Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Gymnogyps californianus	California condor	66

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Small, endemic, constrained, and/or isolated population(s)
Number of Populations: Multiple populations (few)
Species Trends: Unknown population trends
Pesticides noted ☒

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
California condors were widely distributed in North America during the late Pleistocene era (approximately 50,000–10,000 years before present), with records from Oregon, California, Nevada, Arizona, New Mexico, Texas, Florida, New York, and Mexico (Steadman and Miller 1986, Emslie 1987). There is little information about condor abundance, range, dispersal or demographic rates from the time before the species began to experience population declines. There is, however, information about the extant condor population and its trajectory since being listed as endangered and the start of the California Condor Recovery Program. The condor population had dropped to a low of 22 individuals in 1982. By December of 2017, there were 486 California condors, with 293 occurring in three subpopulations in the wild (California, Arizona/Utah, and Baja, Mexico) and 193 in captivity (Service 2017). More recently, successful reproduction has been documented in each of the three subpopulations, and in 2017, the first chick from a nesting pair of wild-fledged birds successfully fledged in the wild in Central California (Ventana Wildlife Society 2017).

Though no definitive causes of the condors' decline during the early 1900s have been established, it was likely the result of high mortality rates due to direct persecution, collection of specimens, and secondary poisoning from varmint control efforts and 1,1,1-trichloro-2,2-bis(pchloro-phenylethane (DDT) (Snyder and Snyder 2005, D'Elia 2013). Lead poisoning may have been a contributing factor, but was not recognized as such until after 1980. In the winter of 1984–1985, a population crash claimed six condors (40 percent of the wild population at that time), leaving only a single breeding pair in the wild (Snyder and Snyder 2000). During 1986 and early 1987, after much controversy, all nine remaining adult and juvenile wild birds were captured in order to ensure their safety and preserve the species' genetic diversity.

Population growth has been steady over the last two decades, and in late 2008 the wild California condor population exceeded the captive population for the first time since 1983. At the end of December 2012, there were 404 condors in the world; 235 of these were free-flying wild birds

distributed among the five release sites. The remaining 169 birds are used for captive breeding, inappropriate for release, or undergoing medical treatment (Service 2012).

Based on mortality data collected by the Service from January 1992 through December 2012, predation by terrestrial mammals (such as black bears (*Ursus americanus*) and coyotes (*Canis latrans*) and golden eagles (*Aquila chrysaetos*) accounted for or is suspected in 18 of 123 (14.6 percent) free-flying California condor deaths in the wild where a cause of death has been established (Rideout et al. 2012, Service, unpubl. data 2009–2012). There is strong evidence that increased mortality from lead poisoning was a serious factor that contributed to the California condor's precipitous decline at the time condors were brought into captivity (Meretsky et al. 2000, Snyder 2007). Lead poisoning from ingestion of spent ammunition in carcasses and offal (gut piles) is the most severe impediment to California condor recovery (Church et al. 2006, Chesley et al. 2009, Hunt et al. 2009, Stroud and Hunt 2009, Finkelstein et al. 2012). Condors would not survive in the wild if they were not regularly trapped, tested, and treated for lead exposure. The Service concluded that the effects of DDT/DDE exposure on California condors are a significant threat to the portion of the population that forages on marine mammals. Several ongoing research projects are evaluating the negative impacts on the population, as well as attempting to identify strategies to mitigate or address those effects.

A recent study by California Department of Fish and Wildlife and Point Reyes Bird Observatory (Gardali et al. 2012) of California's at-risk bird species determined that California condors were not one of the species most vulnerable to climate change, based on the sensitivity (intrinsic characteristics of an organism that make it vulnerable) and exposure (the magnitude of climate change expected) anticipated for each species. No specific observations about condors were made in the published study. Based on what we know about the species and the known and likely effects of climate change, we do not consider climate change as a significant threat to the species. The primary threats, as documented in this report and demonstrated in many scientific references, is the ingestion of lead introduced into the environment, and, to a somewhat lesser degree, the presence of other contaminants such as DDT/DDE and microtrash. (Note: This species has an experimental population, EXPN Entity ID 1737.)

EB/CE Sources:

U.S. Fish and Wildlife Service. 2019. Supplemental Finding for the Recovery Plan for the California condor (*Gymnogyps californianus*). Sacramento, CA. 6 pp.

U.S. Fish and Wildlife Service. 2013. California condor (*Gymnogyps californianus*) 5-Year Review: Summary and Evaluation. Pacific Southwest Region. Sacramento, CA.

Overall Vulnerability: ☒ High ☐ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: California condors are not expected to experience mortality on any use sites. Reproductive effects are only expected in orchards and vineyards.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No mortality expected
Spray drift areas – mortality	No mortality expected
Sublethal – growth (G), reproduction (R) and behavior (B)	<1% (R – low effects)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects expected
Spray drift areas - Prey item mortality	No effects expected
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: California condors are non-migratory but highly mobile. They are wide ranging in search of food, and forage predominantly in open terrain of foothill grassland and oak savanna habitats, and at coastal sites in central California, but have also been observed feeding in more wooded areas, though this is less common. Condors are carrion eaters that may eat individually or in large numbers on a carcass, and may go several days without eating. In good weather, it is common for birds to cover great distances over the course of a day; in extreme cases, from 225 kilometers (km) (141 miles [mi.]) to more than 643 km (400 mi.). However, breeding pairs tend to forage most frequently within 70 km (43 mi.) of a nest, and occasionally as far away as 180 km (112 mi.); non-breeders forage more widely. For this reason, exposure to malathion could be greater than that predicted by overlap as use sites are dispersed throughout the range, rendering them accessible to all individuals when foraging.

The California condor may enter any malathion use site (Pers. comm. 2016 co-occurrence information, USFWS field office request). While we would not anticipate that 100% of carrion eaten by condors would be contaminated with malathion, we would anticipate that all individuals could encounter one or more contaminated carcasses over the course of the action.

Uses driving effects: Orchards and vineyards. Effects calculated for this use site may be overestimated based on the application rate assessed.

Overall Risk: ☐ **High** ☐ **Medium** ☒ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Usage data for the whole range based on data from EPA's SUUM:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	N	16,797,440	36.47	638,835	1.39
Open Space Developed	N	630,489	1.37	31,524	0.07
Developed	N	532,686	1.16	26,634	0.06
Orchards and Vineyards	D	398,134	0.86	171,287	0.37
Other Crops	N	359,748	0.78	0	0
Pasture	N	92,624	0.20	49,150	0.11
Vegetables and Ground Fruit	N	87,278	0.19	87,278	0.19
Wheat	N	70,274	0.15	3,7167	0.08
Other Grains	N	48,251	0.10	15,505	0.03
Corn	N	9,072	0.02	740	0.00
Cotton	N	8,204	0.02	6,864	0.01
Other RowCrops	N	891	0.00	268	0.00
Sub-TOTAL (D): *Other uses with direct effects only*[3]		398,134	0.86	170,124	0.37
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0.00	170,124	0.00
TOTAL[3]:		398,134	0.86	170,124	0.37

[1] Direct effects (D), Indirect effects (I), Use site not utilized by the species (*), No effects expected (N)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs. TOTAL includes usage on all use sites with effects, including mosquito control.

Agricultural usage in California only based on CalPUR data:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	Acres	%
Orchards and Vineyards	D			6,762	0.1
Other Crops	N			0	0
Pasture	N			716	0.002
Vegetables and Ground Fruit	N			91847	0.20
Wheat	N			237	0.001
Other Grains	N			92	<0.001
Corn	N			526	0.001
Cotton	N			330	0.001

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	Acres	%
Other RowCrops	N			6	0.00
TOTAL:	398134			0.37	0.305

 # acres in species range: 46,052,442 acres
% of range in California (i.e., where CalPUR data is available): 36%
Range overlap with Federal lands: 19,199,949 acres, 41.691%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the California condor. As discussed below, although the vulnerability is high for this species, we anticipate the risk and likelihood of exposure to malathion is low.

The California condor has a high vulnerability ranking based on its status, environmental baseline and cumulative effects. However, the risk to the species posed by labeled uses across the range is low, and estimated usage within the range is low. We do not anticipate that malathion uses pursuant to the labels will result in mortality or indirect effects. Low level sublethal effects related to reproduction may occur in orchards and vineyards. We do not anticipate that the use of this pesticide is likely to have species-level effects. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the California condor.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Species/Populations neither constrained nor widespread
Number of Populations: Multiple populations (few)
Species Trends: Unknown population trends
Pesticides noted ☒

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 USFWS 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. 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 Aransas National Wildlife Refuge (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. 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. 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). Collisions with power lines are a substantial cause of whooping crane mortality in migration (Brown et al. 1987, Lewis et al. 1992b).

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 would 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 would reduce visibility for the cranes and would 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 would 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. As malathion is not registered for use on cranberry bogs, we do not suspect malathion exposure in these cases (Pers. comm. 2020 with Sarah Warner, USFWS).

(Note: This species has 3 experimental populations, EXPN Entity IDs 4679, 7342 and 10124.)

EB/CE Source: 5-yr review (Service 2012)

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Breeding whooping cranes are unlikely to enter malathion use sites. Migrating whooping cranes foraging in agricultural fields are unlikely to experience mortality on most use sites. Cranes foraging on birds may experience up to 13% mortality in cotton, though effects to cotton for many uses are likely over-estimated based on calculated values. About 1% or less could experience mortality in developed areas and vegetables and ground fruit. There are reports of possible organophosphate poisoning of juvenile cranes in an experimental population at the Necedah National Wildlife Refuge, although no specific pesticides were mentioned in the report.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	2% (G – low effects) – migratory cranes
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	Fish, amphibians, reptiles, and invertebrates could experience mortality where malathion is used along the migratory route (up 24% of range)
Spray drift areas - Prey item mortality	Additional mortality possible to invertebrates, fish, amphibians, reptiles
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	Fish, amphibians, and invertebrates could experience mortality where malathion is used along the migratory route (up 25% of range).

Risk modifiers: Whooping cranes are omnivorous, probing the soil subsurface with their bills and taking foods from the soil surface or vegetation. Summer foods include large nymphal or larval forms of insects, frogs, rodents, small birds, minnows, and berries. Foods utilized during migration are poorly documented but include frogs, fish, plant tubers, crayfish, insects, and agricultural grains. The largest amount of time is spent feeding in harvested grain fields. The winter diet consists predominately of animal foods, especially blue crabs, clams, and the plant wolfberry. Most foraging occurs in the brackish bays, marshes, and salt flats on the edge of the mainland and on barrier islands. Occasionally, cranes fly to upland sites when attracted by fresh water to drink or by foods such as acorns, snails, crayfish and insects, and then return to the marshes to roost. Some whooping cranes use upland sites frequently in most years, but agricultural croplands adjacent to Aransas National Wildlife Refuge are rarely visited.

Nesting occurs in dense emergent vegetation (sedge, bulrush) in shallow (often slightly alkaline) ponds, freshwater marshes, wet prairies, or along lake margins. Habitat during migration and winter includes marshes, shallow lakes, lagoons, salt flats, grain and stubble fields, and barrier islands.

For the Aransas-Wood Buffalo National Park population, cranes may use rice fields, generally only forage in agriculture and rangeland during migration, and are unlikely to forage in managed forests, developed areas, open space developed areas, golf courses, and right of ways.

Uses driving effects/other considerations: Because breeding whooping cranes are unlikely to enter malathion use sites, effects were based on migration, including dietary items likely to be consumed during this time. The species range analyzed for overlap includes the area of migration. Direct effects from cotton may be over-estimated. The whooping crane will only experience mortality on cotton if it eats birds. However, birds are not a known food item during migration, and the whooping crane only goes into use sites such as cotton when it migrates. We anticipate effects to the prey base from malathion exposure on or near use sites, or from mosquito control applications. Because species taken as food items exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ **High** ☐ **Medium** ☒ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	75,035,020	25.54	337,4276	1.15
Wheat	I	28,198,823	9.60	956,224	0.33

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Corn	I	18,269,520	6.22	54,508	0.02
Open Space Developed	*	10,016,950	3.41	500,847	0.17
Other Grains	I	8,388,174	2.86	310,963	0.11
Other Crops	I	5,779,364	1.97	5,586	0.00
Cotton	D, I*	5,187,855	1.77	169,400	0.06
Developed	*	3,748,601	1.28	187,430	0.06
Pasture	*	3,152,313	1.07	157,804	0.05
Vegetables and Ground Fruit	I	1,974,850	0.67	85,514	0.03
Other RowCrops	I	1,437,665	0.49	39,081	0.01
Rice	I	128,527	0.04	5,309	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		5,187,855	1.77	169,400	0.06
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		69,364,778	23.61	1,626,584	0.55
TOTAL[3]:		74,552,633	49.16	1,795,984	1.70

[1] Direct effects (D), Indirect effects (I), Use site not utilized by the species (*), No effects expected (N)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs. TOTAL includes usage on all use sites with effects, including mosquito control.

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to prey from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 293,791,142 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 12,120,561 acres, 4.126%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The whooping crane is known to rely on food resources and habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow for malathion to degrade before runoff events occur. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required of all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by reducing exposure from ingesting contaminated prey and minimizing losses of prey items due to malathion exposure in aquatic habitats. Changes to the general labels (e.g. reduction in number of applications allowed per year, timing restrictions) will further reduce exposure and impacts to the whooping crane.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the whooping crane. As discussed below, although the vulnerability is high for this species, we anticipate the risk and likelihood of exposure to malathion is low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The whooping crane has a high vulnerability ranking based on its status, environmental baseline and cumulative effects. Based on the information above, we anticipate the risk to the species posed by labeled uses across the range is low, and estimated usage within the range is low. We do not anticipate that malathion uses pursuant to the labels will result in mortality. The only use site where sub-lethal effects would be expected is cotton, where a small number of individuals may experience sublethal effects due to a reduction in growth where exposure occurs. Anticipated usage throughout the range is low, and sub-lethal effects related to cotton may be over-estimated in our analysis, as the whooping crane would not utilize cotton during the breeding season, so any exposure would be limited to the migration period. Effects to the species could occur due to loss of some prey items, although, because breeding whooping cranes are unlikely to enter malathion use sites, these would limited to be seasonal effects from a reduction in dietary items that are likely to be consumed during migration. However, this species has a varied diet, and we would expect that alternative food resources would remain available. In addition, we anticipate the conservation measures described above would further reduce the risk of exposure and effects on whooping cranes and their prey, such as aquatic habitat buffers required of all agricultural uses that will allow for malathion to degrade before runoff events occur. We anticipate low levels of sublethal effects by reducing fitness supporting reproductive capacity for a few individuals that ingest contaminated prey and from reductions in prey. However, we do not anticipate that the use of this pesticide is likely to have species-level effects.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the whooping crane.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☒

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. 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.

EB/CE Sources:

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.

Overall Vulnerability: ☒ High ☐ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Mortality of Attwater's greater prairie-chickens exposed to malathion at maximum rates varies between use sites, with 5-30% expected to experience mortality in vegetables and ground fruit, cotton, and open space developed use sites. Mortality is not expected from exposure to malathion on other use sites. Reproductive effects could occur from exposure to malathion on all use sites.

Risk to the species from labeled uses across the range:

The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	2% (grass, leaves), 0% (insects)
Spray drift areas – mortality	None
Sublethal – growth (G), reproduction (R) and behavior (B)	6% (R – high effects; grass, insects), 16% (R – low effects; grass)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	16% terrestrial invertebrates
Spray drift areas - Prey item mortality	Effects to terrestrial invertebrates
Plants affected (decline in growth)	4%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	39% terrestrial invertebrates

Risk modifiers: The Attwater's greater prairie-chicken uses different areas of coastal prairie grassland, preferring a variety of short, mid and tall grass prairie. They may use grass areas less than 10 inches in height for courtship, feeding, and to avoid moisture. Grass up to 10-16 inches tall is used for roosting and feeding, whereas 16-24 inches of grass (maximum height) are used for nesting, loafing, feeding, and escape. Interspaces between grass clumps should be relatively open to facilitate movement. Densely vegetated areas over 24 inches in height are generally avoided, but may be used occasionally for protection from inclement weather and predators, and as fall feeding grounds.

The diet of the Attwater's greater prairie-chicken consists mostly of insects, especially grasshoppers during the summer and at other times they also eat fruit, leaves, flowers, shoots, seeds, or grain.

Allowable uses driving effects/other considerations: Mortality is only associated with open space developed, vegetables and ground fruit, and cotton, and reproductive effects are estimated to be greater on these use sites. However, effects from cotton are likely over-estimated.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near use sites, and from mosquito control applications. Because terrestrial invertebrates exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance of invertebrates 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	Acres	%
Mosquito Control	I	1,119,818	39.41	120,899	4.25
Other Crops	D, I	110,867	3.90	0	0
Open Space Developed	D, I	106,825	3.76	5,341	0.19
Other Grains	D, I	73,468	2.59	73,468	2.59
Corn	D, I	65,553	2.31	4,101	0.14
Cotton	D, I	64,559	2.27	55,872	1.97
Developed	*	37,421	1.32	1,871	0.07
Rice	D, I	36,583	1.29	5,309	0.19
Wheat	D, I	3,462	0.12	2,877	0.10
Vegetables and Ground Fruit	D, I	644	0.02	645	0.02
Orchards and Vineyards	*	469	0.02	342	0.01
Pasture	I	4	0.00	3	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		461,963	16.26	147,612	5.20
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		461,966	16.26	147,615	5.20
TOTAL[3]:		1,581,785	55.67	268,514	9.45

[1] Direct effects (D), Indirect effects (I), Use site not utilized by the species (*), No effects expected (N)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs. TOTAL includes usage on all use sites with effects, including mosquito control.

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 2,841,520 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 63,636 acres, 2.240%

Overall Usage: ☐ **High** ☒ **Medium** ☐ **Low**

CONSERVATION MEASURES

Reduced application number and rate: New restrictions on corn, cotton (excluding use for the Boll Weevil Eradication Program, although this program has a history of implementation with

conservation measures in place[1]), orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

Species specific measures: In addition to the general label changes that would apply to all uses specified on the label, which would be protective of a wide range of species, the registrants have also agreed to the following conservation measures for the Attwater's prairie chicken:

> *For agricultural uses during the months of February through September, for applications adjacent to use limitation areas[2] (potentially occupied habitats within the range, based on known occurrences): Apply malathion only when the wind is blowing away from grassland habitat, or use a 50-foot ground buffer from grasslands, and an aerial buffer from these habitats according to application rate: (1) 50 feet for <0.5 lbs ai/A; (2) 75 feet for 0.5 - <1 lb ai/A; (3) 150 feet for 1-2.5 lbs ai/A; (4) 200 feet for >2.5 lbs ai/A. Buffer sizes may be reduced by 25 feet for application rates (1) and (2) if a full swath displacement upwind is used during aerial application. Buffer sizes may be reduced by 50 feet for application rates (3) and (4) if a full swath displacement upwind is used during aerial application.*
>
> *For mosquito control: Where feasible, do not apply within the use limitation areas from February through September. If avoidance is not feasible or impairs the ability of the mosquito control district or agency to protect the public's health and welfare, coordinate with the Refuge Manager at the Attwater Prairie Chicken National Wildlife Refuge for on-refuge application and/or the local FWS Ecological Services field offices for all other applications to determine appropriate measures to ensure the proposed application is likely to have no more than minor effects on the species (FWS points of contact are available through the Information, Planning, and Consultation (IPaC) website*

[1] While the proposed label restriction does not apply to applications conducted by APHIS as part of the Boll Weevil Eradication Program, APHIS implements measures that are protective of listed species, as described in the *Description of the Action* section of the Opinion. For example, the 2018 FWS informal section 7(a)(2) consultation with APHIS includes the following conservation measure for the Attwater's prairie-chicken: "Avoid drift into potential habitat. Monitor drift if cotton fields are within 300 feet of potential habitat."

[2] These areas will be provided via links in *BulletinsLive! Two.*

https://ecos.fws.cov/ipac/). The applicator must retain documentation of the technical assistance and the agreed upon species-specific measures that were implemented.

We anticipate these measures will reduce exposure and effects to the species for the following reasons:

- Avoidance and use limitation areas such as the species' range, critical habitat, or key habitat types and areas will effectively reduce exposure to malathion by preventing usage directly in these important areas, thus reducing the likelihood the species and its prey will come into contact with malathion.

- Limiting malathion applications to specific seasons, months of the year, or time of day when the species is not active or otherwise engaged in a critical period of its life cycle (e.g. breeding, migration, overwintering, etc.) will reduce malathion exposure and risk of adverse effects.

Application buffers are designed to reduce spray drift from entering sensitive non-target areas, thereby providing protection to species. While the exact amount of spray drift reduction will vary depending on application methods and habitat features, we expect reductions in concentrations ranging from 82 to 90% from exposure on use sites.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Attwater's greater prairie chicken. As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be high and usage that would lead to exposure would be medium, the implementation of the general and species-specific conservation measures described above are expected to substantially reduce the likelihood of exposure and associated adverse effects to the species.

The Attwater's greater prairie chicken has a high vulnerability ranking based on its status, environmental baseline and cumulative effects. 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. Although further research on this topic is a recovery priority, as noted above, we anticipate insect prey exposed to malathion will die. The risk to the species posed by labeled malathion uses across the range is anticipated to be high, with a medium amount of estimated usage within the range based on standard usage data. We estimated that across the species range, annual malathion uses pursuant to the labels would result in low levels of mortality (about 2%) of individuals from eating grass and leaves, and sublethal effects related to reproduction could affect about 16% of individuals, although only 6% are expected to be high-level reproductive effects. In addition, there could be a loss of about 39% of

invertebrate prey due to mosquito control and 16% loss of invertebrate prey on other use sites within the species range, as well as losses of invertebrates exposed to spray drift.

While usage is not expected on all use sites and at the maximum rates allowed by the labels wherever used each year, we anticipate that usage will occur on up to 9.45% of the species range annually based on standard past usage data. Effects from usage on cotton may be overestimated for the reasons described above, but: (1) effects from this use are still anticipated, and (2) this is one of many uses within the range (i.e., cotton accounts for 2.27% of the 55.67% overlap of use sites with the range, and 1.97% of the 9.47% annual usage anticipated to result in effects), as noted in the Risk table above. At present, we estimate that usage for mosquito control would occur in less than 5% of the prairie chicken's range, where the invertebrate prey base could be reduced from malathion exposure from this use. However, even where exposed to malathion from mosquito adulticide or other uses, we would not expect the invertebrate community to be completely eliminated, as invertebrates exhibit a range of sensitivities to malathion and some are likely to remain available as food resources after malathion applications.

Importantly, the conservation measures described above will substantially reduce the risk of exposure and effects on the Attwater's prairie-chicken and its prey items from malathion. In addition to the general conservation measures that apply to malathion uses, EPA will also implement species-specific label restrictions to protect adults, chicks and their prey. During the breeding season from February through September, agricultural applicators will be required to apply malathion only when the wind is blowing away from potentially occupied grassland habitat or use buffers to minimize transport of malathion into prairie-chicken habitat. Additionally, malathion will not be used for mosquito control in prairie-chicken habitat where feasible, and where avoidance is not feasible, will not be applied without coordinating with the local FWS Refuge or Ecological Services field office to determine appropriate measures to ensure the proposed application is likely to have no more than minor effects on the species. With the measures in place, we anticipate extremely low levels of mortality and reduced fitness supporting reproductive capacity due to losses of invertebrate prey in a few individuals.

While the Attwater's greater prairie-chicken remains on the brink of extinction, with consideration of the general and species-specific conservation measures (which substatially decrease the risk of chickens and their prey to exposure), we do not anticipate the Action would result in species-level effects. Therefore, we do not anticipate that the proposed action would appreciably reduce the survival and recovery of the Attwater's greater prairie chicken.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Rallus obsoletus (=longirostris) yumanensis	Yuma Ridgeways (clapper) rail	84

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☐

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 clapper 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 (LCR) at the time those structures were created. 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 clapper 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 clapper rail habitat currently present on the LCR is 3,653 hectares (ha) (9,041 acres [ac]) with 1,083 ha (4,457 ac) of that on four National Wildlife Refuges (NWR) (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 clapper 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, LCR, and the Cienega de Santa Clara are a source of concern for the Yuma clapper rail populations in those important habitats. These levels may, or may not, be a threat to the Yuma clapper rail. Ongoing and future proposed research looking at selenium levels in adults and eggs at the Salton Sea and LCR will assist in determining the amount of risk posed to the Yuma clapper 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 clapper rails may be affected by climate change, we lack sufficient certainty to know how such changes will affect the subspecies. We believe the effects would 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.

EB/CE Source: Service's Draft Recovery Plan (Service 2010)

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: The Service does not anticipate that exposure of Yuma clapper rails to malathion at maximum rates would result in adverse effects from dietary exposure on use sites or via spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	9% aquatic invertebrates, fish, aquatic amphibians
Spray drift areas - Prey item mortality	Effects to invertebrates, fish, aquatic amphibians
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	32% aquatic invertebrates, fish, aquatic amphibians

Risk modifiers: In the United States, the Yuma clapper rail occurs in freshwater marshes along the Lower Colorado River and tributaries in Arizona, California, Nevada, and Utah and the Salton Sea in California. Individuals are clumped according to resources.

Diet consists of crayfish (*Procamberus clarki* and *Orconectes virilis*), small fish, tadpoles, clams, and other aquatic invertebrates. Foraging habitat consists of brackish or freshwater marsh habitats and complex mosaics, with adequate invertebrate prey supply, refuge, and pools. Yuma clapper rails take prey by surface gleaning or shallow probing on open mudflats, shallow (7.5-cm [3-in.]) open waters, vegetated areas with low emergent stem densities, and the water/emergent vegetation interface, where rails could be exposed to direct spray.

Yuma clapper rails have low mobility and are partially migratory – most remain on the breeding grounds throughout the year, but some winter in brackish marshes along the Gulf of California and Mexico. Breeding occurs from March to July in heavily vegetated freshwater marshes with covers of cattail (*Typha domingensis*) and bulrush (*Scirpus* spp.) where exposure to direct spray is limited.

The Yuma clapper rail likely travels through some areas of agricultural use, and may forage, roost, or breed close to roads if the road is by suitable habitat. The Yuma clapper rail is not likely to enter orchards and vineyards, managed forests, developed areas, or golf courses (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Indirect effects are equivalent to range overlap with use sites.
Effects to the prey base are anticipated from malathion exposure on or near use sites, or from mosquito control applications. Because species taken as food items exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ **High** ☒ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	2,681,742	31.74	62,700	0.74
Pasture	I	243,458	2.88	107,123	1.27
Other Crops	I	171,379	2.03	0	0
Developed	*	419,337	4.96	20,967	0.25
Wheat	I	56,094	0.66	24,981	0.30
Vegetables and Ground Fruit	I	71,519	0.85	7,464	0.09
Cotton	I	48,504	0.57	7,782	0.09

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Open Space Developed	I	123,137	1.46	6,157	0.07
Orchards and Vineyards	*	22,562	0.27	6,947	0.08
Other Grains	I	15,058	0.18	1,986	0.02
Other RowCrops	I	305	<0.01	80	<0.01
Corn	I	10,499	0.12	412	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		739,954	8.76	155,984	1.84
TOTAL[3]:		3,421,695	45.50	218,684	2.91

[1] Direct effects (D), Indirect effects (I), Use site not utilized by the species (*), No effects expected (N)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs. TOTAL includes usage on all use sites with effects, including mosquito control.

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 8,448,078 acres
% of range in California (i.e., where CalPUR data is available): 7%
Range overlap with Federal lands: 5,457,944 acres, 64.606%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The Yuma clapper rail is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the

amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Yuma clapper rail. As discussed below, although the vulnerability is high for this species and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The Yuma clapper rail has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low based primarily on the standard usage data we acquired, as described in the Opinion and as summarized for this species above. We do not anticipate that mortality or sublethal effects would occur on use sites or from spray drift. We do expect that loss of prey items could be fairly high, especially in mosquito control areas where exposure could result in the loss of 32% of prey. This species utilizes freshwater marsh habitats, often associated with larger open water bodies that may be treated for mosquitos. While loss of suitable foraging areas could lead to starvation or site abandonment by individuals, or multiple rails where they are clumped around resources, and site recolonization could be problematic due to the fragmented nature of remaining suitable habitat and the low mobility of the Yuma clapper rail, we anticipate these scenarios from malathion usage are likely to be rare. In addition, we anticipate the conservation measures described above would further reduce the risk of exposure and effects on prey items. Thus, while we anticipate adverse effects to the species would occur from reduced fitness supporting reproductive capacity due to a reduction of prey in some instances, we do not expect species-level effects because of the low amount of anticipated usage within the range. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Yuma clapper rail.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Ammodramus maritimus mirabilis	Cape Sable seaside sparrow	85

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
Predation is one of the most common causes of nest failure and may affect more than half of all Cape Sable seaside sparrow nests (Lockwood et al. 1997). Predation events occur throughout the day and night (Boulton et al. 2009); snakes, rice rats (Oryzomys palustris), and other predators have been identified as nest predators (Pimm et al. 2002; Lockwood et al. 2006). The risk of nest depredation is related to hydrologic conditions, and as water levels rise, nest losses increase (Lockwood et al. 1997). Baiser et al. (2008) noted that in the nests they monitored, 97 percent of nest failure was the result of predation. Known predators of adult sparrows include snakes and raptors (Ogden 1972; Dean and Morrison 2001). Non-native animals such as the Burmese python (Python molurus bivittatus) have become established in southern Florida, and this species, native to South Asia, is now breeding and expanding its range in the greater Everglades ecosystem increasing concerns among land managers about the potential impacts of this invasive snake. There is documented overlap of Cape Sable seaside sparrow subpopulations and python-occupied areas in the Everglades National Park (ENP). Pythons may represent an increased threat of predation of Cape Sable seaside sparrow nests and adults, but relative risk of python predation on sparrows is unknown at this time.

South Florida's ecosystems have been severely degraded by the Central and South Florida (C&SF) Project and associated hydrologic operations which have disrupted the natural volume, timing, quality, and flow of surface and ground water throughout the Everglades. The Cape Sable Seaside Sparrow short hydroperiod prairie habitat is contained entirely within the C&SF Project and has been extensively altered by the project (Nott et al. 1998), with too much water in the western habitats, interrupting breeding and changing vegetation; and too little water in the eastern habitats, allowing invasion of trees into the prairie habitat and allowing frequent, damaging fires. Flooding that occurs as a result of managed water releases, rainfall, and the combined effects of the two, continue to pose a threat to Cape Sable seaside sparrow reproduction and habitat suitability in many areas occupied by Cape Sable seaside sparrow. Similarly, overdrainage in some areas of Cape Sable seaside sparrow habitat may allow woody vegetation encroachment that reduces suitable habitat and continues to result in increased risk of

fires. Water management practices and the invasion of woody and non-native plants continue to threaten Cape Sable seaside sparrow habitat.

Within the area that supports the largest subpopulation (subpopulation B), a fire burned a large area and the area was subsequently deeply flooded for several weeks as a result of a natural rainfall event. This resulted in severe degradation of the habitat that may require 10 or more years to recover. Recent studies within the six subpopulation areas (A through F) have documented such changes in vegetation that reflect a shift from short-hydroperiod prairie habitats suitable for Cape Sable seaside sparrow to conditions that are less suitable for sparrows (Ross et al. 2006) in several areas. Of the six subpopulations, A, B, and E are considered core subpopulation areas potentially capable of supporting relatively large and stable subpopulations. These areas were identified as important to the persistence of the Cape Sable seaside sparrow (Walters et al. 2000), however the periphery populations are vital to Cape Sable seaside sparrow in the future, as they provide additional refuge areas in case of a catastrophic event in the core subpopulations (Slater et al. 2009). The number of Cape Sable seaside sparrow in subpopulation A decreased by 84 percent from 1992 to 1993, a decline from over 2,600 birds to just over 400 birds (Pimm et al. 2002). The numbers have remained low since that time indicating that there are not three stable, self-sustaining core breeding areas for Cape Sable seaside sparrow.

EB/CE Sources:

U.S. Fish and Wildlife Service. 2010. Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*) 5-Year Review: Summary and Evaluation. 22 pp.

U.S. Fish and Wildlife Service. 2019. Recovery Plan for Cape Sable seaside sparrow (*Ammodramus maritimus mirabilis*), Draft Amendment 1. Atlanta, GA. 8 pp.

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed:
Cape Sable seaside sparrows are not expected to utilize any use sites where mortality or sublethal effects are expected to occur, nor are these effects expected from spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected

Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	None expected on use sites
Spray drift areas - Prey item mortality	Up to 19% to terrestrial invertebrates
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	31% to aquatic and terrestrial invertebrates

Risk modifiers: The distribution of the Cape Sable seaside sparrow is limited to the short-hydroperiod wetlands, or marl prairies, located at the southern end of the greater Everglades ecosystem, on the southern tip of mainland Florida.

Aquatic and terrestrial invertebrates comprise the majority of the Cape Sable seaside sparrow diet, though they may also consume seeds when they are available.

Outside of the breeding season, sparrows generally remain sedentary in the general vicinity of their breeding territories, but expand the area that they use compared to the breeding season territory. Average non-breeding season home range size was approximately 42 acres in size, and ranged from 14.1 to 137.1 acres. Some individuals make exploratory movements away from the area of their territories, and may occasionally relocate their territories and home ranges before resuming a sedentary movement pattern. Individuals are area-sensitive, and generally avoid the edges where other habitat types meet the marl prairies. Sparrows are generally sedentary and avoid forested areas. They most consistently occur and are most abundant near the center of the patch of habitat in which they occur. Within a patch of occupied suitable habitat, sparrow breeding territories do not generally saturate the entire area, even when sparrows occur at high densities.

Cape Sable seaside sparrows are unlikely to enter most pesticide use sites, but could be exposed to drift from adjacent areas.

Allowable uses driving effects/other considerations: Indirect effects from spray drift, though it is notable that individuals tend to avoid edge areas and most consistently/abundantly occur near the center of the habitat patch in which they occur.

Effects to the invertebrate prey base are anticipated from malathion exposure near use sites or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated

from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ **High** ☒ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	Acres	%
Mosquito Control	I	16,82,751	31.03	0	0
Developed	*	267,263	4.93	13,363	0.25
Open Space Developed	*	120,690	2.23	6,034	0.11
Orchards and Vineyards	*	79,085	1.46	59,828	1.10
Vegetables and Ground Fruit	*	11,307	0.21	1,785	0.03
Other Crops	*	8,431	0.16	0	0.00
Other Grains	*	3,440	0.06	3,698	0.07
Nurseries	*	2,522	0.05	2,522	0.05
Corn	*	130	<0.01	2	<0.01
Rice	*	14	<0.01	0	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0	0	0
TOTAL[4]:		1,682,751	31.03	0	0

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

This species occurs entirely in Florida, where reported usage of mosquito adulticide is more robust than other states.

 # acres in species range: 5,423,004 acres
% of range in California (i.e., where CalPUR data is available): 0%

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Range overlap with Federal lands: 2,574,307 acres, 47.470%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The Cape Sable seaside sparrow is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of indirect effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from “repeat as necessary” to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service’s biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Cape Sable seaside sparrow. As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The Cape Sable seaside sparrow has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range will be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. Mortality and sublethal effects are not anticipated for this species from malathion exposure on use sites or from spray drift, although we anticipate there could be a loss of invertebrate prey from spray drift and in areas treated with malathion for mosquito control. However, while mosquito control overlaps with about 31% of the range, usage data indicates that past usage within this area has not occurred. In addition, this species is not expected to enter use sites, and past usage data indicates less than 2% of use sites that overlap with the range have been treated. Some invertebrate prey is expected to be lost in areas exposed to spray drift from these use sites, leading to reduced fitness supporting reproductive capacity in a few individuals, but we do not anticipate species-level effects. The tendency of this species to avoid edge habitats reduces the risk of effects to invertebrate prey in foraging areas. In addition, we anticipate the conservation measures described above would further reduce the risk of exposure and effects on prey items. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Cape Sable seaside sparrow.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Colinus virginianus ridgwayi	Masked bobwhite (quail)	89

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The rarity of the masked bobwhites makes determination of their current (and past) distribution difficult. The few that have been detected in recent years in the U.S. (in Arizona) and in Mexico are well within their historic range of occurrence. But habitat fragmentation, drought, buffelgrass invasion, and predation have made their occurrence spotty, at best. Sightings within Arizona have been reported throughout the Altar Valley since 2000. A recurring report of birds comes from the Three Points area at the far northeast end of the Altar Valley, just south of Arizona Highway 86. This report has remained unverified. Buenos Aires National Wildlife Refuge biologists have reported seeing birds north of the refuge. Occasionally, staff and refuge neighbors have reported hearing or seeing bobwhites in the Arivaca, Arizona area on a private ranch southwest of the refuge near Sasabe, Arizona and southeast of the refuge on land managed by Coronado National Forest. A few pockets of birds apparently exist outside refuge bounds.

Habitat loss and alteration may be primarily responsible for the bird's apparent demise. Studies done in Mexico and the U.S. show deficiencies in important components, such as woody vegetation (shrubs) and herbaceous cover. Introduction of non-native grasses, such as buffelgrass and Lehmann's lovegrass, have created monocultures which result in habitat conditions opposite to the diverse habitat that this species requires. Over-grazing is a problem, at times, in Mexico, and has had devastating effects in drought years. Habitat for masked bobwhites currently exists as islands within grassland and mesquite woodlands.

Currently, we do not know where all appropriate habitat exists, nor do we know where all masked bobwhites actually exist. At this time, work is being done to identify and locate additional populations and habitats. Information generated since 1995 updates our understanding of the status of the masked bobwhite, its threats, and recovery potential. According to the Service's recovery plan amendment (2019), recent survey results indicate the occurrence of masked bobwhite in the wild is essentially non-existent, and conservation and recovery is nearly completely restricted to captive flocks at various facilities. The success of the captive breeding program is critical to the bird's survival with the bulk, if not all, of the world's population of

masked bobwhite being held in captivity, primarily at the Buenos Aires National Wildlife Refuge (BANWR) where 600-1000 birds are held at any one time. Approximately 50-70 individuals are kept at Northern Illinois University, and small numbers of individuals (1-12 birds each) are at various zoological institutions around the country. The Sutton Center's masked bobwhite captive facility was established in 2017 when 178 masked bobwhite eggs were provided from BANWR to initiate this facility, which became active in supplying chicks and adults to aid the release program in 2018. Bouts of disease have decimated the BANWR captive flock on 2 occasions and have threatened the species' existence. While diseases of masked bobwhites are not known from the wild population, the species to species spread of a malaria-causing organism at the Phoenix Zoo, in particular, is of special concern. A newly constructed captive breeding facility in Mexico holds promise for species perpetuation.

Signs of inbreeding have already appeared within the captive population, though results of the flock's pedigree showed what appeared to be higher variability than expected. Still, the variability was lower than that of wild Sonoran masked bobwhites and the closely related Texas bobwhites. The translocation of wild Mexican masked bobwhites to BANWR in 1999 appeared to contribute to the longevity of a wild population in the central portion of the refuge, possibly due to the higher genetic variation.

Predation may have a substantial impact on bobwhite populations. Raptor predation is especially noticeable on BANWR, where hawks and owls appear to be the main predator on adult birds, based on telemetry studies. High populations of mammalian and reptilian predators may also be affecting this ground-nesting bird. Predation pressure does not appear to be as acute in Mexico where predator control is implemented and raptors do not appear to be as naturally abundant.

Habitat restoration has begun on both sides of the border. Mechanical treatments and prescribed fire are being utilized in an attempt to create appropriate habitat conditions. Revegetation with native plant species is beginning, and grazing deferments have been used in Mexico in an attempt to retain good bobwhite habitats on private lands. Climate change may have an important and detrimental effect on the masked bobwhite. Reduction of winter rains and change in summer monsoon patterns may reduce chances of survival of the bird. It is too early to predict the outcome of change in weather patterns, but it may be necessary to consider releasing birds in areas outside their historic range by locating habitats which closely resemble those known to be used by the bird. Normal or above average precipitation, during both the winter and monsoon seasons, over a few consecutive years may do more for conserving masked bobwhite than any other action we undertake.

Surveys for masked bobwhite have shown lack of a self-sustaining population on BANWR, and almost zero birds now occur on traditionally occupied areas in Mexico. Overall, survey results in both the U.S. and in Mexico show downward trends, with numbers approaching zero in both countries. The possibility of extinction is high due to continued habitat loss in Mexico from the widespread planting of buffelgrass and rangeland degradation, continued poor quality habitat in the United States, drought, and, possibly, from effects due to global climate change.

EB/CE Sources:

U.S. Fish and Wildlife Service. 2014. Masked Bobwhite (*Colinus virginianus ridgwayi*) 5-Year Review: Summary and Evaluation. Sasabe, Arizona. 37 pp.

U.S. Fish and Wildlife Service. 2019. Recovery Plan for the Masked Bobwhite (*Colinus virginianus ridgwayi*), Amendment 1. Albuquerque, NM. 19 pp.

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: We anticipate that up to 2% of masked bobwhites would die from eating grass exposed to malathion at maximum rates in open space developed and cotton use sites. No direct effects from spray drift are anticipated.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	<1%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	<1%
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	<1% terrestrial invertebrates
Spray drift areas - Prey item mortality	<1% terrestrial invertebrates
Plants affected (decline in growth)	<1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: The masked bobwhite is a granivore and invertivore, and is considered to have a generalist feeding strategy. They eat a variety of legumes and weed seeds in fall, winter, and early spring; and plant material and insects in summer and early fall. Additionally, habitat competition is exerted from cattle grazing, which removes necessary cover, nesting habitat, and food resources from masked bobwhite habitat. Monocultures of vegetation are avoided by the masked bobwhite.

Habitat includes level plains and river valleys; open grasslands, semi-arid desert scrub, and desert grasslands; and weedy bottomlands, grassy and herb-strewn valleys, and forb-rich plains. In Arizona, the clumped masked bobwhite coveys favor areas with relatively high vegetative structural diversity. Survival and nesting success are believed to depend heavily on the availability of herbaceous cover.

The masked bobwhite is non-migratory and breeds from July through September. Home ranges on the Buenos Aires National Wildlife Refuge averaged 10.9 hectares (26.9 acres), and core areas averaged 1.1 hectares (2.7 acres). The majority of the masked bobwhites moved less than 1 kilometer (0.6 mile) between their release location and the site of first trapping. However, some long-distance movements occurred.

Allowable uses driving effects/other considerations: The masked bobwhite currently exists in captivity. Risk to the species is calculated based on range data. We anticipate that any released masked bobwhite exposed to malathion at maximum rates on in cotton or open space developed use site in the future would be likely to experience up to 2% mortality.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near use sites, or from mosquito control applications if masked bobwhite are released near use areas. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☐ Medium ☒ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	N	0	0.000	0	0.00
Open Space Developed	D, I	318	0.128	16	0.006
Developed	D, I	11	0.005	1	0.000
Cotton	D, I	8	0.003	7	0.003
Other Crops	I	4	0.002	0	0
Pasture	I	1	0.001	2	0.001
Sub-TOTAL (D):		337	0.14	23	0.01

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Other uses with direct effects only[3]					
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		344	0.14	25	0.01
TOTAL[4]:		344	0.14	25	0.01

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 247,252 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 120,250 acres, 48.635%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the masked bobwhite. As discussed below, although the vulnerability is high for this species, we anticipate the risk and likelihood of exposure to malathion is low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

The masked bobwhite has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be low, as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We estimate that this species could experience up to 1% mortality or sublethal effects if exposed, and loss of up to 1% of invertebrate prey could occur on use sites. However, only 0.14% of the species range overlaps with use sites, and we anticipate that only 0.01% of overlapping areas will be treated with malathion based on usage data. In addition, this species has become essentially non-existent in the wild, with most or all of the remaining individuals in the United States held in captive breeding facilities, with only few individuals reported in the surrounding areas. The BANWR encompasses much of the masked bobwhite's native range in southern Arizona. Refuge management strategies focus on improving habitat for a variety of species, with an emphasis on the masked bobwhite. Small coveys were released on the Refuge in 2013. Future releases of captive brood stock are anticipated on BANWR lands and potentially other sites that will be managed for the recovery of this species. We expect reintroduction sites from captive breeding efforts to be carefully selected and managed to meet recovery goals. We do not anticipate that pesticide uses associated with the proposed action will occur to an extent that would be inconsistent with recovery objectives on release sites, and pesticides are not a known threat to the bobwhite. The implementation of the general residential conservation measures described above will further reduce the likelihood of exposure for any individuals that may enter developed or open spaced developed use areas.

Due to the low anticipated usage, conservation measures and protection of release sites for captive bred birds, we expect effects will be limited to small losses of prey for a few individuals, particularly those individuals that disperse from release sites to other suitable habitats in or near use areas. However, we do not anticipate that effects will rise to the level of take, and the use of this pesticide is not likely to have species-level effects during the course of the proposed action. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the masked bobwhite.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Sterna antillarum browni	California least tern	96

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Species/Populations widespread or wide-ranging
Number of Populations: Multiple populations (numerous)
Species Trends: Declining population(s)
Pesticides noted ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

The California least tern was Federally listed as endangered in 1969 due to threats such as habitat destruction, human disturbance, and predation (Craig 1971, pp. 4–7; CDFG 1974, p. 23). The Service's 2006 5-year review considered many of those threats to be reduced, but not eliminated (USFWS 2006, p. 22). The 2020 5-year review reports these threats are ongoing and continue to impact the continued survival and recovery of the California least tern, though many of these threats, including human disturbance, vegetation encroachment, and predation, are actively managed and reduced by volunteer, local, State and Federal agency implementation of management plans. In total, 86 percent of the current nesting areas are actively managed to ensure future nest site suitability.

The vast majority of breeding California least terns nest in the U.S.; the rest nest along the Baja California Peninsula in Mexico. Since 1970, California least terns have been regularly documented at nesting sites ranging from the San Francisco Bay area to the mouth of the Tijuana River just north of the United States–Mexico border (Marschalek 2007, pp. 16–18). The California breeding range spans four biogeographic regions as defined in Blanchette et al. (2008), with breeding colonies located within San Francisco Bay, the Santa Maria Basin, north Southern California Bight, and south Southern California Bight. Today, with the exception of a few unclear records, California least tern nesting is confined to 29 nesting areas that total approximately 487 hectares (ha) (1,204 acres (ac)) of habitat along the California coast. The number of California least tern pairs nesting at each nesting area is highly variable. For example, in 2016, the number of pairs estimated nesting at sites in California ranged from 1 (e.g., Sacramento Bufferlands, Pittsburg Power Plant) to 804 (e.g., Santa Margarita River–North Beach South) (Frost 2016, Appendix B-3). In 2016, the majority (approximately 85 percent) of California least tern breeding pairs were concentrated in southern California within the coastal Counties of Ventura, Los Angeles, Orange, and San Diego, and almost half of the birds in San Diego County nested within lands owned and managed by Marine Corps Base (MCB) Camp

Pendleton. They winter predominantely outside of the U.S., along the Pacific coast of mainland Mexico.

The U.S. population of California least tern has increased from an estimated 256 pairs at listing to an estimated 4,095 pairs in 2017. While the decreasing population trend of California least terns over the past 10 years and the low levels of productivity have been an ongoing cause for concern, the number of pairs remains significantly higher than called for in the Recovery Plan. Though intervals of low breeding success related to food resources are a natural aspect of seabird dynamics (Cury et al. 2011, p. 1704), the apparently increasing age of some California least tern populations and lack of juvenile recruitment provides evidence that this decline may be more than a periodic fluctuation and may be indicative of a range-wide decline in numbers. Based on review of the Recovery Plan, the status of the species has improved since listing through recovery efforts that have successfully ameliorated threats associated with destruction and degrdation of habitat. However, while we recommended downlisting in our 2006 5-year review of the species, we did not recommend a change in the species' endangered status in the 2020 review because of updated information related to the decreasing trend in numbers, increasing age of some populations, sustained poor productivity over the last 10 years, and on-going threats (e.g., predation, food availability).

Rising sea levels as a result of climate change may pose a substantial future threat to nesting habitat of the California least tern. Predation continues to threaten the California least tern. This threat is reduced, though not eliminated, by predator management conducted at the majority of active colonies. Food availability poses a threat to California least terns, though its impact varies from year to year with an uncertain overall magnitude. Cumulative impacts of food availability, predation, and destruction of nesting habitat together pose a substantial threat to the persistence of the California least tern, although management at a majority of the U.S. nesting sites helps to reduce the impact of these combined threats. Several California least tern nesting areas are in proximity to areas known to be contaminated with heavy metals or pesticides. However, we were unable to find any studies that quantified effect levels of contaminants on California least terns. Though there are few data available on nesting areas in Mexico, lack of legal protection and conservation measures result in a higher degree of threats attributable for nesting California least terns in Mexico than in the U.S.

EB/CE Source: 5-yr review (2020)

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Adverse effects are not anticipated for California least terns exposed to malathion via consumption of fish on use sites or via spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	<1% mortality in developed areas
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	6%
Spray drift areas - Prey item mortality	Additional effects to fish possible
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	37% fish

Risk modifiers:
The breeding range of California least terns have been documented from the San Francisco Bay Area to the Tijuana River at the Mexican border. California least terns migrate south along the California coast in fall to Baja California, west over mainland Mexico, or as far south as Costa Rica.

California least terns are aquatic birds that are found along the Pacific Coast on beaches, lagoons, rivers, bays, mudflats, and estuaries. California least terns have a broad environmental specificity but do need open beaches for nesting. When no open beaches are available, mostly due to human activity and habitat fragmentation from urban development, California least terns will nest on man-made open habitat such as airports and landfill.

California least terns primarily eat fish but will occasionally eat shrimp and small invertebrates. The California least tern forages within a few hundred meters (thousand feet) of their breeding colony, in waters less than 18.3 m (60 ft.), obtaining most of their food from shallow estuaries and lagoons, and from nearshore ocean waters.

California least terns are very mobile and have a high dispersal rate. California least terns migrate north for breeding and south for overwintering. Breeding season begins in mid-April or early May and is completed by mid-June. There is a second wave of nesting which occurs from mid-June to early August and is typically an additional nesting attempt. Most California least terns depart south by November (as early as August).

The California least tern breeds on flat surfaces in developed areas near the coast, including airfields. Terns could forage in golf course ponds, if near the coast. California least terns are unlikely to enter agricultural areas, managed forests, developed open space areas, and rangeland.

Use of right of ways would be anticipated in rare instances only. (Pers. Comm. 2016 co-occurrence information, USFWS field office request)

Allowable uses driving effects/other considerations: Prey item mortality from various uses, with the highest rates from mosquito adulticide. We anticipate effects to the fish prey base from malathion exposure on or near use sites, or from mosquito control applications. Because fish exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. We expect this reduction would be greater on use sites, where estimated environmental concentrations are higher than would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Usage data for the whole range based on data from EPA's SUUM:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	9,244,375	37.54	10,473	0.04
Developed	I	1,572,147	6.39	78,607	0.32
Open Space Developed	*	634,558	2.58	31,728	0.13
Other Crops	*	179,822	0.73	0	0
Pasture	*	171,811	0.70	93,143	0.38
Other Grains	*	43,295	0.18	15,467	0.06
Orchards and Vineyards	*	38,409	0.16	33,237	0.13
Wheat	*	36,685	0.15	21,685	0.09
Cotton	*	32,450	0.13	4,070	0.02
Vegetables and Ground Fruit	*	22,155	0.09	13,359	0.05
Corn	*	13,259	0.05	703	<0.01
Nurseries	*	4,962	0.02	4,962	0.02
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		1,572,147	6.39	78,607	0.32

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
TOTAL[4]:		10816522	43.93	89080	0.36

Agricultural usage in California only based on CalPUR data:

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Other Crops	*			0	0.00
Pasture	*			0	0.00
Other Grains	*			4	0.00
Orchards and Vineyards	*			567	0.02
Wheat	*			0	0.00
Cotton	*			0	0.00
Vegetables and Ground Fruit	*			24954	0.11
Corn	*			703	0.00
Nurseries	*			4962	0.02
TOTAL *(direct and indirect effects)*[7]**:**				0	0

 # acres in species range: 24,622,321 acres
% of range in California (i.e., where CalPUR data is available): 27%
Range overlap with Federal lands: 11,211,203 acres, 45.533%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The California least tern is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats. Changes to the general labels (e.g. reduction in number of applications allowed per year, timing restrictions) would further reduce potential impacts to the California least tern.

[4] TOTAL includes usage on all use sites with effects, including mosquito control.
[5] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[6] Estimated usage in the range is based on information about annual past usage.
[7] TOTAL includes usage on all use sites with effects, including mosquito control.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the California least tern. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The California least tern has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range will be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We do not anticipate that exposure to malathion would result in mortality or sublethal effects for any uses other than those in developed areas, although prey item mortality is anticipated in developed and mosquito control areas. About 37% loss of fish could occur from mosquito control, and 6% of prey could experience mortality from developed areas with additional loss of fish in spray drift areas. However, while 37.54% of the species range overlaps with mosquito control areas, and 6.39% overlaps with developed areas, usage is anticipated to be 0.04% for mosquito control and 0.32% in developed areas based on past usage data. We anticipate the loss of and reduced fitness supporting reproductive capacity in a very small number of individuals from exposure and food resource (invertebrate prey) declines in localized areas over the duration of the action. However, we do not expect species-level effects to occur. Pesticides are not a known threat to this species, and we anticipate that California least terns will be able to move to other suitable foraging areas where prey can be found if a localized loss of prey occurs due to the use of malathion. In addition, we anticipate the conservation measures described above would further reduce the risk of exposure and effects on California terns and their prey. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the California least tern.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Rallus longirostris obsoletus	California clapper rail	102

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Small, endemic, constrained, and/or isolated population(s)
Number of Populations: Single population
Species Trends: Declining population(s) – one or more populations declining
Pesticides noted ☒

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
From the species' 2013 and 2020 5-Year Reviews:
California clapper rails occur almost exclusively in tidal salt and brackish marshes with unrestricted daily tidal flows, adequate invertebrate prey food supply, well developed tidal channel networks, and suitable nesting and escape cover as refugia during extreme high tides. The California clapper rail now occurs only within the tidal salt and brackish marshes around San Francisco Bay where it is restricted to less than 10 percent of its former geographic range. The California clapper rail population was estimated at 4,200 to 6,000 birds between 1971-1975. Results of an estuary-wide survey estimated a minimum average population between 2005 and 2008 of 1,426 California clapper rails (Liu et al. 2009), however, densities declined during that period at a per-year rate of 20 percent and current numbers are likely lower. Overall, the estimated range-wide California clapper rail population has increased since the 2013 5-Year Review. Our estimated range-wide annual population for 2011 was 899 rails and for 2018 was 1,192 rails. Our analysis indicates that the California clapper rail population has increased across both the San Pablo Bay and Central/South San Francisco Recovery Units since the 2013 5-Year Review, but the distribution of rails has become increasingly concentrated to fewer sites and less habitat area.

A lack of extensive blocks of two tidal marsh habitats with suitable structure is the ultimate limiting factor for the species' recovery. Vulnerability to predation by native and non-native predators is exacerbated by reduction of clapper California clapper rail habitat to narrow and fragmented patches close to urban edge areas that diminish habitat quality. Further, anticipated sea level rise presents a high magnitude threat in the long-term, especially in the central and south San Francisco Bay where opportunities for landward migration of habitat are nearly absent. Levees provide artificial access for terrestrial predators, and displace optimal cover of high marsh vegetation.

The rapid invasion of San Francisco Bay by exotic Spartina alterniflora (smooth cordgrass) and its hybrids with the native S. foliosa (Pacific cordgrass) has presented a unique challenge. In the

near-term, eradication poses a severe threat to California clapper rails and their habitat. Potential covariates associated with reduction in survival are not statistically significant, but suggest survival is lower in association with Spartina control spraying, during periods of high tide inundation, and according to body condition metrics. While invasive Spartina is potentially detrimental to many native species, California clapper rails use invasive Spartina stands. Invasive Spartina benefits the rail by providing habitat for breeding and high tide refugia.

Finally, contaminants, particularly bioaccumulative pollutants such as mercury and selenium, are a significant factor affecting viability of California clapper rail eggs. Tidal marshes in California today are the focus of numerous diverse conservation efforts. Many significant preservation, restoration, management, education, monitoring, and research projects are being planned or are underway, and new initiatives are emerging continuously. Throughout the bay, the remaining clapper rail population is threatened by a suite of mammalian and avian predators known to take individuals and eggs of California clapper rail. Known contaminants of concern in the Bay Area include mercury, selenium, polychlorinated biphenyls, organochlorine and organophosphate pesticides, dioxins/furans, polycyclic aromatic hydrocarbons, and tributyltin from anti-fouling boat paints (see SWRCB 303d list, Region 2; Oros and Hunt 2005; Schwarzbach et al. 2006; Adelsbach and Maurer 2007). Ammonia and pyrethroid insecticides have become a recent concern. In addition, newly emerging contaminants which may act to disrupt endocrine systems, such as polybrominated diphenyl ethers and phthalates, are being detected in the estuary's water, sediments, and biota (Oros et al. 2005, Oros and Hunt 2005) and are poorly understood. Toxic effects of many of these chemicals to rails and other estuary biota are not known. Because California clapper rails have lost so much habitat, their populations are much reduced in size. There are many causes of the increased risk of extinction characteristic of small populations. For example, small populations have increased vulnerability to extinction due to catastrophic events like severe droughts, storms, fires, pollution spills, non-native species invasion, or epidemics (Schonewald-Cox et al. 1983).

EB/CE Sources: Service's 5-year reviews (Service 2013, 2020)

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: The California clapper rail is not anticipated to enter malathion use sites, and no effects are expected from exposure to malathion from mosquito adulticide use or via spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects expected
Spray drift areas - Prey item mortality	26% to invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	65% invertebrates

Risk modifiers: The California clapper rail inhabits coastal wetlands and brackish areas and currently occurs only in the marshes of San Francisco Bay. In San Francisco Bay, approximately 90 percent of the population occurs in the South San Francisco Bay region.

Diet consists primarily of bivalves, crustaceans, and terrestrial invertebrates, with small birds and rodents taken less frequently.

California clapper rails are non-migratory and have low mobility. Breeding occurs from February to August. Brood nests are high tide refuges for young rails, and consist of a platform of woven stems without a substantial canopy, potentially exposing them to spray if an application were to occur on or near their habitat.

California clapper rails are not expected to enter malathion use sites, and as such any exposure to malathion is expected to be from spray drift or mosquito control (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: We anticipate effects to the invertebrate prey base from malathion exposure near use sites or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ **High** ☒ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Usage data for the whole range based on data from EPA's SUUM:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	3,140,106	65.47	16,000	0.33
Developed	*	581,399	12.12	29,070	0.61
Open Space Developed	*	296,912	6.19	14,846	0.31
Other Crops	*	37,233	0.78	0	0
Orchards and Vineyards	*	34,716	0.72	29,451	0.61
Corn	*	33,528	0.70	580	0.01
Other Grains	*	33,201	0.69	13,504	0.28
Pasture	*	31,790	0.66	30,597	0.64
Wheat	*	19,832	0.41	18,484	0.39
Vegetables and Ground Fruit	*	12,807	0.27	12,807	0.27
Rice	*	703	0.01	620	0.01
Other RowCrops	*	670	0.01	670	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0.00	0	0.00
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0.00	0	0.00
TOTAL[4]:		3,140,106	65.47	16,000	0.33

Agricultural usage in California only based on CalPUR data:

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Other Crops	*			0	0.00
Orchards and Vineyards	*			628	0.02
Corn	*			35	0.001
Other Grains	*			4	0.000
Pasture	*			0	0.000
Wheat	*			0	0.000
Vegetables and Ground Fruit	*			14,019	0.29

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.
[5] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[6] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Rice	*			0	0.000
Other RowCrops	*			0	0.000
TOTAL *(direct and indirect effects):*				0	0

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 4,796,461 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 697,794 acres, 14.548%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The California clapper rail is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of indirect effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the California clapper rail. As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The California clapper rail has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We do not anticipate that mortality or sublethal effects would occur on use sites or from spray drift. We do expect that loss of prey items could be high from spray drift and in mosquito control areas (26% and 65% loss of invertebrates coinciding with use area overlaps with the range, respectively). While these overlaps are high, usage data indicates that 0.33% of mosquito control areas have been treated with malathion annually in the recent past, and annual usage for other uses totals 0.411% based on CalPUR data as shown in the usage table above. This species occurs in marsh habitats of the San Francisco Bay, which is within a densely populated area that is likely to be treated for mosquitos. While loss of suitable foraging areas could lead to starvation or site abandonment by individuals or multiple rails where they are clumped around resources, and site recolonization could be problematic due to the fragmented nature of remaining suitable habitat and the low mobility of the California clapper rail, we anticipate these scenarios from malathion usage are likely to be rare due to the low usage anticipated. In addition, we anticipate the conservation measures described above would reduce the risk of exposure and adverse effects on prey items. Thus, while we anticipate adverse effects to a small number of individuals due to a reduction in fitness supporting reproductive capacity from losses of prey in some instances, we do not expect species-level effects because of the low amount of anticipated usage within the range and remaining prey availability. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the California clapper rail.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Rallus longirostris levipes	Light-footed Ridgway's (=clapper) rail	103

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Species/Populations neither constrained nor widespread
Number of Populations: Multiple populations (few)
Species Trends: Increasing population(s)
Pesticides noted ☒

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

Historically, the range of the light-footed Ridgway's rail extended along the Pacific coast from Santa Barbara, California, in the north to (according to most authors) Bahía de San Quintín, Baja California, Mexico in the south (Cooke 1914, p. 18; Grinnell et al. 1918, p. 290). Currently, the U.S. range of light-footed Ridgway's rails in California extends from southern Ventura County in the north to the Mexican border in the south. This represents a contraction in the range from its historical maximum and since the subspecies was listed in 1969. In 2019, light-footed Ridgway's rails were reported at 19 locations from Ventura to San Diego Counties in California. Of these 19 occurrences, only 6 have had more than 20 pairs when averaged over 5 years, 2 of which have not received augmentation from the captive breeding program in that time. The status and distribution of light-footed Ridgway's rail in Baja California, Mexico remains largely unknown.

A statewide abundance estimate was not available at listing, but annual breeding pair census surveys started in 1980. Surveys show the estimated population has fluctuated, but generally increased, with the number of pairs detected ranging from a low of 142 in 1985 to a high of 656 in 2016. However, the most recent surveys have detected a sharp deline from 2016 to 2019 in the number of rail pairs detected from 656 to 308. This is especially concerning, as the population has increasingly been augmented with captive-raised rails, and may indicate an inability of the species to naturally recover from perturbations.

Regulatory mechanisms have generally been successful in stopping destruction and deleterious modification of marshlands inhabited by the rail, and conservation efforts have included habitat improvements, installing artificial nesting platforms, captive breeding and translocation, predator control, and annual range-wide censuses surveys. Reduced habitat quality, the effects associated with small population sizes, and unnaturally high levels of predation are the predominant factors limiting light-footed Ridgway's rail abundance. Additionally, hydrological changes and the

effects of climate change and seal level rise threaten the persistence of this subspecies into the future.

Light-footed Ridgway's rails are omnivorous and opportunistic foragers, which rely mostly on salt marsh invertebrates such as beetles (Coleoptera), garden snails (Helix spp.), California hornsnails (Cerithidea californica), salt marsh snails (Melampus olivaceus), fiddler and hermit crabs (including Pachygrapsus crassipes, Hemigrapsus oregonensis, and probably Uca crenulata), crayfish, isopods, and decapods (USFWS 1985a, p. 9).

The light-footed Ridgway's rail exhibits low levels of genetic variability as determined by randomly amplified polymorphic DNA (RAPD) analysis and microsatellite DNA comparison (Nusser et al. 1996, p. 469; Fleischer et al. 1995, p. 1240), matching or nearly matching the levels of highly inbred species such as the Guam rail (*Rallus owstoni*) and captive Nene (*Branta sandvicensis*). Though a major factor in the listing of this species, major habitat loss due to development is now unlikely for the remaining light-footed Ridgway's rail habitat due to regulation changes. Nonpoint source pollution (e.g., pesticides, metals, polybrominated diphenyl ethers, pyrethroids and other contaminants of emerging concern) from urban, industrial and agricultural uses poses a range-wide risk similar to a stochastic event. Predation is a major ongoing threat to the survival and recovery of this species. This species is generally restricted to coastal salt marshes and prefers to nest in the lower marsh areas. Many of the marshes currently occupied by light-footed Ridgway's rails are immediately surrounded by urban landscapes with little room to expand if water levels were to rise. Therefore, changes in tidal flow patterns and timing will likely impact the local distribution and ultimately the local survival of this species.

EB/CE Source: Service's 5-year reviews (Service 2009, 2020)

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: The light-footed Ridgway's rail is not anticipated to enter malathion use sites, and no effects are expected from exposure to malathion from mosquito adulticide use or via spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected

Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects expected
Spray drift areas - Prey item mortality	Up to 20% to aquatic invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	79%

Risk modifiers: The range of the light-footed Ridgway's rail in California extends from Ventura County in the north to the Mexican border in the south.

Light-footed Ridgway's rails eat salt marsh invertebrates and foraging is mainly restricted to the marsh, though may occasionally occur in habitats surrounding the salt marsh, including vegetation-mud flat interfaces, along mud banks of intertidal creeks, in freshwater vegetation and ditched/ponded water, and to a lesser extent on open mudflats and upland hillsides where rails could be exposed to direct spray.

Light-footed Ridgway's rails are non-migratory and have low to moderate mobility (<1,500 ft). Distribution of individuals is clumped according to resources. Breeding occurs from March to August. Nesting occurs in dense vegetation where exposure to direct spray is limited.

Light-footed Ridgway's rails are not expected to enter use sites, and as such any exposure to malathion is expected to be from spray drift or mosquito control (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Mosquito control, spray drift from use sites.

We anticipate effects to the invertebrate prey base from malathion exposure on or near use sites, or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Usage based on CalPUR data:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	604,084	78.96	0	0.00
Developed	*	330,297	43.17	16,515	2.16
Open Space Developed	*	85,265	11.15	4,263	0.56
Vegetables and Ground Fruit	*	2,400	0.31	2,400	0.31
Nurseries	*	1,934	0.25	1,934	0.25
Orchards and Vineyards	*	1,405	0.18	1	0.00
Other Crops	*	407	0.05	0	<0.01
Pasture	*	266	0.03	0	<0.01
Other Grains	*	131	0.02	0	<0.01
Wheat	*	118	0.02	0	<0.01
Corn	*	11	<0.01	0	<0.01
Cotton	*	7	<0.01	0	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0	0	0
TOTAL[4]:		604084	78.96	0	0

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 765,020 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 163,621 acres, 21.388%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: While the light-footed clapper rail is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application. In addition, exposure to aquatic organisms is reduced due to buffers from waterways, which specify on the label a distance from water bodies where pesticides are not to be applied, and restrictions to application during periods where rain is not forecasted within 24 hours or when the soil is not saturated.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the light-footed Ridgway's rail. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The light-footed Ridgway's rail has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We do not anticipate that mortality or sublethal effects would occur on use sites or from spray drift. We do expect that loss of prey items could be high from spray drift and in mosquito control areas (up to 20% and 79% loss of invertebrates coinciding with use area overlaps with the range, respectively). However, while these overlaps are high, usage data indicates that no mosquito control areas have been treated in the recent past with malathion, and annual usage for other uses totals just over 3% based on CalPUR data as shown in the usage table above. This species is unlikely to enter use sites, so we are primarily concerned about loss of invertebrate prey in spray drift areas. While loss of suitable foraging areas could lead to starvation or site abandonment by individuals or multiple rails where they are clumped around

resources, and site recolonization could be problematic due to the fragmented nature of remaining suitable habitat and the low mobility of the light-footed Ridgway's rail, we anticipate these scenarios from malathion usage are likely to be rare due to the low usage anticipated. In addition, we anticipate the conservation measures described above would reduce the risk of exposure and adverse effects on prey items. Thus, while we anticipate adverse effects to a small number of individuals due to a reduction in fitness supporting reproductive capacity from losses of prey in some instances, we do not expect species-level effects because of the low amount of anticipated usage within the range and remaining prey availability. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the light-footed Ridgway's rail.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Dryobates (= Picoides) borealis	Red-cockaded woodpecker	107

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered; Proposed Rule (10/8/2020): Downlist to threatened
Distribution: Species/Populations widespread or wide-ranging
Number of Populations: Multiple populations (numerous)
Species Trends: Increasing population(s)
Pesticides noted ☒

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

fuels. Without this intervention, many populations, especially the low and very low resilience populations, likely would have been extirpated.

EB/CE Source:

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.

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Most red-cockaded woodpeckers exposed to malathion at maximum rates from foraging in developed use sites are expected to die.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	3% terrestrial invertebrates, no effects from foraging on fruit or seeds
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	4% (G, R – low effects, terrestrial invertebrates; no effects from other dietary items)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	4% terrestrial invertebrates
Spray drift areas - Prey item mortality	Effects to terrestrial invertebrates
Plants affected (decline in growth)	4%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	50% terrestrial invertebrates, no effects to plants

Risk modifiers: The red-cockaded woodpecker occurs in Alabama, Arkansas, Louisiana, Mississippi, Texas, Florida, Georgia, North Carolina, Oklahoma, Virginia, and South Carolina.

Over 75 percent of the diet of red-cockaded woodpeckers consists of arthropods, especially ants and roaches, but also beetles, spiders, centipedes, true bugs, crickets, and moths. Fruits and seeds

make up the small remaining portion of the adult diet. Red cockaded woodpeckers require abundant foraging habitat, consisting of mature pines with an open canopy, low densities of small pines, little or no hardwood or pine midstory, few or no overstory hardwoods, and abundant native bunchgrass and forb groundcovers. Red-cockaded woodpeckers generally capture arthropods on and under the outer bark of live pines and in dead branches of live pines.

This species endemic to open, mature and old growth pine ecosystems. Red-cockaded woodpeckers require open pine woodlands and savannahs with large old pines for nesting and roosting habitat (clusters). Because of the cooperative breeding system, red-cockaded woodpecker populations are unusually resistant to environmental and demographic variation, but highly sensitive to the spatial arrangement of habitat. Colonization of unoccupied habitat is an exceedingly slow process under natural conditions, because cavities take long periods of time to excavate and birds do not occupy habitat without cavities. The species is distributed largely as distinct populations, with large gaps of unoccupied land between them. Red-cockaded woodpeckers are non-migratory.

Red-cockaded woodpeckers may use some managed forests, but are not those that are intensively managed short-rotation (< 30 years) stands, although they may disperse thru intensively managed forest pine stands. Woodpeckers may also use golf courses, residential, and developed areas with sufficient residual large or old pines. Red-cockaded woodpeckers are not expected to forage or roost in agricultural fields, row crops, rice, orchards and vineyards, rangeland, right of ways, and developed open space areas. (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: All effects on use sites, including mortality and sublethal effects to woodpeckers, and mortality to terrestrial invertebrates are driven by overlap with developed areas. These effects are likely over-estimated, as it assumes that all overlap with developed areas within the species range contain suitable habitat for red-cockaded woodpeckers (i.e., sufficient residual large or old pines). It is likely that only a portion of the developed areas contain these features.

Effects to terrestrial invertebrates from spray drift are possible, but likely to be minimized to some extent by from the forest habitat occupied by the woodpecker. In addition, because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	57,482,819	49.65	5,263,507	4.55
Pasture	*	766	<0.01	470	<0.01
Pine Seed Orchards	*	836,273	0.72	44,955	0.04
Open Space Developed	*	5,513,629	4.76	275,681	0.24
Other Crops	*	1,360,815	1.18	44	<0.01
Developed	D, I	4,318,075	3.73	215,904	0.19
Corn	*	1,512,600	1.31	13,666	0.01
Cotton	*	1,281,623	1.11	113,284	0.10
Wheat	*	62,697	0.05	8,289	0.01
Other RowCrops	*	610,273	0.53	29,630	0.03
Orchards and Vineyards	*	951,236	0.82	268,367	0.23
Other Grains	*	667,486	0.58	43,896	0.04
Sub-TOTAL (D): *Other uses with direct effects only*[3]		4,318,075	3.73	215,904	0.19
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		4,318,075	3.73	215,904	0.19
TOTAL[4]:		61,800,894	53.38	5,479,410	4.73

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 115,766,882 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 13,599,214 acres, 11.747%

Overall Usage: ☐ **High** ☒ **Medium** ☐ **Low**

CONSERVATION MEASURES

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the red-cockaded woodpecker. As discussed below, although the vulnerability is high for this species and we anticipate the risk and likelihood of exposure to malathion is medium, the implementation of the general conservation measures described above is expected to reduce the likelihood of exposure.

The red-cockaded woodpecker has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be medium, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Mortality is anticipated on 3% of the range, and low effects to growth and reproduction are anticipated on 4% of the species range annually based on labeled uses. In addition, we anticipate a loss of invertebrate prey on 50% or more of the range based on labeled malathion uses, primarily due to mosquito control. While we do not anticipate that usage will occur everywhere and to the extent the labels allow, usage data indicates that malathion has been used for mosquito control on about 4.55% of the range and on 0.19% of the range on developed areas, which is the only other use site where effects are anticipated for the woodpecker, annually.

This species occurs in open, mature and old growth pine ecosystems. The effects calculated for other uses in the risk table above are driven by overlap with developed areas, and are likely over-estimated due to assumptions that all overlap with developed areas within the species range contains suitable habitat for red-cockaded woodpeckers. However, it is likely that only a portion of the developed areas contain these features. Effects to terrestrial invertebrates from spray drift are possible, but are likely to be minimized to some extent by from the cover provided by the pine habitat occupied by the woodpecker. In addition, the conservation measure described above for residential uses would further reduce the risk of exposure of red-cockaded woodpeckers and their prey on developed use sites. Pesticides have been noted as a threat to this species, and we do anticipate a loss of a small number of individuals, low-level effects to growth and

reproduction and some reductions in prey that would reduce fitness supporting reproductive capacity in a few woodpeckers in developed areas when applications occur. We also anticipate loss of prey in areas treated with malathion for mosquito control. However, we do not anticipate species-level effects due to the somewhat low levels of malathion usage expected in the range for uses with anticipated effects, limited potential for individuals to occur and be exposed to malathion on use sites, separation between populations and reduced risk of exposure due to the association of the woodpecker with forest cover for nesting and many of its foraging opportunities. While geographically separate populations may not be conducive to recolonization or immigration if a population is impacted, it reduces the risk that the species as a whole will experience species-level effects. For these reasons, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the red-cockaded woodpecker.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☒

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The Mississippi sandhill crane is restricted to the Mississippi Sandhill Crane National Wildlife Refuge (NWR) and its immediate environs in southern Jackson County, Mississippi, between the cities of Ocean Springs and Gautier (U.S. Fish and Wildlife Service 1991, Hereford and Dedrickson 2019b). While most nesting occurs on the NWR, Mississippi sandhill cranes frequently use off-refuge areas such as fields and pastures for foraging, especially in autumn, winter and early spring. Approximately 30 percent of the crane observations recorded in 2018 were off-refuge (Hereford and Dedrickson 2019b).

In 2000, the population was estimated at 110-120 individuals (S. G. Hereford, pers. comm.). 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 attatining a free-living, stable, and self-sustaining standing population. Long term self-sustenance and stability will require a genetically viable population, high levels of natural recruitment, and cessation of the captive release program. Currently, the numbers of fledged chicks are not sufficient to maintain the crane population to meet the population goal, although the success rate of natural nests showed improvement from 2013 through 2018. Release of captive-bred juveniles will need to be continued until the problem with low natural juvenile survival rates can be resolved and the Mississippi sandhill crane has demonstrated the ability to sustain its population over time.

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. However, to achieve recovery, the population must become self-sustaining without the need for augmentation of captive-bred chicks. This goal has not yet been achieved. According to the 2019 5-year review, the wild Mississippi sandhill crane population has remained relatively stable since 1993, ranging from 110-140 individuals (Hereford and Dedrickson 2018c, 2019b), primarily due to augmentation from annual releases of captive-bred juveniles, although 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 will still need to be continued for the foreseeable future. Predation of young birds is likely the primary factor affecting mortality in the population. Off-refuge habitat is used less frequently for nesting as there is very limited nesting habitat off-refuge, primarily due to habitat loss and degradation.

The human population in southeastern Mississippi, especially along the coast, has increased dramatically. Construction of roads and power lines and commercial and residential development have accompanied the increased human population. In the mid-1950's, timber companies acquired or leased lands for pine tree production. Slash pine was planted on thousands of acres during the 1950's and 1960's. To encourage tree growth in wet situations, savannas were drained and in some areas seedlings were bedded and furrowed. Access roads and fire breaks were constructed. Wild fires were suppressed. The pine plantations formed dense stands that precluded nesting and feeding by cranes.

Flooding, caused by heavy rainfall, has killed eggs and chicks (Mcllhenny 1938). In April 1980, heavy rainfall may have inundated two nests with eggs. Flash floods regularly occur and nests in low lying areas have been flooded. Hurricanes come ashore along the Mississippi Coast about once every 3 to 5 years. Crane mortality caused by the winds and rains associated with hurricanes has not been documented but loss of birds, eggs, and nests are certainly possible. Conversely, spring and summer droughts are common. Lack of drinking water could cause chick mortality.

Until fairly recently, fire ant eradication with Mirex was common. 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 are often treated with herbicides. Since 1981, eighteen cranes have been necropsied by the National Wildlife Health Research Center (NWHRC, Madison, Wisconsin). Six of these birds were diagnosed as having biliary hyperplasia and five of the six with biliary hyperplasia had adenocarcinomas. In four cases, the tumors could have caused death. Similar tumors are very rare among wild birds and tumors have not been documented among the USGS Patuxent Wildlife Research Center (PWRC, Laurel, Maryland) cranes. Although the causative agent has not been established, because both tumors and biliary hyperplasia have been found in each case, a toxin may be indicated (Couvillion et al., 1991). The susceptibility of the Mississippi sandhill crane to the toxins may be increased by the loss of genetic variability.

EB/CE Sources:

U.S. Fish and Wildlife Service. 1991. Mississippi sandhill crane (*Grus Canadensis pulla*) Recovery Plan. Atlanta, Georgia. 42 pp.

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

Overall Vulnerability: ☒ High ☐ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Of use sites that the Mississippi sandhill crane is expected to enter, no mortality is anticipated on pasture, and mortality of between 0-7% of individuals in open space developed areas is anticipated, depending on food item.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	<1%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	0-10% (G - low effects), 0-10% (G - high effects; consumption of birds only), 0-10% (R - low to high effects)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	0-10% depending on dietary item
Spray drift areas - Prey item mortality	Effects to invertebrates
Plants affected (decline in growth)	10%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	85% (R - low effects; consumption of birds only)
Indirect	85% invertebrates, 8% reptiles and terrestrial amphibians

Risk modifiers: The Mississippi sandhill crane is currently restricted to an area in southern Jackson County, Mississippi, extending from the Pascagoula River west to the Jackson County line, south to Simmons Bayou, north to latitude about 4 miles north of Vancleave. Part of this area is within the Mississippi Sandhill Crane NWR. The main winter roost is in the marshes of Bluff Creek, Bayou Castelle, and Paige Bayou.

Prey of the Mississippi sandhill crane includes adult and larval insects, earthworms, crayfish, small reptiles, amphibians, especially frogs, and perhaps small birds and mammals. During the fall, winter, and early spring, most of the cranes feed on small corn and chufa (*Cyperus esculentus*) fields, pastures, and pecan orchards found within several miles of the nesting range. The crane picks food items from ground surface or probes into substrate.

The Mississippi sandhill crane is found in open savannas, swamp edges, young pine plantations, and wetlands along edges of pine forests. The ideal nesting habitat can be characterized as an

open area of grasses and sedges with perennial shallow water. Other known roosts include savannas, open forests, pastures, and moist clearings in the foraging areas. The Mississippi sandhill crane is non-migratory. The Mississippi sandhill crane normally nests as far as possible from sources of disturbance. First clutches generally hatch from May 1 through May 20.

Mississippi sandhill cranes frequently use pasture inside (managed specifically for them) and outside the national wildlife refuge where they occur. Right of ways, developed open space areas and golf courses may be used for foraging. Use of other agriculture sites, managed forests, and developed areas by cranes is unlikely.

Allowable uses driving effects/other considerations: Overlap with open space developed accounts for all effects other than mosquito control.

We anticipate effects to a portion of the prey base (i.e., invertebrates, reptiles, amphibians) from malathion exposure on or near use sites, and from mosquito control applications. Because species within these taxa exhibit a range of sensitivities to malathion, we expect exposure will reduce their abundance in these areas, but not completely eliminate these taxa in these portions of the range. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	248,878	85.27	15,286	5.24
Developed	*	28,778	9.86	1,439	0.49
Open Space Developed	D, I	28,016	9.60	1,401	0.48
Other Crops	*	681	0.23	0	0
Other RowCrops	*	609	0.21	575	0.20
Cotton	*	543	0.19	543	0.19
Orchards and Vineyards	*	340	0.12	300	0.10
Corn	*	45	0.02	45	0.02

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Vegetables and Ground Fruit	*	26	0.01	26	0.01
Pasture	*	<1	<0.01	<1	<0.01
Pine Seed Orchards	*	<1	<0.01	<1	<0.01
Wheat	*	2	<0.01	1	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		28,016	9.60	1,401	0.48
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		28,016	9.60	1,401	0.48
TOTAL[4]:		276,894	94.87	16,687	5.72

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

The usage table above is based on lands in three counties (Harrison and Jackson Counties, MS and Mobile County, AL) that comprised the prior range of the Mississippi sandhill crane. Of those counties, data indicate that malathion usage for mosquito control occurred only in Mobile County, AL, and was the sole basis for the estimated usage in the range, above. The species range map was refined in January 2022. The current range now includes lands in just one county (Jackson County, MS) with data indicating there has been no usage for mosquito control in the county (based on 2012-2018 data). Therefore, we estimate that there will be no usage for mosquito control within the range of this species. Based on this change, Overall Usage is anticipated to be Low.

 # acres in species range: 291,865 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 38,600 acres, 13.225%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The Mississippi sandhill crane is known to rely, in part, on food resources and habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow for malathion to degrade before runoff events occur. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

where pesticides are not to be applied) are required of all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by reducing exposure from ingesting contaminated prey and minimizing losses of prey items due to malathion exposure in aquatic habitats.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

We anticipate these changes to the general labels (e.g. reduction in number of applications allowed per year, timing restrictions, habitat buffers, etc.) will reduce exposure, thereby reducing potential impacts to the Mississippi sandhill crane.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Mississippi sandhill crane. As discussed below, the vulnerability is high for this species and the risk posed by malathion exposure would be high. However, while usage that would lead to exposure was initially projected to be medium, new information indicates usage would be low due based on the lack of mosquito adulticide usage in a recent refinement of the species range. While this range refinement could lead to changes in overlap for other uses, the general conservation measures described above are expected to further reduce the likelihood of exposure and associated adverse effects to the species. In particular, changes to the labeled use of malathion in open space developed areas (the only use site this species is likely to enter), as described in the Conservation Measures and further below, are expected to reduce exposure to the species such that any increases in overlap with the refined range would not be expected to result in increased effects.

The Mississippi sandhill crane has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within the range would be medium, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. About 13% of the species range is on Federal lands primarily comprised of the Mississippi Sandhill Crane and Grand Bay NWRs that are managed for the species. The species relies on refuge lands, but also utilizes off-refuge habitats for foraging and, less frequently, nesting. Open space developed areas account for all anticipated effects to the species on use sites other than

mosquito control; these uses overlap with 9.60% and 85.27% of the species range respectively. Anticipated effects from labeled uses other than mosquito control include a low level of direct mortality (less than 1%), high to low sublethal effects related to growth and reproduction on 0-10% of the range (depending on prey item consumed) and 0-10% prey item mortality (depending on type of prey). In mosquito control areas, low-level effects to reproduction are anticipated to those individuals consuming birds on up to 85% of the range annually, in addition to the loss of invertebrates in the same areas and loss of reptile and terrestrial amphibian prey in 8% of the range. Some loss of invertebrates is also anticipated in spray drift areas.

While we do not anticipate that usage will occur everywhere the labels allow, past usage data indicates that malathion has been used to treat about 0.48% of the range in open space developed areas (the only non-mosquito adulticide use sites the species is expected to utilize) annually. Usage in 5.24% in the range for mosquito control is likely overestimated. A 2022 range refinement has reduced the range to only one county where recent data indicates usage has not occurred for mosquito control, the primary use that would otherwise drive anticipated effects. As a result, we do not anticipate that any of the effects described in the Risk section and summary above are likely to occur for mosquito control. For other uses, the risk of mortality from direct exposure is low (<1%), sublethal effects to growth and reproduction are anticipated for 0-10% (depending on prey type consumed), and a reduction in some food resources (0-10% depending on dietary item) is anticipated on use sites and spray drift areas (invertebrates only).

However, while the Mississippi sandhill crane continues to have low natural juvenile survival rates and has not demonstrated the ability to sustain its population over time due to its vulnerable status and difficulty of establishing a self-sustaining population, we anticipate only low level impacts from malathion. Low usage is anticipated in the refined species range area due to the lack of past usage for mosquito control in this area. This species has a varied diet, and we anticipate prey of adequate quality and quantity would remain available, such that losses from malathion would not lead to reduced reproductive capacity, reduced growth, starvation, site abandonment or inadequate fuel needed for breeding, raising young and overwintering. In addition, label restrictions described in the general conservation measures above are expected to further reduce the risk of exposure and effects on Mississippi sandhill cranes and their prey items on and adjacent to open space developed (through the residential conservation measures) and agricultural use sites through means such as reducing application rates and frequencies, using only spot treatments in residential areas (including open space developed areas), buffering aquatic habitats and reducing the likelihood of malathion transport off-site after rain events. Thus, with the limited usage and risk of exposure in the refined species range, we do not anticipate the proposed action would have species-level effects.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Mississippi sandhill crane.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Lanius ludovicianus mearnsi	San Clemente loggerhead shrike	115

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Small, endemic, constrained, and/or isolated population(s)
Number of Populations: Single population
Species Trends: Increasing population(s)
Pesticides noted ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The information below is primarily from the Service's 5-year review (Service 2009). The Service's 2020 5-year review states that the evaluation of threats affecting the species and analysis of the status of the species in our 2009 5-year review remains an accurate reflection of the species current status.

The San Clemente loggerhead shrike is a medium sized, predatory passerine bird found only on San Clemente Island, California. San Clemente Island is entirely owned by the U.S. Navy. Its population at the low in 1998 was 14 individuals; in 2006 the populations resurged to approximately 206 individuals. The final listing rule identified habitat degradation by non-native herbivores as a primary threat to the subspecies (42 FR 40682–40685); the recovery plan was more specific and indicated that goats were the primary threat, at the time (USFWS 1984). Only 16 percent of the island (2,282 hectares) remains suitable for nesting by San Clemente loggerhead shrikes. Sheep, goats, and pigs were eradicated from the island by the early 1990s. Canyon shrub/woodland and maritime desert scrub cholla habitat (including the appropriate nesting substrate) is beginning to recover in many areas affected by overgrazing. Predation by introduced black rats and feral cats, and natural predators such as native raptors and foxes, continue to be a threat to the low extant populations of shrike on San Clemente Island, and while rarely documented, is considered to be the greatest cause of annual mortality (Juola et al. 1997; Bradley et al. 2007; Heath et al. 2007). Efforts to negate predation by non-native vertebrate species have continued, and are treated by the Navy's INRMP (U.S. Navy 2002), which provides practicable means to reduce and eliminate feral cats, black rats, and other non-native rodents. Implementation of the U.S. Navy's Loggerhead Shrike Recovery Program (U.S. Navy 2002) has resulted in expanded distribution of the species on the island, with a greater percentage of the population now distant from potential training conflicts. Population modeling suggests that the San Clemente loggerhead shrike faces an unacceptable risk of extinction due to stochastic events (Grant and Wiese 2006). Catastrophic military training fires pose the greatest stochastic single-event risk to the San Clemente loggerhead shrike, a risk second only to that of a severe storm event sweeping over the island. The small endemic population is at risk from stochastic events

and other stressors; however, pesticides and other contaminants are not a threat to this species. Furthermore, their range is entirely within lands owned and trained by the U.S. Navy where heavy pesticide usage would not be expected.

EB/CE Source: Service's 5-year reviews (Service 2009, 2020)

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: We anticipate that San Clemente loggerhead shrikes exposed to malathion at maximum rates on use sites will die.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	6%
Spray drift areas – mortality	Possible mortality if exposed
Sublethal – growth (G), reproduction (R) and behavior (B)	6% (G, R – low effects), 6% (G, R – high effects from consuming birds, mammals)
Direct spray or contact with contaminated media	Possible mortality if exposed
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	3 - 6% terrestrial invertebrates, birds, reptiles, terrestrial amphibians
Spray drift areas - Prey item mortality	Up to 8% to terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	28% from consumption of birds only, 2% from mammals
Sublethal	46% (R – low effects; birds only)
Indirect	46% terrestrial invertebrates, 4% reptiles and terrestrial amphibians

Risk modifiers: The San Clemente loggerhead shrike is endemic to San Clemente Island and occurs in open country with scattered trees and shrubs. The species range map used to determine overlaps with use sites includes a large portion on non-Federal lands because the range map is based on the entire county where the San Clemente sage sparrow occurs. However, this species is endemic to San Clemente Island, which is owned by the U.S. Navy. Thus, the overlaps with use sites and associated risks anticipated are much less than those described above.
San Clemente loggerhead shrikes are insectivores and carnivores, consuming available arthropods such as Hymenoptera, Lepidoptera, Homoptera, and Orthoptera, and reptiles such as

lizards. Some small mammals such as mice (Mus spp.), and small birds such as wrens (Troglodytidae) and warblers (Parulidae) are also used as prey.

Pair formation is usually accomplished during January or February, but has been reported as early as November. Nesting may occur in February, but March and April constitute the prime nesting period. Shrikes primarily use island canyons for nesting, with nests occurring in tall shrubs (at least 2.1 m [7 ft.] high), or small trees. Breeding territories range between 4.5 and 16 ha (11 and 39.5 ac.), varying in relation to the quality of the environment. San Clemente loggerhead shrikes are non-migratory, but undergo seasonal movement in the establishment of both breeding and winter territories.

San Clemente loggerhead shrikes are not expected to enter developed areas, but are known to forage, breed, and roost in rights-of-way (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Effects based on overlap with open space developed and mosquito adulticide.

We anticipate effects to the prey base from malathion exposure on or near use sites, or from mosquito control applications. Because species taken as food items exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	D, I	326,261	45.97	0	0
Developed	*	92,478	13.03	4,624	0.65
Open Space Developed	D, I	42,965	6.05	2,148	0.30
Pasture	I	20	<0.01	0	0
Other Grains	D, I	8	<0.01	0	0
Sub-TOTAL (D):		42,965	6.05	2,148	0.30

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Other uses with direct effects only[3]					
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		42,994	6.06	2,148	0.30
TOTAL[4]:		369,255	52.02	2,178	0.30

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 709,776 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 385,556 acres, 54.321%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the San Clemente loggerhead shrike. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The San Clemente loggerhead shrike has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. While malathion usage could result in mortality and/or sublethal effects to growth and reproduction on up to 46% of the range from mosquito control and 6% from other uses annually, as well as loss of invertebrate prey on 46% or more of the range, CalPUR usage data indicates that malathion has not been used for mosquito control and has only been used on 0.03% of the range in the recent past. In addition, the species range map used to determine overlaps with use sites includes a large portion of the range on non-Federal lands because the range map is based on the entire county where the San Clemente loggerhead shrike occurs. This species is endemic to San Clemente Island, which is owned by the U.S. Navy. Thus, the overlaps with use sites and associated risks anticipated are even less than those described in the tables above. In addition, the U.S. Navy initiated a Loggerhead Shrike Recovery Program in 2002. We anticipate pesticide usage on U.S. Navy lands would consider and minimize effects to the species, and be carried out in accordance with its recovery program and pesticide management policy and guidance provided by the Armed Forces Pest Management Board (AFPMB 2020). Moreover, we anticipate the conservation measure described above would further reduce the risk of exposure and effects on shrikes and their prey items from residential uses.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the San Clemente loggerhead shrike.

Conclusion: Not likely to jeopardize

ADDITIONAL REFERENCES

AFPMB (Armed Forces Pest Management Board). 2020. Armed Forces Pest Management Board web site at https://www.acq.osd.mil/eie/afpmb/.

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Amphispiza belli clementeae	San Clemente sage sparrow	116

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened; Proposed Rule (5/5/2021): Delist
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The San Clemente sage sparrow is a non-migratory island endemic (Kaiser et al. 2008, p. 33); it was historically common throughout the 14,500-hectare (35,830 acres) San Clemente Island (Grinnell 1897, p. 18; Breninger 1904, p. 221; Linton 1908, p. 85), one in the chain of the Channel Islands archipelago located 80 kilometers (49 miles) from the California coastline. It has the smallest distribution of any subspecies of sage sparrow, as it occurs only on San Clemente Island (Turner et al. 2005, p. 1). San Clemente Island is owned by the Navy. While the Navy uses the island for military operations, it has helped to alleviate threats to the sage sparrow and conserve listed species on the island through implementation of their Integrated Natural Resources Management Plan, and have engaged in population monitoring and removal of nonnative plant and animal species in portions of the island.

While the San Clemente sage sparrow population has improved from the low of 38 individuals in 1984, it remains small and fluctuates considerably on an annual basis; currently, over 500 adult individuals exist in the wild. The primary threat identified at listing, the browsing effect of feral goats and the rooting effect of feral pigs, has been eliminated, although impacts to the habitat from the historic overgrazing remain. Other factors including: 1) habitat modification from military activities, increased fire frequency, and fire suppression activities (Factor A), 2) predation from introduced and native predators (Factor C), 3) potential threat of disease (Factor C), 4) small population size, low juvenile survivorship, and limited distribution (Factor E), and 5) climate change (Factor E), continue to affect the San Clemente sage sparrow. The Navy has provided considerable leadership to help alleviate remaining threats to the sage sparrow and conserve listed species on the island through implementation of the INRMP, including population monitoring and removal of nonnative plant and animal species in portions of the island. The Navy has worked to manage anthropogenic disturbance to sage sparrow nesting habitat and promote mitigation and avoidance of the sage sparrow during military activities. These efforts have resulted in higher adult populations in the last decade. However, juvenile survivorship has continued to decrease and remains a concern. Due to ongoing threats throughout its range, the San Clemente sage sparrow remains at risk of becoming endangered in the

foreseeable future. Consistent with our recommendations in previous reviews when adult population estimates were much lower than those observed in recent years, we recommend that the status of the San Clemente sage sparrow, as threatened, remain unchanged at this time.

EB/CE Sources:

U. S. Fish and Wildlife Service. 2009. San Clemente sage sparrow (*Amphispiza belli clementeae*) 5-Year Review: Summary and Evaluation. Carlsbad, California. 29 pp.

U.S. Fish and Wildlife Service. 2021. Removing Five Species from San Clemente Island from the Federal lists of endangered and threatened wildlife and plants. Proposed Rule. Federal Register 86:23882-23913.

Overall Vulnerability: ☐ **High** ☐ **Medium** ☒ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: San Clemente sage sparrows exposed to malathion on use sites could experience up to 100% mortality.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	6%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	6% (G – low effects), 6% (R – low effects), 6% (R – high effects from consumption of grass only)
Direct spray or contact with contaminated media	Possible mortality if exposed
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	6% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 8% to terrestrial invertebrates
Plants affected (decline in growth)	6%
MOSQUITO CONTROL	
Direct (mortality)	17% (grass only), 5% (leaves only), no effects from other dietary items
Sublethal	No effects expected
Indirect	47% terrestrial invertebrates

Risk modifiers: The species range map used to determine overlaps with use sites includes a large portion on non-Federal lands because the range map is based on the entire county where the

San Clemente sage sparrow occurs. However, this species is endemic to San Clemente Island, which is owned by the U.S. Navy. Thus, the overlaps with use sites and associated risks anticipated are less than those described above.

San Clemente sage sparrows are closely tied to the maritime desert scrub plant communities occupy of San Clemente Island. San Clemente sage sparrows are clumped according to resources. They were previously detected mainly within the lower marine terraces along the northwestern portion of San Clemente Island, but are now known to be more widely distributed on San Clemente Island (Pers. comm. 2016 biological information, USFWS field office request). Sparrow density varies significantly, with relatively high densities noted in shrub habitats (Pers. comm. 2016 biological information, USFWS field office request). They are ground-dwelling sparrows, using shrub canopy for feeding, cover, song perching, roosting, and nesting. In addition to maritime desert scrub plant communities, they are known to use cactus (Cylindropuntia sp.) and saltbush (Atriplex sp.) for protective coverage and food/prey species.

San Clemente sage sparrows are generalists that eat various insects and spiders during the breeding season, and grasses, seeds, fruit, and insects during the nonbreeding season. Individuals run along the ground to forage; they may also glean from foliage and branches. Breeding season is from mid-March to mid-June. San Clemente sage sparrows are non-migratory.

San Clemente sage sparrows are not expected to enter developed areas (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Effects from open space developed and mosquito control only.

We anticipate effects to the invertebrate prey base from malathion exposure on or near use sites, or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Usage data based on CalPUR data:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	D, I	326,261	46.98	0	0
Developed	*	92,478	13.32	4,624	0.67
Open Space Developed	D, I	42,965	6.19	2,148	0.31
Pasture	D, I	20	<0.01	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		42,985	6.19	2,170	0.31
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		42,986	6.19	2,170	0.31
TOTAL[4]:		369,247	53.17	2,170	0.31

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 694,489 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 370,269 acres, 53.315%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the San Clemente sage sparrow. As discussed below, the vulnerability is low for this species. We anticipate the risk posed by malathion exposure would be medium, although usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The San Clemente sage sparrow has a low vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. While malathion usage could result in mortality and/or sublethal effects to growth and reproduction on up to 17% of the range from mosquito control and 6% from other uses annually, as well as loss of invertebrate prey on 47% or more of the range, CalPUR usage data indicates that malathion has not been used for mosquito control and has only been used on 0.31% of the range in the recent past. In addition, the species range map used to determine overlaps with use sites includes a large portion on non-Federal lands because the range map is based on the entire county where the San Clemente sage sparrow occurs. However, this species is endemic to San Clemente Island, which is owned by the U.S. Navy. Thus, the overlaps with use sites and associated risks anticipated are less than those described in the tables above. While the Navy uses the island for military operations, it has engaged in the conservation of listed species such as the San Clemente sage sparrow. Very little usage has occurred in the species range in the past, and we anticipate future pesticide usage on U.S. Navy lands would consider and minimize effects to the species, and be carried out in accordance with its pesticide management policy and guidance provided by the Armed Forces Pest Management Board (AFPMB 2020). Moreover, we anticipate the conservation measure described above would further reduce the risk of exposure and effects on sage sparrows and their prey items from residential uses.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the San Clemente sage sparrow.

Conclusion: Not likely to jeopardize

ADDITIONAL REFERENCES

AFPMB (Armed Forces Pest Management Board). 2020. Armed Forces Pest Management Board web site at https://www.acq.osd.mil/eie/afpmb/.

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Vireo bellii pusillus	Least Bell's vireo	123

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered, Five-Year Review Recommendation (9/26/2006): Downlist to Threatened
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
Riparian habitat suitable for vireos had declined by an estimated 95 percent at the time of the listing (1986), primarily driven by anthropogenic modification (e.g., flood control, water impoundment and diversion, urban development, agricultural conversion, and livestock grazing; Service 1998). Since then, the amount of riparian habitat loss has been reduced and to some extent restoration efforts have increased vireo habitat. Most of the improvement has occurred in southern California, although it appears that protection and restoration efforts in the northern portion of the vireo's historic range have been successful also. Within the past decade, control of giant reed and other exotic plants has been and continues to be systematically conducted on both the Santa Ana River and at Camp Pendleton. Although control of giant reed has made great progress since the listing of the vireo, invasions by other exotic plants (e.g., Tamarix species, perennial pepperweed [Lepidium latifolium]) continue to degrade existing riparian habitat and impede recovery efforts (Kus and Beck 1998; Hoffman and Zembal 2006). Although nest parasitism by cowbirds has been reduced on a local level in southern California, it remains the primary threat limiting the vireo's overall recovery. Several regional Natural Communities Conservation Planning and Habitat Conservation Plans have been developed that include long-term conservation goals for vireo. Additional protections have been added for migratory bird conservation on military lands through the Sikes Act Improvement Act and the 2006 Memorandum of Understanding between the FWS and Department of Defense.

EB/CE Source: USFWS 2006 5-year review

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: We anticipate that 72-100% of least Bell's vireos exposed to malathion via consumption of arthropods at maximum rates on use sites will die, depending on the use site.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	10%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	8% (G, R – low effects), 1.5% (R – high effects)
Direct spray or contact with contaminated media	Possible mortality if exposed
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	10% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 26% for terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	3.5%
Sublethal	No effects expected
Indirect	57% terrestrial invertebrates

Risk modifiers: The least Bell's vireo is currently distributed in southern California, with 54% of the total population occurring in San Diego County and 30% occurring in Riverside County. There has not yet been any meaningful recolonization of the San Joaquin and Sacramento valleys, although one breeding pair was observed in the San Joaquin Valley in 2005 and 2006, and there have been incidental sightings in the Salinas Valley.

Least Bell's vireos are invertivores that opportunistically prey on insects (beetles, grasshoppers, moths, and caterpillars), spiders, snails, and fruits. They glean prey from leaves and bark and occasionally by hovering in the air. Foraging occurs most often in dense brush and less frequently in treetops in riparian and adjacent chaparral habitat. Approximately 70 percent of foraging occurs about 180 to 270 m (600 to 900 ft.).

Least Bell's vireos primarily inhabit woodland including cottonwood willow forest and mule fat scrub. Use of oak woodlands much more rare than believed at the time of listing, and typically only occurs where oaks are interspersed with willows. More regularly uses mesquite thickets in desert areas. Also occurs in non-native salt cedar forests in desert areas (Pers. comm. 2016 biological information, USFWS field office request). This species rarely occurs outside of riparian habitat (e.g., willow dominated riparian habitat in coastal and Central Valley locations;

willow and/or mesquite riparian in desert areas) areas (Pers. comm. 2016 biological information, USFWS field office request).

Least Bell's vireos are migratory and arrive in their breeding habitats in mid-March to early April. Nests are constructed in low thickets (within 1 m [3 ft.] of the ground) along willow-dominated riparian habitat. Least Bell's vireos depart from southern California in late August and September for their wintering range in Mexico.

Where riparian habitat occurs in these areas, least Bell's vireos may use orchards and vineyards, managed forests, developed open space areas, right of ways, golf courses, and rangeland for feeding, breeding, and migration. Use of agricultural is uncertain but cannot be ruled out at this time. Least Bell's vireos likely migrate through developed areas (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Calculated effects are based on a uniform distribution throughout its breeding range. However, most least Bell's vireos are located in the southern portion of its range, where overlap with agricultural uses may be lower than that of the northern part of its range near Sacramento. The analysis also assumes that vireos are entering all use sites where overlap occurs. However, only a subset of use sites are expected to contain riparian habitat that is suitable for the least Bell's vireo. For these reasons, mortality is expected to be less than that predicted by the MagTool.

We anticipate effects to the invertebrate prey from malathion exposure on or near use sites, or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Agricultural usage based on CalPUR data:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	D, I	7,344,534	56.52	22,648	0.17

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Developed	*	1,225,387	9.43	61,269	0.47
Open Space Developed	D, I	800,089	6.16	40,004	0.31
Orchards and Vineyards	D, I	196,686	1.51	1,303	0.015
Other Crops	D, I	155,205	1.19	0	0
Vegetables and Ground Fruit	D, I	55,817	0.43	55,817	0.43
Wheat	D, I	48,660	0.37	32	<0.001
Other Grains	D, I	39,732	0.31	4	<0.001
Pasture	D, I	24,436	0.19	741	0.008
Corn	D, I	4,579	0.04	1,080	0.01
Cotton	D, I	1,531	0.01	0	0.00
Other RowCrops	D, I	337	0.00	6	<0.001
Sub-TOTAL (D): *Other uses with direct effects only*[3]		1,327,073	10.21	160,250	1.24
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		1,327,073	10.21	160,250	1.24
TOTAL[4]:		8,671,607	66.74	182,898	1.41

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 12,994,092 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 4,164,113 acres, 32.046%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the least Bell's vireo. As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be high, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The least Bell's vireo has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. Malathion uses overlap with up to 66.74% of the range. Malathion usage based on labeled uses could result in mortality on up to 3.5% of the range from mosquito control and mortality and sublethal effects on over 10% from other uses annually, as well as loss of invertebrate prey on 57% or more of the range. However, risks may be overestimated because the least Bell's vireo rarely occurs outside of willow or willow/mesquite dominated riparian habitat, and individuals are only likely to be exposed to malathion on use sites or in spray drift areas with these types of habitats. Least Bell's vireos are also more concentrated in areas within the range that have lower overlaps with agricultural use sites, as discussed above. In addition, while overlaps with use sites are high, CalPUR usage data indicates that malathion has been been used for mosquito control on 0.17% of the range annually, and on 1.24% of the range for other uses that may have effects to the species. We anticipate the conservation measures described above would reduce the risk of exposure and effects on the vireo and its prey items on and adjacent to use sites. We anticipate the loss of a few individuals, sublethal effects to growth and reproduction, and a reduction in food resources that would reduce fitness supporting reproductive capacity for a few individuals in localized areas over the duration of the action. However, we do not anticipate species-level effects due to the low amount of anticipated usage, the conservation measures to be implemented

and the close association of this species with riparian habitat that is limited on use sites and that offers some protective cover.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the least Bell's vireo.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Mycteria americana	Wood stork (breeding population)	124

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Species/Populations widespread or wide-ranging
Number of Populations: Multiple populations (numerous)
Species Trends: Increasing population(s)
Pesticides noted ☒

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The U.S. wood stork population decline between 1930 and 1978 is attributed to reduction in the food base necessary to support breeding colonies, which is thought to have been related to loss of wetland habitats and changes in hydroperiods. The estimated U.S. population of breeding wood storks throughout the southeastern United States declined from 15,000–20,000, to about 10,000 pairs in 1960, to a low of 2,700–5,700 pairs between 1977 and 1980. Three counts of more than 10,000 pairs have occurred during the past 8 years, and the count of 12,720 pairs in 2009 is the highest on record since the early 1960s. Loss, fragmentation, and modification of wetland habitats continue as threats to wood storks. Changes in local habitat conditions are known to impact wood storks. Contaminants (including pesticides) are not considered a significant threat, although losses from contamination events have been recorded. Based on the best available scientific information, it is our assessment that the species is showing the ability to respond to these threats through expansion of its range, adjusting reproductive timing, and utilizing a variety of wetlands for foraging, roosting, and breeding, including manmade wetlands.

EB/CE Source:

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Reclassification of the U.S. Breeding Population of the Wood Stork From Endangered to Threatened; Final Rule. Federal Register 79:37077-37103.

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Wood storks exposed to malathion at maximum rates on use sites are not expected to experience adverse effects from foraging on or near fish in use sites.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	10% fish, aquatic amphibians
Spray drift areas - Prey item mortality	Effects to fish and aquatic amphibians
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	36% fish and aquatic amphibians

Risk modifiers: Wood storks feed almost entirely on fish between 2 and 25 cm in length. Wood storks also occasionally consume crustaceans, amphibians, reptiles, mammals, birds, and arthropods. Storks forage in a wide variety of shallow wetlands, wherever prey concentrations reach high enough densities, in water that is shallow and open enough for the birds to be successful in their hunting efforts. Parents feed young by regurgitating whole fish into the bottom of the nest at a rate of 3 to 10 or more feedings per day.

Wood storks are a wetland dependent species. They require a mosaic of wetlands with varying climatological and seasonal conditions. Freshwater emergent wetlands are particularly essential for wood storks. Wood storks use man-made wetlands for foraging and breeding purposes, including, but not limited to, storm water treatment areas and ponds, golf course ponds, borrow pits, reservoirs, roadside ditches, agricultural ditches, drainages, flow-ways, mining and mine reclamation areas, and dredge spoil sites.

Wood storks breed year-round, depending on location. Wood storks are migratory and highly mobile. During a satellite tracking study of wood storks in Mississippi and Louisiana, extensive inter- and intra-regional movements from both Southeast U.S. and Mexican/Guatemalan populations of wood storks were documented. It is believed that storks nesting in north Florida, Georgia, and South Carolina move south during the winter months. Wood storks can forage up to 80 miles from their nesting site (typically 5-12 miles). For this reason, exposure to malathion could be greater than that predicted strictly by overlap as storks from different nesting and roosting sites can beyond areas of overlap to forage.

For all uses sites, wood storks may forage in ditches and shallow wet areas and roost in open areas. Wood storks may also breed in islands on golf course ponds. (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: We anticipate effects to the prey base from malathion exposure on or near use sites, or from mosquito control applications. Because species taken as food items exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	59,760,060	51.37	5,557,355	4.78
Open Space Developed	I	5,687,539	4.89	284,377	0.24
Developed	I	3,939,879	3.39	196,994	0.17
Cotton	I	1,653,702	1.42	73,718	0.06
Other Crops	I	1,484,515	1.28	648	<0.01
Corn	I	1,284,055	1.10	6,555	0.01
Orchards and Vineyards	I	1,186,600	1.02	271,954	0.23
Pine Seed Orchards	I	1,014,078	0.87	44,955	0.04
Other RowCrops	I	779,685	0.67	32,918	0.03
Other Grains	I	706,225	0.61	25,990	0.02
Wheat	I	65,828	0.06	4,500	<0.01
Pasture	I	420	<0.01	90	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		17,802,527	15.30	942,699	0.81
TOTAL[4]:		77,562,587	66.67	6,500,055	5.59

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

This species consumes fish, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 116,332,610 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 9,850,061 acres, 8.467%

Overall Usage: ☐ **High** ☒ **Medium** ☐ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The wood stork is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from “repeat as necessary” to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service’s biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the wood stork. As discussed below, although the vulnerability is medium for this species and we anticipate the risk and likelihood of exposure to malathion is medium, the implementation of the general conservation measures described above is expected to reduce the likelihood of exposure.

The wood stork has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be medium, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. No mortality or sublethal effects are anticipated on any malathion use sites, although loss of fish and amphibian prey could occur on 36% or more of the range. Usage data for use sites where effects are anticipated indicates that mosquito adulticide has been used on 4.78% of the range, and malathion for other uses occurred on about 0.81% of the range annually. We anticipate the conservation measures described above would reduce the risk of exposure and effects to prey items on and adjacent to agricultural and residential use sites. While malathion usage could result in reduced fitness supporting reproductive capacity of a few individuals from the loss of prey, this species is highly mobile and we anticipate alternative foraging areas would be available if local foraging sites become unsuitable due to lack of adequate food resources. While there may be adverse effects to some individuals due to impacts to prey, we do not anticipate species-level effects from malathion usage.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the wood stork.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Small, endemic, constrained, and/or isolated population(s)
Number of Populations: Single population
Species Trends: Unknown population trends
Pesticides noted ☐

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 would 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 of 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 include 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).

EB/CE Source: Service's 5-year review (Service 2009)

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Audubon's crested caracaras exposed to malathion via consumption of arthropods and terrestrial vertebrates on use sites are expected to experience high rates of mortality, up to 100%. Caracaras consuming aquatic invertebrates or fish are expected to experience lower mortality, up to about 3%.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	10% birds, 3% mammals, <1% other dietary items
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	0-22% (G, R – low to high effects from birds, mammals, arthropods only), 0-8% (B – low effects, birds only)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	Up to 24% depending on food item
Spray drift areas - Prey item mortality	Effects to invertebrates, fish, amphibians
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	85% (R – low effects, birds only)
Indirect	85% invertebrates, 60% fish and amphibians

Risk modifiers: The historic range of Audubon's crested caracara in Florida generally consisted of St. Johns River marshes in Brevard County and the major prairie ecosystem originally present within Highland, Glades, Polk, Osceola, Okeechobee, Hardee, Desoto, Indian River, St. Lucie, and Martin Counties. The overall current range remains relatively similar, with sightings of individuals in other neighboring counties, but 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.

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.

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. 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. They will also regularly patrol sections of highway in search of carrion.

Audubon's crested caracaras are resident and non-migratory. Adult caracaras may be found in their home range year-round. 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 would 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). Egg laying has been estimated to begin as early as late September, but the height of the nesting season is in January and February. Most reproductive activity occurs during the winter dry season, although nesting attempts may occur throughout the year.

The Audubon's crested caracara could enter any pesticide use sites to forage, roost, or breed (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Orchards and Vineyards, Open Space Developed, Developed, Other Grains. Effects from orchards and vineyards are likely over-estimated due to analysis based on maximum application rates applicable only to California. When considering effects to dietary items, it should be noted that the crested caracara is a highly opportunistic feeder.

We anticipate effects to a portion of the prey base (i.e., invertebrates, fish, amphibians) from malathion exposure on or near use sites, and from mosquito control applications. Because species within these taxa exhibit a range of sensitivities to malathion, we expect exposure will reduce their abundance in these areas, but not completely eliminate these taxa in these portions of the range. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	10,297,967	85.85	1,701,086	14.18
Orchards and Vineyards	D, I	910,957	7.59	252,940	2.11
Open Space Developed	D, I	723,095	6.03	36,155	0.30
Developed	D, I	515,061	4.29	25,753	0.21
Other Grains	D, I	503,555	4.20	18,255	0.15
Other Crops	D, I	127,208	1.06	0	0
Vegetables and Ground Fruit	D, I	17,296	0.14	1,785	0.01
Rice	D, I	12,893	0.11	411	<0.01
Corn	D, I	8,386	0.07	158	<0.01
Nurseries	D, I	5,018	0.04	5,018	0.04
Pasture	I	66	<0.01	15	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		2,823,469	23.54	340,475	2.84
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		2,823,535	23.54	340,490	2.84
TOTAL[4]:		13,121,502	100.00	2,041,576	17.02

This species consumes amphibians, invertebrates and fish, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 11,995,906 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 627,404 acres, 5.230%

Overall Usage: ☒ **High** ☐ **Medium** ☐ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The Audubon's crested caracara is known to utilize food resources and habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow for malathion to degrade before runoff events occur. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

where pesticides are not to be applied) are required of all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by reducing exposure from ingesting contaminated prey and minimizing losses of prey items due to malathion exposure in aquatic habitats.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). The reduction of the maximum application rate for citrus (i.e., the primary Orchard and Vineyard use in Florida where this species occurs), from 4.5 lbs/acre to 1.5 lbs/acre (outside of California), is expected to greatly lower the risk of effects to species from that which was modeled in the BE. The reduction in application rate is expected to result in a corresponding reduction in environmental concentrations to one-third of modeled values. These lowered concentrations are expected to substantially reduce sublethal effects and mortality to birds, which are particularly vulnerable to higher application rates of malathion, and reduce exposure to all species and habitats near citrus groves by decreasing the amount of malathion in and near these use sites. These reductions will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

Note: With the conservation measures above for citrus and residential uses, there is no concern for mortality of caracaras, and sub-lethal effects are reduced to approximately 0-12% low reproductive effects (with effects from ingesting contaminated birds and mammals), with no high reproductive or behavioral effects anticipated for these uses versus the effects without the conservation measures as shown in the table in the Risk section above.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Audubon's crested caracara. As discussed below, although the vulnerability is high for this species and we anticipate the risk and likelihood of exposure to malathion is high, factors related to the varied diet of the caracara and

implementation of the general conservation measures described above are expected to reduce risks and the likelihood of exposure.

The Audubon's crested caracara has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within the range would be high, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above.

Caracaras could enter any pesticide use sites to forage, roost or breed. In the absence of conservation measures, malathion usage could result in caracara mortality of 10% from eating birds, 3% from eating mammals, and 1% from eating other dietary items across the range each year, based on labeled uses. In addition, sublethal effects to growth, reproduction and behavior would be anticipated on up to 22% of the range for uses other than mosquito control, and low level effects to reproduction would be anticipated on 85% of the range and from mosquito control annually. Loss of invertebrate prey would be anticipated on 85% or more of the range, and loss of fish and amphibians would be anticipated on 60% or more of the range annually based on labeled uses, with mosquito control as the primary driver.

While we do not anticipate that usage will occur everywhere and to the extent the labels allow, usage data indicates that malathion has been used for mosquito control on about 14.18% of the range and on 2.84% of the range on other use sites where effects may occur annually. Although anticipated usage is high, the conservation measures and label changes discussed above are expected to reduce effects to the point where malathion usage is not anticipated to result in caracara mortality, and sublethal effects are expected to be limited to low effects to reproduction on up to 12% of the range for uses other than mosquito control. Low level effects to reproduction are anticipated for those caracaras that eat birds in mosquito control areas with malathion usage.

This species exists as a small and isolated population that is patchily distributed across southern Florida, primarily on privately owned lands. We anticipate low-level effects to reproduction and reductions in food availability for this species from the anticipated levels of malathion usage. However, the general conservation measures are expected to reduce the risk of exposure and effects on caracara and its prey items on and adjacent to developed and open space developed (through the residential conservation measures) and agricultural use sites through means such as reducing application rates and frequencies, using spot treatments, buffering aquatic habitats and reducing the likelihood of malathion transport off-site after rain events. In addition, we anticipate the conservation measures would reduce the risk of exposure and effects on prey items in aquatic habitats and in citrus groves, which are two known key sources for caracara prey, and eliminate the likelihood of direct mortality of caracaras. While significant levels of sublethal effects and reductions in food resources would likely lead to reduced fitness supporting reproductive capacity, reduced growth, starvation, site abandonment and inadequate fuel needed for breeding, raising young and surviving through the seasons, these types of effects are anticipated to be substantially reduced by the conservation measures and label changes that are in place. Caracaras are known to be opportunistic feeders, and while there may be reductions in various types of

prey (i.e., invertebrates, fish and amphibians) from malathion exposure, we expect adequate sources of unaffected prey will remain available for the caracara. In addition, while sub-lethal effects are anticipated from caracara eating certain types of prey exposed to malathion, we expect only low-level reproductive effects to those individuals exposed by eating contaminated birds or mammals. While we anticipate adverse effects, the consequences of the proposed action are not likely to have species-level effects. Therefore, we anticipate that the proposed action would not appreciably reduce survival and recovery of the Audubon's crested caracara.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Falco femoralis septentrionalis	Northern aplomado falcon	126

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☒

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
During the 5 years from 2010 to 2014, the known number of breeding pairs of aplomado falcons in the United States has varied between 28 and 36 pairs, almost all of which are using artificial nesting towers in southern coastal Texas. In 2013 and 2014, intensive surveys conducted throughout the subspecies' historical range in the United States resulted in the observation of 29 pairs in south coastal Texas and 1 pair in New Mexico. The causes for the historical decline of the northern aplomado falcon included widespread shrub encroachment that resulted from control of range fires and intense overgrazing (U.S. Fish and Wildlife Service 1986; Burnham et al. 2002) and agricultural development in grassland habitats used by the aplomado falcon (Hector 1987; Keddy-Hector 2000). Pesticide exposure was likely a significant cause of the subspecies' continued decline and eventual disappearance from the United States with the initiation of widespread use of the bio-acculumative, toxic pollutants DDT and dieldrin after World War II (51 FR 6686, February 25, 1986; Hector 1987). The criteria in the 1990 recovery plan for the northern aplomado falcon include the permanent elimination of certain pesticides such as DDT and dieldrin. According to the species' 5-year review, the impacts of DDE and dieldrin on aplomado falcons have shown such significant decline that they no longer constitute a threat to the subspecies, and the review considers this recovery criterion to be met. The Service continues to evaluate, monitor and minimize threats including other pesticides and contaminants to extant populations of northern aplomado falcons.

Currently, long-term drought, shrub encroachment in areas of Chihuahuan grasslands, and the increased presence of the great-horned owl (Bubo virginianus), which preys upon aplomado falcons, may be limiting recovery of this subspecies (Hunt et al. 2013). Perhaps more significant are the effects of degraded grasslands and drying climatic conditions on avian prey populations (Hector 1987, Gulf South Research Corporation and La Tierra Environmental Consulting 2013). Overgrazing and periods of drought have eliminated cover and food availability for grassland birds, and have likely reduced insect prey abundance. At the same time, large-scale conversion of North American grassland habitats to agriculture has greatly diminished populations of migratory birds (Chadde 1992, Smith 1992, Samson and Knopf 1994, Noss et al. 1995, Ricketts

et al. 1999, Pool et al. 2012, Gulf South Research Corporation and La Tierra Environmental Consulting 2013).

Habitat loss and degradation on both the breeding and wintering grounds of migratory birds negatively impact important avian prey species for aplomado falcons, such as meadowlarks (Sturnella spp.) and mourning doves (Zenaida macroura) (DeSante and George 1994, Gulf South Research Corporation and La Tierra Environmental Consulting 2013). Highly suitable potential habitat and the availability of grassland birds for prey are limiting factors for the species (Gulf South Research Corporation and La Tierra Environmental Consulting 2013). In recent years, between 140,000 and 328,000 (mean = 234,000) birds are killed annually by collisions with monopole turbines used for wind power generation in the contiguous United States (Loss et al. 2013). With low population numbers in the United States and without accelerated and improved management actions that address the threats and needs of the aplomado falcon, this subspecies is likely to remain in endangered status and in danger of extinction within the foreseeable future. (Note: This species has an experimental population, EXPN Entity ID 9122.)

EB/CE Source: 2014 5-Year Review

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Mortality predicted to northern aplomado falcons foraging on malathion use sites is highly variable by use site, ranging from as low as 1% up to 98%.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	4% across its range in TX
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	Up to 9% (G, R – low effects), 5% (G, R-high effects), 2% (B – low effects)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	2% birds
Spray drift areas - Prey item mortality	No effects expected
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	21% (R – low effects) in TX

Indirect	No mortality to prey birds expected

Risk modifiers: The northern aplomado falcon feeds primarily on birds (up to rock dove size), to a lesser extent on insects (moths, beetles, cicadas, orthopterans); uncommonly on small mammals, lizards, and snakes. Decidedly crepuscular in hunting habits, often catching prey after sunset; not very active in middle of day.

Habitat of the aplomado falcon is open rangeland and savanna, semiarid grasslands with scattered trees and shrubs. Such settings offer maximum detectability of potential prey and protection against predators. The aplomado falcon does not typically occupy hilly or highly irregular terrain.

The northern aplomado falcon is non-migratory and lays eggs from January-June (mainly March-May, peak in April). Aplomado falcons do not build their own nests, but use nest sites constructed by large raptors or corvids.

Allowable uses driving effects/other considerations: Effects estimated based on consumption of birds.

We anticipate effects to the avian prey base from malathion exposure on use sites. Because birds exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	D	6,195,558	20.75	500,808	1.68
Other Grains	D	778,046	2.61	79,899	0.27
Cotton	D, I	489,913	1.64	162,155	0.54
Developed	D, I	433,069	1.45	21,653	0.07
Open Space Developed	D, I	386,336	1.29	19,317	0.06
Other Crops	D	302,517	1.01	31	<0.01
Corn	D	134,068	0.45	4,101	0.01
Pasture	D	35,555	0.12	2,376	0.01

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Orchards and Vineyards	D	31,884	0.11	17,377	0.06
Vegetables and Ground Fruit	D	23,772	0.08	2,418	0.01
Wheat	D	23,670	0.08	23,635	0.08
Rice	D	10,882	0.04	5,186	0.02
Sub-TOTAL (D): *Other uses with direct effects only*[3]		2,649,712	8.88	338,150	1.13
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		1,309,318	4.39	203,125	0.68
TOTAL[4]:		8,845,270	29.63	838,958	2.79

Malathion usage on use sites is not expected to result in indirect effects from spray drift.

 # acres in species range: 29,854,469 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,433,475 acres, 4.802%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the northern aplomado falcon. As discussed below,

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The northern aplomado falcon has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Malathion usage could result in falcon mortality of 4% across the range each year, based on labeled uses. In addition, effects to growth, reproduction and behavior are anticipated on 9% of the range annually, with 5% being high-level effects to growth and reproduction. Low-level effects to reproduction are also anticipated on 21% of the range from mosquito control annually. We also anticipate 2% mortality of birds, the primary prey for this species, across the range annually. However, we do not anticipate that usage will occur everywhere and to the extent the labels allow. Usage data indicates that malathion has been used on 2.79% of the range annually on use sites where effects may occur. The northern aplomado falcon could enter any pesticide use sites to forage, roost or breed. We anticipate the loss of some individuals, sublethal effects to growth, reproduction and behavior, and reductions in food availability that would reduce fitness supporting reproductive capacity or lead to starvation or site abandonment by a few individuals from the anticipated levels of malathion usage. While fairly high adverse effects would be anticipated, we do not anticipate species-level effects based on the somewhat low usage anticipated. The conservation measures described above would further reduce the risk of exposure and effects on the falcon and their prey in the small areas of overlap of the species range with developed and open space developed use sites. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the northern aplomado falcon.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Strix occidentalis lucida	Mexican spotted owl	129

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
Currently, high-intensity, stand-replacing fires are influencing ponderosa pine and mixed conifer forest types in Arizona and New Mexico. Uncharacteristic, high-severity, stand-replacing wildland fire is probably the greatest threat to the Mexican spotted owl. As throughout the West, fire severity and size have been increasing within the range of the owl. Landscape level wildland fires, such as the Rodeo-Chediski Fire (2002), Wallow Fire (2011), and Whitewater-Baldy Complex (2012), have resulted in the loss of tens of thousands of acres of occupied and potential nest/roost habitat across significant portions of the Mexican spotted owl's range.

Two primary reasons were cited for the original listing of the Mexican spotted owl in 1993: (1) historical alteration of its habitat as the result of timber-management practices; and, (2) the threat of these practices continuing. The danger of stand-replacing fire was also cited as a looming threat at that time. Since publication of the original Recovery Plan (USDI FWS 1995), we have acquired new information on the biology, threats, and habitat needs of the Mexican spotted owl. Threats to its population in the United States (but likely not in Mexico) have transitioned from commercial-based timber harvest to the risk of stand-replacing wildland fire. Recent forest management has moved from a commodity focus and now emphasizes sustainable ecological function and a return toward pre-settlement fire regimes, both of which have potential to benefit the spotted owl. Southwestern forests have experienced larger and more severe wildland fires from 1995 to the present, compared to fires prior to 1995. Climate variability compounded with unhealthy forest conditions may increase negative effects to habitat from fire. The intensification of natural drought cycles and the ensuing stress placed upon overstocked forested habitats could result in even larger and more severe fires in owl habitat.

Historical and current anthropogenic uses of Mexican spotted owl habitat include both domestic and wild ungulate grazing, recreation, fuels reduction treatments, resource extraction (e.g., timber, oil, gas), and development. These activities have the potential to reduce the quality of owl nesting, roosting, and foraging habitat, and may cause disturbance during the breeding season. Livestock and wild ungulate grazing is prevalent throughout the range of the owl and is

thought to have a negative effect on the availability of grass cover for prey species. Recreation impacts are increasing throughout the Southwest, especially in meadow and riparian areas. There is anecdotal information and research that indicates that owls in heavily used recreation areas are much more erratic in their movement patterns and behavior. Fuels reduction treatments, though critical to reducing the risk of severe wildland fire, can have short-term adverse effects to owls through habitat modification and disturbance.

As the human population grows in the southwestern United States, small communities within and adjacent to wildlands are being developed. This trend may have detrimental effects to spotted owls by further fragmenting habitat and increasing disturbance during the breeding season. Several fatality factors have been identified as particularly detrimental to the Mexican spotted owl, including predation, starvation, accidents, disease, and parasites. For example, West Nile Virus has the potential to adversely impact the Mexican spotted owl. The virus has been documented in Arizona, New Mexico, Utah, and Colorado, and preliminary information suggests that owls may be highly vulnerable to this disease (Courtney et al. 2004). Unfortunately, due to the secretive nature of spotted owls and the lack of intensive monitoring of banded birds, we will most likely not know when owls contract the disease or the extent of its impact to the owl rangewide.

EB/CE Source:

U.S. Fish and Wildlife Service. 2012. Final Recovery Plan for the Mexican Spotted Owl (*Strix occidentalis lucida*), First Revision. U.S. Fish and Wildlife Service. Albuquerque, New Mexico, USA. 413 pp.

Overall Vulnerability: ☐ High ☒ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: We anticipate that <1% of Mexican spotted owls exposed to malathion at maximum rates on most use sites will die. Exposure on developed and open space developed areas could result in higher mortality, up to 14% based on consumption of small mammals, and 65% based on consumption of birds.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	<1%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	1-3% (G, R – low effects), 1% (G, R – high effects)

Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	Up to 3% for most dietary items, no effects to mammals
Spray drift areas - Prey item mortality	Effects to invertebrates, reptiles, amphibians
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	22% (R – low effects, birds only)
Indirect	22% terrestrial invertebrates, 2% reptiles and amphibians

Risk modifiers: The range of the Mexican spotted owl includes areas in Arizona, Colorado, New Mexico, Texas, and Utah. Populations in Arizona are patchily distributed and occur where appropriate habitat is present throughout all but the arid southwestern portion of the state.

The Mexican spotted owl feed on small mammals, particularly mice, voles, and woodrats. They will also take birds, bats, reptiles and arthropods. The Mexican spotted owl is a "perch and pounce" predator, using elevated perches to find prey items using sight and sound. They can take prey on the wing, particularly birds. Most hunting is at night, however, there are some reports of diurnal foraging.

Mated pairs of owls are territorial and Adults may or may not leave their territory during the winter. In the southwestern U.S., these owls are apparently largely non-migratory, with some vertical migration at higher elevations and some migration of 20-50 km between summer and winter ranges. Mexican spotted owls nest in caves, in stick nests built by other birds, on debris platforms in trees, and in tree cavities. Mexican spotted owls have distinct annual breeding periods, with timing that may vary slightly throughout their range but is generally consistent overall. In Arizona, courtship begins in March, eggs are laid in late March or, more typically, early April. Nestling owls (owlets) generally fledge in early- to mid-June and dispersal occurs from mid-September to early October. Mexican spotted owls are sporadic breeders. Most of the population nests successfully in good years, whereas only a small proportion of pairs will nest successfully in poor years.

Spotted owls are residents of old-growth or mature forests that possess complex structural components (uneven aged stands, high canopy closure, multi-storied levels, high tree density). Canyons with riparian or conifer communities are also important components. Owls are usually found in areas with some type of water source (i.e., perennial stream, creeks, and springs, ephemeral water, small pools from runoff, reservoir emissions). Even small sources of water such as small pools or puddles create humid conditions. Owl foraging habitat includes a wide variety of forest conditions, canyon bottoms, cliff faces, tops of canyon rims, and riparian areas. Juvenile owls disperse into a variety of habitats ranging from high-elevation forests to pinyon-

juniper woodlands and riparian areas surrounded by desert grasslands. Observations of long-distance dispersal by juveniles provide evidence that they use widely spaced islands of suitable habitat which are connected at lower elevations by pinyon-juniper and riparian forests.

Allowable uses driving effects/other considerations: Malathion is not labeled for managed forest use, which is the primary habitat used by this species.

We anticipate effects to the prey base from malathion exposure on or near use sites, or from mosquito control applications. Because species taken as food items exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	362,77,766	22.12	1,441,341	0.88
Pasture	D, I	1,078,918	0.66	68,185	0.04
Developed	D, I	1,047,929	0.64	52,396	0.03
Other Crops	D, I	1,036,271	0.63	0	0
Open Space Developed	D, I	937,889	0.57	46,894	0.03
Wheat	D, I	506,768	0.31	137,087	0.08
Corn	D, I	270,835	0.17	2,919	<0.01
Other Grains	D, I	178,632	0.11	36,315	0.02
Vegetables and Ground Fruit	D, I	91,729	0.06	7,684	<0.01
Cotton	D, I	58,295	0.04	53,419	0.03
Orchards and Vineyards	D, I	36,279	0.02	16,690	0.01
Other RowCrops	D, I	23,534	0.01	1,736	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		5,267,078	3.21	423,325	0.26
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		52,67,078	3.21	423,325	0.26

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
TOTAL[4]:		41,544,845	25.33	1,864,666	1.14

This species consumes invertebrates as well as other prey, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 163,998,517 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 71,550,327 acres, 43.629%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Mexican spotted owl. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The Mexican spotted owl has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as

[4] TOTAL includes usage on all use sites with effects, including mosquito control.

described above. We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Malathion usage could result in a low level of mortality (<1%) and sublethal effects to growth and reproduction on 22% of the range from mosquito control and 3% from other uses annually based on labeled uses. In addition, there could be a loss of terrestrial invertebrates on up to 22% of the range and loss of reptiles and amphibians on up to 3% of the range annually. However, the Mexican spotted owl primarily utilizes forested habitats where there is a low likelihood of malathion usage or exposure to owls or their prey from drift due to the forest cover, and they eat a varied diet primarily consisting of vertebrates that are on the low end for anticipated effects. In addition, usage data indicates that only 1.14% of the range has been treated annually in the past, and about 44% of the range is on Federal lands where the use of pesticides is carefully considered and extremely minimal malathion usage has been reported on these lands in the past. The conservation measures described above for residential areas would further reduce the risk of exposure and effects on the owls and their prey in the small areas of overlap of the species range with developed and open space developed use sites. While we anticipate there will be some adverse effects to a small number of individuals due to mortality, effects on growth and reproduction due to exposure, and a reduction in fitness supporting reproductive capacity due to losses in prey, we do not anticipate species-level effects from the proposed action.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Mexican spotted owl.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Charadrius melodus	Piping plover - Great Lakes Watershed	130

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Species/Populations widespread or wide-ranging
Number of Populations: Population size/location(s) unknown
Species Trends: Declining population(s) – one or more populations declining
Pesticides noted ☒

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 fledlings per breeding pair, although analsysis 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. 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, would 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 populaiton numbers, the current status of the DPS suggests they are increasing in number and expanding their current range.

EB/CE Sources:

USFWS. 2009. Piping plover (*Charadrius melodus*) 5-year review: Summary and evaluation. Northeast Region, Hadley, Massachusetts. 214 pp.

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

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Breeding and wintering piping plovers are not expected to enter malathion use sites. Migrating piping plovers foraging on use sites may experience 0-42% mortality, depending on the type of crop.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects to breeding and wintering plovers. Migrating plovers may experience mortality foraging in crops (no overlap data available).
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects to breeding and wintering plovers. Migrating plovers may experience mortality or low sublethal effects (G, R) foraging in crops (no overlap available).
Direct spray or contact with contaminated media	Individuals have <10% chance of mortality if exposed during migration

Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects to breeding plovers
Spray drift areas - Prey item mortality	Effects to invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	64% invertebrates (breeding plovers)

Risk modifiers: 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 most malathion use sites, including rice, orchards and vineyards, and developed open space areas, but may migrate through agricultural lands, golf courses, and right of ways. Breeding has been documented in developed areas (quarries) but it is considered a rare event. (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Only migrating plovers are expected to enter use sites, which are not reflected in the overlap values. These effects are considered qualitatively. Indirect effects listed are for breeding areas. Additional indirect effects may occur within the range of migration.

Effects to the invertebrate prey base are anticipated from malathion exposure near use sites or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated

from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ **High** ☐ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	1,847,017	63.79	59,105	2.04
Corn	*	592,088	20.45	25,035	0.86
Open Space Developed	*	154,715	5.34	7,736	0.27
Developed	*	121,386	4.19	6,069	0.21
Other Crops	*	10,647	0.37	0	0
Wheat	*	8,343	0.29	3,729	0.13
Pasture	*	8,279	0.29	4,159	0.14
Orchards and Vineyards	*	2,188	0.08	1,685	0.06
Other Grains	*	974	0.03	627	0.02
Vegetables and Ground Fruit	*	697	0.02	672	0.02
Nurseries	*	470	0.02	470	0.02
Christmas Trees	*	31	<0.01	27	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0	0	0
TOTAL[4]:		1,847,017	63.79	59,105	2.04

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 2,895,474 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 89,874 acres, 3.104%

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Overall Usage: ☐ High ☐ Medium ☒ Low

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The piping plover is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from “repeat as necessary” to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service’s biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the piping plover (Great Lakes Watershed). As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be high, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The piping plover has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described

above. We anticipate usage within breeding and wintering areas in the species the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Malathion used for mosquito control could result in loss of invertebrates in 64% of the range during the breeding season based on labeled uses. We do not anticipate plovers will enter use sites except during migration when plovers may experience 0-42% mortality and loss of food resources, depending on the type of crop or use site. The risks to plovers foraging on use sites during migration are in addition to the risks reflected in the tables above. Additional mortality and effects to growth and reproduction, and effects from loss of prey, are anticipated during migration. However, we would expect usage to be lower during the migratory season, malathion has relatively low persistency in the environment, and limited opportunities for chance encounters all lower the risk of exposure during migration. Usage data indicates that malathion is used in 2.04% of the breeding and overwintering range annually for mosquito control. We do not anticipate effects from usage on other overlapping use sites, although this does not include the risks from potential exposure during migration as mentioned earlier. Threats to piping plovers and their habitat in their migration and wintering ranges indicate a continuing loss and degradation of habitat due to a variety of reasons, and several studies indicate that foraging habitat and food resources ultimately affect piping plover survival, as discussed above. Significant declines in food resources could lead to reduced fitness supporting reproductive capacity, starvation, or inadequate fuel needed for migration. We anticipate the loss of a small number of individuals, sublethal effects and reductions in food availability that will affect of a few individuals across the range of this species, primarily during migration when plovers are more likely to enter use sites. However, this species is wide-ranging, and plovers would not be expected to be on numerous sites at the very time they are being treated as they pass or stop by during migration. In addition, we anticipate the conservation measures described above would further reduce the risk of exposure and effects on piping plovers and their prey. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the piping plover (Great Lakes DPS).

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Charadrius melodus	Piping plover - Entire population (except Great Lakes Watershed)	131

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Species/Populations widespread or wide-ranging
Number of Populations: Multiple populations (few)
Species Trends: Increasing population(s)
Pesticides noted ☒

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, would 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 biphenol (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.

EB/CE Sources:

USFWS. 2009. Piping plover (*Charadrius melodus*) 5-year review: Summary and evaluation. Northeast Region, Hadley, Massachusetts. 214 pp.

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

Overall Vulnerability: ☐ High ☒ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Breeding piper plovers are not expected to enter malathion use sites. Migrating piping plovers foraging on use sites may experience 0-42% mortality, depending on the type of crop.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects to breeding and wintering plovers. Migrating plovers may experience mortality foraging in crops (no overlap data is available for migration areas because they are not included in the range map for this species).
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects to breeding and wintering plovers. Migrating plovers may experience mortality or low sublethal effects (G, R) foraging in crops (no overlap available for migration areas because they are not included in the range map for this species).
Direct spray or contact with contaminated media	Individuals have <10% chance of mortality if exposed during migration
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects to breeding plovers
Spray drift areas - Prey item mortality	Effects to invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	32% invertebrates (breeding plovers)

Risk modifiers: 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 most malathion use sites, including rice, orchards and vineyards, but may migrate through agricultural lands, golf courses, and developed open space areas. Breeding has been documented in developed areas (quarries) but it is considered a rare event. (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Only migrating plovers are expected to enter use sites, which are not reflected in the overlap values. These effects are considered qualitatively. Indirect effects listed are for breeding areas. Additional indirect effects may occur within the range of migration.
We anticipate effects to the invertebrate prey base from malathion exposure near use sites or from mosquito control applications. Because species taken as food items exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	100,703,254	31.92	0	0
Wheat	*	19,310,464	6.12	1,080,721	0.34
Corn	*	12,824,424	4.07	90,412	0.03
Open Space Developed	*	10,844,602	3.44	542,230	0.17
Developed	*	7,960,843	2.52	398,042	0.13
Cotton	*	5,724,316	1.81	197,147	0.06
Other Grains	*	5,556,497	1.76	381,589	0.12

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Other Crops	*	4,335,959	1.37	12	<0.01
Pasture	*	2,289,146	0.73	240,532	0.08
Vegetables and Ground Fruit	*	1,334,140	0.42	103,833	0.03
Other RowCrops	*	967,997	0.31	46,745	0.01
Rice	*	673,897	0.21	49,212	0.02
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0	0	0
TOTAL[4]:		100,703,254	31.92	0	0

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 315,479,471 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 23,677,144 acres, 7.505%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: While the piping plover is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

the number of allowable applications is reduced from “repeat as necessary” to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service’s biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the piping plover (Entire population except Great Lakes Watershed). As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be high, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The piping plover has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within breeding and wintering areas in the species the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. However, additional usage is anticipated within migratory areas where plovers forage on use sites. The associated risks and usage associated with sites during migration are in addition to those shown in the tables above.

Malathion used for mosquito control could result in loss of invertebrates in 32% of the range during the breeding season based on labeled uses. We do not anticipate plovers will enter use sites except during migration when plovers may experience 0-42% mortality and loss of food resources, depending on the type of crop or use site. Additional mortality and effects to growth and reproduction, and effects from loss of prey, are anticipated during migration. Usage data indicates that malathion has not been used in the breeding and overwintering range annually for mosquito control. We do not anticipate effects from usage on other overlapping use sites, although this does not include the risks from potential exposure during migration. Threats to piping plovers and their habitat in their migration and wintering ranges indicate a continuing loss and degradation of habitat due to a variety of reasons, and several studies indicate that foraging habitat and food resources ultimately affect piping plover survival, as discussed above. Significant declines in food resources could lead to reduced fitness supporting reproductive capacity, starvation, or inadequate fuel needed for migration. We anticipate the loss of a small number of individuals, sublethal effects and reductions in food availability that will affect a few individuals across the range of this species, primarily during migration when plovers are more likely to enter use sites. However, this species is wide-ranging, and would not be expected to be on many sites at the very time they are being treated as they pass by or stop during migration. In addition, we anticipate the conservation measures described above would further reduce the risk of exposure and effects on piping plovers and their prey. Therefore, we do not anticipate that the

proposed action would appreciably reduce survival and recovery of the piping plover (Great Lakes Watershed).

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Charadrius nivosus nivosus	Western snowy plover	132

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Species/Populations widespread or wide-ranging
Number of Populations: Multiple populations (numerous)
Species Trends: Increasing population(s)
Pesticides noted ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
Threats to the western snowy plover remain essentially the same as at the time of its listing in 1993. However, the magnitude of the threats has been reduced through active management afforded by protections under the Act, with a resultant increase to the overall plover population. Despite the reduction in the threats' magnitude relative to the time of listing, the western snowy plover is still at risk.

The reasons for decline and degree of threats vary by geographic location; however, the primary threat is habitat destruction and degradation. Habitat loss and degradation can be primarily attributed to human disturbance, urban development, introduced beachgrass (Ammophila spp.), and expanding predator populations. Natural factors, such as inclement weather, have also affected the quality and quantity of western snowy plover habitat as well as lack of comprehensive State and local regulatory mechanisms throughout the range of the western snowy plover. (U.S. Fish and Wildlife Service 1993a).

We also noted that because some of the threats have been reduced, the estimated western snowy plover population levels in the United States have increased over the last 4 years (L. Stenzel, in litt. 2004a); management actions in several areas appear to be effective (Page et al. 2003; G. Page, in litt. 2004a); and numerous local management plans, habitat conservation plans, and integrated natural resource management plans have been implemented or are in the planning stages (Lauten et al. 2006; Colwell et al. 2005). We found these trends and management actions encouraging. We believe significant progress has been made toward recovery in a relatively short period of time (approximately 10 years), and that continued implementation of recovery actions that reduce the remaining threats could justify a delisting of the western snowy plover in the future, although delisting was not found to be warranted in a 12-month petition finding in 2006. In the interim period, we proposed a mechanism that will afford regulatory relief for areas that are contributing to recovery now. In the same issue of the Federal Register, we published a proposal for a special rule under section 4(d) of the Act that would exempt certain actions in

certain areas from the section 9 take prohibitions of the Act, throughout the range of the DPS (71 FR 20625).

EB/CE Sources:

USFWS. 2004. Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition To Delist the Pacific Coast Population of the Western Snowy Plover and Initiation of a 5-Year Review. Federal Register 69:13326-13329.

USFWS. 2006. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to Delist the Pacific Coast Population of the Western Snowy Plover. Federal Register 71:20607-20624.

Overall Vulnerability: ☐ **High** ☐ **Medium** ☒ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Western snowy plovers are not expected to enter use sites and are not expected to experience direct effects from exposure following mosquito adulticide application.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects expected
Spray drift areas - Prey item mortality	Up to 13% terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	40% terrestrial invertebrates

Risk modifiers: The current Pacific coast breeding range of the western snowy plover extends from Damon Point, Washington, to Bahia Magdelena, Baja California, Mexico. The western

snowy plover is currently known to occur in Sonora, Mexico, and at the Buenos Aires National Wildlife Refuge in southern Arizona.

Western snowy plovers are invertivores and primarily visual foragers, using the run-stop-peck method of feeding typical of Charadrius species. Western snowy plover food consists of immature and adult forms of aquatic and terrestrial invertebrates. They forage in the wet sand and amongst surf-cast kelp in the intertidal zone, in dry sand areas above the high tide, on salt pans, on spoil sites, and along the edges of salt marshes, salt ponds, and lagoons. Western snowy plovers have been observed pecking small, flying insects from mid-air and shaking one foot in very shallow water to agitate potential prey. Opportunities for foraging are directly dependent on salinity levels. Salt ponds of medium salinity seem to provide the best quality foraging habitat.

The listed Pacific coast population of the western snowy plover breeds primarily above the high-tide line on coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries. Less common nesting habitats include bluff-backed beaches, dredged material disposal sites, salt pond levees, dry salt ponds, and river bars. In winter, western snowy plovers are found on many of the beaches used for nesting as well as on beaches where they do not nest, in manmade salt ponds, and on estuarine sand and mud flats.

Although some western snowy plovers remain in their coastal breeding areas year-round, others migrate south or north for winter. Migrants begin arriving at breeding areas in southern Washington in early March, and in central California as early as January; although the main arrival is from early March to late April. Because some individuals nest at multiple locations during the same year, birds may continue arriving through June. The nesting season of the western snowy plover extends through late September. Western snowy plover chicks are precocial, leaving the nest within hours after hatching to search for food. Broods rarely remain in the nesting area until fledging and may travel along the beach as far as 6.4 kilometers (4 mi.) from their natal area. In western North America, wintering occurs mainly in coastal areas from southern Washington to Central America. Both coastal and interior populations use coastal locations in winter. Western snowy plovers are typically gregarious in winter. Although some individuals defend territories on beaches, most usually roost in loose flocks; they are frequently observed foraging in loose flocks.

Western snowy plovers are may utilize right of ways, and are unlikely to enter agricultural lands, orchards and vineyards, managed forests, developed and developed open space areas, rangeland, or golf courses (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Effects to the invertebrate prey base are anticipated from malathion exposure near use sites or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Usage data for the whole range based on data from EPA's SUUM:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	5,044,836	39.66	18,167	0.14
Developed	*	900,105	7.08	45,005	0.35
Open Space Developed	*	506,045	3.98	25,302	0.20
Other Crops	*	181,951	1.43	0	0
Orchards and Vineyards	*	68,661	0.54	58,309	0.46
Other Grains	*	38,960	0.31	13,573	0.11
Wheat	*	38,239	0.30	23,674	0.19
Vegetables and Ground Fruit	*	29,535	0.23	29,535	0.23
Cotton	*	29,508	0.23	28,755	0.23
Pasture	*	27,627	0.22	27,054	0.21
Corn	*	6,625	0.05	761	0.01
Other RowCrops	*	4,973	0.04	2,179	0.02
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0.00	0	0.00
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0.00	0	0.00
TOTAL[4]:		5,044,836	39.66	18,167	0.14

Agricultural usage in California only based on CalPUR data:

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Other Crops	*	181,951	1.43	0	0

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.
[5] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[6] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Orchards and Vineyards	*	68,661	0.54	82	0.001
Other Grains	*	38,960	0.31	336	0.003
Wheat	*	38,239	0.30	1,396	0.011
Vegetables and Ground Fruit	*	29,535	0.23	27,123	0.21
Cotton	*	29,508	0.23	2,771	0.02
Pasture	*	27,627	0.22	2,212	0.033
Corn	*	6,625	0.05	40	<0.001
Other RowCrops	*	4,973	0.04	0	<0.001
	TOTAL:	5,044,836	39.66	33,960	0.278

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 12,721,093 acres
% of range in California (i.e., where CalPUR data is available): 73%
Range overlap with Federal lands: 3,570,685 acres, 28.069%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The western snowy plover is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is

limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the western snowy plover. As discussed below, the vulnerability is low for this species. We anticipate the risk posed by malathion exposure would be medium, although usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The western snowy plover has a low vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the standard and CalPUR usage data we acquired, as described in the Opinion and summarized for this species above. No mortality or sublethal effects are anticipated on any malathion use sites, although loss of terrestrial invertebrates could occur 40% or more of the range annually from spray drift and mosquito control based on labeled uses. However, we do not anticipate that usage will occur everywhere the labels allow, and past usage data indicates that malathion has used to treat about 0.14% of the range for mosquito control and less than 0.5% of any other use site in the range annually. The western snowy plover may occur in mosquito control areas, but it is not known to enter any of the other use sites, so exposure of prey would be from spray drift. We anticipate the conservation measures described above would reduce the risk of exposure and effects on prey items. While malathion usage is likely to result in the loss of some prey items, impacting the level of fitness supporting reproductive capacity in a few individuals, this species is mobile and we anticipate alternative foraging areas would be available if local foraging sites become temporarily unsuitable due to a lack of adequate food resources. While there may be adverse effects to some individuals due to the extra energy expenditure needed to find prey, we do not anticipate species-level effects from malathion usage. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the western snowy plover.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☐

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 so low and 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 FWS 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 FWS, 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.

EB/CE Sources:

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

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

Overall Vulnerability: ☒ High ☐ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed:

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	6%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	5% (G, R – low effects)
Direct spray or contact with contaminated media	Potential for mortality if exposed
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	7% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 18% terrestrial invertebrates
Plants affected (decline in growth)	7%
MOSQUITO CONTROL	
Direct (mortality)	1%
Sublethal	No effects expected
Indirect	72% terrestrial invertebrates

Risk modifiers: The range of the Florida grasshopper sparrow consists only of three management units under public ownership and three known private ranches in south-central Florida, as described above. During the breeding season, Florida grasshopper sparrows form breeding aggregations within suitable habitat, and individual male sparrows set up territories within the breeding aggregations. If a breeding aggregation occurred on or near a use site, the percent of the population potentially exposed to a pesticide could be higher than predicted. Mean territory size for Florida grasshopper sparrows at one location was 1.8 ha (4.4. acres), with a maximum size of 4.8 ha (11.86 acres). During the non-breeding season, Florida grasshopper sparrows appear to expand their range of movements. As determined by radio telemetry, the average home range size during the non-breeding season is 29 ha (72 acres), with individual home ranges varying from 1 to 174 ha (2.5 to 430 acres). Home ranges are not mutually exclusive, and home ranges of many different individuals overlap.

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.

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 the many use categories overlapping with their range, though entering or foraging in these sites has not been ruled out at this time.

Allowable uses driving effects/other considerations: Calculations are based on grasshopper sparrows utilizing most malathion use sites because this could not be definitively ruled out, however their use of these sites is considered unlikely. Therefore, direct and indirect effects on use sites are likely over-estimated.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near use sites, and from mosquito control applications. Because terrestrial invertebrates exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance of invertebrates 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	5,980,942	71.55	841,566	10.07
Orchards and Vineyards	*	592,275	7.09	260,588	3.12
Developed	*	414,209	4.96	20,710	0.25
Open Space Developed	D, I	378,687	4.53	18,934	0.23
Other Grains	D, I	118,268	1.41	18,255	0.22
Other Crops	D, I	35,622	0.43	0	0
Vegetables and Ground Fruit	D, I	13,913	0.17	1,785	0.02
Nurseries	D, I	4,809	0.06	4,809	0.06
Corn	D, I	1,107	0.01	158	<0.01
Rice	D, I	468	0.01	<1	<0.01
Pasture	D, I	7	0.00	6	<0.01
Sub-TOTAL (D):		552,882	6.61	43,948	0.53

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Other uses with direct effects only[3]					
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		552,882	6.61	43,948	0.53
TOTAL[4]:		6,533,824	78.16	885513	10.59

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

The usage table above is based on an unrefined species range map using county boundaries that include Collier, Desoto, Glades, Hendry, Highlands, Miami-Dade, Okeechobee, Osceola, and Polk counties in Florida. The current occupied portion of the range includes only Highlands, Okeechobee, Osceola, and Polk counties. Of these, 2012-2018 usage data indicates malathion has been only been used for mosquito control in Osceola County. One of the few known occupied sites in this county, the TLWMA, is a state-managed property that has been used for species recovery and as a release site for captive-bred Florida grasshopper sparrows. We anticipate that conservation management on this property will ensure protective measures would be in place for the sparrow, including for pesticide usage. Considering this information, we anticipate malathion usage shown in the table above reflects much greater usage than would be expected in the occupied portion of the range.

 # acres in species range: 8,359,198 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,489,661 acres, 17.821%

Overall Usage: ☒ **High** ☐ **Medium** ☐ **Low**

CONSERVATION MEASURES

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). The reduction of the maximum application rate for citrus (i.e., the primary Orchard and Vineyard use in Florida where this species occurs), from 4.5 lbs/acre to 1.5 lbs/acre (outside of California), is expected to greatly lower the risk of effects to species from that which was modeled in the BE. The reduction in application rate is expected to result in a corresponding reduction in environmental concentrations to one-third of modeled values. These lowered concentrations are expected to substantially reduce sublethal effects and mortality to birds, which are particularly vulnerable to higher application rates of malathion, and reduce exposure to all species and habitats near citrus

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

groves by decreasing the amount of malathion in and near these use sites. These reductions will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

Species specific measures: In addition to the general label changes that would apply to all uses specified on the label, which would be protective of a wide range of species, the registrants have also agreed to the following measures for the Florida grasshopper sparrow:

> *For agricultural use sites: During the months of April – September, for applications adjacent to use limitation areas*[5] *(potentially occupied habitats on conserved public and private lands within the range, based on known occurrences): 1. Apply malathion only when wind is blowing away from dry prairie habitat, OR 2.Use a 50-foot ground buffer from dry prairie habitat, and an aerial buffer from these habitats according to application rate: (1) 50 feet for <0.5 lbs ai/A; (2) 75 feet for 0.5 - <1 lb ai/A; (3) 150 feet for 1-2.5 lbs ai/A; (4) 200 feet for >2.5 lbs ai/A. Buffer sizes may be reduced by 25 feet for application rates (1) and (2) if a full swath displacement upwind is used during aerial application. Buffer sizes may be reduced by 50 feet for application rates (3) and (4) if a full swath displacement upwind is used during aerial application.*
>
> *For mosquito control: Where feasible, do not apply within the use limitation areas from April to September. If avoidance is not feasible or impairs the ability of the mosquito control district or agency to protect the public's health and welfare, coordinate with the local FWS Ecological Services field office to determine appropriate measures to ensure the proposed application is likely to have no more than minor effects on the species (FWS points of contact are available through the Information, Planning, and Consultation (IPaC) website https://ecos.fws.cov/ipac/). The applicator must retain documentation of the technical assistance and the agreed upon species-specific measures that were implemented.*

We anticipate these measures will reduce exposure and effects to the species for the following reasons:

Avoidance and use limitation areas such as the species' range, critical habitat, or key habitat types and areas, are effective ways to reduce exposure to malathion by preventing usage directly

[5] These areas will be provided via links in *BulletinsLive! Two*.

in these important areas, thus reducing the likelihood the species and its prey will come into contact with malathion.

Limiting malathion applications to specific seasons, months of the year, or time of day when the species is not active or otherwise engaged in a critical period of its life cycle (e.g., breeding, migration, overwintering, metamorphosis/emergence, etc.) is an effective means of reducing malathion exposure and risk of adverse effects.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Florida grasshopper sparrow. As discussed below, although the vulnerability is high for this species, and we anticipate the risk of exposure to malathion based on usage would be high, the implementation of the general and species-specific conservation measures described above are expected to substantially reduce the likelihood of exposure and associated adverse effects to the species.

The Florida grasshopper sparrow has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within the range would be high, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. Malathion usage could result in sparrow mortality on 1% of the range from mosquito adulticide and on up to 6% from other uses, along with low level sublethal effects to growth and reproduction on up to 5% of the range, based on labeled uses. Additional mortality could occur from spray drift or contact with contaminated media. In addition, loss of invertebrate prey could occur on 72% or more of the range annually based on labeled uses. While we do not anticipate that usage will occur everywhere and to the extent the labels allow, usage data indicates that malathion has been used for mosquito control on 10.07% of the range and on 0.53% of the range on use sites where effects may occur annually. However, usage is likely overestimated, as discussed below the table in the Usage section above. Effects from spray drift could occur from any of the use sites whether or not the Florida grasshopper sparrow utilizes the site itself.

The sparrow forms breeding aggregations. Any usage on or near breeding sites poses the risk of exposing a high number of breeding birds and their young to malathion. This species is highly endangered, now occurring in only six known locations versus the eight documented in surveys conducted in 2000-2004. While some of the occupied sites have management measures in place to conserve the species, population numbers have declined to historic lows at all known sites. As of 2018, there were only 23 estimated wild breeding pairs at sites where the sparrow is being monitored. Further loss of individuals and reduced recruitment would further exacerbate threats to the survival of the Florida grasshopper sparrow posed by low population densities and small

and isolated populations, and reduce the success of recovery efforts (e.g., the survival and reproduction of released captive bred individuals and recolonization of suitable habitats).

While malathion poses risks to the species, the conservation measures described above would substantially reduce the risk of exposure and effects on the sparrow and its prey items from malathion. We expect the general measures involving the reduced numbers and rates of applications for agricultural uses to result in corresponding reductions in environmental concentrations that would substantially reduce sublethal effects and mortality. Additionally, restrictions to the method and frequency of application for residential uses of malathion are expected to substantially reduce exposure in developed and open space developed areas. Spot treatments only in residential areas makes spray drift off-site unlikely and is likely to reduce application footprints. The decreased number of allowable applications and intervals of 7-10 days between applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application. We anticipate a reduction in invertebrate abundance on and near all use sites, although even without the conservation measures we would not expect that the invertebrate prey community would be completely eliminated as invertebrates exhibit a range of sensitivities to malathion and some invertebrate prey would likely remain. The conservation measures would substantially minimize losses of prey that could otherwise lead to reduced fitness supporting reproductive capacity, lower recruitment, reduced growth, starvation, site abandonment or inadequate fuel needed from terrestrial invertebrate prey.

In addition to the general conservation measures, EPA will also implement species-specific label restrictions to protect adults, chicks and their prey. These species-specific measures are expected to further minimize effects from malathion applications for agricultural uses and mosquito control by restricting usage in potentially occupied habitats during the breeding season when invertebrate prey are most essential for both adults and chicks. During the breeding season from April through September, agricultural applicators will be required to apply malathion only when the wind is blowing away from dry prairie habitat or will use buffers to minimize transport of malathion into sparrow habitat. Malathion will not be used for mosquito control in Florida grasshopper sparrow habitat without coordinating with the local FWS Ecological Services field office to determine appropriate measures to ensure the proposed application is likely to have no more than minor effects on the species.

With the conservation measures in place, mortality, effects to growth and reproduction, and a reduction in fitness supporting reproductive capacity due to losses of invertebrate prey are expected to be limited to a very small number of individuals over the project duration. We do not anticipate the Action will contribute to population declines or impede recovery efforts. Thus, the consequences of the proposed action are not likely to have species-level effects. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Florida grasshopper sparrow.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Pipilo crissalis eremophilus	Inyo California towhee	137

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened; 12-month finding and proposed rule (11/4/2013): Delist due to recovery
Distribution: Species/Populations widespread or wide-ranging
Number of Populations: Multiple populations (numerous)
Species Trends: Increasing population(s)
Pesticides noted ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
This species was proposed for delisting by the Service in 2013 because it has recovered and no longer requires the protections of the ESA. Threats to the Inyo California towhee at the time of listing included grazing by feral equines, recreational activities (hiking, camping, hunting, and offhighway vehicle (OHV) use), water diversion, and mining. Potential threats identified since listing include energy development, invasive and nonnative plants, predation (including nest parasitism), and climate change. The Inyo California towhee, are omnivorous, feeding on seeds, grain, invertebrates and fruit, with the composition of their diet changing with food availability (Davis 1957, pp. 129-166). The distribution of the Inyo California towhee's range occurs predominantly on Federal lands. Given there is no mention of pesticides as a potential threat to this species, and that the species is considered recovered to the point it no longer requires the protections of the ESA, this species is not likely to be vulnerable to the EPA's action under this consultation.

EB/CE Source:

USFWS. 2013. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition and Proposed Rule To Remove the Inyo California Towhee (*Pipilo crissalis eremophilus* = *Melozone crissalis eremophilus*) From the Federal List of Endangered and Threatened Wildlife. Notice of petition finding; proposed rule; notice of availability of a draft post-delisting monitoring plan. Federal Register 78:65938-65953.

Overall Vulnerability: ☐ **High** ☐ **Medium** ☒ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: We anticipate that 100% of Inyo California towhees exposed to malathion via consumption of arthropods at maximum rates on use sites will die.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	1%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	1% (G, R – low effects)
Direct spray or contact with contaminated media	No additional mortality expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	1% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 2% terrestrial invertebrates
Plants affected (decline in growth)	1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	28% terrestrial invertebrates

Risk modifiers: The Inyo California towhee occurs on the western and eastern slopes of the southern Argus Mountains of the Mojave Desert. Elevations range from approximately 817 to 1,890 meters (m) (2,680 to 6,200 feet [ft.]) above sea level.

Inyo California towhees are insectivore and granivore opportunistic feeders, foraging primarily in open rocky and sandy desert hillsides on just about any seed or invertebrate they encounter. To eat, towhees primarily peck and glean when foraging, but will also engage in scratching, flycatching, chasing, and harvesting to find or capture food. When there is not enough food available (most likely due to snow cover), the Inyo California towhee migrate to lower elevations to find food.

Inyo California towhees are non-migratory, holding their territories year-round. Initiation of nesting coincides with local plant growth and flowering periods, which are influenced by rainfall and temperature that also affect insect abundance. The breeding season generally starts early in spring, with courtship and nest building commencing in March. The first clutches are laid in April, but can be laid as early as late March; replacement clutches may be laid as late as May or early June. Inyo California towhees need tree-dense canopies high off the ground for protection.

Inyo California towhees are clumped according to resources, scattered over a relatively small area (approximately 43,700 ha [108,000 ac.]), within approximately 51.5 kilometers (32 miles) of canyons of the Argus Mountains. These habitat areas consist of desert riparian habitats with dense thickets (often of willows) around desert springs and streams in rocky canyons. The Inyo California towhee requires areas of dense riparian habitat to provide nesting substrate, protection from predators, and shade from the desert sun. Adjacent upland habitats are their principal foraging grounds, which also provides nesting habitat.

Inyo California towhees are unlikely to enter agricultural lands (including pasture), managed forests, or golf courses (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: We anticipate effects to the invertebrate prey base from malathion exposure on or near use sites, or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ **High** ☒ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Agricultural usage based on CalPUR data:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	482,193	28.16	0	0
Open Space Developed	D, I	9,146	0.53	457	0.03
Developed	D, I	5,040	0.29	252	0.01
Pasture	*	1,875	<0.01	0	0
Orchards and Vineyards	D, I	14	<0.01	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		14,200	0.83	718	0.04
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		14,200	0.83	726	0.04
TOTAL[4]:		496,393	28.99	726	0.04

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 1,712,178 acres
% of range in California (i.e., where CalPUR data is available): 100%

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Range overlap with Federal lands: 1,213,170 acres, 70.855%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Inyo California towhee. As discussed below, the vulnerability is low for this species. We anticipate the risk posed by malathion exposure would be medium, although usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The Inyo California towhee has a low vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the CalPUR data we acquired, as described in the Opinion and summarized for this species above. About 1% mortality and 1% low effects to growth and reproduction are anticipated across the species range based on labeled uses. In addition, there could be a loss of invertebrate prey on 28% or more of the range based on labeled malathion uses, primarily due to mosquito control. However, usage data indicates that malathion has not been used for mosquito control in the range, and malathion usage for all other uses has occurred on only 0.04% of the range annually. In addition, we anticipate the conservation measures described above for residential uses would further reduce the risk of exposure and effects on the towhee and its prey where the range overlaps with developed and open space developed sites. This species has been moving toward recovery, and is anticipated to be delisted in the foreseeable future. While malathion usage is expected to result in the loss of a few individuals and reductions in prey that would affect fitness supporting reproductive capacity in some areas where individuals are exposed, we do not

anticipate species-level effects or a setback to recovery from malathion. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Inyo California towhee.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Dendroica chrysoparia	Golden-cheeked warbler (=wood)	139

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
Distribution: Species/Populations neither constrained nor widespread
Number of Populations: Population size/location(s) unknown
Species Trends: Declining population(s) – one or more populations declining
Pesticides noted ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The golden-cheeked warbler is threatened by ongoing and imminent habitat loss. Historically, the primary cause of habitat loss was juniper clearing to create pastures for cattle grazing (Pulich 1976, pp. 72-73). Other causes of habitat loss included cutting junipers for fence posts, furniture, and cedar oil. However, recent habitat loss in Travis, Williamson, and Bexar Counties is due to rapid suburban development (Biological Advisory Team 1990, p. 19; Groce et al. 2010, p. 142). Further, the human population is projected to continue to increase throughout the golden-cheeked warbler's range (Groce et al. 2010, p. 118). This growth will continue to bring additional residential and commercial development, which will further reduce and fragment golden-cheeked warbler breeding habitat.

The loss of habitat through activities such as residential development often results in the fragmentation of larger contiguous patches of habitat and increased isolation of habitat patches which can prevent the interaction between nearby populations of the golden-cheeked warbler. Habitat fragmentation has been shown to influence habitat quality for woodland songbirds, such as the golden-cheeked warbler, in the following ways: (1) small patch size and thus small population size make extant populations more susceptible to random extinction or effects of inbreeding; (2) increased distance between patches reduces gene flow between populations and makes recolonization of vacant patches more difficult; and (3) increased proportion of habitat edge in small patches may alter patterns of insect abundance, vegetation structure, and songbird foraging activity (due to changes in the microclimate) (Brett 1989, pp. 7-8; Reville et al. 1990, p. 23; Saunders et al. 1991. p. 18, 22, 24). Fragmentation also heightens rates of nest parasitism and nest predation to the point at which the surviving songbird populations cannot maintain themselves (Lovejoy et al. 1986, p. 263; Wilcove et al. 1986, p. 248, 251).

Additional threats to the golden-cheeked warbler breeding habitat include reduced oak recruitment due to herbivory from native and non-native animals, death of mature oaks from oak wilt, and the potential for catastrophic wildland fires from increasing fine fuel loads and urban encroachment (Groce et al. 2010, pp. 137-139, 141). Pine-Oak Forest Conversion. The ongoing

destruction and fragmentation of pine-oak forests throughout the golden-cheeked warbler's migration and wintering habitat has been due to unsustainable forestry practices, fires from agricultural conversion, extraction of timber, and cattle ranching (Dinerstein et al. 1995, p. 87; Redo et al. 2009, p. 95; Groce et al. 2010, p. 131). While some countries have a legal framework that encourages sustainable forestry, they still allow clearcutting, which results in forest fragmentation, reduced species diversity, and soil loss (ACMPOF 2008, p. 34).

Red-imported fire ants (Solenopsis invicta), snakes, other bird species, and mammals have all been documented to prey on golden-cheeked warbler adults and/or young (Stake et al. 2004, p. 341; Reidy et al. 2008, pp. 462-463; Reidy et al. 2009, p. 418). Texas rat snakes have been observed preying on female warblers while on the nest (Stake et al. 2004, p. 341; Reidy et al. 2008, p. 462; Reidy et al. 2009, p. 418). Other likely or documented golden-cheeked warbler predators include western coachwhip (Masticophis flagellum testaceus), Great Plain's rat snake (Elaphe guttata emoryi), western scrub-jay (Aphelocoma californica), Cooper's hawk (Accipiter cooperii), American crow (Corvus brachyrhynchos), greater roadrunner (Geococcyx californianus), brown-headed cowbird (Molothrus ater), and mice (Peromyscus sp.) (Stake et al. 2004, p. 341; Reidy et al. 2008, p. 463).

The loss of golden-cheeked warbler habitat is ongoing and significant due to the threats discussed above. The magnitude of impacts associated with these combined threats is high, because (1) the breeding range of the species is limited to central Texas and (2) habitat within the breeding and wintering ranges of the warbler continues to be lost. Given the ongoing, wide-spread destruction of its habitat, this species continues to be in danger of extinction throughout its range. Therefore, we recommended no change to the classification of the golden-cheeked warbler as endangered in our 2014 5-Year Review.

EB/CE Source: 2014 5-Year Review

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed:

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	5%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	5% (G, R – low effects)

Direct spray or contact with contaminated media	Possible mortality if exposed
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	5% terrestrial invertebrates
Spray drift areas - Prey item mortality	Effects to terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	1%
Sublethal	No effects expected
Indirect	21% terrestrial invertebrates

Risk modifiers: The breeding range of the golden-cheeked warbler encompasses central Texas from Dallas, Palo Pinto, and Bosque counties south through the eastern and south-central portions of the Edwards Plateau, approximately 20,000 square kilometers.

Golden-cheeked warblers eat a variety of insects. In Texas, birds are thought to take advantage of insect blooms, large insect populations associated with different plants as the growing season progresses. Individuals forage mostly in hardwoods (oaks) on breeding range.

The golden-cheek warbler is migratory and arrives on its breeding grounds from early to mid-March. Most are gone by end of July, with some present to early August. The warbler nests usually in loose groups of fewer than 6 pairs (sometimes up to 21 pairs). Breeding habitat consists of old-growth and mature regrowth Ashe juniper-oak woodlands in limestone hills and canyons, at 180 to 520 meters elevation, including edges and open mosaics of Ashe juniper-scrub oak association in broken terrain in canyons and slopes, and closed canopy stands with plenty of old junipers and a sufficient proportion of deciduous oaks in the canopy; occupied sites contain junipers at least 40 years old. This species may occupy habitat patches as small as perhaps 50 hectares (larger if close to urban areas). In migration and winter, golden-cheeked warblers occur mainly in montane pine or pine-oak associations but also in broadleaf associations in lower montane wet and tropical forest.

The golden-cheeked warbler is a woodland obligate that is unlikely to enter agricultural sites (including pasture), golf courses, and developed areas (Pers. comm., 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Direct effect calculated are a result of overlap with open space developed use sites, though only those areas with suitable woodland habitat would be likely to be utilized by this species. If these areas exist within the overlap of the species range, they are likely to be only a portion of the overlapping area. Therefore direct effects are likely over-estimated. Indirect effects from spray drift are possible, though pesticide drift is not likely to travel significant distances into woodland habitat.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near use sites, or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to

malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ **High** ☒ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	5,373,878	20.82	181,500	0.70
Open Space Developed	D, I	1,335,698	5.18	66,785	0.26
Developed	*	867,538	3.36	43,377	0.17
Wheat	*	475,659	1.84	160,330	0.62
Corn	*	445,875	1.73	4,101	0.02
Other Grains	*	364,583	1.41	79,898	0.31
Other Crops	*	123,047	0.48	0	0
Cotton	*	87,419	0.34	77,536	0.30
Orchards and Vineyards	*	7,323	0.03	6,266	0.02
Other RowCrops	*	2,556	0.01	1,941	0.01
Vegetables and Ground Fruit	*	1,547	0.01	1,374	0.01
Pasture	*	271	<0.01	271	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		1,335,698	5.18	66,785	0.26
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		1,335,698	5.18	66,785	0.26
TOTAL[4]:		6,709,576	26.00	248,285	0.96

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 25,808,920 acres
% of range in California (i.e., where CalPUR data is available): 0%

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Range overlap with Federal lands: 359,722 acres, 1.394%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the golden-cheeked warbler. As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The golden-cheeked warbler has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Over 5% mortality and 5% low effects to growth and reproduction could occur across the species range based on labeled uses. In addition, there could be a loss of invertebrate prey on 21% or more of the range based on labeled malathion uses, primarily due to mosquito control. However, usage data indicates that malathion has been used for mosquito control on 0.70% of the range, and for other uses with effects to the warbler on 0.26% of the range annually. This species is a woodland obligate that is unlikely to enter most use sites, and is anticipated to be protected from spray drift to a large degree due to the forest cover. In addition, we anticipate the conservation measures described above for residential uses would further reduce the risk of exposure and effects on the warbler and its prey where the range overlaps with developed and open space developed sites. While malathion usage could result in the loss of a few individuals and reductions in prey that would affect fitness supporting reproductive capacity in some areas

where individuals are exposed, we do not anticipate species-level effects due to the low anticipated levels of malathion in the range and reduced risk of exposure due to forest cover and the conservation measures. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the golden-cheeked warbler.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Aphelocoma coerulescens	Florida scrub-jay	140

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Small, endemic, constrained, and/or isolated population(s)
Number of Populations: Multiple populations (numerous)
Species Trends: Declining population(s) – one or more populations declining
Pesticides noted ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:

Florida scrub-jays once occupied 39 out of 40 counties in peninsular Florida. Historically, many of these counties would have contained hundreds or even thousands of breeding pairs (Fitzpatrick et al. 1994). Florida scrub-jay population trends from historical estimates to present day show the overwhelming majority of populations range-wide have continued to decline since the species was listed. Boughton and Bowman (2011) report that consideral evidence exists that extant populations have declined to less than 10% of their historic numbers. A comparative study between 1992-93 and 2009-10 analyzing populations on managed conservation lands showed a 25% decline during this timeframe, with extant populations at less than 50% of the potential carrying capacity on these lands. As of 2015, post-breeding surveys suggest 13 of the original 39 counties lack occupancy on public conservation lands. Still, the Service's 2020 5-year review found the Florida scrub-jay remains secure on many managed conservation lands throughout its historical range. There is a general lack of data on private lands that complicates assessment of statewide population numbers.

Florida scrub-jays are non-migratory and extremely sedentary. They are restricted to scrub and scrubby flatwoods, primarily concentrated along both the Atlantic and Gulf coasts and on the central ridges. Landscape attributes of optimal habitat can be described as low and open with low densities of pine trees (Woolfenden and Fitzpatrick 1984, 1991). Woodlands and forests are not suitable for the scrub-jay and they decrease habitat suitability of nearby scrub.

Road mortality, supplemental food, changes in habitat, stochastic events, and exotic plants and animals all pose risks to some scrub-jay populations, although fire suppression and the resulting degradation in habitat represents the most significant and widespread manmade threat affecting the scrub-jay's continued existence. Demographic instability resulting from human development is another significant threat. Florida scrub-jay populations in suburban landscape settings are declining and disappearing all across Florida. Destruction of scrub-jay habitat due to land use changes threatens scrub-jays on private property. Habitat destruction is difficult to quantify, but

is anticipated to continue based on past and projected human population growth and development in Florida.

The recovery strategy for the Florida scrub-jay emphasizes creating and maintaining viable populations across most of the species' remaining geographic subpopulations and distinct genetic units, with priorities around the need for large landscapes that provide optimal opportunities for long-term persistence of Florida scrub-jay populations and maintaining and improving connectivity to facilitate dispersal among local populations. Florida scrub-jays interact as metapopulations made up of multiple local populations that are relatively isolated, spatially distributed and bound together by occasional dispersal between populations. A total of 21 metapopulations with 10 genetic units based on genetic similarity between individuals have been described (Coulon et al. 2008, 2010, and 2012). Pairs occupy year-round, multi-purpose territories (Woolfenden and Fitzpatrick 1984; Fitzpatrick et al. 1991, 1994) averaging 9 to 10 ha (22 to 25 ac), with a minimum of about 5 ha (12 ac), in size. Given the size of Florida scrub-jay territories and the short dispersal distances exhibited by the species, it is critical to maintain large, contiguous blocks of Florida scrub-jay habitat to support local populations that are relatively resistant to local extinction and to avoid loss of connectivity with other populations.

Many partners have worked together towards recovery of the species since the publication of the 1990 Florida Scrub-Jay Recovery Plan. Land acquisitions by public entities (local, state and federal) and conservation non-profits have reduced habitat degradation, destruction, and fragmentation threats to some scrub-jay populations. A statewide mapping exercise in 2015 (unpubl.) estimated that there are approximately 139,716 ha (345,233 ac) in conservation, which includes roughly 78% of the potential remaining scrub habitat in peninsular Florida. There are currently (at the time of the 2019 Species Status Assessment, based on Boughton and Bowman 2011) 65 Florida scrub-jay populations on conservation lands, spanning the entire width and nearly the length of the Florida peninsula. Of those, there are four very highly resilient populations that support 73% of known family groups on conservation lands (1,580 out of 2,160).

Effective land management is essential for maintaining suitable habitat. Boughton and Bowman (2011) found that even on conservation lands, most populations are smaller and more isolated from one another than they were historically, and restoration and (they emphasize) *effective* management of potential habitat in core areas is necessary to prevent the extirpation of scrub-jay populations. Losses have continued through the present (Chen et al. 2016), with populations declining on both protected and unprotected lands, especially in unmanaged and suburban areas. The Service has developed Florida scrub-jay mitigation guidance to be used when assessing minimization and mitigation needs for the species for actions under section 10 and section 7 of the ESA (Service 2009), and some mitigation involving scrub habitat aquisition and management has occured through Habitat Conservation Plans such as Brevard County's Scrub Conservation and Development Plan.

EB/CE Sources:

U.S. Fish and Wildlife Service. 2009. Amended Guidance for Assessing Mitigation Needs for the Florida Scrub-jay. Memorandum from the Field Supervisors of the Jacksonville and South Florida Ecological Services Offices to staff dated March 16, 2009. Jacksonville, FL. 7 pp.

U.S. Fish and Wildlife Service. 2019. Recovery Plan for the Florida Scrub-Jay (*Aphelocoma coerulescens*). Atlanta, GA. 7 pp.

U.S. Fish and Wildlife Service. 2019. Species Status Assessment, Florida Scrub-Jay (*Aphelocoma coerulescens*), Version 1.0. Jacksonville, FL. 140 pp.

U. S. Fish and Wildlife Service. 2020. Florida Scrub-Jay (*Aphelocoma coerulescens*) 5-Year Review: Summary and Evaluation. Jacksonville, Florida. 45 pp.

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: The Florida scrub-jay may experience up to about 10% mortality from exposure to malathion at maximum application rates on use sites from the consumption of arthropods. Consumption of small vertebrates may result in 21-39% mortality. Additional mortality is not expected from exposure via spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	22% terrestrial invertebrates, birds, mammals, 0-2% from other food items
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	22% (G, R – low effects; terrestrial invertebrates, birds, mammals), 4 -22% (G, R – high effects; terrestrial invertebrates, birds, mammals), 4% (B – low effects; birds only)
Direct spray or contact with contaminated media	Not a significant contributor to mortality
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	22% terrestrial invertebrates, reptiles, amphibians, 13% birds
Spray drift areas - Prey item mortality	Up to 22% terrestrial invertebrates

Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	42% birds, 2% mammals, no effects from other dietary items
Sublethal	80% (R – low effects, birds only)
Indirect	80% terrestrial invertebrates, 7% reptiles and amphibians

Risk modifiers: Florida scrub-jays are restricted to scattered and often small, isolated patches of scrub in peninsular Florida. In general, scrub-jays only persist long-term in early successional scrub communities that are relatively large or in close proximity to other scrub communities. Such scrub habitat occurs only on fine, white, drained sand. Scrub-jay use of microhabitats shows obligatory reliance on oaks.

The Florida scrub-jay is opportunistic, consuming about 60 percent animal matter including invertebrates, small terrestrial and aquatic vertebrates, and carrion, as well as nuts, fruits, and seeds. Insects, principally orthopterans and lepidopteran larvae, form the bulk of the diet over most of the year. Jays most frequently seek food by hopping along bare sand under scrub oaks, or by jumping from shrub to shrub within the oak foliage or palmetto fronds, examining leaves and darting after startled animals that attempt to escape. When encountered, a variety of small vertebrates are also taken including birds, reptiles, amphibians, and mammals. Acorns form the principal plant food. In late summer and fall jays spend a considerable part of their day gathering ripening acorns, either to be eaten immediately or cached in the sand to be eaten throughout the rest of the year.

Florida scrub-jays are non-migratory and extremely sedentary. Eggs are laid from early March to late June, with the majority laid in late March. Florida scrub-jays nest gregariously, gathering in small, scattered colonies.

Allowable uses driving effects/other considerations: Developed, open space developed, and orchards and vineyards are the main drivers of effects. Effects from orchards and vineyards are likely over-estimated based on maximum use rates analyzed that are not applicable to Florida crops (see discussion about how EECs were derived for this UDL in the "Approach to the Usage Analysis" section of the Opinion, and information about reduced rates in the Conservation Measures section below).

Effects to a portion of the prey base (i.e., invertebrates, birds, reptiles and amphibians) are anticipated from malathion exposure on or near use sites, and from mosquito control applications. Because species within these taxa exhibit a range of sensitivities to malathion, we expect exposure will reduce their abundance in these areas, but not completely eliminate these taxa in these portions of the range. We anticipate this reduction will be greater on use sites, where estimated environmental concentrations are higher than would be anticipated from spray drift or following mosquito control. These reductions would likely recover over time following

an application. Because the Florida scrub-jay is an opportunistic feeder, these reductions are expected to pose less risk to this species.

Overall Risk: ☒ **High** ☐ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control		4,122,210	79.91	1,029,806	19.77
Open Space Developed	D, I	481,834	9.34	24,092	0.47
Developed	D, I	418,482	8.11	20,924	0.41
Orchards and Vineyards	D, I	220,572	4.28	216,447	4.20
Corn	D, I	18,696	0.36	158	0.00
Vegetables and Ground Fruit	D, I	4,484	0.09	2,145	0.04
Other Crops	D, I	3,902	0.08	0	0.00
Other Row Crops	D, I	3,401	0.07	3,401	0.07
Other Grains	D, I	1,632	0.03	1,632	0.03
Sub-TOTAL (D): *Other uses with direct effects only*[3]		1,153,003	22.35	268,798	5.22
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		1,153,003	22.35	268,798	5.22
TOTAL[4]:		5,275,214	102.27	1,298,604	24.99

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 5,158,349 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 686,385 acres, 13.31%

Overall Usage: ☒ **High** ☐ **Medium** ☐ **Low**

CONSERVATION MEASURES

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). The reduction of the maximum application rate for citrus (i.e., the primary Orchard and Vineyard use in Florida where this species occurs), from 4.5 lbs/acre to 1.5 lbs/acre (outside of California), is expected to greatly lower the risk of effects to species from that which was modeled in the BE. The reduction in application rate is expected to result in a corresponding reduction in environmental concentrations to one-third of modeled values. These lowered concentrations are expected to substantially reduce sublethal effects and mortality to birds, which are particularly vulnerable to higher application rates of malathion, and reduce exposure to all species and habitats near citrus groves by decreasing the amount of malathion in and near these use sites. These reductions will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Florida scrub-jay. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk and likelihood of exposure to malathion would be high, factors related to the species habitats and conservation status and the implementation of the general conservation measures described above is expected to reduce the risks and likelihood of exposure.

The Florida scrub-jay has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within the range would be high, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. We anticipate individuals would be affected by malathion due to the high risk it poses to

exposed individuals and anticipated usage within the range, but we do not anticipate species-level effects would occur due to considerations related to the species status, distribution, and proportion of habitat located on conservation lands, as described below.

Malathion usage, not including mosquito adulticide, could result in Florida scrub-jay mortality on up to 224% of the range annually from eating terrestrial invertebrates, birds and mammals, 0-2% from eating other dietary items, and sublethal effects to growth, reproduction and behavior of individuals on up to 22% of the range, with 4-22% being high level sublethal effects to growth and reproduction. These uses could also result in the loss of 22% of terrestrial invertebrates, reptiles and amphibians and 13% of birds. Additionally, we anticipate mortality across up to 42% of the range, low level sublethal effects to reproduction and loss of invertebrate prey across 80% of the range, and losses of reptiles and amphibians across 7% of the range due to malathion used for mosquito control. These effects are based on labeled uses across the range, excluding uses on 13.31% of the range overlapping with Federal lands.

While we do not anticipate that usage will occur everywhere and to the extent the labels allow, usage data indicates that malathion has been used for mosquito control on about 19.77% of the range and on 5.22% of the range on use sites where effects to the scrub-jay are anticipated to occur annually. Any additional malathion usage that may occur on Federal lands is expected to be extremely low and localized, and carried out with avoidance and minimization measures in place for listed species based on standard practice and procedures. The degree of anticipated effects from the highest overlapping agricultural use, orchards and vineyards, is over-estimated as noted in the Risk section and as discussed in the Conservation Measures section above. The lower rates to be used on citrus within the range of the species decrease potential exposure of the scrub-jay on Orchard and Vineyard use sites, thus reducing the risk of mortality, sub-lethal effects and prey losses in these overlapping areas. In addition, we anticipate the other conservation measures described above would further reduce the risk of exposure and effects on the scrub-jay and its prey items on and adjacent to agricultural and residential use sites through means such as reducing application rates and frequencies and using spot treatments only in residential areas. However, we expect Florida scrub-jays would enter pesticide use sites to forage, roost or breed, resulting in losses of some exposed individuals, as well as sublethal effects to surviving exposed individuals. We also anticipate that individuals would experience losses of food resources, which would lead to reduced fitness supporting reproductive capacity, reduced growth, starvation, site abandonment or inadequate fuel needed for breeding, raising young and surviving through the seasons in some areas. While Florida scrub-jays are known to have a varied diet, they eat insects throughout the year that are highly susceptible to malathion. The losses of prey, and levels of mortality and sub-lethal effects to the scrub-jay from eating prey exposed to malathion across the range are all anticipated to be high where usage occurs.

Notwithstanding the risks and anticipated effects to the species discussed above, it is important to consider that this species is comprised of many populations distributed across the Florida peninsula, with 65 populations occurring on conservation lands that have protections in place and cover most (about 78%) of the potential remaining scrub habitat required by this species. While

populations have declined on both public and private lands, pesticides are not known to be a primary threat. Malathion is anticipated to result in adverse effects to individuals of the species through mortality, sublethal effects and effects associated with the loss of food resources. However, we anticipate the amount and extent of usage across occupied habitats will be lower than estimated in the risk assessment, with a limited number of individuals exposed, due to the conservation status and management of many of these sites as well as the conservation measures that will be in place for malathion uses. Consequently, we do not anticipate that effects to exposed individuals would result in species-level effects. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Florida scrub-jay.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Strix occidentalis caurina	Northern spotted owl	142

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened; Notice of 12-month finding (12/15/2020): Uplisting to endangered is warranted but precluded by higher priority actions
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The northern spotted owl (*Strix occidentalis caurina*) inhabits structurally complex forests from southwest British Columbia through the Cascade Mountains and coastal ranges in Washington, Oregon, and California, as far south as Marin County. After a status review (USFWS 1990a), the northern spotted owl was listed under the Endangered Species Act (ESA) as threatened on June 26, 1990 (USFWS 1990b) because of widespread loss of spotted owl habitat across the spotted owl's range and the inadequacy of existing regulatory mechanisms to conserve the spotted owl. Past habitat loss and current habitat loss are also threats to the spotted owl, even though loss of habitat due to timber harvest has been greatly reduced on Federal lands over the past two decades. Many populations of northern spotted owls continue to decline, especially in the northern parts of the subspecies' range, even with extensive maintenance and restoration of spotted owl habitat in recent years.

Managing sufficient habitat for the northern spotted owl now and into the future is important for its recovery. However, it is becoming more evident that securing habitat alone will not recover the spotted owl. Based on the best available scientific information, competition from the barred owl (*S. varia*) poses a significant and complex threat to the spotted owl. The spotted owl was listed as threatened throughout its range "due to loss and adverse modification of spotted owl habitat as a result of timber harvesting and exacerbated by catastrophic events such as fire, volcanic eruption, and wind storms" (USFWS 1990b:26114). More specifically, threats to the spotted owl included low populations, declining populations, limited habitat, declining habitat, inadequate distribution of habitat or populations, isolation of populations within physiographic provinces, predation and competition, lack of coordinated conservation measures, inadequacy of regulatory mechanisms and vulnerability to natural disturbance (USFWS 1992b).

Between 2006 and 2011, additional scientific research has indicated that northern spotted owl populations have continued to decline at a rate of 2.7% per year, with declines being associated with both habitat loss and barred owl presence (Forsman et al. 2011). The northern spotted owl

is doing poorer than at the time of the last 5-year review, and observed population declines indicate an increased possibility for this species to become endangered in the future. Barred owls generally have a greater negative impact on spotted owls in northern areas; however, the relationship between the two species is highly variable across range of the northern spotted owl. While populations are declining, spotted owls are still present across the majority of the species range.

EB/CE Source:

U.S. Fish and Wildlife Service. 2011. Revised Recovery Plan for the Northern Spotted Owl (*Strix occidentalis caurina*). U.S. Fish and Wildlife Service, Portland, Oregon. xvi + 258 pp.

U.S. Fish and Wildlife Service. 2020. 12-Month Finding for the northern spotted owl. Federal Register 85:81144-81152.

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Only dispersing juveniles are expected to enter malathion use sites. We anticipate that <1 - 20% of northern spotted owls exposed to malathion at maximum rates on use sites would die based on consumption of small mammals. Consumption of birds could result in higher mortality.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	<1% to dispersing juveniles
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	<1% (G, B)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	<1% birds, no effects to mammals
Spray drift areas - Prey item mortality	No effects expected
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected to mammals and birds

Risk modifiers: The current range of the northern spotted owl extends from southwest British Columbia through the Cascade Mountains, coastal ranges, and intervening forested lands in Washington, Oregon, and California; extending east to just northwest of the Pit River (in northeastern Shasta County), and as far south as Marin County.

The northern spotted owl is a carnivore; it consumes various arboreal and semi-arboreal small mammals, birds, and, rarely, reptiles and amphibians. Habitat plays an important role in resource availability and prey selection. Dense canopy closure (60 to 90 percent), access to water, a mosaic of suitable old-growth tree structure, and an absence of human disturbance are key aspects of suitable forage habitat. The northern spotted owl roosts during the day and has crepuscular feeding habits. However, it may forage opportunistically during the day, leaving its roost temporarily to feed.

Northern spotted owl distribution is clumped according to resources; population size and density are relatively low at the northern and southern ends of the range. Northern spotted owls live in and require mixed-conifer forests, Douglas fir, and redwoods with high canopy closure, dense overstory, old-growth trees with large cavities for nesting, and dense leaf litter that support prey species. The species is restricted or separated from suitable habitat by large bodies of water; mountain ranges; areas of unforested lands; and removal or modification of habitat by forest fires, insects, and diseases.

The northern spotted owl is non-migratory. Adults maintain a territory year-round; however, individuals shift their home ranges based on natal and breeding dispersal (occurring between the breeding [February through September] and nonbreeding seasons). Dispersal of juveniles from natal sites typically begins in September and October, and may continue through November and December. The median natal dispersal distance from fledging to “permanent” settlement is about 16 km (10 mi.) for males and 25 km (15.5 mi.) for females.

Contiguous habitat is a key resource for the subspecies. They require dense cover for camouflage during foraging, and protection from predators. Dispersal habitat, at a minimum, consists of stands with adequate tree size and canopy closure to provide protection from avian predators, and at least minimal foraging opportunities. There is little evidence that small openings in forest habitat influence the dispersal of spotted owls, but large, non-forested areas apparently are barriers to both natal and breeding dispersal.

Depending on the condition of the forest, northern spotted owls make use of some managed forests for foraging, roosting, nesting, and travel, and juveniles disperse through these forests. Right of ways that traverse through structurally diverse forests are entered by spotted owls moving across to adjacent high-quality habitat. Depending on how the right of way is managed, it may provide foraging opportunities. Juvenile spotted owls have been known to disperse across unsuitable areas which could include fields and crops, orchards and vineyards. Developed and developed open space areas are not considered habitat for northern spotted owls, though may

very occasionally contain dispersing juveniles that move on quickly. Spotted owls may fly across golf courses if they are imbedded in, or adjacent to, structurally diverse forests. (Pers. Comm. 2016 co-occurrence information, USFWS field office request)

Allowable uses driving effects/other considerations: As adult owls are not expected to enter malathion use sites, reproductive effects were not considered. Other effects described are to dispersing juveniles only and assume the juveniles disperse through any available cropland in the range of the species.

We anticipate effects to the avian prey base from malathion exposure on use sites. Because birds exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☐ Medium ☒ Low

USAGE
(Anticipated usage within the range based on past usage data)

Usage data for the whole range based on data from EPA's SUUM:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	N	11,475,020	23.00	94,467	0.19
Open Space Developed	*	886,996	1.78	44,350	0.09
Developed	*	722,441	1.45	36,122	0.07
Orchards and Vineyards	D, I	282,822	0.57	141,321	0.28
Other Crops	D	154,416	0.31	23,834	0.05
Rice	*	122,700	0.25	15,626	0.03
Pasture	D	89,332	0.18	89,332	0.18
Vegetables and Ground Fruit	D, I	67,285	0.13	50,610	0.10
Wheat	D	55,107	0.11	55,107	0.11
Other Grains	D	37,871	0.08	16,496	0.03
Corn	D	25,380	0.05	765	0.00
Christmas Trees	D	15,253	0.03	15,253	0.03
Sub-TOTAL (D): *Other uses with direct effects only*[3]		727,465	1.46	392,718	0.78
Sub- TOTAL (I):		350,107	0.70	191,931	0.38

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Other uses with indirect effects only[3]					
TOTAL[4]:		12,202,485	24.46	487,185	0.97

Agricultural usage in California only based on CalPUR data:

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Orchards and Vineyards	D, I			822	0.01
Other Crops	D			2.4	0.000
Rice	*			622	0.001
Pasture	D			896	0.009
Vegetables and Ground Fruit	D, I			182	0.000
Wheat	D			0	0.000
Other Grains	D			0	0.000
Corn	D			0	0.000
Christmas Trees	D			0	0.000
TOTAL:				**2524.4**	**0.02**

 # acres in species range: 49,881,213 acres
% of range in California (i.e., where CalPUR data is available): 43%
Range overlap with Federal lands: 27,931,310 acres, 55.996%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the northern spotted owl. As discussed below, although the vulnerability is high for this species, we anticipate the risk and likelihood of exposure to malathion is low.

The northern spotted owl has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be low as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above.

[4] TOTAL includes usage on all use sites with effects, including mosquito control.
[5] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[6] Estimated usage in the range is based on information about annual past usage.

Malathion could result in mortality of less than 1% of dispersing juveniles and sublethal effects to growth and behavior on less than 1% of the range annually from labeled uses, as well as some loss of prey items (less than 1% of birds). Usage data indicates that malathion has been used for uses that could cause effects to the northern spotted owl on 0.97% of the range in the recent past. Over half of the range is on Federal lands where effects to listed species are considered in land management decisions. While we anticipate the loss of a very small number of individuals, sublethal effects, and a decline in bird prey that would reduce fitness supporting reproductive capacity in a small number of owls in localized areas over the duration of the action, we do not expect species-level effects to occur. Pesticides are not a known threat to this species, and we anticipate that northern spotted owls will be able to find other suitable prey if a localized loss of bird prey occurs. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the northern spotted owl.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Polioptila californica californica	Coastal California gnatcatcher	145

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Species/Populations neither constrained nor widespread
Number of Populations: Population size/location(s) unknown
Species Trends: Unknown population trends
Pesticides noted ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The coastal California gnatcatcher is recognized as a subspecies and was listed throughout its range in 1993.

Within the U.S., the coastal California gnatcatcher is restricted to coastal southern California from Ventura and San Bernardino Counties, south to the Mexican border. We estimate 56 percent of the range is in the U.S. and 44 percent is in Baja California, Mexico. This subspecies occurs primarily in or near vegetation categorized as coastal scrub, including coastal sage scrub. The largest impacts to coastal sage scrub in California, including within the range of the coastal California gnatcatcher, both past and present, have been due to the effects of urbanization and agriculture (Cleland et al. 2016, p. 439). Nine potential threats were identified as having impacts on the subspecies or its habitat in the 2010 5-year review and reassessed in the 2016 12-month finding. These threats include grazing, wildland fire, vegetation type conversion, climate change, disease, predation, fragmentation, and brood parasitism. No new threats were found at the time of the 2020 5-year review.

In our 2010 5-year review, we reported an estimate of 1,324 gnatcatcher pairs over an 111,006-acre (ac) (44,923-hectare (ha)) area on lands owned by city, county, State, and Federal agencies (public and quasipublic lands) of Orange and San Diego Counties. We indicated that this study sampled only a portion of the U.S. range of the subspecies (the coastal regions), and that it was limited to 1 year (Winchell and Doherty 2008, p. 1,324). Standardized, rangewide population trends and occupancy estimates for the coastal California gnatcatcher (within the United States or Mexico) have not been available given the limited and incomplete survey information as well as the variability in the survey methods and reporting. Based on our 2016 petition finding and current as of our 2020 5-year review, we have received the following additional results from limited surveys of the coastal California gnatcatcher in the U.S. since our 2010 5-year review was published: (1) 25 nests (with 11 successes out of 29 nesting attempts) within the Western Riverside County Multi-Species HCP for the year 2014 in eight of the plan's designated core areas (Biological Monitoring Program 2015, p. 8); (2) 122 pairs and 33 single males (155

territories) within the City of Carlsbad (under the San Diego County Multiple Species HCP in 2013, an increase of 28 territories from 2010 despite little change in survey area (City of Carlsbad 2013, p. 2); (3) for Orange County, 12.7 percent occupancy within the Central Reserve and 34.3 percent occupancy in the Coastal Reserve (plus 17 other incidental observations) (Leatherman Bioconsulting 2012, p. 5); and (4) 436 occupied sites for the coastal California gnatcatcher on Marine Corps Base Camp Pendleton (Camp Pendleton) (San Diego County) in 2014, including 122 territorial males, 283 pairs, and 31 family groups, with an additional 53 transient individuals identified (Tetra Tech 2015, p. ii).

A study published by Vandergast et al. (2019) assessed the genetic connectivity within the U.S. portion of the coastal California gnatcatcher's range. The study finds that gnatcatchers within this population are retaining genetic connectivity and a large effective population size throughout most of the U.S. range. Conversely, evidence of reduced connectivity and loss of genetic diversity was found within population aggregations within the northern portion of the subspecies' range (i.e., Ventura and Los Angeles Counties) where urbanization has led to increasing habitat fragmentation and a loss of surrounding suitable habitat within 30 kilometers of those aggregations. This suggests further habitat loss, fragmentation, or degradation within the subspecies' range could lead to a loss of population connectivity and genetic diversity within the subspecies, as is evident from the emerging population structure within Ventura and Los Angeles Counties (Vandergast et al. 2019, pp. 7–8). Overall, evidence of recent gene flow occurring across large distances and the maintenance of genetic similarity throughout a majority of the subspecies' U.S. range indicates that dispersal is less limited than previously estimated by banding studies (Vandergast et al. 2019, pp. 5–7).

Our 2016 petition finding reported that much of the subspecies' range in the U.S. is included in completed Natural Community Conservation Community Planning/HCPs where the coastal California gnatcatcher is a ''covered species." Our analysis for the U.S. portion of the range found that 16 percent of coastal sage scrub receives permanent protection and minimal human use; 35 percent is permanently protected from urban development but allows multiple uses including off-highway vehicle use or mining; and 49 percent has no assured protections preventing urban development.

EB/CE Sources:

U.S. Fish and Wildlife Service. 2010. Coastal California Gnatcatcher, (*Polioptila californica californica*), 5-year Review: Summary and Evaluation. Carlsbad, CA. 51 pp.

U.S. Fish and Wildlife Service. 2016. Endangered and threatened wildlife and plants; 12-month finding on a petition to delist the coastal California gnatcatcher. Federal Register 81:59952-59975.

U.S. Fish and Wildlife Service. 2020. 5-Year Review, Coastal California Gnatcatcher, (*Polioptila californica californica*). Carlsbad, CA. 4 pp.

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Breeding gnatcatchers are not expected to enter use sites. Dispersing individuals could experience 100% mortality on developed and open space developed lands. Mortality is expected in up to 9% of individuals exposed to malathion from mosquito control.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	Possible mortality if exposed while dispersing (32% overlap)
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects expected
Spray drift areas - Prey item mortality	Up to 18% terrestrial invertebrates
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	6%
Sublethal	No effects expected
Indirect	69% terrestrial invertebrates

Risk modifiers: The range of the gnatcatcher is coastal southern California and northwestern Baja California, Mexico, from southern Ventura and San Bernardino counties, California, south to approximately El Rosario, Mexico. The range of the gnatcatcher is closely aligned with coastal scrub vegetation found on dry coastal slopes, washes, and mesas. The northern and eastern limits of the coastal scrub vegetation communities used by the gnatcatcher are largely bound by mountainous areas, while the southern limit is defined by the transition to the Vizcaíno desert. The distribution of coastal California gnatcatchers within this range is clumped. The density of gnatcatchers is highest in high-quality habitat and decreases as habitat quality decreases.

Coastal California gnatcatchers are insectivores and invertivores. They are opportunistic feeders and eat grasshoppers, crickets, spiders, beetles, bees, and caterpillars found widely distributed throughout sage scrub plant communities.

The gnatcatcher is non-migratory and defends breeding territories ranging in size from 1 to 6 hectares (ha) (2 to 14 acres [ac.]). The home range size of the gnatcatcher varies seasonally and geographically, with winter season home ranges being larger than breeding season ranges, and inland populations having larger home ranges than coastal populations. Dispersal of juveniles generally requires a corridor of native vegetation that provides certain foraging and sheltering requisites, and that connects to larger patches of appropriate sage scrub vegetation. The gnatcatcher generally disperses short distances through contiguous, undisturbed habitat, but juvenile gnatcatchers are capable of dispersing long distances (up to 22 km [14 mi.]) across fragmented and highly disturbed sage scrub habitat, such as that found along highway and utility corridors or remnant mosaics of habitat adjacent to developed lands.

Coastal California gnatcatchers breed from late February through July (sometimes later), with the peak of nest initiations (start-ups) occurring from mid-March through mid-May. Juveniles are dependent on or remain closely associated with their parents for up to several months following departure from the nest and dispersal from their natal territory.

Coastal California gnatcatchers are unlikely to enter agricultural lands (including pasture), managed forests, and rangeland. Gnatcatchers may travel through golf courses, developed, and open space developed areas for dispersal, and forage, roost, and potentially breed in rights of ways if suitable vegetation exists as habitat (along edges or where vegetation has regrown) (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Direct effects from uses other than mosquito control are based on the possibility of a gnatcatcher being present at the time of a pesticide application while traveling through developed or open space developed use sites during dispersal, and being directly exposed to that spray. These sites overlap 32% with the range, but are not all expected to be used for this purpose. Gnatcatchers are not expected to forage in these use sites, and as such are not included in the calculation of direct effects from dietary items.

We anticipate effects to the invertebrate prey base from malathion exposure near use sites or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Agricultural usage based on CalPUR data:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	D, I	3,545,320	68.52	0	0
Developed	*	1,149,317	22.21	57,466	1.11
Open Space Developed	*	493,685	9.54	24,684	0.48
Wheat	*	38,033	0.74	0	0
Other Crops	*	14,224	0.27	0	0
Orchards and Vineyards	*	6,673	0.13	45	0.001
Vegetables and Ground Fruit	*	5,911	0.11	5,911	0.11
Nurseries	*	4,805	0.09	1,033	0.02
Pasture	*	3,925	0.08	134	0.004
Other Grains	*	3,183	0.06	0	0
Cotton	*	49	<0.01	0	0
Corn	*	44	<0.01	506	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0	0	0
TOTAL[4]:		3545320	68.52	0	0

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 5,174,322 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 1,583,480 acres, 30.603%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Coastal California gnatcatcher. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be high, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The Coastal California gnatcatcher has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within the range would be low, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. While malathion usage could result in mortality on up to 32% of the range if juveniles are exposed when dispersing across use sites and 6% of the range from mosquito control, as well as loss of invertebrate prey on 69% or more of the range annually based on labeled uses, CalPUR usage data indicates that malathion has not been used for mosquito control and has not been used on sites the species is likely to enter other than when juveniles are dispersing. Juveniles present on overlapping use sites when malathion is being used could be effected, but data indicates that usage on these sites has occurred on less than 2% of the range annually. In addition, the conservation measures described above for residential areas would reduce the risk of exposure and effects on the gnatcatcher and its prey associated with developed and open space developed use sites. While we anticipate the loss of a few individuals and losses of invertebrate prey that would lead to reduced fitness supporting reproductive capacity in a few individuals, we do not anticipate species-level effects from the proposed action. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the coastal California gnatcatcher.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Empidonax traillii extimus	Southwestern willow flycatcher	149

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The primary cause of the flycatcher's decline is loss and modification of habitat. Its riparian nesting habitat tends to be uncommon, isolated, dispersed, and dynamic due to natural disturbance and regeneration events such as floods, drought, and to a lesser extent, fire. These habitat characteristics have been exacerbated over time through alteration of river function from land and water management actions. With increasing human populations and related agricultural and urban development, riparian areas have largely been modified, reduced, and destroyed by various mechanisms. In some instances, there have also been site-specific and temporal increases in riparian habitat. Overall, riparian ecosystems in the Southwest have declined from reductions in water flow and groundwater, interruptions in natural hydrological events and cycles, physical modifications to streams, direct removal of riparian vegetation, and an increase in fire events, due to water management and land use practices.

Most of the larger and many of the minor southwestern streams that likely supported flycatcher habitat are now dammed. Operation of dams modifies, reduces, destroys, or (in some instances) increases riparian habitats both downstream and upstream of the dam site. Below dams, changing the amplitude, magnitude, frequency, duration, timing, and rate of change of hydrologic conditions strongly influences the structure and function of riparian ecosystems (Poff et al. 1997, pp. 269-274). As a result of the operation of dams, maximum and minimum flow events can both be altered; base flows can be increased or decreased; and flood flows are reduced in size and frequency. Tamarisk is a significant vegetative component of the flycatcher's breeding and foraging habitat (Durst et al. 2008, p. 15). Tamarisk is also an exotic plant within the flycatcher's breeding range, and often misunderstood for the reasons behind its presence and proliferation throughout the southwestern United States (Gelt 2008, pp. 2-3; Nagler et al. 2009, pp. 11-31). The introduction of the leaf beetle threatens to impact the quality and abundance of tamarisk within the flycatcher's range in the United States and Mexico that can be used for migration "stopover" habitat (shelter and foraging). Tamarisk is widespread across major river systems and reservoirs in the states of AZ, UT, CO, TX, NM, southern CA and NV (Shafroth et al. 2010b, p.12).

Urban development, even in areas away from streams with flycatcher habitat, can create increased demands for domestic and industrial water use. These demands are satisfied by diverting water from streams or through groundwater pumping. Domestic livestock has been a significant contributing factor in the alteration of riparian habitats in the arid western United States (Rickard and Cushing 1982, p. 360; Kauffman and Kruger 1984, pp. 430-434; Cannon and Knopf 1984, pp. 234-237; General Accounting Office 1988, pp 8-13; Clary and Webster 1989, pp. 1-3, Schultz and Leininger 1990, pp. 295-296; Belsky et al. 1999, pp. 1-4; USFWS 2002. Recreation is often concentrated in riparian areas because of the shade, water, aesthetic values, and recreation opportunities. As regional human populations grow, the magnitude and cumulative effects of these activities are considerable. Effects include: reduction in vegetation through trampling, clearing, woodcutting and prevention of seedling germination due to soil compaction; bank erosion; increased incidence of fire; promoting establishment of exotic plant species; promoting increases in predators and scavengers due to food scraps and garbage (ravens, jays, grackles, skunks, squirrels, domestic cats, etc.); promoting increases in brood parasitic cowbirds; and noise disturbance. Brood parasitism by brown-headed cowbirds can negatively affect flycatchers and populations by reducing reproductive performance.

EB/CE Source: 2014 5-Year Review

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Southwestern willow flycatchers are expected to experience 60-100% mortality if exposed to malathion at maximum rates on use sites. Mortality from spray drift is not expected.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	4%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	3% (G, R – low effects)
Direct spray or contact with contaminated media	Possible mortality if exposed on use sites
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	4% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 8% terrestrial invertebrates
Plants affected (decline in growth)	N/A

MOSQUITO CONTROL	
Direct (mortality)	1%
Sublethal	No effects expected
Indirect	27% terrestrial invertebrates

Risk modifiers: The southwestern willow flycatcher occurs in the southwestern United States, mostly in New Mexico and Arizona. The northern distributional limit of this subspecies cannot be precisely defined. Elevational range extends from near sea level to more than 8,520 feet (2,600 meters); the majority of territories are below 5,250 feet (1,600 meters).

Flycatchers are diurnal invertivores. They forage in and above the canopy, along the patch edge, in openings in the territory and above water, and glean from tall trees as well as herbaceous ground cover. They eat mainly insects caught in flight, and sometimes glean insects from foliage; occasionally they eat berries.

The flycatcher breeds in vegetation alongside rivers, streams, or other wetlands (riparian habitat). While there are exceptions, generally flycatchers are not found nesting in areas without willows, tamarisk, or both. Nesting occurs usually from early June through the end of July, peaking in mid-June; sometimes they may lay eggs as early as late May. Breeding territories are about 1.5 acres. Densities may be on the order of 9-14 pairs/100 acres. The southwestern willow flycatcher migrates from the southwestern U.S. to wintering grounds in Mexico and southward between August and September.

Flycatchers are believed to exist and interact as groups of metapopulations. A metapopulation is a group of geographically separate flycatcher breeding populations connected to each other by immigration and emigration. Therefore, estimates of effects could be higher or lower than those predicted by assuming that individuals are even distributed.

Allowable uses driving effects/other considerations: Effects to the invertebrate prey base are anticipated from malathion exposure on or near use sites, or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Usage data for the whole range based on data from EPA's SUUM:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	32,804,181	27.36	853,114	0.71
Developed	D, I	1,704,295	1.42	85,215	0.07
Open Space Developed	D, I	1,276,135	1.06	63,807	0.05
Pasture	D, I	676,655	0.56	202,382	0.17
Other Crops	D, I	575,292	0.48	0	0
Orchards and Vineyards	D, I	318,425	0.27	98,512	0.08
Vegetables and Ground Fruit	D, I	222,762	0.19	88,467	0.07
Wheat	D, I	186,064	0.16	132,000	0.11
Other Grains	D, I	132,833	0.11	47,395	0.04
Cotton	D, I	95,495	0.08	54,290	0.05
Corn	D, I	46,293	0.04	2,084	0.00
Other RowCrops	D, I	1,636	0.001	1,175	0.001
Sub-TOTAL (D): *Other uses with direct effects only*[3]		5,235,885	4.37	775,327	0.65
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		5,235,885	4.37	775,327	0.65
TOTAL[4]:		38,040,066	31.73	1628440	1.36

Agricultural usage in California only based on CalPUR data:

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Pasture	D, I			980	0.01
Other Crops	D, I			10	<0.01
Orchards and Vineyards	D, I			4,961	0.05
Vegetables and Ground Fruit	D, I			95,098	0.08
Wheat	D, I			20	<0.01
Other Grains	D, I			4	<0.01
Cotton	D, I			0	0
Corn	D, I			526	<0.01
Other RowCrops	D, I			6	<0.01
TOTAL:				101,605	0.14

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.
[5] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[6] Estimated usage in the range is based on information about annual past usage.

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 119,877,947 acres
% of range in California (i.e., where CalPUR data is available): 16%
Range overlap with Federal lands: 53,387,793 acres, 44.535%

Overall Usage: ☐ High ☐ Medium ☒ Low

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the southwestern willow flycatcher. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be high, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The southwestern willow flycatcher has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Over 4% mortality and 3% low effects to growth and reproduction could occur across the species range based on labeled uses. In addition, there could be a loss of invertebrate prey on 27% or more of the range based on labeled malathion uses, primarily due to mosquito control. However, data indicates that malathion has been used for mosquito control on 0.71% of the range, and for other uses with effects to the flycatcher on 0.65% of the range annually based on

standard data. CalPUR data indicates that usage on agricultural use sites in California (16% of the species range) is lower (0.14%). This species is primarily found in and near riparian habitat, nesting in willows or tamarisk, and foraging in and above the canopy, along riparian edges, in areas with herbaceous cover, above water and in habitat openings. We anticipate adverse effects in all overlapping use sites, although riparian cover is likely to provide some protection and reduce the risks to this species from spray drift. In addition, about 45% of the range is on Federal lands where malathion usage has been found to be minimal, and the conservation measures described above for residential areas would reduce the risk of exposure and effects on the flycatcher and its prey associated with developed and open space developed use sites. We do anticipate the loss of a small number of individuals, effects to reproduction and growth, and loss of prey that would reduce fitness supporting reproductive capacity in a few individuals. However, we do not anticipate species-level effects due to the levels of malathion usage we expect in the range, widespread distribution of the species and reduced risk of exposure due to the association of the flycatcher with riparian cover. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the southwestern willow flycatcher.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Endangered
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 ☐

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 have the ability to 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 eleminated 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 are able to 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.

EB/CE Sources:

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

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

Overall Vulnerability: ☒ High ☐ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Adverse effects are not expected for Everglade snail kites exposed to malathion via consumption of aquatic invertebrates at maximum rates.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	

Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects to snails, 22% other aquatic invertebrates and fish
Spray drift areas - Prey item mortality	No effects to snails, up to 18% other aquatic invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects to snails, 70% other aquatic invertebrates and fish

Risk modifiers: The current 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. Six large freshwater systems comprise the current range: Upper St. Johns marshes, Kissimmee Chain of Lakes, Lake Okeechobee, Loxahatchee Slough, the Everglades, and the Big Cypress basin.

The snail kite has a highly specific diet composed almost entirely of apple snails (*Pomacea paludosa*). Suitable foraging habitat for the snail kite is typically a combination of low profile (< 3 m) marsh with an interdigitated matrix of shallow (0.2-1.3 m deep) open water, which is relatively clear and calm. Snail kites require foraging areas that are relatively clear and open in order to visually search for apple snails. Therefore, dense growth of herbaceous or woody vegetation is not conducive to efficient foraging. The snail kite is known to feed on introduced apple snails (e.g., *Pomacea bridgesi* and others), and on rare occasions, will prey on small turtles, crayfish, and fish.

Snail kites in Florida are not migratory, but nomadic in response to water depths, hydroperiod, food availability, and other habitat changes. Nesting almost always occurs over water, which deters predation (Sykes 1987b). Nesting substrates include small trees (usually < 10 m in height), and herbaceous vegetation, such as sawgrass, cattail, bulrush, and reed (*Phragmites australis*). Most pair bonds form from late November to early June.

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. Roosting sites are also almost always located over water. In Florida, 91.6 percent are located in willows, 5.6 percent in Melaleuca, and 2.8 percent in pond cypress. Non-breeding snail kites use communal roosts throughout the year in association with other birds, particularly anhingas (*Anhinga anhinga*), herons, and vultures.

Allowable uses driving effects/other considerations: 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 malathion 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 malathion, their abundance is expected to be reduced where exposure occurs, but not completely eliminated. Reductions are likely to be temporary and would be a function of application frequency. Community recovery is expected to occur over a short period of time following a single application. Thus, we anticipate that risk will be lower than the modeled indirect effects to these prey suggest.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	13,119,642	69.83	1,209,434	6.44
Developed	I	1,407,669	7.49	70,383	0.37
Open Space Developed	I	1,121,477	5.97	56,074	0.30
Orchards and Vineyards	I	816,974	4.35	260,588	1.39
Other Grains	I	507,285	2.70	18,255	0.10
Other Crops	N	138,931	0.74	0	0
Vegetables and Ground Fruit	I	18,952	0.10	1,785	0.01
Rice	I	12,931	0.07	411	<0.01
Nurseries	I	10,580	0.06	10,580	0.06
Corn	I	8,717	0.05	158	<0.01
Pasture	I	66	0.00	15	<0.01
		17,163,224	91.36	1,627,683	0.08
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		4,043,582	21.53	418, 249	2.23
TOTAL[4]:		17,163,224	91.36	1,627,683	8.67

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in indirect effects due to loss of prey from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 18,788,660 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 2,906,729 acres, 15.471%

Overall Usage: ☐ **High** ☒ **Medium** ☐ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The Everglade snail kite is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). The reduction of the maximum application rate for citrus (i.e., the primary Orchard and Vineyard use in Florida where this species occurs), from 4.5 lbs/acre to 1.5 lbs/acre (this rate applies everywhere except California), is expected to greatly lower the risk of effects to species from this use from that which was modeled in the BE. The reduction in application rate is expected to result in a corresponding reduction in environmental concentrations to one-third of modeled values. These lowered concentrations are expected to substantially reduce sublethal effects and mortality to birds, which are particularly vulnerable to higher application rates of malathion, and reduce exposure to all species and habitats near citrus groves by decreasing the amount of malathion in and near these use sites. These reductions will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as

the number of allowable applications is reduced from “repeat as necessary” to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service’s biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Everglade snail kite. As discussed below, the vulnerability is high for this species and we anticipate the risk and likelihood of exposure to malathion is medium. However, factors associated with the prey used by this species (primarily apple snails) and implementation of the general conservation measures described above are expected to reduce the risks and likelihood of exposure.

The Everglade snail kite has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be medium, based primarily on the standard data we acquired, as described in the Opinion and summarized for this species above. We do not anticipate mortality or sublethal effects from direct exposure or from the consumption of contaminated prey, based on labeled uses. While we anticipate reductions in some types of aquatic invertebrate prey, the loss of prey is of low concern for this species. The snail kite has a specialized beak designed for a highly specific diet composed almost entirely of apple snails (*Pomacea paludosa*), although more rarely they will eat small turtles, crayfish, and fish. Some individual snail kites have been found to eat introduced apple snails (*Pomacea bridgesi* and other *Pomacea* spp.). While these snails may not be as accessible as dietary items, particularly for juvenile kites due to the differences in prey size (the native *Pomacea paludosa* is smaller than the known invasive *Pomacea* spp.), studies indicate the kites forage to some degree on these non-native apple snails.

Apple snails are not susceptible to effects from malathion exposure. Mortality of apple snails is not anticipated, although mortality of other aquatic invertebrates and fish could occur in 70% to 91% of the range, based on overlaps with labeled uses and the degree to which mosquito control overlaps with other uses. Additional losses of prey could occur due to spray drift on 18% of the range, although, as with use sites, we do not anticipate impacts to apple snails from spray drift. The extent to which the kites would utilize agricultural and developed use sites is largely unknown. If they do not utilize all use sites, the loss of prey shown in the Risk table above for uses other than mosquito control may be over-estimated, and to the extent they do utilize these areas, we anticipate the conservation measures described above would reduce the risk of exposure and effects on prey items on agricultural and residential use sites. The loss of some secondary aquatic invertebrate prey across 70% of the species range could occur in mosquito control sites. While we do not anticipate malathion will be used to the extent the labels allow,

usage data indicates that annually, malathion has been used for mosquito control on 6.44% of the range, and on 2.23% of the range for other uses with effects to some invertebrate and fish prey, not including areas where exposure to malathion may occur from spray drift. Additional malathion usage that may occur on the 15.471% of the range on Federal lands, although usage in these areas is expected to be extremely low and localized, and carried out with avoidance and minimization measures in place for listed species such as the snail kite based on standard practice and procedures.

We do not expect the abundance and distribution of apple snails, the primary food source for the kite, to be measurably affected by malathion usage. Where other types of prey are reduced, kites would likely be able to forage on apple snails, find other prey nearby, or move to other foraging areas; it is unlikely that every area within an individual's home range would have an application of malathion at the same time. While the snail kite is associated with aquatic habitats for nesting and foraging that overlap extensively with mosquito control use sites, we do not anticipate sizable invertebrate prey losses that would impact the kite due to its primary dependence on native and non-native apple snails. Furthermore, even though some secondary food resources would likely be reduced, we do not expect that these prey items would be lost altogether where exposed. Additionally, the conservation measures described above would reduce the risk of exposure and effects on prey items on and adjacent to developed and open space developed (through the residential conservation measures) and agricultural use sites and in aquatic habitats. There have been declining trends in snail kite populations, and reductions in the abundance of apple snails throughout many portions of the kite's range is considered a threat to the species. However, we do not anticipate levels of prey losses from malathion that would lead to the starvation of adult or juvenile kites, reduced fecundity, nest failure, or an overall reduction in recruitment and numbers of individuals because apple snails are not susceptible to effects from malathion. Other prey items that may serve as alternate food sources for the kite are likely to remain available, although at reduced levels where exposure occurs. We do not anticipate effects on this species that would result in species-level effects. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Everglade snail kite.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
Gunnison sage-grouse were formerly native to southwestern Colorado, northern New Mexico, southeastern Utah, and possibly northeastern Arizona (Schroder et al. 2004, p. 370). Since the 1900s, the grouse's occupied range contracted, due largely to habitat loss associated with the conversion of sagebrush habitats to agriculture and residential and commercial development. The Gunnison sage-grouse now occupies an estimated 10 percent of its historical range (Schroeder et al. 2004, p. 370). The Bureau of Land Management manages approximately 42 percent of the currently occupied habitat, and 43 percent is privately owned. The U.S. Forest Service manages approximately 10 percent, the National Park Service manages approximately 2 percent, and the States of Colorado and Utah collectively manage approximately 2 percent of the occupied grouse habitat. Throughout their life cycle, the grouse depends on a variety of shrub-steppe habitats and are obligate users of several sagebrush species to breed, feed, and shelter.

Currently, Gunnison sage-grouse are found in eight, small populations distributed across eight counties in Colorado and one county in Utah, with seven populations located in Colorado (Gunnison Basin, Poncha Pass, Crawford, Cerro Summit-Cimarron-Sims Mesa, Piñon Mesa, San Miguel Basin, and Dove Creek) and one population in Utah (Monticello). The Gunnison Basin population is the largest population of the eight and has the most occupied habitat, covering approximately 239,641 hectares (592,168 acres). 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, covering approximately 11,234 hectares (27,776 acres). All of the 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 (GSRSC 2005, p. 94). The Gunnison Basin population supports approximately 85 percent of breeding Gunnison sage-grouse and 65 percent of the occupied habitat. The remaining 15 percent of the individuals are distributed among the remaining 7 populations, which comprise approximately 35 percent of the overall occupied habitat. The eight Gunnison sage-grouse populations occupy six different ecoregions, or areas delineated by common geology, landforms, soils, vegetation, climate, land use, wildlife, and

hydrology (EPA 2018). The ecoregions represent distinct ecological, or habitat, differences between the populations (Service 2019, p. 15).

As described in our Species Status Assessment (Service 2019, entire), we base our assessment of species viability, defined as the likelihood of persistence over the long-term, on the concepts of resiliency, redundancy, and representation, collectively known as the 3 Rs (Smith el al. 2018, p. 306). Based on the analysis documented in our Species Status Assessment, three of the eight grouse populations currently have low resiliency (Crawford, Poncha Pass, and Monticello), two populations have moderate resiliency (CSCSM and San Miguel Basin), two populations have high resiliency (Gunnison Basin and Piñon Mesa), and one population (Dove Creek) has critically low resiliency (Service 2019, p. 39). At the time of writing the final recovery plan, most populations, including the Gunnison Basin population, have decreased from their 2019 levels (CPW 2020, entire). Although the exact reasons for population declines are unknown, stochastic environmental and demographic changes have likely contributed.

As discussed in the 2014 listing rule, we determined that the most substantial threats to Gunnison sage-grouse currently and in the future 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 and habitat decline due to human disturbance; and recreation. Some existing regulatory mechanisms are in place to conserve Gunnison sage-grouse, but individually or collectively they do not fully address the substantial threats faced by the species, particularly habitat decline, small population size and structure, drought, climate change, and disease. The threats listed above are also acting cumulatively, contributing to the challenges faced by Gunnison sage-grouse now and into the future.

EB/CE Sources:

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.

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

Overall Vulnerability: ☐ High ☒ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Gunnison sage-grouse exposed to malathion at maximum rates sites via consumption of arthropods and leaves are not expected to experience mortality on most use sites. Individuals that forage in developed or open space developed use sites have a low chance of mortality (up to about 2%). Individuals could experience sublethal effects on use sites with higher allowable use rates, but no effects are expected on uses with the highest overlap (pasture, other crops, wheat, and other grains).

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	<0.1% from consumption of leaves, no effects from terrestrial invertebrates
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	1% (G, R – low effects)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	7% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 14% terrestrial invertebrates
Plants affected (decline in growth)	1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	16% terrestrial invertebrates, no effects to plants

Risk modifiers: This Gunnison sage-grouse occurs locally in the Gunnison Basin and southwestern Colorado, and in adjacent southeastern (San Juan County) Utah south and east of the Colorado River.

Gunnison sage-grouse are herbivores and insectivores whose diet consists of almost exclusively sagebrush in winter; during the remainder of the years Gunnison sage-grouse eat sagebrush, forbs, and insects.

Sage-grouse use a variety of habitats throughout the year, but the primary component necessary is sagebrush (Artemisia spp.), especially big sagebrush (A. tridentata). Sagebrush is used for hiding and thermal cover as well as for food in the winter. Leks, used for male displays from mid-March to early June, consist of open areas with good visibility (for predator detection) and acoustics (for transmission of male display sounds). Female nesting sites typically are in

relatively tall and dense stands of sagebrush, about 0.2-8.0 kilometers from the leks. Nest sites also have grass and forbs that provide additional hiding cover. As chicks mature and vegetation in the uplands desiccates, females move their broods to wet meadow areas that retain succulent forbs and insects through the summer. From mid-September into November all individuals use upland areas with 20 percent or greater sagebrush cover and some green forbs.

The life cycle involves several significant stages, minimally including wintering, lek attendance, nesting, and brood rearing. In Colorado and likely Utah, males display on leks from mid-March through late May, depending on elevation and conditions. Hatching begins around mid-May and may extend into July; the peak usually is in mid-June. Sage-grouse are strong fliers but tend to travel slowly on foot unless threatened, in which case the grouse tend to hide or fly (less likely to run long distances).

This species is basically non-migratory in some areas, but in other areas it makes limited seasonal movements among different habitats. Overall, the vast majority of nests are within 6.4 km of the lek of capture. Longer movements of up to 24 km have been observed in individual Gunnison sage-grouse in the Gunnison Basin population, and 30 km or more between winter range and nesting areas.

Gunnison sage-grouse use rangeland for all life stages (breeding, foraging, roosting, winter habitat). They may occasionally use developed open space areas or right of ways to move between fragmented areas, but tend to avoid powerline right of ways through habitat. Managed forests are not used by Gunnison sage-grouse (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Effects to terrestrial invertebrates, a secondary food item of the grouse, could occur on all use sites or from spray drift. Overlap with the “other crops” use category (1.3% overlap) is likely over-estimated based on data from the NASS census indicating that malathion-registered crops in this category do not appear to be grown in the range of this species. This information is captured below in the usage data. Therefore, mortality to terrestrial invertebrates is likely over-estimated by this percentage. In addition, because invertebrates exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance where exposed, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	Acres	%
Mosquito Control	I	1,306,131	15.64	342,800	4.10
Pasture	I	218,920	2.62	31,927	0.38
Other Crops	I	108,633	1.30	0	0
Wheat	I	71,224	0.85	71,224	0.85
Open Space Developed	D, I	45,626	0.55	2,281	0.03
Other Grains	I	42,108	0.50	24,049	0.29
Vegetables and Ground Fruit	D, I	31,604	0.38	3,633	0.04
Developed	D, I	27,044	0.32	1,352	0.02
Corn	I	2,559	0.03	1,476	0.02
Other RowCrops	D, I	1,376	0.02	724	0.01
Orchards and Vineyards	D, I	145	<0.01	100	<0.01
Nurseries	I	71	<0.01	71	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		105,795	1.27	8,090	0.10
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		549,311	6.58	136,837	1.65
TOTAL[4]:		1,855,442	22.21	479,637	5.75

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 8,353,336 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 4,784,824 acres, 57.280%

Overall Usage: ☐ **High** ☒ **Medium** ☐ **Low**

CONSERVATION MEASURES

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the Gunnison sage grouse. As discussed below, although the vulnerability is medium for this species and we anticipate the risk and likelihood of exposure to malathion is medium, the implementation of the general conservation measures described above is expected to reduce the likelihood of exposure.

The Gunnison sage grouse has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be medium, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. A small amount of mortality (on less than 0.1% of the range) and low effects to growth and reproduction on 1% of the range are anticipated annually based on labeled uses. In addition, there could be a loss of invertebrate prey on 16% or more of the range based on labeled malathion uses, primarily due to mosquito control on 16% of the range, but also from use sites on 7% and spray drift areas on 14% of the range that may or may not overlap with mosquito control sites. Mortality to terrestrial invertebrates may be over-estimated due to calculations involving crops that may not be grown in the species range. Data indicates that malathion has been used for mosquito control on 4.10% of the range, and for other uses with effects to the grouse on 1.65% of the range annually. Gunnison sage-grouse use rangeland for all life stages. They may occasionally use developed open space areas or right of ways to move between fragmented areas. We anticipate the conservation measures described above for residential uses would greatly reduce the risk of exposure and effects on the grouse and its prey items on developed and open space developed use sites. Terrestrial invertebrates are a secondary food item of the grouse. Alternative and perhaps other preferable food resources are likely to remain available if invertebrates are reduced due to exposure to malathion, although a reduction in invertebrate abundance could be problematic during the breeding season when the grouse are congregating at lek sites or needing to feed their young. About 57% of the range is on Federal

lands where malathion usage has been found to be minimal. We do anticipate adverse effects that may include a small amount of mortality, effects to growth and reproduction, and losses of terrestrial invertebrate prey wherever exposed that would lead to reduced fitness supporting reproductive capacity in a few individuals. However, we do not anticipate species-level effects based on the levels of anticipated usage, low level of direct effects, diet of this species, and extent of Federal lands where usage is not anticipated. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the Gunnison sage grouse.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

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

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
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 ☐

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 of 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 ($l = 0.61 \pm 0.10$ 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.

EB/CE Sources:

USFWS. 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.

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

Overall Vulnerability: ☒ High ☐ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: We anticipate that 30-100% of streaked horned larks exposed to malathion at maximum rates will die from consumption of insects, depending on the use site.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	14%
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	13% (G, R – low effects), 1% (R – high effects)
Direct spray or contact with contaminated media	<2% across the range could experience mortality if exposed on use sites
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	15% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 35% terrestrial invertebrates
Plants affected (decline in growth)	13%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	31% terrestrial invertebrates

Risk modifiers: The streaked horned lark (Eremophila alpestris strigata) is endemic to the Pacific Northwest (British Columbia, Washington, and Oregon). The current range and distribution 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 and industrial sites near the Columbia River in Portland, Oregon); and 3) the Willamette Valley in Oregon.

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. Suitable habitat is generally 16 to 17% bare ground and may be even more open at sites selected for nesting. 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-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 nesting season for streaked horned larks begins in early April and ends mid- to late August. Breeding streaked horned larks opportunistically shift sites as habitat becomes available among private agricultural lands in the Willamette Valley. The streaked horned lark is a local migrant, most wintering in the Willamette Valley (72%) and on the islands in the lower Columbia River (20%); the rest spend the winter on the Washington coast (8%) or in the south Puget Sound (1%). Streaked horned larks spend the winter in large groups of mixed subspecies of horned larks in the Willamette Valley, and in smaller flocks along the lower Columbia River and Washington Coast. If one of these flocks were exposed to pesticide use, a greater number of individuals could be affected than that predicted by assuming a uniform distribution.

Streaked horned lark 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, Christmas tree farms, vineyards, developed spaces, and developed open spaces for breeding, foraging, and winder roosting, and right of ways that traverse agricultural lands. Larks do not use forested habitats, including managed forests. (Pers. comm. 2016 co-occurrence information, USFWS field office request)

Allowable uses driving effects/other considerations: Developed and open space developed land use categories account for most overlap and effects for this species. Streaked horned larks are only anticipated to use these areas with suitable open landscape context, which is expected to be a portion of those overlapping with the species range. As exposure and effects calculations assume that larks use all available areas within these use sites, results may be over-estimated although some of the most productive habitats for the streaked horned lark, such as airports and industrial lands that include undeveloped areas, fall into this use site category.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near use sites, or from mosquito control applications. Because invertebrate exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☒ High ☐ Medium ☐ Low

USAGE

(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	Acres	%
Mosquito Control	I	4,657,199	31.42	18,167	0.12
Developed	D, I	1,177,017	7.94	58,851	0.40
Open Space Developed	D, I	653,946	4.41	32,697	0.22
Vegetables and Ground Fruit	D, I	93,230	0.63	79,467	0.54
Other Crops	D, I	84,920	0.57	23,834	0.16
Orchards and Vineyards	D, I	64,002	0.43	36,786	0.25
Corn	D, I	60,819	0.41	616	<0.01
Wheat	D, I	38,880	0.26	26,328	0.18
Christmas Trees	D, I	26,611	0.18	26,611	0.18
Other Grains	D, I	17,281	0.12	7,546	0.05
Other RowCrops	D, I	10,114	0.07	1,055	0.01
Pasture	D, I	4,958	0.03	3,909	0.03
Sub-TOTAL (D): *Other uses with direct effects only*[3]		2,231,778	15.06	297,701	2.01
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		2,231,778	15.06	297,701	2.01
TOTAL[4]:		6,888,977	46.48	315,868	2.13

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself).

 # acres in species range: 14,820,764 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 2,205,328 acres, 14.880%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Reduced application number and rate: New restrictions on corn, orchards and vineyards, pasture, other crops, and vegetables and ground fruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). The reduction in application rate is

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

expected to result in a corresponding reduction in environmental concentrations to one-third of modeled values. These lowered concentrations are expected to reduce sublethal effects and mortality to birds, which are particularly vulnerable to higher application rates of malathion. These reductions will help reduce the amount of malathion used and decrease potential exposure to the species, thus decreasing the risk of both indirect and direct effects to the species.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the streaked horned lark. As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be high, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The streaked horned lark has a high vulnerability based on its status, distribution, and trends. This species exists in small and isolated sub-populations, primarily on privately owned lands. Streaked horned larks use agricultural lands for breeding, foraging, and winter roosting, and if the landscape context is open, they may also travel through or use newly planted orchards, Christmas tree farms, vineyards, rights of ways, developed spaces, and developed open spaces for breeding, foraging and winter roosting.

The risk to the species posed by labeled uses across the range is anticipated to be high, as described above. Malathion use would result in lark mortality of 14% or more across the range each year. In addition, sublethal effects to growth and reproduction are anticipated on up to 13% of the range for uses other than mosquito control, with 1% considered to be high level effects to reproduction. In addition, loss of invertebrate prey is anticipated on up to 81% of the range from mosquito control (31%), other use sites (15%) and in spray drift areas (35%) annually based on labeled uses. Mosquito control sites may overlap to some degree with other use sites. Where exposure occurs, the loss of individuals and sublethal effects is anticipated to lead to reduced fitness supporting reproductive capacity, reduced growth, starvation, site abandonment or

inadequate fuel needed especially for breeding and raising young in areas where usage occurs. While adult larks are known to feed on a wide variety of grass and weed seeds, they eat and feed insects to their young. Losses of insect prey and the effects from eating prey exposed to malathion are anticipated to be high where exposure occurs.

However, while risk to the species would be high where exposure occurs, we anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. We do not anticipate that usage will occur everywhere and to the extent the existing labels allow. Usage data indicates that malathion has been used for mosquito control on 0.12% of the range and on 2.01% of the range on other use sites where mortality, sublethal effects and loss of prey could occur annually. With this low level of usage, we anticipate small losses of individuals, effects to growth and reproduction, and reductions in food availability that would lead to reduced fitness supporting reproductive capacity in a small number of individuals. However, we do not anticipate species-level effects. Conservation measures described above for agricultural and residential areas will further reduce the risk of exposure and effects on the lark and its invertebrate prey on developed and open space developed use sites.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the streaked horned lark.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Coccyzus americanus	Yellow-billed cuckoo (Western U.S. DPS)	6901

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
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 ☒

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The western yellow-billed cuckoo is a migratory bird species, traveling between its wintering grounds in Central and South America and its breeding grounds in North America (Continental U.S. and Mexico) each spring and fall, often using river corridors as travel routes. The western yellow-billed cuckoo's breeding range is known from 12 States in the U.S. (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Texas, Utah, Washington, Wyoming) and 6 States in Mexico. The western yellow-billed cuckoo DPS was listed as a threatened species in a final rule published on October 3, 2014 (79 FR 59992). On May 4, 2017, we received a petition requesting removal of the DPS from the List of Endangered and Threatened Wildlife due to an error in our DPS analysis and its documented use of additional habitat. We published a substantial 90-day finding on June 27, 2018 indicating that delisting may be warranted due to information on additional habitat being used by the species (83 FR 30091). However, we did not find delisting to be warranted at the time of our notification published on September 16, 2020 (85 FR 57816). We found that the threats identified in the final listing rule are still acting on the species and continue to affect the cuckoo's viability. In addition, minerals mining projects negatively impact recently identified occupied habitat in central and southern Arizona. Current western yellow-billed cuckoo breeding populations are fragmented and geographically isolated.

The primary factors threatening the western DPS of the yellow-billed cuckoo are the loss and degradation of habitat for the species from altered watercourse hydrology and natural stream processes, livestock overgrazing, encroachment from agriculture, and conversion of native habitat to predominantly nonnative vegetation. Additional threats to the species include the effects of climate change, pesticides, wildfire, and small and widely separated habitat patches. The cumulative impact from various threats is also a factor that will exacerbate multiple existing threats to the western yellow-billed cuckoo and its habitat. Various Federal, State, and international regulatory mechanisms in place provide varying degrees of conservation oversight that may to some degree address the threat of ongoing habitat loss and degradation; however, because the yellow-billed cuckoo is not a protected or sensitive species in a majority of the U.S.

or in Canada and Mexico, the application of these regulatory mechanisms to conserve the western yellow-billed cuckoo or its habitat is unknown and the effectiveness of these regulatory mechanisms is uncertain.

These factors pose current and future threats to the species because they are ongoing and likely to continue in the near future. Threats associated with habitat destruction, modification, and degradation are related to dam construction and operations, water diversions, riverflow management; stream channelization and stabilization; conversion to agricultural uses, such as crops and livestock grazing; urban and transportation infrastructure; and increased incidence of wildfire. Continuing ramifications of actions that caused habitat loss in the past have resulted in ongoing curtailment of the habitat of the western yellow-billed cuckoo throughout its range. These factors also contribute to fragmentation and promote conversion to nonnative plant species, particularly tamarisk.

The threats affecting western yellow-billed cuckoo habitat are ongoing and significant and have resulted in curtailment of the range of the species. Loss of riparian habitat leads not only to a direct reduction in western yellow-billed cuckoo numbers but also leaves a highly fragmented landscape, which in combination with other threats (see below), can reduce breeding success through increased predation rates and barriers to dispersal by juvenile and adult western yellowbilled cuckoos. Threats associated with habitat rarity and small and isolated population sizes make the remaining western yellow-billed cuckoo populations increasingly susceptible to further declines through lack of immigration, reduced populations of prey species (food items), pesticides, and collisions with tall vertical structures during migration. The serious and ongoing threat of small overall population size, which is the result of other threats in combination, leads to an increased chance of local extirpations. Patch size, when coupled with habitat loss and other threats facing the species, including proximity to incompatible land uses, which increases exposure to predators and pesticides, is a significant cumulative threat to the western yellow-billed cuckoo now and in the future.

EB/CE Sources:

U.S. Fish and Wildlife Service. 2014. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for the Western Distinct Population Segment of the Yellow-billed Cuckoo (*Coccyzus americanus*). Final Rule. Federal Register 79:59991-60038.

U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Findings on a Petition To Delist the Distinct Population Segment of the Western Yellow-Billed Cuckoo and a Petition To List the U.S. Population of Northwestern Moose. Final Rule. Federal Register 85:57816-57818.

Overall Vulnerability: ☒ High ☐ Medium ☐ Low

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed:

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	3% from consuming birds, 1% from consuming terrestrial invertebrates
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	2-5% (G, R – low effects; birds and terrestrial invertebrates), 2% (G, R – high effects; birds only)
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	5% terrestrial invertebrates, reptiles and amphibians
Spray drift areas - Prey item mortality	Up to 12% terrestrial invertebrates
Plants affected (decline in growth)	1%
MOSQUITO CONTROL	
Direct (mortality)	1% from consuming birds only
Sublethal	26% (R – low effects; birds only)
Indirect	26% terrestrial invertebrates, 2% reptiles and amphibians

Risk modifiers: The primary dietary item of the yellow-billed cuckoo is large insects such as cicadas, katydids, and caterpillars. They may also take frogs and lizards. In summer and fall, cuckoos forage on small wild fruits, including elderberries, blackberries and wild grapes. In winter, fruit and seeds become a larger part of the diet.

The yellow-billed cuckoo is migratory. Nesting peaks later (mid-June through August) than in most co-occurring bird species, and may be triggered by an abundance of the cicadas, katydids, caterpillars, or other large prey which form the bulk of the species' diet. Western yellow-billed cuckoos breed in large blocks of riparian habitats (particularly woodlands with cottonwoods and willows). Western yellow-billed cuckoos appear to require large blocks of riparian habitat for nesting. Home ranges have been estimated at 10 hectares (ha) and 40 ha (99 ac), in separate studies. Nesting densities have been estimated between 1 to 26 pairs per 40 ha (99 ac).

Yellow-billed cuckoos may forage, roost, and breed in orchards, managed forests, right of ways, and golf courses where trees are present. They also may forage in right of ways, golf courses, rangeland, and developed open spaces adjacent to riparian, mesquite, or mixed oak woodland

where large insects are available. Cuckoos are likely to forage in crop edges, but not within the crop. Use of developed areas with impervious surfaces above 50% is unlikely. (Pers. comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Though cuckoos are only likely to forage in crop edges, these use sites were left in the calculation of direct effects as crop edges can contain pesticide concentrations equivalent to on-site values. However, the extent of the effects may be over-estimated as the acreage associated with crop edges will be smaller than that of the entire crop area. Open space developed is the main driver of effects for this species.

Effects to the prey base are anticipated from malathion exposure on or near use sites, or from mosquito control applications. Because species taken as food items exhibit a range of sensitivities to malathion, 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 would be anticipated from spray drift or following mosquito control. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Usage data for the whole range based on data from EPA's SUUM:

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	78,547,296	26.29	2,122,056	0.71
Developed	*	3,909,713	1.31	195,486	0.07
Open Space Developed	D, I	3,183,105	1.07	159,155	0.05
Other Crops	D, I	3,122,291	1.04	17,167	0.01
Wheat	D, I	2,958,685	0.99	322,194	0.11
Pasture	D, I	2,566,631	0.86	378,802	0.13
Orchards and Vineyards	D, I	1,235,456	0.41	331,901	0.11
Vegetables and Ground Fruit	D, I	959,346	0.32	284,147	0.10
Other Grains	D, I	501,529	0.17	77,357	0.03
Corn	D, I	476,439	0.16	4,915	<0.01
Cotton	D, I	222,227	0.07	57,428	0.02

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Other RowCrops	D, I	88,536	0.03	8,316	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		15,314,246	5.12	1,641,383	0.55
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		31,971,573	10.70	3,099,450	1.04
TOTAL[4]:		110,518,869	36.99	5,221,506	1.75

Agricultural usage in California only based on CalPUR data:

Use type	Risk to species[5]	Use overlap with range		Estimated usage in range[6]	
		Acres	%	acres	%
Other Crops	D, I			6	<0.01
Wheat	D, I			365	<0.01
Pasture	D, I			6,166	0.04
Orchards and Vineyards	D, I			4,795	0.03
Vegetables and Ground Fruit	D, I			96,880	0.03
Other Grains	D, I			152	<0.01
Corn	D, I			566	<0.01
Cotton	D, I			94	<0.01
Other RowCrops	D, I			6	<0.01
TOTAL[7]:				109,030	0.1

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in effects to the prey base from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 298,815,855 acres
% of range in California (i.e., where CalPUR data is available): 9%
Range overlap with Federal lands: 141,938,538 acres, 47.500%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.
[5] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[6] Estimated usage in the range is based on information about annual past usage.
[7] TOTAL includes usage on all use sites with effects, including mosquito control.

Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the yellow-billed cuckoo. As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low.

The yellow-billed cuckoo has a high vulnerability based on its status, distribution, and trends. This species breeds in large patches of riparian habitat. They may forage, roost, and breed in orchards, managed forests, right of ways, and golf courses where trees are present. They also may forage in right of ways, golf courses, rangeland, and developed open spaces adjacent to riparian, mesquite, or mixed oak woodland where large insects are available. Cuckoos are likely to forage in crop edges, but not within crops that were included in our calculations of risk. Pesticides have been noted as a threat to this species. We anticipate adverse effects in all overlapping use sites except developed areas, and in areas exposed to spray drift. However, the cuckoo's use of riparian habitat is likely to provide some protective cover and reduce the risks to this species and their nests from spray drift.

The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. Mortality is anticipated on over 3% of the range, and effects to growth and reproduction on 26% or more of the species range annually based on labeled uses. The sublethal effects are anticipated to be high effects to growth and reproduction on 2% of the range. In addition, we anticipate a loss of invertebrate prey on 26% or more of the range based on labeled malathion uses, primarily due to mosquito control.

We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Usage data indicates that malathion has been used for mosquito control on 0.71% of the range, and for other uses with effects to the cuckoo on 1.04% of the range annually based on standard data. CalPUR data indicates that usage on agricultural use sites in California (9% of the species range) is lower (0.10%). In addition, about 48% of the range is on Federal lands where malathion usage has been found to be minimal.

We anticipate the loss of a small number of individuals, effects to reproduction and growth, and loss of prey that would lead to reduced fitness supporting reproductive capacity in a few individuals. However, we do not anticipate species-level effects due to the low levels of malathion usage we expect in the range, somewhat widespread distribution of the species and reduced risk of exposure due to the association of the cuckoo with riparian cover for nesting and some of its foraging opportunities. Additionally, we expect that the conservation measures described above will further reduce exposure and effects to the species. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the yellow-billed cuckoo.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Calidris canutus rufa	Red Knot	8621

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
An overall, sustained decline of red knot numbers occurred at Tierra del Fuego and Delaware Bay in the 2000s, and that 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.

(1) Past habitat losses in wintering and migration areas have reduced the resilience of the red knot (Factor A). Ongoing losses in these areas from sea level rise, shoreline hardening, and development are expected to continue into the coming decades (Factor A). 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 (Factor A).

(2) Threats to the current and future quality and quantity of prey resources occur 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) (Factor E). Reduced food availability in Delaware Bay due to commercial harvest of the horseshoe crab (Limulus polyphemus) (HSC) 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 HSC 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 (Factor D). However, HSC 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 (Factor D). While we anticipate a fully functioning management framework would continue to

adequately abate the threat to red knots from the HSC harvest, there are other biological factors independent of harvest that may limit the availability of HSC eggs into the future. For example, HSC population growth may be limited by a biological lag time because HSCs 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 HSC populations. Other factors (e.g., early life stage mortality, undocumented or underreported mortality) may also be slowing HSC population growth (Factor E). 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 HSC egg resource will continue to adequately support red knot population growth over the next decade.

(3) 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 (Factor E). 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 (Factor E).

(4) 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 (Factor C). 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 (Factor C). 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 (Factor C).

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 (Factor B); predation in nonbreeding areas (Factor C); and human disturbance, oil spills, and wind energy development especially near the coasts (Factor E). 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.

EB/CE Source:

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

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Red knots are not expected to experience mortality sublethal effects from use of malathion at maximum rates on use sites or from exposure via spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects expected
Spray drift areas - Prey item mortality	Effects to aquatic invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	28% aquatic invertebrates

Risk modifiers: 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. This species can be found scouring sand or mud, making pecks and snatches at sand.

The red knot is found primarily near seacoasts on tidal flats and beaches, less frequently in marshes and flooded fields, sandy or pebbly beaches, and river mouths. During the winter season they use relatively undisturbed sandy beaches and tidal flats.

Red knots migrate in large flocks northward through the contiguous 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. Knots that visit Delaware Bay in spring come mostly from South America, and these have strong fidelity to migration stopover sites; those that winter in Florida are underrepresented during migration in New Jersey and Massachusetts. This species typically makes long flights between stops. Delaware Bay is the most important spring migration stopover in the eastern United States.

Red knots could forage in rice fields, but are unlikely to enter any other pesticide use sites except possibly flying through during migration (Pers. Comm. 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: We anticipate effects to the aquatic invertebrates from malathion exposure near use sites or from mosquito control applications. Because aquatic invertebrates exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	139,459,608	27.78	8,034,153	1.60
Wheat	*	21,334,808	4.25	1,029,573	0.21
Open Space Developed	*	17,058,085	3.40	852,904	0.17
Corn	*	15,262,622	3.04	121,075	0.02
Developed	*	13,296,337	2.65	664,817	0.13
Cotton	*	7,329,561	1.46	229,646	0.05
Other Grains	*	7,100,000	1.41	365,745	0.07
Other Crops	*	5,303,656	1.06	6,817	<0.01
Pasture	*	3,015,050	0.60	245,905	0.05
Vegetables and Ground Fruit	*	1,665,772	0.33	118,536	0.02

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Other RowCrops	*	1,403,463	0.28	60,731	0.01
Pine Seed Orchards	*	545,512	0.11	44,955	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0	0	0
TOTAL[4]:		139,459,608	27.78	8,034,153	1.60

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 502,050,771 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 31,732,797 acres, 6.32%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The red knot is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10

[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the red knot. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The red knot has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. No mortality or sublethal effects are anticipated on any malathion use sites, although loss of aquatic invertebrate prey could occur on 28% of the range from malathion use for mosquito control and in spray drift areas.

Usage data indicates that mosquito adulticide has been used on1.60% of the range annually. No effects to the species are anticipated on other malathion use sites, where usage estimates are even lower, although there is some expected invertebrate prey loss in spray drift areas from non-mosquito adulticide uses. While we anticipate malathion usage would result in the loss of prey items, this species is highly mobile and we anticipate alternative foraging areas would be available if local foraging sites become unsuitable due to lack of adequate food resources. While there may be adverse effects to a small number of individuals due to impacts to prey that reduce fitness supporting reproductive capacity, we do not anticipate species-level effects from malathion usage. We anticipate the conservation measures described above would further reduce the risk of exposure and effects on prey items on and adjacent to developed and open space developed (through the residential conservation measures) and agricultural use sites.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the red knot.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Laterallus jamaicensis ssp. jamaicensis	Eastern Black Rail	11319

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
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 ☒

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.

EB/CE Source:

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

Overall Vulnerability: ☐ **High** ☒ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labeled uses across the range)

Risk to individuals if exposed: Eastern black rails are not expected to be exposed to malathion on use sites. No effects are expected from exposure via spray drift.

Risk to the species from labeled uses across the range:
The table below summarizes the risk to the species from labeled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	No effects expected
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	No effects expected
Spray drift areas - Prey item mortality	Up to 40% terrestrial invertebrates
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected

Indirect	23% terrestrial invertebrates, no effects expected to plants

Risk modifiers: Eastern black rails occur in salt, brackish, and freshwater wetlands in the eastern United States (east of the Rocky Mountains), Mexico, Central America, and the Caribbean, with 90% of its population is along Atlantic and Gulf coasts. Eastern black rails occupy relatively high elevations along heavily vegetated wetland gradients, with soils moist or flooded to a shallow depth. Occupied habitats are reflective of the subspecies' movement habits. Eastern black rails fly little during the breeding and wintering seasons, and will typically flush only for a short distance when pursued. Instead, the birds will remain on the ground, running quickly through dense vegetation likely using the runways of rodents and rabbits, and are considered secretive because of this behavior. Black rails require dense vegetative cover that allows movement underneath the canopy, and birds are found in a variety of salt, brackish, and freshwater marsh habitats that can be tidally or non-tidally influenced.

Eastern black rails forage on a variety of small (<1 cm) aquatic and terrestrial invertebrates, especially insects, and seeds (e.g., Typha, Scirpus, Spartina spp.) by gleaning or pecking at individual items. Black rails are probably opportunistic foragers and changes in diet in winter are likely related to lower invertebrate availability and greater energy provided by seeds.

Allowable uses driving effects/other considerations: As the black rail is a wetland specialist, individuals are not expected to enter malathion use sites, but could be exposed to malathion from mosquito control or spray drift from adjacent use sites. Since black rails tend to remain under cover of vegetation and fly little when breeding or wintering, direct exposure to pesticide spray is considered unlikely. For this analysis, migrating birds were assumed to select similar habitats to breeding and wintering birds.

We anticipate effects to the invertebrate prey base from malathion exposure near use sites or from mosquito control applications. Because invertebrates exhibit a range of sensitivities to malathion, we expect exposure will reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time.

Overall Risk: ☐ **High** ☒ **Medium** ☐ **Low**

USAGE
(Anticipated usage within the range based on past usage data)

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Mosquito Control	I	262,201,838	22.82	11,226,555	0.98
Corn	*	78,355,855	6.82	160,938	0.01
Open Space Developed	*	45,043,201	3.92	2,252,160	0.20
Developed	*	32,939,171	2.87	1,646,959	0.14
Wheat	*	27,026,418	2.35	762,276	0.07
Other Crops	*	13,826,508	1.20	4,075	0.00
Other Grains	*	10,469,974	0.91	279,930	0.02
Cotton	*	10,114,971	0.88	313,181	0.03
Pasture	*	9,070,565	0.79	258,708	0.02
Other RowCrops	*	1,980,071	0.17	49,937	<0.01
Orchards and Vineyards	*	1,682,735	0.15	307,370	0.03
Vegetables and Ground Fruit	*	1,535,961	0.13	66,063	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		0	0	0	0
TOTAL[4]:		262,201,838	22.82	11,226,555	0.98

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 1,149,161,323 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 92,031 acres and 105,517,635 acres, 4.159% and 9.201%

Overall Usage: ☐ **High** ☐ **Medium** ☒ **Low**

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The eastern black rail is known to rely on food resources and utilize habitats associated with aquatic systems. Malathion applications are restricted to periods when rain is not forecasted to occur within 48 hours for agricultural uses and 24 hours for residential uses, which will allow time for malathion to degrade before runoff events occur that could transport it. In addition, aquatic habitat buffers (specified on the label as a

[1] Direct effects (D), Indirect effects (I), No effects expected (N), Use site not utilized by the species (*)
[2] Estimated usage in the range is based on information about annual past usage.
[3] Mosquito control has the potential to overlap with other uses. It is not included in the Sub-TOTALs.
[4] TOTAL includes usage on all use sites with effects, including mosquito control.

distance from water bodies where pesticides are not to be applied) are required for all agricultural and residential uses. These measures are anticipated to reduce the effects to the species by minimizing losses of prey items due to malathion exposure in aquatic habitats.

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to substantially reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing any initial residues to degrade prior to the next application.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the eastern black rail. As discussed below, although the vulnerability is medium for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The eastern black rail has a medium vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. No mortality or sublethal effects are anticipated on any malathion use sites, although loss of aquatic invertebrate prey could occur on 23% of the range from malathion use for mosquito control and in spray drift areas in 40% of the range. Usage data indicates that mosquito adulticide has been used on 0.98% of the range annually. No effects to the species are anticipated on other malathion use sites, although there is some expected spray drift from use sites overlapping with about 0.5% of the range likely to result in the loss of some prey. While malathion usage could result in the loss of prey in some areas, this species is mobile and we anticipate alternative foraging areas would be available if local foraging sites become unsuitable due to lack of adequate food resources. While there may be adverse effects to some individuals due to impacts to fitness supporting reproductive capacity due to losses of prey, we do not anticipate species-level effects from malathion usage. However, we anticipate the conservation measures described above would further reduce the risk of exposure and effects to prey items on and adjacent to developed and open space developed (through the residential conservation

measures) and agricultural use sites. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the eastern black rail.

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Tympanuchus pallidicinctus	Lesser prairie-chicken (Northern DPS)	11674

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Proposed Threatened
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The lesser prairie-chicken (*Tympanuchus pallidicinctus*) is a species of prairie grouse that occurs in the grasslands and shrublands of the Southern Great Plains in parts of Colorado, Kansas, New Mexico, Oklahoma, and Texas. The lesser prairie-chicken has experienced substantial and protracted declines in distribution and abundance due to habitat loss and fragmentation across its range prompting concern about its status. The Northern DPS includes the Sand Sagebrush Ecoregion, the Mixed Grass Ecoregion, and the Short Grass/CRP Ecoregion. The Short-Grass/CRP region has the highest number of birds, with a 5-year estimate of approximately 17,000 birds. Other portions of the range have lower population resiliency. In particular, the Sand Sagebrush Ecoregion has approximately 1,000 birds remaining.

Habitat degradation, loss, and fragmentation are the primary threats to the lesser prairie-chicken in the Northern DPS, with other threats such as fire, incompatible livestock grazing, and extreme weather events further decreasing population resiliency and species redundancy. The largest impacts in this DPS are grassland conversion to cropland and woody vegetation encroachment. The Sand Sagebrush Ecoregion is also experiencing habitat degradation, largely due to incompatible grazing management. The lesser prairie-chicken is particularly vulnerable to changes on the landscape, as it requires large blocks of suitable habitat to complete its life-history needs. This includes its lek breeding system, which requires males and females to be able to hear and see each other over relatively wide distances, the need for large patches of habitat that include several types of microhabitats, and the behavioral avoidance of vertical structures. Insecticides are not currently a known threat to the species.

While resiliency of populations throughout the Northern DPS has decreased from historical levels, the DPS still has redundancy and genetic and environmental representation. However, current threats acting on the landscape are expected to either continue at the same levels or increase in severity in the foreseeable future. Habitat loss is projected to outpace conservation efforts to restore habitat. Though we do not expect rates of habitat conversion to cropland to be

equivalent to historical rates, we expect any additional conversion that does occur will have a disproportionately large effect on resiliency and redundancy due to the limited amount of remaining large intact grasslands. Conversion of habitat due to oil, gas, and wind energy development has and will continue to occur, though the rates of development are uncertain. Woody vegetation encroachment is also expected to continue, particularly in the Mixed-Grass Ecoregion. Increased drought and severe weather events associated with climate change are expected to decrease population resiliency and redundancy into the foreseeable future. As habitat availability continues to decline, and available habitat blocks decrease in size, populations may decline to below quasi-extinction levels.

Conservation measures and regulatory mechanisms are acting to reduce the magnitude of threats impacting the lesser prairie-chicken and its habitat. However, future restoration efforts will not likely be enough to offset the impacts of habitat loss and fragmentation. Conservation efforts tend to focus on localized management to affect habitat quality, while not addressing the overarching limiting factor of habitat loss and fragmentation, which is not addressing the long-term population needs for the lesser prairie-chicken. Thus, these measures are having only minimal impacts on threats acting throughout the DPS. Based on our future projections, we anticipate habitat will become increasingly fragmented and less able to support lesser prairie-chickens.

EB/CE Source:

U.S. Fish and Wildlife Service. 2021. Endangered and threatened wildlife and plants; lesser prairie-chicken; threatened status with section 4(d) rule for the Northern distinct population segment and endangered status for the Southern distinct population segment; proposed rule. Federal Register 86:29432-29482.

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labelled uses across the range)

Risk to individuals if exposed: Lesser prairie-chickens exposed to malathion on use sites from foraging on grass could experience low level reproductive effects on most use sites. For use sites with higher allowable application rates (developed, open space developed), effects to growth or more pronounced reproductive effects could occur from foraging on both grass and arthropods. If individuals were exposed on use sites with higher allowable application rates (vegetables and ground developed, and open space developed), mortality would be anticipated for 5 – 30% of those exposed. However we anticipate that lesser-prairie chickens will rarely enter those use sites. Mortality and sublethal effects are not expected from exposure to spray drift or from mosquito control, though this exposure could result in effects to the invertebrate prey base.

Risk to the species from labelled uses across the range:

The table below summarizes the risk to the species from labelled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	Low likelihood across range
Spray drift areas – mortality	None
Sublethal – growth (G), reproduction (R) and behavior (B)	Low level reproductive effects if exposed on wheat or other grains
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	Mortality of terrestrial invertebrates
Spray drift areas - Prey item mortality	Mortality of terrestrial invertebrates
Plants affected (decline in growth)	No effects anticipated
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	Mortality of terrestrial invertebrates

Risk modifiers: The northern DPS of the lesser prairie-chicken occurs in the grasslands and shrublands s in parts of Colorado, Kansas, Oklahoma, and Texas.

Most lesser prairie-chicken adults live for two to three years and reproduce in the spring and summer. Males congregate on leks during the spring to attract and mate with females. Males tend to exhibit strong site fidelity, often returning to a specific lek many times, even in cases of declining female attendance and habitat condition. Females tend to establish nests relatively close to the lek, commonly within 0.6 to 2.4 mi (1 to 4 km), where they incubate 8 to 14 eggs for 24 to 27 days and then raise broods of young throughout the summer. Some females will attempt a second nesting if the first nest fails. Eggs and young lesser prairie-chicken are susceptible to natural mortality from environmental stress and predation. The appropriate vegetative community and structure is vital to provide cover for nests and young and to provide food resources as broods mature into adults.

Activities critical to lesser prairie-chicken populations include mating on leks in the spring from February through June, peaking in mid-April, followed by nesting and egg incubation from March to May and potential renesting in June. Rearing of chicks in broods occurs throughout the summer until September (Boal and Haukos 2016, p. 4). Habitats used by broods often occur in areas with a greater biomass of invertebrates and forbs, emphasizing the importance of forbs in providing the invertebrate prey base used by young lesser prairie-chicken (Jamison et al. 2002, pp. 520, 524).

In general, adult lesser prairie-chicken diet consists largely of plant materials especially during the fall, winter, and early spring when insects are less common. Insects are a key component of

the diet during the late spring and summer and are especially important for broods to provide nutrition for early growth periods.

While lesser prairie-chicken may forage in agricultural croplands, croplands do not provide for the habitat requirements of the species life cycle (cover for nesting and thermoregulation), and thus they avoid landscapes dominated by cultivated agriculture, particularly where small grains are not the dominant crop (Crawford and Bolen 1976a, p. 102). Fall and wintering habitat for juveniles and adults is similar to that used for breeding with the exception that small grain agricultural fields can be used more heavily for feeding during this period than during the breeding season (Giesen 1998, p. 4). Lesser prairie-chicken avoid using areas with trees, vertical structures, and other human disturbances in areas with otherwise adequate habitat conditions. As the landscape becomes more fragmented, longer dispersal distances over areas of unusable habitat may be required (Patten et al. 2011, pp. 60–61).

Allowable uses driving effects/other considerations: Given the habitat preferences of the lesser prairie-chicken, the malathion use sites they are most likely to utilize are those associated with small grains, represented by the use layers of wheat and other grains in our analysis. For these grains, maximum allowable application rates are low and therefore only low levels of reproductive effects are anticipated to occur if exposed from foraging on grasses. No effects are expected to occur if exposed from foraging on arthropods. Lesser prairie-chickens are expected to have a greater association with these crops outside of the breeding season, in the fall and winter.

Developed and open space developed use sites are unlikely to be used by lesser prairie-chickens with the possible exception of dispersing juveniles traveling between fragmented habitat.

Effects to the invertebrate prey base are anticipated from malathion exposure on use sites or from spray drift from adjacent fields. Lesser prairie-chickens depend on invertebrate prey mainly in the breeding season, when individuals tend to avoid cultivated crops other than some foraging on small grains. Because terrestrial invertebrates exhibit a range of sensitivity to malathion, malathion is expected to reduce abundance of invertebrate prey in areas of exposure, but not result in complete mortality to the prey base either on use sites, or from exposure via spray drift of mosquito adulticide, where effects are expected to be less pronounced.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Information regarding past usage of malathion for wheat and other grains indicates that a low percentage (less than or equal to 2.5%) of wheat and other grains were treated with malathion in each of the states where the lesser prairie-chicken is found. It is unknown how much of this usage occurs within or near the range of the lesser prairie-chicken, and could be higher or lower

than these statewide averages. We estimate that up to 5% of developed and open space developed within the species range could undergo some level of treatment with malathion. However, given the habitat preferences of the lesser prairie-chicken and limited utilization of these use sites, this is likely to represent a low percentage of the species range overall.

For mosquito adulticide, data indicated past usage of malathion in 10 of the 57 counties in Colorado, Kansas, Oklahoma, and Texas that encompass the recovery units of the lesser prairie-chicken. Data indicate that sales or usage in these counties occurred only once or twice in these counties for the 5 years of data available.

 # acres in species range: USFWS species range map not available at the time of this analysis
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: USFWS species range map not available at the time of this analysis

Overall Usage: ☐ High ☐ Medium ☒ Low

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to significantly reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing initial residues to degrade prior to the next application.

Reduced application number and rate: New restrictions on corn, cotton (excluding use for the Boll Weevil Eradication Program[1]), orchards and vineyards, pasture, other crops, and vegetables and groundfruit lower the maximum allowable number of applications to 2-4 per year (depending on the specific crop; previous allowable numbers of applications ranged from 3 to 13 applications per year). This will help reduce the amount of malathion used and decrease potential exposure to the species.

CONCLUSION

[1] While the proposed label restriction does not apply to applications conducted by APHIS as part of the Boll Weevil Eradication Program, APHIS generally implements measures that are protective of listed species, as described in the Description of the Action section of the Opinion. The 2018 FWS informal section 7(a)(2) consultation with APHIS included conservation measures for listed species that may be affected in the program area. Based on the consultation history of this program, it is likely that similar measures will be added for the recently proposed lesser prairie-chicken DPSs, if needed.

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the lesser prairie-chicken (Northern DPS). As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The lesser prairie-chicken (Northern DPS) has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Malathion usage could result in moderate to high levels of mortality if exposed at maximum rates on vegetables and ground fruit, developed and open space developed sites. On most use sites, low level reproductive effects are anticipated if individuals are exposed, and effects to growth and higher reproductive effects are anticipated from foraging on grass and arthropods on use sites with higher allowable application rates (i.e., developed, open space developed). However, lesser prairie-chicken utilization of vegetables and ground fruit, developed and open space developed use sites is likely to be limited given the habitat preferences of the species, and we expect these use sites to represent a low percentage of the species range overall. Loss of terrestrial invertebrate prey is anticipated on use sites other than mosquito control and from spray drift. However, we only anticipate low-level effects from this prey loss due to the timing and availability of alternate food resources. Lesser prairie-chickens depend on invertebrate prey mainly in the breeding season, when individuals tend to avoid cultivated crops, other than some foraging on small grains. In addition, because terrestrial invertebrates exhibit a range of sensitivity to malathion, malathion is not expected to result in complete mortality to the prey base either on use sites, or from exposure via spray drift where effects are expected to be less pronounced. No mortality, sub-lethal effects or loss of terrestrial invertebrate prey used by this species are anticipated from malathion used for mosquito control. While we anticipate there will be some adverse effects, we do not anticipate species-level effects from the proposed action. Furthermore, the conservation measures described above for agricultural and residential uses are expected to further reduce the risk of exposure and effects on the prairie-chicken and its prey items on and adjacent to these use types of sites. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the lesser prairie chicken (Northern DPS).

Conclusion: Not likely to jeopardize

Integration and Synthesis Summary: Birds

Scientific Name:	Common Name:	Entity ID:
Tympanuchus pallidicinctus	Lesser prairie-chicken (Southern DPS)	11675

VULNERABILITY
(Summary of status, environmental baseline and cumulative effects)

Status: Proposed Endangered
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 ☐

Environmental Baseline/Cumulative Effects (EB/CE) Summary:
The lesser prairie-chicken (*Tympanuchus pallidicinctus*) is a species of prairie grouse that occurs in the grasslands and shrublands of the Southern Great Plains in parts of Colorado, Kansas, New Mexico, Oklahoma, and Texas. The lesser prairie-chicken has experienced substantial and protracted declines in distribution and abundance due to habitat loss and fragmentation across its range. The Shinnery Oak Ecoregion comprises the Southern DPS. Based on mean population estimates, the Southern DPS has very low resiliency to stochastic events. It may have as few as 5,000 birds remaining. The population count dropped to as low as 1,000 birds in 2015 after the last severe drought. Under current climactic conditions, another wide-scale severe drought could occur in this ecoregion at any time, and the species may not be able to recover.

Over the past several decades, habitat loss, fragmentation, and degradation have resulted in the loss of large areas of the habitat that supports the lesser prairie-chicken in the Southern DPS. Suitable habitat has been lost as grasslands are converted to cropland, and as petroleum and natural gas production and wind energy development have resulted in further loss of habitat. The lesser prairie-chicken is particularly vulnerable to changes on the landscape, as it requires large blocks of suitable habitat to complete its life-history needs. This includes its lek breeding system, which requires males and females to be able to hear and see each other over relatively wide distances, the need for large patches of habitat that include several types of microhabitats, and the behavioral avoidance of vertical structures. In the case of petroleum and wind energy production, the extent of the impact from the threat is not just the original site, but also all roads, powerlines, and other infrastructure associated with the sites, and noise associated with those areas that may interfere with communication between male and female birds.

In the Southern DPS, woody vegetation encroachment by honey mesquite has played a significant role in limiting available space for the lesser prairie-chicken and is one of the primary threats to the species in this DPS. Fire, incompatible grazing management, and drought associated with climate change also continue to degrade habitat. The size of fires, especially in areas dominated by woody vegetation, are increasing. When managed compatibly, fire and

grazing can improve habitat quality. However, fire management efforts are currently occurring on only a limited portion of the lesser prairie-chicken range. Insecticides are not currently a known threat to the species.

The Southern DPS is particularly vulnerable to effects associated with climate change and drought, and warmer and drier trends are expected to continue (Grisham et al. 2013, entire; Grisham et al. 2016c, p. 742). Given the needs of lesser prairie-chicken for cool microclimates to find appropriate nest sites and rear broods, droughts like those that have recently occurred on the landscape could further impact already declining population growth rates in this DPS.

Some conservation measures and regulatory mechanisms are acting to reduce the magnitude of threats impacting the lesser prairie-chicken and its habitat. However, restoration efforts have not been enough to offset the impacts of habitat loss and fragmentation. Conservation efforts tend to focus on localized management to affect habitat quality, while not addressing the overarching limiting factor of habitat loss and fragmentation, which is not addressing the long-term population needs for the lesser prairie-chicken. Thus, these measures are only minimally ameliorating the threats acting throughout the DPS. The Southern DPS is continuing to experience ongoing habitat loss and fragmentation, and additional threats from influence of anthropogenic noise and extreme weather events, particularly droughts. Overall, the lesser prairie-chickens in the Southern DPS are likely to continue to experience declines in resiliency, redundancy, and genetic representation.

EB/CE Source:

U.S. Fish and Wildlife Service. 2021. Endangered and threatened wildlife and plants; lesser prairie-chicken; threatened status with section 4(d) rule for the Northern distinct population segment and endangered status for the Southern distinct population segment; proposed rule. Federal Register 86:29432-29482.

Overall Vulnerability: ☒ **High** ☐ **Medium** ☐ **Low**

RISK
(Risk is based on species exposure and response from labelled uses across the range)

Risk to individuals if exposed: Lesser prairie-chickens exposed to malathion on use sites from foraging on grass could experience low level reproductive effects on most use sites. For use sites with higher allowable application rates (developed, open space developed), effects to growth or more pronounced reproductive effects could occur from foraging on both grass and arthropods. If individuals were exposed on use sites with higher allowable application rates (vegetables and ground developed, and open space developed), mortality would be anticipated for 5 – 30% of those exposed. However we anticipate that lesser-prairie chickens will rarely enter those use sites. Mortality and sublethal effects are not expected from exposure to spray drift or from mosquito control, though this exposure could result in effects to the invertebrate prey base.

Risk to the species from labelled uses across the range:
The table below summarizes the risk to the species from labelled uses across the range based on range overlaps with use sites and anticipated effects associated with the particular uses.

DIRECT (all uses except mosquito control)	
Use areas – mortality	Low likelihood across range
Spray drift areas – mortality	None
Sublethal – growth (G), reproduction (R) and behavior (B)	Low level reproductive effects if exposed on wheat or other grains
Direct spray or contact with contaminated media	No effects expected
Volatilization	Not an appreciable source of exposure
INDIRECT (all uses except mosquito control)	
Use areas - Prey item mortality	Mortality of terrestrial invertebrates
Spray drift areas - Prey item mortality	Mortality of terrestrial invertebrates
Plants affected (decline in growth)	No effects anticipated
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	Mortality of terrestrial invertebrates

Risk modifiers: Most lesser prairie-chicken adults live for two to three years and reproduce in the spring and summer. Males congregate on leks during the spring to attract and mate with females. Males tend to exhibit strong site fidelity, often returning to a specific lek many times, even in cases of declining female attendance and habitat condition. Females tend to establish nests relatively close to the lek, commonly within 0.6 to 2.4 mi (1 to 4 km), where they incubate 8 to 14 eggs for 24 to 27 days and then raise broods of young throughout the summer. Some females will attempt a second nesting if the first nest fails. Eggs and young lesser prairie-chicken are susceptible to natural mortality from environmental stress and predation. The appropriate vegetative community and structure is vital to provide cover for nests and young and to provide food resources as broods mature into adults.

Activities critical to lesser prairie-chicken populations include mating on leks in the spring from February through June, peaking in mid-April, followed by nesting and egg incubation from March to May and potential renesting in June. Rearing of chicks in broods occurs throughout the summer until September (Boal and Haukos 2016, p. 4). Habitats used by broods often occur in areas with a greater biomass of invertebrates and forbs, emphasizing the importance of forbs in providing the invertebrate prey base used by young lesser prairie-chicken (Jamison et al. 2002, pp. 520, 524).

In general, adult lesser prairie-chicken diet consists largely of plant materials especially during the fall, winter, and early spring when insects are less common. Insects are a key component of the diet during the late spring and summer and are especially important for broods to provide nutrition for early growth periods.

While lesser prairie-chicken may forage in agricultural croplands, croplands do not provide for the habitat requirements of the species life cycle (cover for nesting and thermoregulation), and thus they avoid landscapes dominated by cultivated agriculture, particularly where small grains are not the dominant crop (Crawford and Bolen 1976a, p. 102). Fall and wintering habitat for juveniles and adults is similar to that used for breeding with the exception that small grain agricultural fields can be used more heavily for feeding during this period than during the breeding season (Giesen 1998, p. 4). Lesser prairie-chicken avoid using areas with trees, vertical structures, and other human disturbances in areas with otherwise adequate habitat conditions. As the landscape becomes more fragmented, longer dispersal distances over areas of unusable habitat may be required (Patten et al. 2011, pp. 60–61).

Allowable uses driving effects/other considerations: Given the habitat preferences of the lesser prairie-chicken, the malathion use sites they are most likely to utilize are those associated with small grains, represented by the use layers of wheat and other grains in our analysis. For these grains, maximum allowable application rates are low and therefore only low levels of reproductive effects are anticipated to occur if exposed from foraging on grasses. No effects are expected to occur if exposed from foraging on arthropods. Lesser prairie-chickens are expected to have a greater association with these crops outside of the breeding season, in the fall and winter.

Developed and open space developed use sites are unlikely to be used by lesser prairie-chickens with the possible exception of dispersing juveniles traveling between fragmented habitat.

Effects to the invertebrate prey base are anticipated from malathion exposure on use sites or from spray drift from adjacent fields. Lesser prairie-chickens depend on invertebrate prey mainly in the breeding season, when individuals tend to avoid cultivated crops other than some foraging on small grains. Because terrestrial invertebrates exhibit a range of sensitivity to malathion, malathion is expected to reduce abundance of invertebrate prey in areas of exposure, but not result in complete mortality to the prey base either on use sites, or from exposure via spray drift of mosquito adulticide, where effects are expected to be less pronounced.

Overall Risk: ☐ High ☒ Medium ☐ Low

USAGE
(Anticipated usage within the range based on past usage data)

Information regarding past usage of malathion for wheat and other grains indicates that a low percentage (less than or equal to 2.5%) of wheat and other grains were treated with malathion in each of the states where the lesser prairie-chicken is found. It is unknown how much of this usage occurs within or near the range of the lesser prairie-chicken, and could be higher or lower than these statewide averages. We estimate that up to 5% of developed and open space developed within the species range could undergo some level of treatment with malathion.

However, given the habitat preferences of the lesser prairie-chicken and limited utilization of these use sites, this is likely to represent a low percentage of the species range overall.

For mosquito adulticide, data indicated past usage of malathion in 5 of the 16 counties in New Mexico and Texas that encompass the recovery units of the lesser prairie-chicken. Data indicate that sales or usage in these counties occurred only once or twice in these counties for the 5 years of data available.

 # acres in species range: USFWS species range map not available at the time of this analysis
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: USFWS species range map not available at the time of this analysis

Overall Usage: ☐ High ☐ Medium ☒ Low

CONSERVATION MEASURES

Residential use label changes: New restrictions to the method and frequency of application for residential use of malathion are expected to significantly reduce exposure to species that overlap with developed and open space developed areas. Label changes will ensure that residential use is limited to spot treatments only (rendering spray drift offsite unlikely) and reducing the extent of area which can be treated in the developed and open space developed areas by as much as 75% or more from modeled values. In addition, we expect the frequency of exposure to decrease as the number of allowable applications is reduced from "repeat as necessary" to a maximum of 2–4 applications per year (depending on the specific residential use). Retreatment intervals of 7-10 days between any repeated applications are expected to reduce environmental concentrations by allowing initial residues to degrade prior to the next application.

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CONCLUSION

[1] While the proposed label restriction does not apply to applications conducted by APHIS as part of the Boll Weevil Eradication Program, APHIS generally implements measures that are protective of listed species, as described in the Description of the Action section of the Opinion. The 2018 FWS informal section 7(a)(2) consultation with APHIS included conservation measures for listed species that may be affected in the program area. Based on the consultation history of this program, it is likely that similar measures will be added for the recently proposed lesser prairie-chicken DPSs, if needed.

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of malathion, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the lesser prairie-chicken (Southern DPS). As discussed below, although the vulnerability is high for this species, and we anticipate the risk posed by malathion exposure would be medium, usage that would lead to exposure is anticipated to be low; the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure.

The lesser prairie-chicken (Southern DPS) has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is anticipated to be medium, as described above. Malathion could result in moderate to high levels of mortality if exposed at maximum rates on vegetables and ground fruit, developed and open space developed sites. On most use sites, low level reproductive effects are anticipated if individuals are exposed, and effects to growth and higher reproductive effects are anticipated from foraging on grass and arthropods on use sites with higher allowable application rates (i.e., developed, open space developed). However, lesser prairie-chicken utilization of vegetables and ground fruit, developed and open space developed use sites is likely to be limited given the habitat preferences of the species, and we expect these use sites to represent a low percentage of the species range overall. Loss of terrestrial invertebrate prey is anticipated on use sites other than mosquito control and from spray drift. However, we only anticipate low-level effects from this prey loss due to the timing and availability of alternate food resources. Lesser prairie-chickens depend on invertebrate prey mainly in the breeding season, when individuals tend to avoid cultivated crops, other than some foraging on small grains. In addition, because terrestrial invertebrates exhibit a range of sensitivity to malathion, malathion is not expected to result in complete mortality to the prey base either on use sites, or from exposure via spray drift where effects are expected to be less pronounced.

We anticipate usage within the range would be low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. Usage from wheat and other grains, as well as for developed/open space developed are all anticipated to be low (5% or less). While we do not have usage estimates for mosquito adulticide, the available data indicate usage in 5 of 16 counties in New Mexico and Texas that encompass recovery units of the species, although the sales or usage data suggest low levels of usage. Based on these low levels of usage and the associated risk, we do not anticipate mortality, sub-lethal effects or appreciable losses of terrestrial invertebrate prey used by this species from malathion used for mosquito control. Thus, while we anticipate there will be some adverse effects, we do not anticipate species-level effects from the proposed action. Furthermore, the conservation measures described above for agricultural and residential uses are expected to further reduce the risk of exposure and effects on the prairie-chicken and its prey items on and adjacent to these use types of sites. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the lesser prairie chicken (Southern DPS).

Conclusion: Not likely to jeopardize