populations occupy six different ecoregions, each with distinct ecological differences (USFWS 2019). The Gunnison Basin population is the largest population with the most occupied habitat, covering approximately 239,641 hectares. The Poncha Pass population, located to the east of the Gunnison Basin population, is the smallest population and has the least amount of occupied habitat (approximately 11,234 hectares). All Gunnison sage-grouse in the Poncha Pass population were translocated from the Gunnison Basin population in the 1970s after the population was considered extirpated in the 1950s, with additional translocations in the 2000s. The Gunnison Basin population supports approximately 85% of breeding Gunnison sage-grouse and 65% of the occupied habitat. The remaining 15% of individuals are distributed among the remaining seven populations, which comprise approximately 35% of the overall occupied habitat. Based on the analysis documented in our Species Status Assessment, one of the eight grouse populations had critically low resilience (Dove Creek), three had low resiliency (Crawford, Poncha Pass, Monticello), two had moderate resiliency (Cerro Summit and San Miguel Basin), and two had high resiliency (Gunnison Basin and Piñon Mesa). By 2020, most populations, including the Gunnison Basin population, decreased from their 2019 levels (USFWS 2020).

Although the exact reasons for population declines are unknown, stochastic environmental and demographic changes have likely contributed. The primary reason for the decline is believed to be habitat loss associated with the conversion of sagebrush habitat to agriculture and residential and commercial development. As discussed in the 2014 listing rule, we determined that the most substantial threats to Gunnison sage-grouse include habitat decline due to human disturbance, small population size and structure, drought, climate change, and disease. Other threats that are impacting Gunnison sage-grouse to a lesser degree or in localized areas include grazing practices inconsistent with local ecological conditions, fences, invasive plants, fire, mineral development, pinion-juniper encroachment, large-scale water development, predation (primarily in association with anthropogenic disturbance), habitat decline due to human disturbance, and recreation (USFWS 2014, 2020).

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 20.2% 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 7.5% of the species' range overlaps with methomyl use sites while 12.7% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 26. Overlap and usage data for the Gunnison sage-grouse.

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	3.7	5.1	8.9	0.5	0.8	1.3
Citrus	NA	NA	NA	NA	NA	NA
Corn[12]	0.3	1	1.4	<0.1	<0.1	0.1
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	1.4	3	4.3	<0.1	0.1	0.2
Other Orchards	<0.1	<0.1	<0.1	<0.1	<0.1	0.1
Other Row Crops	0.2	0.6	0.9	0.1	0.3	0.4
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	1.9	2.8	4.7	1.9	2.8	4.7

[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.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Wheat	NA	NA	NA	NA	NA	NA
Total	**7.5**	**12.7**	**20.2**	**2.6**	**4.2**	**6.8**

Usage

Based on past usage data, up to 6.8% of the species' range will be treated with methomyl annually (2.6% on-field and 4.2% off-field).

Additional Exposure Considerations

Additional pesticide usage data from the USDA Census of Agriculture indicate that methomyl usage within the species' range is likely less than what is estimated in the table above. The Census of Agriculture reports only 1.2% of the species' range has been treated annually with any insecticides. Given that the Census of Agriculture reports the usage of all insecticides (not just methomyl) and is specific to the counties where the Gunnison sage-grouse's range occurs, we have high confidence only a small portion of the species' range is likely to be treated each year.

The Gunnison sage-grouse is known to use agricultural areas, particularly as part of their leks or breeding areas. Given that breeding season likely coincides with periods of methomyl application, individuals may be at greater risk of exposure despite the low level of usage within the range.

Exposure Summary

There is a high level of overlap between the action area and the species' range (20.2% total overlap) and a moderate level of past methomyl usage within the range (estimated up to 6.8% range treated annually). However, additional pesticide usage data from the Census of Agriculture indicate that insecticide usage within the counties containing the species' range is low (1.2% range treated with any insecticide), suggesting that only a small portion of the range is likely to be treated with methomyl. However, given that some breeding areas can occur in agricultural fields, which presumably include methomyl use sites, we anticipate exposure is likely to occur despite the low level of reported usage. 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 expect the consumption of food items in an around agricultural fields is the primary route of methomyl exposure to the Gunnison sage-grouse. Available life history data indicate that arthropods are an important seasonal food item, particularly for recently hatched chicks in summer. Leaves, grasses, and forbs make up a major component of the species' diet year-round as well. Individuals that exclusively consume contaminated food items on methomyl use sites can be exposed to dosages up to 27 mg/kg-bw, which can result in mortality of exposed individuals. Individuals that forage on contaminated food items off-field will accumulate lower levels of methomyl (up to 1 mg/kg-bw), however, this could still result in up to 22.1% mortality of exposed individuals. This exposure assumption is conservative because while Gunnison sage-grouse can occasionally forage on croplands, they prefer and typically forage in sagebrush habitats. We do not anticipate sublethal effects are likely to occur at predicted levels off-field. Even though some individuals will die, there will be no sublethal effects to individuals, and we expect medium levels of direct effects.

Indirect Effects:

The Gunnison sage-grouse feeds on plants (e.g., leaves, grasses, forbs) and arthropod prey (which is especially important to newly hatched chicks). Based on available toxicity data, we do not expect adverse effects to plant resources, but we do expect that arthropods will die with exposure to methomyl both on- and off-field. Prey species exhibit a range of sensitivities to methomyl. We anticipate arthropod prey reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. We expect exposure will reduce arthropod abundance, but not completely eliminate the prey base in these portions of the range. As such, even though toxicity to prey items is anticipated to be high on use sites, we anticipate a medium level of indirect adverse effects to the grouse are likely to occur, particularly during the time of chick growth when they may forage on agricultural lands.

Toxicity Summary

We expect a medium level of direct adverse effects will occur on-field as individuals consume food items on methomyl use sites are likely to die. Additionally, the consumption of contaminated food items off-field can result in mortality of exposed individuals, though at a much lower rate. We do not anticipate any sublethal effects to growth or reproduction are likely to occur. We anticipate a medium level of indirect adverse effects through the loss of arthropod prey, particularly during periods of chick growth. We do not expect indirect effects from loss of plant food items. As such, the species as a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The Gunnison sage-grouse has a medium exposure ranking. There is a high extent of overlap between the action area and the species' range (20.2% total overlap), however, there will likely only be a small portion of the range treated based on data from the Census of Agriculture (up to 1.2% range treated annually with any insecticide). However, we anticipate individuals, particularly during lekking and summer, right after breeding occurs, will forage on methomyl use sites at a period that coincides with potential methomyl applications. As such, we anticipate there will be a moderate number of individuals exposed to methomyl despite the low level of usage as reported by the Census of Agriculture.

The Gunnison sage-grouse has a medium toxicity ranking. We anticipate individuals that forage on contaminated food items on methomyl use sites will die. Individuals that consume contaminated food in areas adjacent to application sites will accumulate lower levels of methomyl but will still die. While we anticipate there will be large reductions in the abundance of arthropod prey species on use sites, we do not expect mortality across the entire arthropod prey community, and they will recover after methomyl degrades. We do not expect reductions in availability of plant food items. Even though we expect a moderate number of individuals will be exposed, only a small number of individuals will experience adverse effects from a loss of arthropods necessary during the breeding season and to support growing chicks.

In summary, we anticipate a moderate number of individuals are likely to be exposed to methomyl. However, we expect that only a small number of individuals will die and medium levels of indirect effects through loss of arthropod prey will occur from the proposed action. As such, we anticipate the overall risk of adverse effects to the species is medium.

Conclusion

The Gunnison sage-grouse has medium vulnerability because of its declining trends and specific habitat requirements. It is listed as threatened and occurs in the southwestern U.S. in seven populations in Colorado and one in Utah. They use various shrub-steppe habitats and are obligate sagebrush inhabitants. They feed on invertebrates and forbs. As of 2020, one population had critically low resilience, three had low resiliency, two had moderate resiliency, and two had high resiliency. Gunnison sage-grouse are threatened by habitat loss and fragmentation, small population size, drought, climate change, and disease.

Methomyl use sites overlap 20.2% of the species range, 7.5% of which is on-field. Census of Agriculture data suggests that only up to 1.2% of the species' range has been treated with insecticides annually in the past, including methomyl. In addition, substantial portions of the species' range occur on federal lands where we do not expect methomyl use to occur. Thus, we have high confidence that only a small portion of the species' range is likely to be treated each year. However, Gunnison sage-grouse are known to use agricultural areas during breeding and lekking, which likely coincide with periods of methomyl application. Specifically, males lek on agricultural fields in spring, and males, non-brooding females, brooding female, and juveniles forage on croplands in the summer (USFWS 2020). Despite the low level of anticipated use in the range, Gunnison sage-grouse may be at greater risk of exposure due to this behavior. Consumption of contaminated food items on and near agricultural fields is likely to result in mortality to a moderate number of individuals.

We anticipate a medium level of adverse effects are likely to occur when Gunnison sage-grouse and their food items are exposed. Gunnison sage-grouse can be exposed to methomyl from off-field consumption of plants (e.g., leaves, grasses, forbs) and arthropod prey, though at lower rates than those consumed after on-field exposures. Gunnison sage-grouse chicks primarily eat invertebrates. Prey losses in exposed foraging areas during the breeding season are likely to result in reduced fitness supporting reproductive capacity and reduced growth and survival of chicks. We expect variable, but occasionally large reductions in arthropod abundance, which will result in medium levels of indirect adverse effects, particularly to adults during the breeding season and chicks that require arthropod food resources for their survival and growth. While we expect a moderate number of Gunnison sage-grouse will be exposed to methomyl and a moderate number of individuals will experience reduced fitness, survival, and growth, especially during the breeding and chick-rearing periods of the year when their diet relies on abundant arthropod prey, we do not expect the proposed action will lead to species-level effects. Overall, we anticipate high levels of adverse effects to the Gunnison sage-grouse where individuals and prey in their foraging areas are exposed. However, exposure is anticipated to occur in a small portion of the range each year due to low anticipated usage as determined from past Census of Agriculture data. Additionally, Gunnison sage-grouse occur across multiple populations, and we do not anticipate that all will be impacted by 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Gunnison sage-grouse.

References

U.S. Fish and Wildlife Service. 2020. Final recovery plan for Gunnison sage-grouse (*Centrocercus minimus*). Lakewood, Colorado. 36 pp.

U.S. Fish and Wildlife Service. 2019. Species Status Assessment for the Gunnison Sage-Grouse (*Centrocercus minimus*). Lakewood, Colorado. 96 pp.

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Threatened Status for Gunnison Sage-Grouse. Final Rule. Federal Register 79:69191-69310.

Integration and Synthesis Summary: Birds - Streaked Horned lark

Scientific Name:	Common Name:	Entity ID:
Eremophila alpestris strigata	Streaked horned lark	4296

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is high. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is high. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the streaked horned lark. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 8/9/2022; Wherever found; *States within the range:* OR, WA. Figure 20 depicts a map of the species' range.

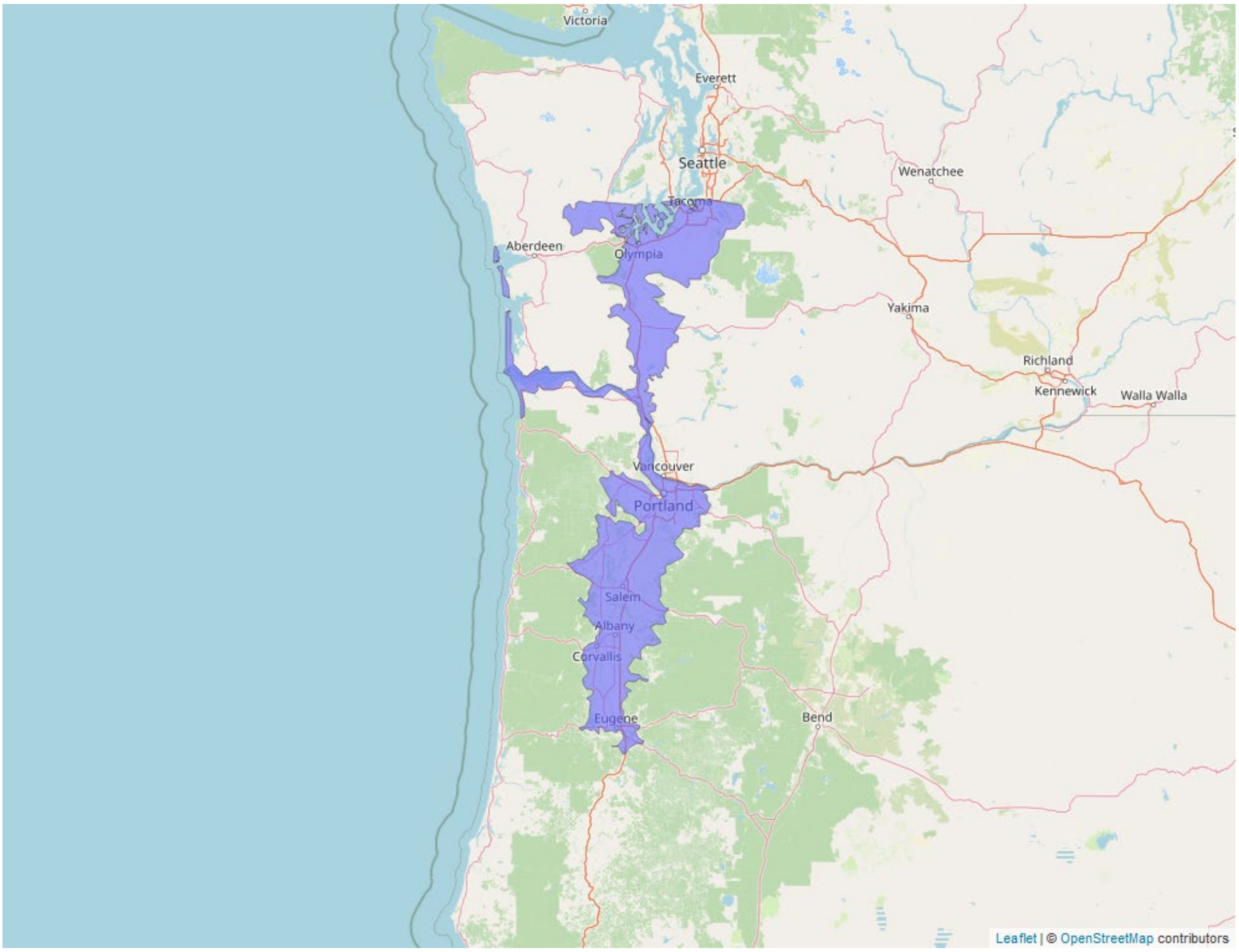

Figure 22. Range map of streaked horned lark (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/7268.

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: 4/13/2021

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: No

Environmental Baseline/Cumulative Effects (EB/CE) Summary

We consider the impacts from the loss of genetic diversity, low reproductive success, stochastic weather events, aircraft strikes, and recreation to pose a threat to the streaked horned lark in combination with the other threat factors, particularly given the inherent vulnerability of streaked horned lark due to small population sizes and isolation of small populations. Streaked horned lark has been extirpated as a breeding subspecies throughout much of its range, including all its former range in British Columbia, the San Juan Islands, the northern Puget Trough, the Washington coast north of Grays Harbor, the Oregon coast, and the Rogue and Umpqua Valleys in southwestern Oregon (Pearson & Altman 2005, pp. 4– 5). The current range of the streaked horned lark can be divided into three regions: (1) The south Puget Sound in Washington; (2) the Washington coast and lower Columbia River islands (including dredge spoil deposition sites near the Columbia River in Portland, Oregon); and (3) the Willamette Valley in Oregon.

An analysis of recent data from a variety of sources concludes that the streaked horned lark has been extirpated from the Georgia Depression (British Columbia, Canada), the Oregon coast, and the Rogue and Umpqua Valleys (Altman 2011, p. 213); this analysis estimates the current rangewide population of streaked horned larks to be about 1,170–1,610 individuals (Altman 2011, p. 213). Recent studies have found that larks have very low nest success in Washington (Pearson et al. 2008, p. 8); comparisons with other ground-nesting birds in the same prairie habitats in the south Puget Sound showed that streaked horned larks had significantly lower values in all measures of reproductive success (Anderson 2010, p. 16). Estimates of population growth rate (l, lambda) that include vital rates from nesting areas in the south Puget Sound, Washington coast, and Whites Island in the lower Columbia River indicate streaked horned larks have abnormally low vital rates, which are significantly lower than the vital rates of the arctic horned lark (Camfield et al. 2010, p. 276). One study estimated that the population of streaked horned larks in Washington was declining by 40 percent per year (l = 0.61 ± 0.10 SD), apparently due to a combination of low survival and fecundity rates (Pearson et al., 2008, p. 12). More recent analyses of territory mapping at 4 sites in the south Puget Sound found that the total number of breeding streaked horned lark territories decreased from 77 territories in 2004, to 42 territories in 2007, a decline of over 45 percent in 3 years (Camfield et al. 2011, p. 8). On the Washington coast and Columbia River islands, there are about 120–140 breeding larks (Altman 2011, p. 213). Data from the Washington coast and Whites Islands were included in the population growth rate study discussed above; populations at these sites appear to be declining by 40 percent per year (Pearson et al. 2008, p. 12). Conversely, nest success appears to be very high at the Portland industrial sites (Rivergate and the Southwest Quad). In 2010, nearly all nests successfully fledged young (Moore 2011, p. 13); only 1 of 10 monitored nests lost young to predation (Moore 2011, pp. 11–12). There are about 900–1,300 breeding streaked horned larks in the Willamette Valley (Altman 2011, p. 213). The largest known population of streaked horned larks breeds at the Corvallis Municipal Airport; depending on the management conducted at the airport and the surrounding grass fields each year, the population has been as high as 100 breeding pairs (Moore and Kotaich 2010, pp. 13–15).

Although streaked horned larks use a wide variety of habitats, populations are vulnerable because the habitats used are often ephemeral or subject to frequent human disturbance. Ephemeral habitats include bare ground in agricultural fields and wetland mudflats; habitats subject to frequent human disturbance include mowed fields at airports, managed road margins, agricultural crop fields, and disposal sites for dredge material (Altman 1999, p. 19). Genetic analysis has shown that streaked horned larks have suffered a loss of genetic diversity due to a population bottleneck (Drovetski et al. 2005, p. 881), the effect of which may be exacerbated by continued small total population size. The potential impacts of a changing global climate to the streaked horned lark are presently unclear. Habitat changes to streaked horned lark habitat from climate change may provide some benefit to the subspecies, and as such climate change is not currently considered a threat; however, stochastic weather events may pose a threat to wintering flocks in the Willamette Valley.

Death of individual larks caused by aircraft strikes is a threat to the small populations at airports, as the loss of even a single breeding individual can have an adverse effect on the population. Recreation activities can cause the degradation of streaked horned lark habitat and direct mortality to nests and young. The current influences on streaked horned lark viability are the ongoing loss and degradation of suitable habitat, military training, land management activities and related effects, recreation, and aircraft strikes. Conservation actions to benefit the lark have been implemented at a number of sites throughout the lark’s range, partially ameliorating the adverse effects of these threats. Threats that influence individuals, but which are not known to influence populations or have a species-level affect include predation, disease, and pesticides.

Overall Vulnerability: High

Effects of the Action: Exposure

Overlap

We expect 55.4% 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 13.5% of the species’ range overlaps with methomyl use sites while 41.9% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 27. Overlap and usage data for the streaked horned lark.

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	0.4	2.4	2.7	<0.1	0.3	0.4
Citrus	NA	NA	NA	NA	NA	NA
Corn[13]	1.7	4.3	6	<0.1	0.2	0.3
Cotton	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Other Grains	1.2	5.9	7.1	<0.1	0.3	0.4
Other Orchards	3.6	13.8	17.4	3.6	13.8	17.4
Other Row Crops	0.8	3.8	4.6	0.4	1.7	2.1
Soybeans	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Vegetables and Ground Fruit	5.8	11.8	17.6	5.8	11.8	17.6
Wheat	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Total	**13.5**	**41.9**	**55.4**	**10**	**28.2**	**38.2**

Usage

Based on past usage data, we anticipate up to 38.2% of the species' range will be treated with methomyl (Table 27).

Additional Exposure Considerations

Streaked horned larks forage on the ground in low vegetation or on bare ground; adults feed on a wide variety of grass and weed seeds, but feed insects to their young. Habitat used by larks is generally flat with substantial areas of bare ground and sparse low-stature vegetation primarily composed of grasses and forbs. The streaked horned lark nests in a broad range of habitats, including native prairies, coastal dunes, fallow and active agricultural fields, wetland mudflats, sparsely-vegetated edges of grass fields, recently planted Christmas tree farms with extensive bare ground, moderately- to heavily-grazed pastures, gravel roads or gravel shoulders of lightly-

[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.

traveled roads, airports, and dredge deposition sites in the lower Columbia River. Wintering streaked horned larks use habitats that are very similar to breeding habitats. The streaked horned lark is a local migrant, most wintering in the Willamette Valley and on the islands in the lower Columbia River; the rest spend the winter on the Washington coast or in the south Puget Sound

Larks are attracted to the wide-open landscape context and low vegetation structure in agricultural fields, especially in grass seed fields. The switch from grass seed production to crops that lack the low-statured vegetation and bare ground preferred by the streaked horned lark (e.g., wheat, stock for nurseries and greenhouses, grapes, blueberries, and hazelnuts) has contributed to a decline in suitable habitat for this species. Maintenance of extensive agricultural lands (primarily grass seed farms) has been noted as an important factor in maintaining the population of streaked horned larks in the Willamette Valley and aiding in the recovery of the subspecies in Oregon. As such, take prohibitions for routine agricultural activities on non-federal lands is excepted throughout the range of the streaked horned lark as a means to maintain suitable habitat and remove incentives to decrease that suitable habitat to avoid liability under the Act. The rule excepting these activities from take prohibition contains a number of examples of common agricultural practices, including “Planting, harvesting, rotation, mowing, tilling, discing, burning, and herbicide application to crops”. In addition, while the rule does not specifically mention insecticides in the exceptions from prohibitions, it does mention the removal or other management of noxious weeds using methods that include herbicide and fungicide application, and fumigation.

Streaked horned larks use agricultural lands for breeding, foraging, and winter roosting. Of all agricultural types, grass seed provides the most habitat for the lark. In addition, if the landscape context is open, larks may use newly planted orchards and vineyards for breeding, foraging, and winter roosting (Pers. comm. 2016 co-occurrence information, USFWS field office request). As methomyl is not registered for use on grass seed and many of the use sites within the species’ range are not consistent with preferred habitat of streaked horned larks when active, exposure to methomyl is expected to be lower than is predicted by overlap. In addition, though larks may these sites when fields are fallow, that use is unlikely to coincide with methomyl usage.

Exposure Summary

There is a high extent of overlap between the action area and the species’ range. Based on past usage data, we expect a high level of usage within the species’ range. While we do not expect that all methomyl use sites will provide suitable habitat to streaked horned larks, especially when crops are active, we still consider the potential for exposure to be high due to the extensive occurrence of agriculture within the range. As such, we expect a large number of individuals to experience exposure from the proposed action.

Overall Exposure Ranking: High

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to streaked horned larks. Exposure to methomyl is expected to result in mortality to streaked horned larks depending on the expected dosage, which is determined by the dietary item and the location where foraging occurs. We expect that consumption of seeds will result in mortality to streaked horned larks on-field, with dosage up to 1.6 mg/kg-bw, while off-field dosages are only expected to reach 0.1 mg/kg-bw and not expected to cause mortality. We expect methomyl concentration on insects, which are primarily fed to young larks, will be high enough to cause mortality both on-field and in the areas adjacent to fields that have been exposed via spray drift. We do not expect sublethal effects to occur from exposure to methomyl at estimated environmental concentrations.

Indirect Effects:

Streaked horned lark adults feed on a wide variety of grass and weed seeds, and feed insects to their young. Based on available toxicity data, we do not expect adverse effects to plant resources, but expect that arthropods will die with exposure to methomyl, both on- and off-field. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than will be anticipated from spray drift. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur, particularly during the time of nesting and chick growth.

Toxicity Summary

We expect mortality to occur to chicks fed insects that have been exposed to methomyl either on-field or from spray drift. We expect adults to die from feeding on seeds that have been exposed on-field, but not in areas adjacent to fields. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur due to decreases in prey abundance during the period of nesting and chick growth.

Overall Toxicity Ranking: High

Effects of the Action Summary

The streaked horned lark has a high exposure ranking. Based on past methomyl usage data, we expect up to 38.2% of the range may be treated annually but may potentially cover up to 55.4% of the range over the duration of the proposed action depending how usage patterns change over time. While we do not expect that all methomyl use sites will provide suitable habitat to streaked horned larks, especially when crops are active, we still consider the potential for exposure to be high due to the extensive occurrence of agriculture within the range. As such, we expect a large number of individuals are likely to be exposed to methomyl.

The streaked horned lark has a high toxicity ranking. We expect mortality to occur to chicks fed insects that have been exposed to methomyl either on-field or from spray drift. We expect adults to die from feeding on seeds that have been exposed on-field, but not in areas adjacent to fields. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur due to decreases in prey abundance during the period of nesting and chick growth.

Given that we expect a large number of individuals are likely to experience exposure, and given that we expect a large level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is high.

Conclusion

The streaked horned lark has been extirpated as a breeding subspecies throughout much of its range, including all its former range in British Columbia, the San Juan Islands, the northern Puget Trough, the Washington coast north of Grays Harbor, the Oregon coast, and the Rogue and Umpqua Valleys in southwestern Oregon. The current range of the streaked horned lark can be divided into three regions: (1) The south Puget Sound in Washington; (2) the Washington coast and lower Columbia River islands (including dredge spoil deposition sites near the Columbia River in Portland, Oregon); and (3) the Willamette Valley in Oregon. Streaked horned larks use a wide variety of habitats that are often ephemeral or subject to frequent human disturbance, including agricultural crop fields. Genetic analysis has shown that streaked horned larks have suffered a loss of genetic diversity due to a population bottleneck. The current influences on streaked horned lark viability are the ongoing loss and degradation of suitable habitat, military training, land management activities and related effects, recreation, and aircraft strikes. Pesticides have not been found to influence populations or have a species-level affect. Conservation actions to benefit the lark have been implemented at a number of sites throughout the lark's range. The species has a high vulnerability ranking.

The streaked horned lark has a high exposure ranking. Data indicate 55.4% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area, and we anticipate up to 38.2% of the species' range will be treated with methomyl annually based on past usage data. Streaked horned larks use agricultural lands for breeding, foraging, and winter roosting. They forage on the ground in low vegetation or on bare ground. Adults feed on a wide variety of grass and weed seeds, but feed insects to their young. Streaked horned larks are attracted to wide open landscapes and low vegetation structure which can be found in some agricultural fields. As such, maintenance of extensive agricultural lands (primarily grass seed farms, which is not a methomyl use) has been noted as an important factor in maintaining the population of streaked horned larks in parts of the range. Exposure to methomyl use sites is expected to be lower than is predicted by the overlap due to the lark's preferred habitats and timing of use, as they prefer low-statured vegetation and bare ground that may be limited in some crop fields during the active growing season. Habitat conditions in some types of agricultural fields will be more favorable when they are fallow, a time period when methomyl applications will be less likely to occur.

We expect consumption of food items in and around agricultural fields to be the primary route of methomyl exposure to streaked horned larks. We expect mortality of chicks fed insects that have been exposed to methomyl either on-field or from spray drift. We also expect mortality of adults that feed on seeds that have been exposed on-field, but not in areas adjacent to fields. Indirect effects are likely to occur due to decreases in prey abundance during the period of nesting and chick growth that lead to starvation, reduced growth or impacts to fitness. While we do not expect that all methomyl use sites will provide suitable habitat to streaked horned larks, especially when crops are active, we consider the potential for exposure to be high due to the extensive occurrence of agriculture and use sites within the range. As such, we expect a large number of individuals are likely to be exposed to methomyl. Given that we expect a large level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is high.

In summary, the streaked horned lark has a high vulnerability and a high overall risk associated with the proposed action. However, this species has a fairly wide distribution, occurring in three different regions of western Oregon and Washington. We do not anticipate adverse effects will occur in all areas at the same time, although we expect the loss of a large number of individuals, as well as losses of prey items across overlapping portions of the range over the duration of the proposed action. We expect individuals will be able to move to areas with alternate prey when losses occur in localized areas, although we anticipate reduced reproductive success, starvation, and reduced chick growth for a small number of individuals in localized areas. According to the 2021 Species Status Assessment for the streaked horned lark, pesticides may affect individuals, but are not known to influence populations or have a species-level affect. Thus, while there is extensive overlap of the range with the proposed action and high anticipated usage that will likely impact a large number of individuals, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the streaked horned lark.

References

U.S. Fish and Wildlife Service. 2012. Determination of Endangered Status for the Taylor's Checkerspot Butterfly and Threatened Status for the Streaked Horned Lark. Federal Register 77(197):61938-62058.

U.S. Fish and Wildlife Service. 2021. Species Status Assessment for the Streaked Horned Lark (*Eremophila alpestris strigata*). Version 1.0. Portland, Oregon. 78 pp.

Integration and Synthesis Summary: Birds – Rufa red knot

Scientific Name:	Common Name:	Entity ID:
Calidris canutus rufa	Rufa red knot	8621

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is low. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the rufa red knot. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 5/26/2023; Wherever found; *States within the range:* AL, AR, CO, CT, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NY, OH, OK, PA, RI, SC, SD, TN, TX, VA, WI, WV, WY. Figure 21 depicts a map of the species' range.

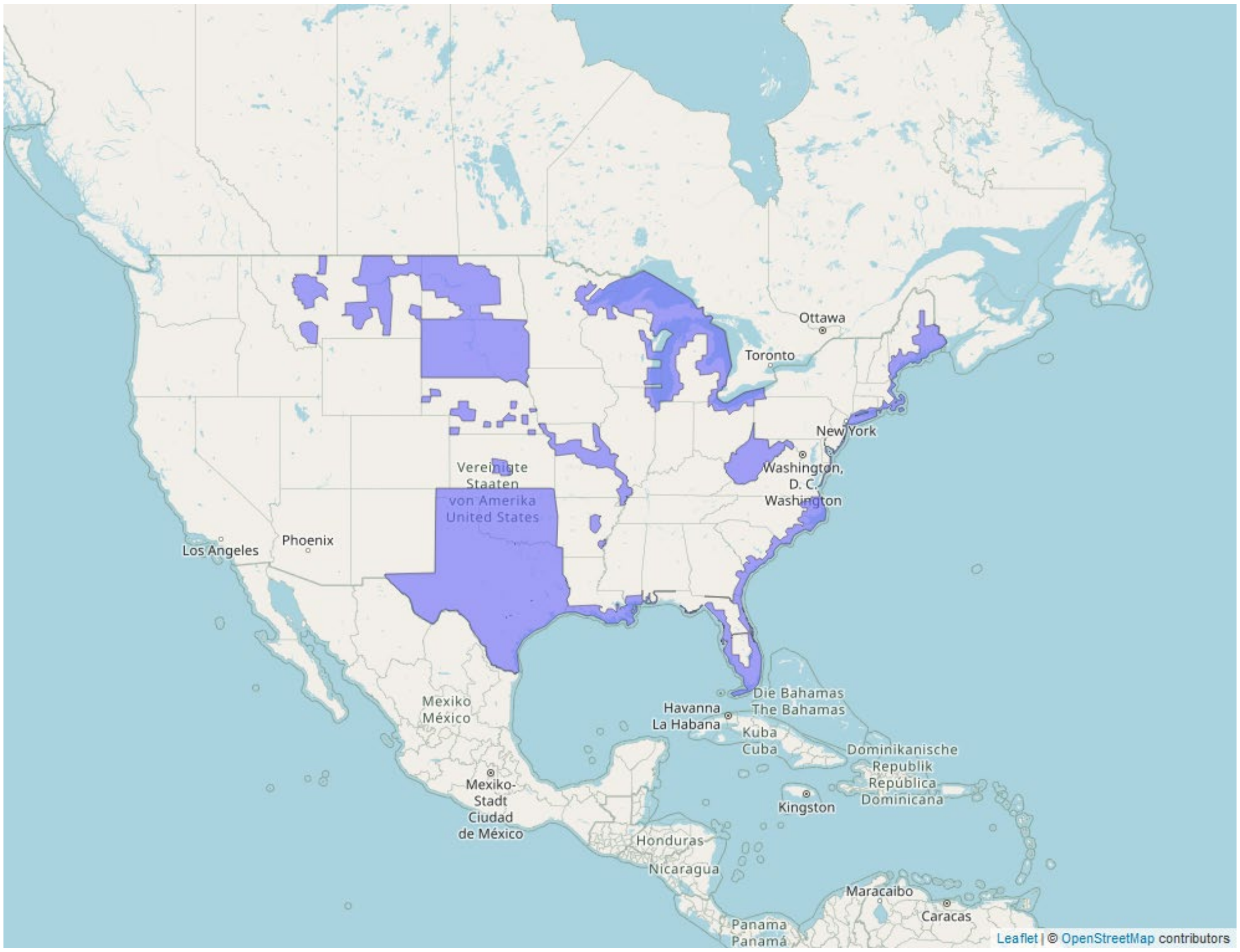

Figure 23. Range map of Rufa red knot (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/1864.

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: 12/6/2021

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 rufa red knot is a subspecies of the red knot listed as threatened in 2014. An overall, sustained decline of rufa red knot numbers occurred at Tierra del Fuego and Delaware Bay in the 2000s, and these red knot populations may have stabilized at a relatively low level in the last few years. Although we lack sufficiently robust data to conclude if other wintering and stopover areas also declined, we conclude it is likely that declines at Tierra del Fuego and Delaware Bay drove an overall population decline (i.e., lower total numbers), because these two sites supported a large majority of rangewide knots during the baseline 1980s period. Past habitat losses in wintering and migration areas have reduced the resilience of the red knot. Ongoing losses in these areas from sea level rise, shoreline hardening, and development are expected to continue into the coming decades. Beach nourishment can be beneficial or detrimental to red knot habitat, though any negative effects are mostly considered to be short-term. More recently, vegetation and ecosystem changes resulting from climate change, and potentially from development, have begun to threaten habitat loss on the breeding grounds as well.

Threats to the current and future quality and quantity of prey resources are present throughout the red knot's range from climate change and other causes (e.g., ocean acidification; warming coastal waters; marine diseases, parasites, and invasive species; sediment placement; recreation; and fisheries). Reduced food availability in Delaware Bay due to commercial harvest of the horseshoe crab (*Limulus polyphemus*) is considered a primary causal factor in red knot population declines in the 2000s. Red knots rely on horseshoe crab eggs as food during their spring stopover in Delaware Bay. We do not consider the horseshoe crab harvest a threat under the science-based management framework that has been developed and adopted to explicitly link harvest quotas to red knot population growth. However, horseshoe crab monitoring necessary for the implementation of the management framework was not conducted in 2013 or 2014 due to lack of funding; thus, the framework is not currently being implemented as it was intended to function. There is uncertainty regarding implementation of the framework in the future. While we anticipate a fully functioning management framework will continue to adequately abate the threat to red knots from the horseshoe crab harvest, there are other biological factors independent of harvest that may limit the availability of horseshoe crab eggs into the future. For example, horseshoe crab population growth may be limited by a biological lag time because horseshoe crabs take up to 10-years to become sexually mature and therefore it may take at least that long for harvest restrictions (which have been phased in since 2000) to produce a corresponding increase in horseshoe crab populations. Other factors (e.g., early life stage mortality, undocumented or underreported mortality) may also be slowing horseshoe crab population growth. Most data suggest that the volume of horseshoe crab eggs is currently sufficient to support the Delaware Bay's stopover population of red knots at its present size. However, because of the uncertain trajectory of horseshoe crab population growth, it is not yet known if the horseshoe crab egg resource will continue to adequately support red knot population growth over the next decade.

The red knot faces ongoing and future increases in asynchronies (timing mismatches) throughout its migration and breeding range as a result of climate change and unknown causes. Successful annual migration and breeding of red knots is highly dependent on the timing of departures and arrivals to coincide with favorable food and weather conditions in the spring and fall migratory stopover areas and on the Arctic breeding grounds. On the arctic breeding grounds, normal 3- to 4-year cycles of high predation, mediated by rodent (e.g., lemming) cycles, result in years with low reproductive output of red knots (in some years it is zero), but do not threaten the survival of the red knot at the subspecies level. That is, when lemmings are abundant, predators (e.g., arctic fox) concentrate on the lemmings, and shorebirds breed successfully, but when lemmings are in short supply, predators switch to shorebird eggs and chicks (Niles et al. 2008, p. 101; COSEWIC 2007, p. 19; Meltofte et al. 2007, p. 21; USFWS 2003, p. 23; Blomqvist et al. 2002, p. 152; Summers and Underhill 1987, p. 169). It is believed shorebirds, such as red knots, have adapted to these cycles, therefore these natural cycles are not considered a threat to the red knot. What is a threat, however, is that these natural rodent/predator cycles are being disrupted by climate change, which may increase predation rates on shorebirds over the long term and have subspecies level effects (Factor C and Factor E) (Chapter 28 in IPCC 2014, p. 14; Fraser et al. 2013, pp. 13, 16; Brommer et al. 2010, p. 577; Ims et al. 2008, p. 79; Kausrud et al. 2008, p. 98). The documented collapse or dampening of rodent (e.g., lemmings) population cycles of over the last 20 to 30 years in parts of the Arctic can be attributed to climate change with ''high confidence'' (Chapter 28 in IPCC 2014, p. 14).

We conclude that disruptions in the rodent/ predator cycle pose a substantial threat to the red knot, as they may result in prolonged periods of low reproductive output of red knots due to increased predation. The substantial impacts of elevated egg and chick predation on shorebird reproduction are well known. Disruptions in the rodent/ predator cycle may have already affected red knot populations and are likely to increase due to climate change. Other factors may cause additive red knot mortality. Individually, these factors are not expected to have subspecies level effects; however, cumulatively, these factors could exacerbate the effects of the primary threats if they further reduce the species' resiliency. These secondary factors include hunting; predation in nonbreeding areas; and human disturbance, oil spills, and wind energy development especially near the coasts. In summary, the rufa red knot faces numerous threats across its range on multiple geographic and temporal scales. These threats are affecting the subspecies now and will continue to have subspecies-level effects into the future.

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 43.9% 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 28). Up to 20% of the species' range overlaps with methomyl use sites while 23.9% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 28. Overlap and usage data for the Rufa red knot.

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	4.3	5.7	0.2	0.7	0.9
Citrus	NA	NA	NA	NA	NA	NA
Corn[14]	8.1	6	14.1	0.4	0.3	0.7
Cotton	2.8	2.1	4.9	0.1	<0.1	0.2
Other Grains	4.8	7.5	12.3	0.2	0.4	0.6
Other Orchards	0.2	0.5	0.6	0.2	0.4	0.6
Other Row Crops	1.2	1.5	2.7	0.5	0.7	1.2
Soybeans	7.2	4.5	11.7	0.4	0.2	0.6
Vegetables and Ground Fruit	1.4	2	3.4	1.4	2	3.4
Wheat	NA	NA	NA	NA	NA	NA
Total	**20**	**23.9**	**43.9**	**3.1**	**4.5**	**7.6**

Usage

Based on past usage data, we anticipate up to 7.6% of the species' range will be treated with methomyl annually (Table 28).

[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.

Additional Exposure Considerations

Red knots migrate in large flocks northward through the conterminous United States mainly April-June, southward July-October. The species is more abundant in migration along the U.S. Atlantic coast than on the Pacific coast. This species typically makes long flights between stops. Delaware Bay is the most important spring migration stopover in the eastern United States

Red knots are not expected to forage in agricultural areas where methomyl is registered for use, but suitable habitat adjacent to use sites could be exposed from spray first of runoff (Pers. Comm. 2016 co-occurrence information, USFWS field office request). Given the broad nature of the range map for this species in certain areas, it is unlikely that the entire area of overlap adjacent to agriculture represents red knot foraging habitat. Therefore, it is expected the area of red knot habitat exposed to spray drift is lower than the 23.9% overlap and 4.5% treated.

Exposure Summary

The red knot is not expected to forage in agricultural use sites. Given that all areas adjacent to agriculture in the species' range are unlikely to be red knot habitat, we anticipate a medium extent of overlap between the action area and the species' range that could be exposed via spray drift, and a low extent of usage in these areas. As such, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We do not expect the red knot to experience any direct adverse effects from dietary exposure to estimated environmental concentrations of methomyl concentrations.

Indirect Effects:

The red knot is an invertivore that consumes mollusks, eggs of crab (primarily horseshoe crab), seeds, and small fishes. Horseshoe crab eggs are an important source of food for north-bound migrants at Delaware Bay. Based on available toxicity data, we expect individuals of these prey species will likely die with exposure to methomyl as a result of spray drift or runoff. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. As the red knot eats a variety of dietary items, we anticipate that they will generally be able to adapt to the loss any particular prey item. In addition, this species is highly mobile and thus anticipate alternative foraging areas will be available if local foraging sites become unsuitable due to lack of adequate food resources. While reduced food availability from horseshoe crab decline has been cited as a causal factor of red knot decline, horseshoe crabs are not expected to be in proximity to methomyl use sites due to their coastal and offshore habitats. As such, even though toxicity to prey items is anticipated to be high, we anticipate a low level of indirect adverse effects are likely to occur.

Toxicity Summary

We do not expect any direct adverse effects to red knots through dietary exposure of contaminated prey. Though we anticipate methomyl exposure will cause mortality to some organisms that act as food resources for the red knot, we expect as a generalist feeder, the red knot will be less affected by the loss of any specific dietary item. In addition, methomyl usage is not expected to contribute to the decline in horseshoe crabs that decreased food resources at the significant stopover location in Delaware Bay. As such, we determine the red knot has a low toxicity ranking.

Overall Toxicity Ranking: Low

Effects of the Action Summary

The red knot has a medium exposure ranking. The red knot is not expected to forage in agricultural use sites. Given that all areas adjacent to agriculture in the species' range are unlikely to be red knot habitat, we anticipate a medium extent of overlap between the action area and the species' range that could be exposed via spray drift, and a low extent of usage in these areas. As such, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

The red knot has a low toxicity ranking. We do not expect any direct adverse effects to red knots through dietary exposure of contaminated prey. Though we anticipate methomyl exposure will cause mortality to some organisms that act as food resources for the red knot, we expect as a generalist feeder, the red knot will be less affected by the loss of any specific dietary item. In addition, methomyl usage is not expected to contribute to the decline in horseshoe crabs that decreased food resources at the significant stopover location in Delaware Bay. As such, we determine the red knot has a low toxicity ranking.

Given that we expect a moderate number of individuals are likely to experience exposure, no direct adverse effects are expected, and only low levels of indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is low.

Conclusion

Red knot numbers experienced a sustained declines at Tierra del Fuego and in the Delaware Bay in the 2000s, although these red knot populations appear to have stabilized at a relatively low level more recently. Habitat losses and degradation in wintering and migration areas have reduced the resilience of the red knot. Other threats include reductions in the current and future quality and quantity of prey resources. Reduced food availability of horseshoe crab eggs in the Delaware Bay was considered a primary causal factor in red knot population declines in the 2000s. Red knots rely on this food resource during their spring stopover. It is not yet known if the horseshoe crab egg resource will continue to adequately support red knot population growth over the next decade. In addition, the red knot faces ongoing and future increases in asynchronies (timing mismatches) throughout its migration and breeding range as a result of climate change and unknown causes. Successful annual migration and breeding of red knots is highly dependent on the timing of departures and arrivals to coincide with favorable food and weather conditions, as well as the timing of prey/predator cycles. Disruptions in the rodent/predator cycle may have already affected red knot populations and are likely to increase due to climate change. These and other threats are likely to continue into the future. We assigned a medium vulnerability ranking to this species. The rufa red knot has a medium exposure ranking.

We expect 43.9% of the species range overlaps with methomyl use sites or is likely to be exposed through off-site transport within the action area. Within these overlapping areas, anticipate 7.9% will be exposed to methomyl annually. However, rufa red knots are not expected to forage in agricultural areas where methomyl is registered for use, and it is unlikely that the entire area of overlap adjacent to agriculture represents red knot foraging habitat. Off-field areas that will be exposed overlap with 23.9% of the range, and we expect 4.5% of the range will be treated annually. However, we do not anticipate the red knot will be exposed in all of these areas, and where exposed, we do not expect the red knot will experience direct adverse effects. Prey losses are likely to occur, although prey items exhibit a range of sensitivities to methomyl, and some are likely to remain. Horseshoe crabs are not expected to be in proximity to methomyl use sites due to their coastal and offshore habitats, and thus we do not anticipate impacts to horseshoe crab eggs from the proposed action. In addition, the red knot forages on a variety of prey and seeds and is highly mobile, thus individuals are likely to find alternative foraging areas when there are localized reductions in prey. Therefore, we determine the overall risk of the proposed action to the species is low, although we expect a small number of individuals will be affected from the losses of invertebrate prey that lead to starvation during migration or reduced fitness.

In summary, the rufa red knot has a medium vulnerability, and the overall risk to the species is low. The rufa red knot is not likely to be directly affected from consuming exposed food items, and most individuals will likely move to alternative sites to forage as needed to find sufficient prey when there are losses of invertebrates in localized areas. We expect impacts to a small number of individuals due to starvation or lower reproductive success as a consequence of losses of prey items over the duration of the proposed action. However, we do not expect these effects will likely reduce the reproduction, numbers, and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the rufa red knot.

References

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot. Final Rule. Federal Register 79:73705-73748.

Integration and Synthesis Summary: Birds - Eastern black rail

Scientific Name:	Common Name:	Entity ID:
Laterallus jamaicensis ssp. jamaicensis	Eastern black rail	11319

Species Overview

In reviewing the status of the species, the environmental baseline, and cumulative effects for the action area, we determined that the species' vulnerability is medium. In our evaluation of the effects of the proposed action to the species, based on overlap of the action area with the species' range, past annual usage of methomyl within the species' range, and the direct and indirect effects to the species from methomyl exposure, we determine the risk of adverse effects to the species is medium. Based on this information and other factors in our analysis of the consequences of the action on the likelihood of the survival and recovery of this species in the wild, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the eastern black rail. We discuss our rationale for this conclusion for the species in the sections below.

Species range

Based on range map dated: 7/24/2023; Wherever found; *States within the range:* AL, AR, CO, FL, GA, IN, LA, MS, NC, SC, TN, TX, VA. Figure 22 depicts a map of the species' range.

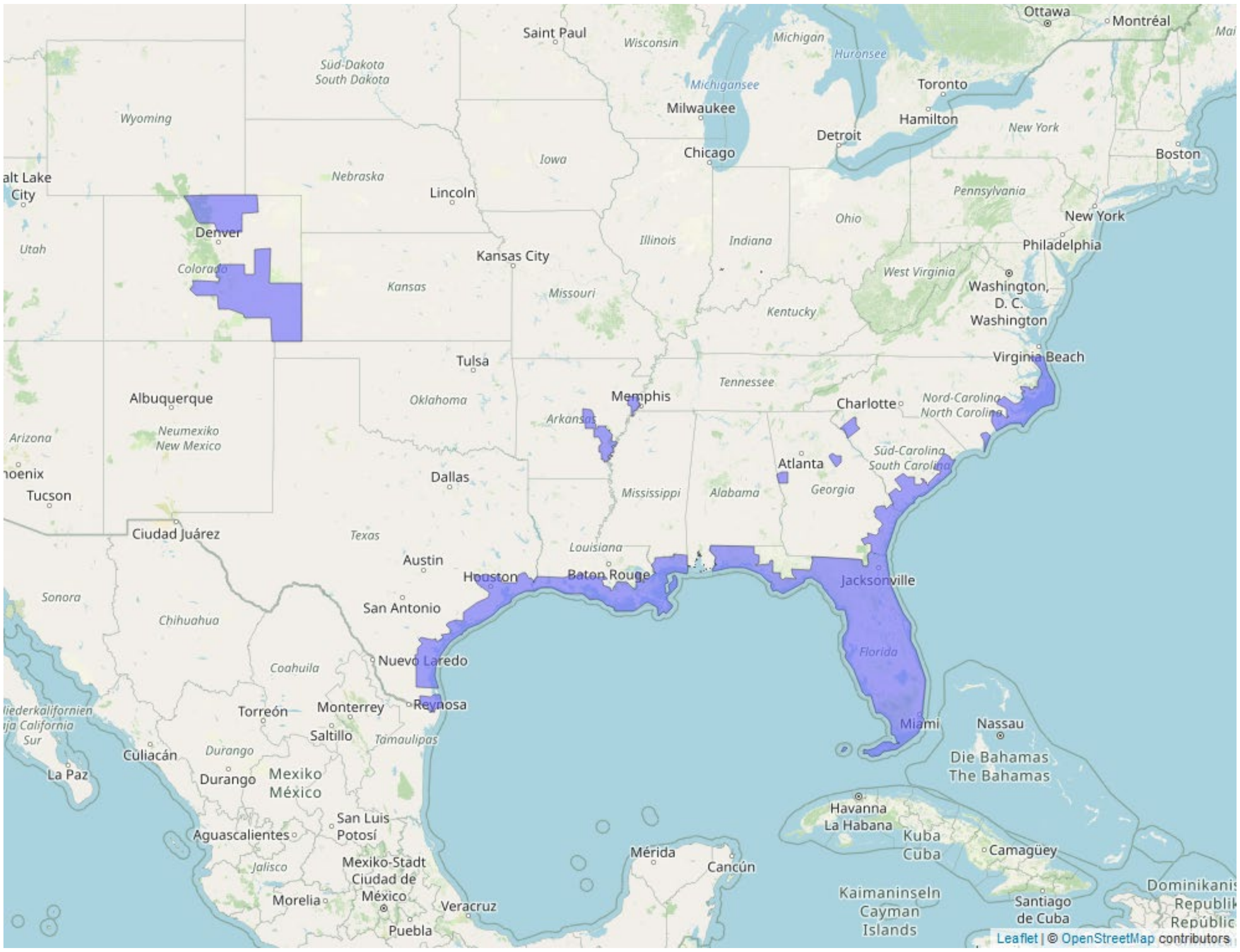

Figure 24. Range map of eastern black rail (blue polygons). Range map accessed at https://ecos.fws.gov/ecp/species/10477.

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 (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 eastern black rail is a subspecies of black rail, a small, cryptic marsh bird that occurs in salt, brackish, and freshwater wetlands in the eastern United States (east of the Rocky Mountains), Mexico, Central America, and the Caribbean. Despite having a wide distribution, the eastern black rail currently has low redundancy across its range. Eastern black rails occupy relatively high elevations along heavily vegetated wetland gradients, with soils moist or flooded to a shallow depth. The subspecies requires dense vegetative cover that allows movement underneath the canopy, and because birds are found in a variety of salt, brackish, and freshwater wetland habitats that can be tidally or non-tidally influenced, plant structure is considered more important than plant species composition in predicting habitat suitability.

Historically, the primary stressors to the eastern black rail included habitat degradation and fragmentation from conversion of marshes and wetlands to agricultural lands or urban areas. Also, historical efforts to reduce mosquito populations included marsh draining and ditching, both of which reduced suitable habitat for the eastern black rail. The change of hay harvesting from traditional methods to mechanical methods also lead to habitat degradation and direct mortality of eastern black rails present around these areas. In addition, coastal prairie habitats in Texas were converted to pasture for cattle grazing as well as agriculture (forage, grain crops). Habitat degradation and resulting wetland loss from ditching and draining of marshes for mosquito control is not a current stressor, and conversion of wetlands to agricultural and urban areas has slowed as compared to historically.

Currently, the eastern black rail is impacted by the loss, degradation, and fragmentation of wetland habitats resulting from sea level rise along the coast and ground-and surface-water withdrawals across the subspecies' range. Incompatible land management techniques, such as application of poorly timed and planned prescribed fires, intense grazing, or haying, also have negative impacts on the eastern black rail and its habitat, especially when conducted at sensitive times, such as the breeding season or the flightless molt period. Stochastic events, such as flood events and hurricanes, can also have significant impacts on populations of eastern black rail. A concern is the wide-spread use of pesticides to control mosquitoes in marshes that are used by eastern black rails and potential impacts that may occur to the prey base (Morris et al. 2005, pp. 11-12; Poulin et al. 2010, p. entire; Lagadic et al. 2014, pp. 108-109). The importance of mosquitoes to the diet of eastern black rails is currently unknown. However, individuals have been observed to feed on mosquito larvae in the field, as well as consume adult mosquitoes when captured temporarily (Woodrow 2017, pers. comm.; Hand 2018, pers. comm.). While there are hotspots for environmental contaminants, there is no evidence of specific threats that might affect the subspecies and demonstrate a population level response. Indirect effects to eastern black rails such as impacts to forage base from certain pesticides require further study. In reviewing the potential factors that could be affecting the viability of the eastern black rail, concerns identified included environmental contaminants such as pesticides.

Overall Vulnerability: Medium

Effects of the Action: Exposure

Overlap

We expect 26.3% 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 29). Up to 11.4% of the species' range overlaps with methomyl use sites while 14.8% of the range occurs off-field (but may still be exposed to spray drift or runoff).

Table 29. Overlap and usage data for the eastern black rail.

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	0.7	1.1	1.8	0.1	0.2	0.3
Citrus	NA	NA	NA	NA	NA	NA
Corn[15]	3.2	4.4	7.6	0.2	0.2	0.4
Cotton	1.8	1.9	3.7	<0.1	0.1	0.2
Other Grains	4.5	4.7	9.2	0.2	0.3	0.5
Other Orchards	<0.1	0.3	0.4	<0.1	0.3	0.4
Other Row Crops	0.8	1.6	2.3	0.4	0.7	1.1
Soybeans	2.8	2.5	5.3	0.2	0.1	0.3
Vegetables and Ground Fruit	0.3	0.9	1.3	0.3	1	1.3

[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.

Use Layer	Use Site Overlap (% range)	Off-field Overlap (% range)	Total Overlap (% range)	% Range Treated (On-field)	% Range Treated (90-m)	Total % Range Treated
Wheat	NA	NA	NA	NA	NA	NA
Total	**11.4**	**14.8**	**26.3**	**1.4**	**2.8**	**4.2**

Usage

Based on past usage data, we anticipate up to 4.2% of the species' range will be treated with methomyl annually (Table 29). Of this total area, we expect up to 2.8% will include off-field areas exposed due to spray drift or runoff.

Additional Exposure Considerations

Eastern black rails occupy relatively high elevations along heavily vegetated wetland gradients, with soils moist or flooded to a shallow depth. Eastern black rails fly little during the breeding and wintering seasons, and will remain on the ground, running quickly through dense vegetation likely using the runways of rodents and rabbits. As such, black rails require dense vegetative cover that allows movement underneath the canopy.

As the eastern black rail is a wetland specialist, individuals are not expected to enter agricultural fields but could be exposed to methomyl from spray drift or runoff where wetlands are adjacent to agricultural fields. Given the relatively broad nature of the species' range map, we do not expect that all areas adjacent to methomyl use sites will be wetland habitats suitable for eastern black rails. In addition, where these areas occur adjacent to agricultural fields, we expect the dense vegetation of the marsh habitats where the black rail resides will limit off-site movement of methomyl to some degree. Thus, we expect that overlap and usage that will result in exposure will be less than the 14.8% of the range and 2.8% annual usage estimated within the 90-m spray drift and runoff zone.

Exposure Summary

The eastern black rail is not expected to forage in agricultural fields. Given the habitat requirements of the black rail, we expect a medium extent of overlap between adjacent off-field sites within the action area and the species' range. Based on past usage data, we expect a low level of usage within the species' range. Given that the extent of overlap is medium and that expected usage is low, we expect a moderate number of individuals are likely to experience exposure from the proposed action.

Overall Exposure Ranking: Medium

Effects of the Action: Toxicity

Direct Effects:

We expect consumption of food items in areas around agricultural fields to be the primary route of methomyl exposure to eastern black rails. Eastern black rails forage on a variety of small aquatic and terrestrial invertebrates and seeds, by gleaning or pecking at individual items. Consumption of plants or aquatic prey items contaminated with methomyl is not expected to result in adverse effects to eastern black rails. Consumption of arthropods that have been exposed via spray drift can result in dosages that we expect to cause mortality, up to 0.8 mg/kg-bw methomyl. However, the densely vegetated habitat where eastern black rails forage is expected to limit exposure of terrestrial invertebrates to spray drift. While insects contaminated by spray drift may move into areas where black rails forage, we expect that the incidence of this occurring will be low. Given the wide variety of dietary items consumed by the eastern black rail, we expect that individuals consuming only contaminated terrestrial invertebrates will be rare. We do not expect sublethal effects are likely to occur at predicted exposure levels. As such, we expect a low level of direct adverse effects to the eastern black rail.

Indirect Effects:

The eastern black rail is thought to be an opportunistic forager and relies on a variety of small aquatic and terrestrial invertebrates, especially insects, and seeds. While no effects to plants are expected, we anticipate effects to aquatic and terrestrial invertebrates from methomyl exposure from adjacent use sites. Because species taken as food items exhibit a range of sensitivities to methomyl, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. However, as a generalist feeder, we anticipate that eastern black rails will be less affected by any specific loss of prey items and can consume other available dietary items. As such, even though toxicity to prey items is anticipated to be high, we anticipate a medium level of indirect adverse effects are likely to occur.

Toxicity Summary

We expect a low level of mortality to individuals from exposure to methomyl concentrations off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but that eastern black rail will be able to adapt as opportunistic feeders. As such, we determine the eastern black rail has a medium toxicity ranking.

Overall Toxicity Ranking: Medium

Effects of the Action Summary

The eastern black rail has a medium exposure ranking. The eastern black rail is not expected to forage in agricultural fields. Based on past methomyl usage data, we expect up to 2.8% of the off-field overlap with the range may be treated annually, but may potentially cover up to 14.8% of the range over the duration of the proposed action. However, given the habitat requirements of the black rail, we expect the extent of areas within the species range that will be exposed to spray drift will be less than the percentages indicated by the 90-m off-field estimates. This indicates that a moderate portion of the species' range is likely to be treated overall. As such, we expect a moderate number of individuals are likely to be exposed to methomyl.

The eastern black rail has a medium toxicity ranking. We expect a low level of mortality to individuals from exposure to methomyl concentrations off-field. We do not expect sublethal effects are likely to occur at predicted exposure levels. We expect a medium level of indirect effects are likely to occur to individuals as we anticipate methomyl exposure will cause mortality to organisms that act as food resources for the species, but that eastern black rail will be able to adapt as opportunistic feeders.

Given that we expect a moderate number of individuals are likely to experience exposure and given that we expect a moderate level of direct and indirect adverse effects are likely, we determine the overall risk of adverse effects to the species is medium.

Conclusion

The eastern black rail is a small, cryptic marsh bird that occurs in salt, brackish, and freshwater wetlands east of the Rocky Mountains. Despite having a wide distribution, the species currently has low redundancy across its range. Eastern black rails occupy relatively high elevations along heavily vegetated wetland gradients, with soils moist or flooded to a shallow depth. The subspecies requires dense vegetative cover that allows movement underneath the canopy, and because birds are found in a variety of salt, brackish, and freshwater wetland habitats that can be tidally or non-tidally influenced, plant structure is considered more important than plant species composition in predicting habitat suitability.

While there are regional differences in threats to the species, in general eastern black rails are impacted by the loss, degradation, and fragmentation of wetland habitats resulting from conversion of wetlands to agricultural or urban land uses, sea level rise along the coast, and ground- and surface-water withdrawals across the range. Incompatible land management practices may also have negative impacts on the eastern black rail, i.e., poorly timed and planned prescribed fires, excessive grazing, and/or certain mechanical treatments. While there are hotspots for environmental contaminants, there is no evidence of specific threats that might affect the subspecies and demonstrate a population level response (USFWS 2021).

In relative terms, regional strongholds in the Southeast and Southwest still exist for this subspecies; however, the best available scientific data suggest that the remaining strongholds support a relatively small total population size across the contiguous United States, i.e., an estimated 1,299 individuals on the upper Texas coast within specific protected areas prior to Hurricane Harvey, and an estimated 355 – 815 breeding pairs on the Atlantic Coast from New Jersey to Florida (including the Gulf Coast of Florida) prior to multiple recent major hurricanes. There are no current population estimates from the interior States (Colorado, Kansas, or Oklahoma) (USFWS 2019).

The species range overlaps 26.3% with methomyl use sites or could be exposed through off-site transport within the action area. Within these overlapping areas, while 4.2% has been treated with methomyl annually in the past, Eastern black rails are not expected to use agricultural fields and given the relatively broad nature of the species' range map, we do not expect that all areas adjacent to methomyl use sites will be wetland habitats suitable for eastern black rails. Where suitable habitat occurs adjacent to agricultural fields, we expect the dense vegetation of the marsh habitats where the black rail resides will limit off-site movement of methomyl to some degree. Thus, we expect exposure on use sites, and overlap and usage in off-field areas to be less than the 14.8% and 2.8% estimated within the 90-m spray drift and runoff zone. As such, we expect a low level of mortality to individuals (a loss of few individuals) from exposure to methomyl concentrations in off-field areas and sublethal effects are not likely to occur.

Methomyl exposure will also cause mortality to a moderate level of the invertebrate prey base of the species. However, eastern black rails are opportunistic feeders, and we anticipate they will be able to adapt to a temporary decrease in the abundance of certain prey types by foraging on those that are present. As a result, we anticipate the species will experience minimal adverse effects, in the form of decreased fitness, from the loss of invertebrate prey within a small portion (less than 2.8%) of the range.

In summary, we expect the loss of a small number of individuals, as well as moderate losses of prey items leading to minor reductions in fitness supporting reproductive capacity or growth in a small number of individuals over the duration of the proposed action. Because the species has a wide distribution, is an opportunistic feeder and will be able to access alternative available prey, is not expected to experience exposure on agricultural fields, and its dense habitat is anticipated to limit off-site movement of methomyl and therefore decrease exposure, we do not expect the stated effects will likely reduce the reproduction, numbers and distribution of the species to an extent that will cause 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 expected to appreciably reduce the likelihood of survival and recovery of this species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the eastern black rail.

References

U.S. Fish and Wildlife Service. 2018. Species status assessment report for the eastern black rail (*Laterallus jamaicensis jamaicensis*), Version 1.2. Atlanta, Georgia.

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