Integration and Synthesis Summary: Mammals

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

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: All populations stable, with none known to be increasing or decreasing
Pesticides noted ☒

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

Most of the overall population declines were attributed to declines at high-priority hibernacula in Kentucky and Missouri and to a lesser extent, Indiana. A new threat, White-Nose Syndrome (WNS), has emerged in the northeastern United States that has caused mortality of thousands of hibernating Indiana bats and has affected five other bat species over the past several winters. Among the nine states currently known to be affected by WNS (NY, VT, NH, MA, CT, NJ, PA, VA, and WV), New Jersey, New York, Pennsylvania, Vermont, and West Virginia have "affected" Indiana bat hibernacula (USFWS, unpublished data, 2009). Additional threats include: quarrying and mining operations (summer and winter habitat), loss/degradation of summer/migration/swarming habitat, loss of forest habitat connectivity, some silvicultural practices and firewood collection, disease and parasites, predation, competition with other bat species, environmental contaminants (not just "pesticides"), climate change, and collisions with man-made objects (e.g., wind turbines, communication towers, airstrikes with airplanes, and roadkill). Destruction and degradation of the bat's winter hibernacula (i.e., caves and mines) and summer habitat (i.e., forests) has been identified as a longstanding and ongoing threat to the species. Human disturbance of hibernating bats was originally identified as one of the primary threats to the species and still remains a threat at several important hibernacula in the bat's range (USFWS 2007). The primary forms of human disturbance to hibernating bats result from cave commercialization (cave tours and other commercial uses of caves), recreational caving, vandalism, and research-related activities.

EB/CE Source: 2009 5-Year Review

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: Indiana bats are not expected to experience direct effects from exposure to malathion at maximum rates on use sites or from spray drift.

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	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	22% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 39% terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	23% terrestrial invertebrates

Risk modifiers: Summer maternity roosts are typically behind exfoliating bark of dead trees and often these are located along forest edges for solar advantage. Because maternity colonies are commonly found near agricultural areas, pup rearing occurs during times of increased exposure. Indiana bats hibernate colonially primarily in caves (and mines) often long distances from summer maternity colonies. From late October to early April, Indiana bats hibernate. As they congregate near hibernacula in the fall just prior to hibernation, bats forage intensively and breed.

In an Illinois study, Indiana bats were detected in the following habitats: agricultural land including cropland and old fields (67%), upland forest (30%), floodplain forest (2.2%) and areas covered with water (0.1%). In southern Michigan, the general landscape occupied by Indiana bats consisted of open fields and agricultural lands (55%), wetlands and lowland forest (19%), other forested habitats (17%), developed areas (6%), and perennial water sources such as ponds and streams (3%). In southern Illinois, Carter and others reported that all roosts were located in bottomland, swamp, and floodplain areas. Miller and others determined the predominant habitat types near areas where Indiana bats were captured in Missouri were forest, crop fields, and grasslands. Indiana bats make extensive use of agricultural edges (and edges between forested areas and other open areas) for foraging and as travel corridors (Pers. Comm 2016 biological information, USFWS field office request).

Allowable uses driving effects/other considerations: Indirect effects are driven by overlap with corn, open space developed, and developed, as well as mosquito control.

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 would 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	70,080,526	22.60	964,121	0.31
Corn	I	33,266,177	10.73	100,155	0.03
Open Space Developed	I	16,064,490	5.18	803,224	0.26
Developed	I	12,078,762	3.90	603,938	0.19
Pasture	I	1,815,422	0.59	91,900	0.03
Wheat	I	1,514,608	0.49	56,183	0.02
Other Crops	I	888,215	0.29	1,428	0.00
Cotton	I	628,357	0.20	39,178	0.01
Vegetables and Ground Fruit	I	388,912	0.13	25,455	0.01
Rice	I	294,916	0.10	38,073	0.01
Other Grains	I	269,098	0.09	21,822	0.01
Other RowCrops	I	185,814	0.06	7,670	<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]		67,394,771	21.74	1,789,026	0.58
TOTAL[4]:		137,475,297	44.34	2,753,147	0.89

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

[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.

site itself). Developed and open space developed uses have less potential for spray drift than other uses.

 # acres in species range: 310,064,681 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 21,947,058 acres, 7.078%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Indiana bat. As discussed below, although pesticides are a known threat to this species, the vulnerability and risk are medium, and the likelihood of exposure to malathion is very low and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Indiana bat has a medium vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is medium, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur within use areas or in spray drift areas. Malathion usage on any use site has the potential to result in mortality to terrestrial

invertebrate prey resources from spray drift (whether or not the species will utilize the site itself). Indiana bats make extensive use of agricultural edges (and edges between forested areas and other open areas) for foraging and as travel corridors (Pers. Comm 2016 biological information, USFWS field office request). We anticipate low intensity and short duration adverse effects will occur from a reduction in prey resources (i.e., terrestrial invertebrates) within use areas and spray drift areas. However, the usage area within the non-Federal portion of the species range is extremely limited (<1%), and we anticipate only small reductions in prey resources over the duration of the Action.

Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion.

Therefore, while some individuals may experience small losses in available prey, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur. Based on this analysis, we do not anticipate that the Action would appreciably reduce survival and recovery of the Indiana bat in the wild.

Conclusion: Is not likely to jeopardize

ADDITIONAL REFERENCES

Pers. Comm 2016 biological information, USFWS field office request.

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Odocoileus virginianus leucurus	Columbian white-tailed deer (Columbia River DPS)	3

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: All populations stable, with none known to be increasing or decreasing
Pesticides noted ☐

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

While flooding has caused short-term population declines, the population tends to return to prior levels within a few years. From 1997 until the 2013 translocation, the Julia Butler Hansen (JBH) Mainland Unit subpopulation had stabilized above the minimum 50-deer threshold in the recovery plan criteria; the current population is estimated at 46. The major threat to this subpopulation would be several floods in consecutive years. The Upper Estuary Islands have yet to maintain the target population of 50 deer despite numerous translocation efforts to populate the islands. While the overall Distinct Population Segment population trend appears to decline along a similar trajectory as the JBH Mainland Unit subpopulation, in actuality, the overall trend is disproportionately influenced by the decline of the unsustainable highs that the JBH Mainland Unit experienced in the late 1980s. The species is threatened by land conversion, hunting, flooding, invasive species, disease, predation, hybridization, vehicle collisions, and climate change.

EB/CE Source: 2013 5-Year Review

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: Columbia white-tailed deer have a low chance of mortality (<5%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, orchards and vineyards).

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	<0.5%
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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	12%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers:

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for most direct effects to the Columbia white-tailed deer.

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	1,220,798	62.40	0	0
Developed	D, I	123,466	6.31	6,173	0.32
Open Space Developed	D, I	113,391	5.80	5,670	0.29
Christmas Trees	D, I	1,962	0.10	1,649	0.08
Corn	N	1,675	0.09	460	0.02
Vegetables and Ground Fruit	N	1,461	0.07	1,461	0.07
Other Crops	N	1,433	0.07	0	0
Pasture	N	1,117	0.06	853	0.04

[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, I	629	0.03	629	0.03
Nurseries	I	470	0.02	470	0.02
Other Grains	N	420	0.02	325	0.02
Wheat	N	120	0.01	120	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		239,448	12.24	14,121	0.72
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		239,918	12.26	14,591	0.74
TOTAL[4]:		239,918	12.26	14,591	0.74

 # acres in species range: 1,956,549 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 107,448 acres, 5.492%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Columbian white-tailed deer. As discussed below, even though the vulnerability is high for this species, risk to the species and the likelihood of exposure to malathion are low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we

[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.

anticipate that small numbers of individuals will be adversely affected over the duration of the Action, we do not expect species-level effects to occur.

The Columbian white-tailed deer has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We anticipate a very low level of mortality (<0.5%) and no sublethal effects from applications on use sites, and no mortality or sublethal effects within spray drift areas. The species is a generalist herbivore. We anticipate that malathion usage pursuant to label will result in a 12 percent decline in plant growth, although we do not anticipate that this decline in plant growth would result in measurable effects in food availability for individuals of the species. We anticipate adverse effects to the species will occur, based on the low level of mortality expected; however, we do not anticipate species-level effects because of the very low level of usage of malathion (<1%) within the non-Federal portion of the species range according to standard data. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their food base, and their habitat to malathion. The residential use label changes will ensure that applications in developed and open spaced developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. While we anticipate that very small numbers of individuals would be adversely affected over the duration of the Action, via low levels of mortality from exposure to malathion on use sites, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Columbian white-tailed deer in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Odocoileus virginianus clavium	Key deer	4

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:

Harveson et al. (2007) provided estimates of deer abundance from 2000 to 2001 for each of the 11 island complexes which together constitute the entire current range of the Key deer. The 11 island complexes (each containing one or more keys) are equivalent to the 11 Key deer subpopulations which function as a metapopulation. The 11 subpopulations of Key deer are divided into three geographic categories: (1) core subpopulations on mainline keys (n = 2), (2) non–core subpopulations on mainline keys (n = 4), and (3) non–core subpopulations on outer keys (n = 5). For the 11 complexes, abundance totaled 646. Estimates for subpopulations other than Big Pine Key (BPK) and No Name Key (NNK) are considered preliminary and confidence intervals were not provided. By 2001, deer may have occupied all available habitat on BPK, NNK, and Newfound Harbor (Nettles et al. 2002, Lopez et al. 2004a, Harveson et al. 2007). In other subpopulations, deer numbers were estimated to remain well below the carrying capacity of the habitat available to them (Harveson et al. 2007). The Key deer is threatened by habitat loss, fences, exotics, fire suppression, disease, vehicular mortality, and climate change. This small ranged species is thought to be relatively stable. Connectivity of the southern end of BPK with the rest of the island has been threatened due to the U.S. 1 corridor. Any division of BPK would result in a reduction in the subpopulation size. In 2003, the Florida Department of Transportation constructed deer-proof fencing along a 1.6 mile (2.6 kilometer) segment of the highway, with underpasses to allow for safe passage under U.S. 1. Folk (1992) described threats resulting from fencing, including habitat fragmentation, habitat loss, and risk of entanglement. Lopez (2001) found that 30 percent of the developed areas (230 ac [93 ha]) on BPK and NNK had been completely fenced and unavailable for use as habitat for deer. This equates to more than three percent of the area within the core. Increased fencing results in further fragmentation of habitat and alteration of deer ranges and movement and in certain areas such effects may be exacerbated due to the presence of roads (Folk et al. 1990, Lopez 2001). Habitat destruction due to development continues to occur, though at low rates (as in the preceding decade, but in contrast to the 1970s and 1980s). The State's Florida Forever program continues to acquire parcels for conservation within the range of the Key deer annually. Through 2005, 1,726 ac (698 ha) out of 2,830 ac (1,145 ha) targeted for acquisition within the Coupon Bight/Key deer project, and 5,175 ac (2,094 ha) out of 11,854 ac (4,797 ha) within the Florida Keys Ecosystem project had been

acquired (Florida Department of Environmental Protection 2006). Specific risks to Key deer associated with altered fire regimes (the lack of frequent fires) in recent decades has not been quantified or fully explored. However, Carlson et al. (1993) reported that fire in pine rockland benefited Key deer (and endemic herbs) by retarding succession, and improved nutritive quality of browse over a short term and quantity of browse over a relatively longer period.

EB/CE Source: 2010 5-Year Review

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: Key deer have a low chance of mortality (<5%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, orchards and vineyards).

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	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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers:

Allowable uses driving effects/other considerations:

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	271,974	11.35	56,293	2.35
Developed	I	15,416	0.64	771	0.03
Open Space Developed	I	6,555	0.27	328	0.01
Nurseries	I	61	<0.01	61	<0.01
Orchards and Vineyards	I	13	<0.01	7	<0.01
Other Grains	N	5	<0.01	5	<0.01
Vegetables and Ground Fruit	N	4	<0.01	4	<0.01
Other Crops	N	3	<0.01	<1	<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]		22,045	0.92	1,167	0.05
TOTAL[4]:		22,045	0.92	1,167	0.05

 # acres in species range: 2,395,378 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,195,668 acres, 49.916%

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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Key deer. As discussed below, even though the vulnerability is high for this species, pesticides are not a known threat to this species and the risk to the species and the likelihood of exposure to malathion are low. While we anticipate that small numbers of individuals may be affected over the duration of the proposed action, we do not expect species-level effects will occur.

[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.

The Key deer has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We anticipate no mortality or sublethal effects to individuals of the species will occur on use sites or from spray drift within the non-Federal portions of the species range. Further, the species is a generalist herbivore, and, while we anticipate that malathion usage pursuant to label will result in a very slight decline in plant growth (1%), we do not expect such a small decline will result in measurable reductions to the available food resources for individuals of the species. Additionally, we expect a very low level of usage (<1%) within the non-Federal portion of the species range according to standard data. Thus, the lack of anticipated effects to individuals and very low usage within the species range indicates that adverse effects to individuals of the species are not reasonably certain to occur and we do not anticipate any species-level effects resulting from the Action.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of Key deer in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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:

We estimate that the average minimum number of breeding adult black-footed ferrets in the wild is 418 animals, with a minimum of 313 of those animals at four of the most successful sites to date (Aubrey Valley, Arizona; Cheyenne River Indian Reservation, South Dakota; Conata Basin, South Dakota; and Shirley Basin, Wyoming). Approximately 280 additional animals are managed in captive breeding facilities. At this time, the downlisting criteria may be 40 percent complete with regard to establishing 10 successful populations and approximately 24 percent complete with regard to the goal of 1,500 breeding adults at successful sites. The species remains vulnerable to several threats, including sylvatic plague and inadequate regulatory mechanisms. The black-footed ferret was historically found throughout the Great Plains, mountain basins, and semi-arid grasslands of North America wherever prairie dogs occurred. The black-footed ferret depends on prairie dogs for food and on their burrows for shelter. The historical range of the ferret coincided with the ranges of the black-tailed prairie dog (*Cynomis ludovicianus*), Gunnison's prairie dog (*C. gunnisoni*), and white-tailed prairie dog (*C. leucurus*). The ferret's close association with prairie dogs was an important factor in the ferret's decline. From the late 1800s to approximately the 1960s, prairie dog occupied habitat and prairie dog numbers were dramatically reduced by conversion of native grasslands to cropland, poisoning, and disease. The ferret population declined precipitously as a result.

EB/CE Source: 2013 Recovery Plan for the Black-Footed Ferret (*Mustela nigripes*) Second Revision 78 FR 77485 77486

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: Black-footed ferrets have a low chance of mortality (<1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, orchards and vineyards).

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	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	<1% birds and mammals,
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: The black-footed ferret occurs in Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, South Dakota, Utah, and Wyoming. Black-footed ferret habitat occurs in intermountain and prairie grasslands areas with prairie dog colonies that contain high burrow densities and therefore high densities of prairie dogs required for food (prey base) and shelter (burrows). The spatial arrangement of the black-footed ferret is clumped, in association with prairie dog habitat.

Dietary items can include small mammals such as ground squirrels, cottontail rabbits, and deer mice. Other dietary items include birds. The black-footed ferret is non-migratory, however dispersal among young from natal areas (and occasionally adults) occurs, predominantly in the fall months. Dispersal distance is generally between 49 kilometers (km) (30 mi) and 20 km (12 mi). Males tend to move and disperse more than females.

Although the preferred dietary item of the black-footed ferret is primarily small mammals (i.e. typically prairie dogs), the combination of the other potential dietary items (i.e. birds) in which the black-footed ferret consume increases its likelihood of exposure to malathion. Additionally, the clumped, colony distribution of the black-footed ferret within the range would increase the magnitude of effect for the species, if that colony is exposed.

Allowable uses driving effects/other considerations:

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	683,173	55.99	94,100	7.71
Pasture	N	2,058	0.17	1,952	0.16
Wheat	N	13,532	1.11	13,532	1.11
Other Crops	N	4,448	0.36	0	0
Other Grains	N	5,972	0.49	5,712	0.47
Corn	N	8,812	0.72	7,702	0.63
Open Space Developed	I	6,050	0.50	302	0.02
Other RowCrops	N	2,643	0.22	2,643	0.22
Developed	I	1,294	0.11	65	0.01
Vegetables and Ground Fruit	I	1,817	0.15	1,728	0.14
Cotton	I	3	<0.01	<1	<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]		9,164	0.75	2,095	0.17
TOTAL[4]:		9,164	0.75	2,095	0.17

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: 1,220,269 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 57,166 acres, 4.685%

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

[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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, as proposed, is not likely to jeopardize the continued existence of the black-footed ferret. As discussed below, even though the vulnerability is high for this species, pesticides are not a known threat to this species and the risk to the species and the likelihood of exposure to malathion are low. While we anticipate that small numbers of individuals may be affected over the duration of the proposed action, we do not expect species-level effects to occur.

The black-footed ferret has a high level of vulnerability based on its status, environmental baseline, and cumulative effects. The risk to the species posed by labeled uses across the range is low, and estimated usage within the non-Federal portion of the species range is low, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate that malathion usage pursuant to the labels will result in mortality or sublethal effects in use areas or in spray drift areas. Dietary items for this species primarily include small mammals such as ground squirrels, cottontail rabbits, and deer mice, and the species also consumes birds. We anticipate that malathion applications will result in an extremely small (<1%) reduction in birds and mammals as prey resources. Additionally, we estimate that malathion usage within the non-Federal portion of the species range will be low (<1%), reducing the likelihood of exposure of the species and its prey to malathion. We do not anticipate that that such small losses of prey would reduce food resources for individuals of the species to such an extent that their growth, survival, or reproduction would be impacted. Thus, we do not anticipate species-level effects.

Therefore, we anticipate that the Action would not appreciably reduce survival and recovery of the black-footed ferret.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: Declining population(s) – one or more populations declining
Pesticides noted ☒

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

Agricultural development of kit fox habitat remains the largest threat to the kit fox. Although kit fox were once thought able to inhabit established agricultural fields, subsequent research has shown that kit fox are unable to maintain long-term occupancy in these areas, although they forage into fields at night. Since listing, kit fox have been increasingly threatened by introduced red fox, which have expanded their range southward from the San Francisco Bay Area. High coyote densities also threaten kit fox where they apparently exclude them from what appears to be otherwise suitable open and protected lands. Threats to the species include continued loss of kit fox habitat to agricultural and urban development, pesticide exposure, competitive exclusion by other canids, the highly fluctuating population dynamic of most kit fox populations, isolation and loss of small subpopulations due to stochastic events and habitat fragmentation, off-road vehicle use and loss of prey. Although substantial progress has been made in protecting habitat, it is not yet likely that all protected habitat parcels contain the requisite contiguous acreage, vegetative structure, and prey base to adequately sustain kit fox. Pesticide and anticoagulant rodenticide use pose an unquantified, but potentially significant threat to kit fox populations, both through direct mortality and through loss of prey species. Kangaroo rats, preferred prey for the kit fox, have declined throughout much of the kit fox's range, and several of these species are also federally-endangered.

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

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: San Joaquin kit fox have a low chance of mortality (<8%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, orchards and vineyards).

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	0 – 1.5% depending on dietary item
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	17% (R – low effects, birds only), no other sublethal effects expected 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	19% birds, 42% terrestrial invertebrates
Spray drift areas - Prey item mortality	Effects to terrestrial invertebrates
Plants affected (decline in growth)	23%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	78% terrestrial invertebrates, no effects to other prey items

Risk modifiers: The San Joaquin kit fox occurs in suitable habitat in the San Joaquin Valley. The boundaries of the kit fox's range still extend from southern Kern County north to Contra Costa, Alameda, and San Joaquin counties on the western side of the valley; and to the La Grange area, Stanislaus County, on the eastern side of the valley. The most northerly sighting was made at the Black Diamond Mines Regional Preserve near Antioch, Contra Costa County, in the early 1990s. The largest extant populations were known from western Kern County, on and around the Elk Hills area and Buena Vista Valley; and the nearby Carrizo Plain Natural Area, where relatively level terrain is separated by narrow rugged ranges.

The San Joaquin kit fox is a wide-ranging species, and will forage on a variety of items, including small mammals such as mice, kangaroo rats, squirrels and rabbits, as well as ground-nesting birds, insects, leaves, and grass. Additionally, this species can utilize a variety of habitats and use sites for migration, travel, and foraging purposes, as well as during the breeding season. The combination of the wide variety of dietary items and habitats in which the fox can occur increases its likelihood of exposure to malathion.

Allowable uses driving effects/other considerations: Sublethal effects to the San Joaquin kit fox are due to consumption of birds exposed to malathion on orchards and vineyards. The maximum application rate used in calculations is not completely representative of usage for these categories within the range of the San Joaquin kit fox and therefore likely over-estimates effects. In

addition, anticipated effects are calculated based on all individuals consuming exposed birds. Because kit foxes consume a wide variety of dietary items, calculations based on consumption of birds alone also contributes to the over-estimation of effects.

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 would 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	11,619,094	77.60	23,233	0.16
Orchards and Vineyards	D, I	2,308,031	15.42	18,768	0.125
Other Crops	I	1,047,162	6.99	0	0
Open Space Developed	D, I	598,325	4.00	29,916	0.20
Developed	D, I	554,436	3.70	27,722	0.19
Wheat	I	469,777	3.14	18,707	0.047
Pasture	I	412,903	2.76	36,369	0.243
Vegetables and Ground Fruit	D, I	292,534	1.95	26,558	0.178
Cotton	D, I	243,128	1.62	14,766	0.098
Other Grains	I	210,471	1.41	2,493	0.017
Corn	I	72,441	0.48	1,065	0.007
Rice	I	3,028	0.02	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		3,996,453	26.69	117,730	0.791
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		6,212,235	41.49	176,364	1.105

[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]:	17,831,329	119.09	199,597	1.265

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: 14,972,545 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 1,343,549 acres, 8.973%

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.

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the San Joaquin kit fox. As discussed below, even though the vulnerability is high for this species, and pesticides

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

are a known threat, the risk to the species is medium and the likelihood of exposure to malathion is low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The San Joaquin kit fox has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is medium, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the CalPUR usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We anticipate a low level of mortality (0-1.5% depending on the prey item) in use areas and sublethal effects (17% reduction in reproductive success from consumption of contaminated birds) will occur on use sites and in spray drift areas. We also anticipate a reduction of prey resources (i.e., terrestrial invertebrate and birds) in use areas, and a 23 percent decline in plant growth. We therefore anticipate adverse effects to the species caused by mortality, sublethal effects, and reduction in prey resources. However, we do not expect that these adverse effects will cause species-level effects because of the low level of usage (1.265%) within the non-Federal portion of the species range. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. While we anticipate that small numbers of individuals would be adversely affected by low levels of sub-lethal effects through small reductions in reproductive success, and small reductions in fitness from loss of prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the San Joaquin kit fox in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: All populations at least stable, and one or more increasing populations
Pesticides noted ☐

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

Gray wolves are the largest wild members of the canid (dog) family and have a broad circumpolar range. The gray wolf, being a keystone predator, is an integral component of the ecosystems to which it typically belongs. The wide range of habitats in which wolves can thrive reflects their adaptability as a species, and includes temperate forests, mountains, tundra, taiga, and grasslands. Gray wolves were originally listed as subspecies or as regional populations of subspecies in the contiguous United States and Mexico. In 1978, gray wolves were largely confined to northern Minnesota, with some wolves occupying Isle Royale and possibly other individuals scattered in Wisconsin and Michigan (43 FR 9608). Wolves in northern Minnesota subsequently dispersed and recolonized Wisconsin and Michigan, resulting in a metapopulation in the Great Lakes area (Mech 2010, p. 130). There are no significant physical barriers separating Minnesota wolves from those in Wisconsin and Michigan, as evidenced by frequent movement of wolves among the three States (Treves et al. 2009, entire).

EB/CE Source: U. S. Fish and Wildlife Service. February 29, 2012. Lower 48-State and Mexico Gray wolf (*Canis lupus*) listing, as revised 5-Year Review: Summary and Evaluation U.S. Fish and Wildlife Service Washington Office Arlington, Virginia. 22 pp.

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: We do not anticipate effects to gray wolves from consuming mammals exposed to malathion at maximum rates on use sites. A small percentage of gray

wolves (up to 3% of individuals exposed) is expected experience mortality from the consumption of birds on use sites with higher allowable application rates.

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	<1% from consumption of birds only
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	<0.1% mammals, 2% birds, 8% fish and amphibians
Spray drift areas - Prey item mortality	Effects to fish and amphibians
Plants affected (decline in growth)	3%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects to birds, mammals, plants; 3% fish and amphibians

Risk modifiers:

Gray wolves can disperse across large distances, as they are wide-ranging, highly mobile, with a high likelihood of dispersal. Gray wolves are highly mobile and readily disperse or migrate hundreds of kilometers (hundred or more miles). Gray wolves have an annual home range (territory) of up to several hundred km^2. Young gray wolves disperse from natal to new territories (hundreds of kilometers [hundred or more miles]) between the ages of 1 and 2 years, typically between February-April and October-November; 35 percent of known-age wolves remained in their natal territory for more than 2 years.

Wolves primarily are predators of medium and large mammals, primarily: deer, moose, bison, elk, sheep, mountain goat, caribou, and antelope. This species will also prey on with small mammals, beavers, birds, and large invertebrates. Other dietary items include domestic animals (dogs, sheep, and cattle), birds, fish, and plant items such as berries and fruits. The distribution of wolves within their range is primarily clumped, as wolves are social animals. They typically live and hunt in packs of 2-12 wolves.

Allowable uses driving effects/other considerations: Direct effects to gray wolves are only expected to occur when consuming birds from use sites with higher maximum application rates, including Developed and Open Space Developed. As birds are not a primary prey item for this species, any effects are likely overestimated.

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	8,986,838	9.78	154,467	0.17
Corn	I	1,749,114	1.90	14,937	0.02
Open Space Developed	D, I	1,553,314	1.69	77,666	0.08
Pasture	I	1,487,034	1.62	221,369	0.24
Developed	D, I	739,878	0.80	36,994	0.04
Wheat	I	709,664	0.77	163,015	0.18
Other Crops	I	680,620	0.74	2	0.00
Orchards and Vineyards	D, I	410,101	0.45	112,737	0.12
Vegetables and Ground Fruit	D, I	382,780	0.42	157,204	0.17
Other Grains	I	171,639	0.19	29,841	0.03
Other RowCrops	I	43,033	0.05	1,424	0.00
Christmas Trees	D, I	5,565	0.01	4,353	0.00
Sub-TOTAL (D): *Other uses with direct effects only*[3]		798,445	0.87	274,294	0.30
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		5,639,550	6.13	704,881	0.77
TOTAL[4]:		146,26,387	15.91	859,348	0.93

 # acres in species range: 91,933,005.64 acres
% of range in California (i.e., where CalPUR data is available): 4%
Range overlap with Federal lands: 31,599,145.26 acres, 34.371%

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). 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 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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the gray wolf. As discussed below, the vulnerability is medium for this species, but the risk to the species and the likelihood of exposure to malathion are low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the proposed action, we do not expect species-level effects to occur.

The gray wolf has a medium vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Given the species is an apex predator preferring large mammalian prey items, we expect that effects from ingestion of contaminated birds, the only prey pathway where impacts would be expected to occur, are likely overestimated and that the low levels of exposure for the species will not result in adverse effects to the species. Moreover, we do not expect that small reductions in mammals, birds, and other food items would substantially impact fitness, survival, or reproduction for individuals of this species, due to the wide variety of habitats it occupies and ability to cover large distances within its range.

Furthermore, we anticipate the additional conservation measures above, including residential and agriculture use label changes will further reduce the likelihood of exposure of the species, their

prey, and their habitat from uses within developed, open spaced developed, and agricultural areas. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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.

Thus, while we anticipate very small reductions in prey for individual wolves, we do not anticipate such reductions would impact survival, growth, reproduction of individual wolves or result in species-level effects. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the gray wolf in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Canis lupus	Gray wolf (Western Great Lakes Population)	12

VULNERABILITY

(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Species/Populations neither constrained or widespread
Number of Populations: Multiple populations (few)
Species Trends: All populations at least stable, and one or more increasing populations
Pesticides noted ☐

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

Gray wolves are the largest wild members of the canid (dog) family and have a broad circumpolar range. The gray wolf, being a keystone predator, is an integral component of the ecosystems to which it typically belongs. The wide range of habitats in which wolves can thrive reflects their adaptability as a species, and includes temperate forests, mountains, tundra, taiga, and grasslands. Gray wolves were originally listed as subspecies or as regional populations of subspecies in the contiguous United States and Mexico. In 1978, gray wolves were largely confined to northern Minnesota, with some wolves occupying Isle Royale and possibly other individuals scattered in Wisconsin and Michigan (43 FR 9608). Wolves in northern Minnesota subsequently dispersed and recolonized Wisconsin and Michigan, resulting in a metapopulation 2 in the Great Lakes area (Mech 2010, p. 130). There are no significant physical barriers separating Minnesota wolves from those in Wisconsin and Michigan, as evidenced by frequent movement of wolves among the three States (Treves et al. 2009, entire). The species' dispersal capabilities allow wolf populations to quickly expand and recolonize vacant habitats as long as rates of human-caused mortality are not excessive; although, the rate of recolonization can be affected by the extent of intervening unoccupied habitat between the source population and newly recolonized area (USFWS 2020, p. 7).

EB/CE Source: U.S. Fish and Wildlife Service. 2020. Federal Register 85 (213).

U. S. Fish and Wildlife Service. February 29, 2012. Lower 48-State and Mexico Gray wolf (Canis lupus) listing, as revised 5-Year Review: Summary and Evaluation U.S. Fish and Wildlife Service Washington Office Arlington, Virginia. 22 pp.

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:

We do not anticipate effects to gray wolves from consuming mammals exposed to malathion at maximum rates on use sites. A small percentage of gray wolves (up to 3% of individuals exposed) is expected experience mortality from the consumption of birds on use sites with higher allowable application rates.

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	<1% from consumption of birds only
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	<1% low reproductive effects from consumption of 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	<1% mammals, 2% birds, 7% fish and amphibians
Spray drift areas - Prey item mortality	Effects to fish and amphibians
Plants affected (decline in growth)	3%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects to birds, mammals, plants; 5% fish and amphibians

Risk modifiers:

Gray wolves can disperse across large distances, as they are wide-ranging, highly mobile, with a high likelihood of dispersal. Gray wolves are highly mobile and readily disperse or migrate hundreds of kilometers (hundred or more miles). Gray wolves have an annual home range (territory) of up to several hundred km^2. Young gray wolves disperse from natal to new territories (hundreds of kilometers [hundred or more miles]) between the ages of 1 and 2 years, typically between February-April and October-November; 35 percent of known-age wolves remained in their natal territory for more than 2 years.

Wolves primarily are predators of medium and large mammals, primarily: deer, moose, bison, elk, sheep, mountain goat, caribou, and antelope. This species will also prey on with small mammals, beavers, birds, and large invertebrates. Other dietary items include domestic animals

(dogs, sheep, and cattle), birds, fish, and plant items such as berries and fruits. The distribution of wolves within their range is primarily clumped, as wolves are social animals. They typically live and hunt in packs of 2-12 wolves.

Allowable uses driving effects/other considerations: Direct effects to gray wolves are only expected to occur when consuming birds from use sites with higher maximum application rates, including developed, open space developed, and orchards and vineyards. As birds are not a primary prey item for this species, any effects are likely overestimated. In addition, reproductive effects are only associated with orchards and vineyards, which is likely also overestimated based on a higher maximum application rate than is allowable in the states within the wolf's range.

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	1,447,709	4.83	93	0.00
Open Space Developed	D, I	682,353	2.28	34,118	0.11
Wheat	I	661,291	2.21	42,198	0.14
Corn	I	654,135	2.18	17,228	0.06
Pasture	I	512,485	1.71	30,915	0.10
Developed	D, I	157,566	0.53	7,878	0.03
Other RowCrops	I	99,134	0.33	11,923	0.04
Other Grains	I	89,151	0.30	5,053	0.02
Vegetables and Ground Fruit	D, I	73,939	0.25	6,452	0.02
Other Crops	I	40,647	0.14	0	0.00
Nurseries	I	1,575	0.01	1,575	0.01
Christmas Trees	D, I	119	0.00	98	0.00
Sub-TOTAL (D): *Other uses with direct effects only*[3]		913,977	3.05	48,545	0.16
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		2,132,476	7.11	115,440	0.39
TOTAL[4]:		3,580,185	11.94	115533	0.39

[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.

Malathion usage on any use site has the potential to result in reductions to forage fish 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: 29,972,335.87 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 4,583,418.833 acres, 15.292%

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.

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the gray wolf (Western Great Lakes Population). As discussed below, the vulnerability is medium for this species, but the risk to the species and the likelihood of exposure to malathion are low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the proposed action, we do not expect species-level effects to occur.

The gray wolf (Western Great Lakes Population) has a medium vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage within the non-Federal portion of the

range of the species, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Given the species is an apex predator preferring large mammalian prey items, we expect that effects from ingestion of contaminated birds, the only prey pathway where impacts would be expected to occur, are likely overestimated and that the low levels of exposure for the species will not result in adverse effects to the species. Moreover, we do not expect that small reductions in mammals, birds, and other food items would substantially impact fitness, survival, or reproduction for individuals of this species, due to the wide variety of habitats it occupies and ability to cover large distances within its range.

Furthermore, we anticipate the additional conservation measures above, including residential and agriculture use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat from uses within developed, open spaced developed, and agricultural areas. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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.

Thus, while we anticipate very small reductions in prey for individual wolves, we do not anticipate such reductions would impact survival, growth, reproduction of individual wolves or result in species-level effects. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the gray wolf (Western Great Lakes Population) in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Dipodomys heermanni morroensis	Morro Bay kangaroo rat	16

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:

There are two primary causes of the decline of the Morro Bay kangaroo rat. First, direct loss of habitat has occurred from development in the vicinity of Los Osos. Second, in the absence of fire, its optimum habitat comprising the early stages of coastal dune scrub has progressed to a dense, mature plant community lacking open spaces for the species' movement and food plants. Other threats include predation by cats, habitat fragmentation, stochastic events, invasive plant species, competition with other burrowing rodents, and extreme weather events. As a result of all of these threats, the species may be extinct. The last capture of a Morro Bay kangaroo rat occurred in 1986, and the last captive individual died in 1993. Despite many trapping efforts since 1986, the Morro Bay kangaroo rat has not been captured again. However, a species expert has recently observed potential signs, suggesting that some isolated colonies may still persist in pockets of suitable habitat. In addition, we have not been able to search on several, large private properties of interest, including two where the species previously occurred.

EB/CE Source: U.S. Fish and Wildlife Service. May 26, 2010. Morro Bay Kangaroo Rat (*Dipodomys heermannii morroensis*) 5- Year Review: Summary and Evaluation. 33 pp.

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: Morro Bay kangaroo rates are not anticipated to experience mortality or sublethal effects from exposure to malathion on use sites or as a result of spray drift.

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	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	7.5% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 15% terrestrial invertebrates
Plants affected (decline in growth)	4%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	45% terrestrial invertebrates

Risk modifiers: The Morro Bay kangaroo rat lives in burrow systems in early seral stages of the chaparral community, in sandy soils with slopes of less than 15 degrees. The early seral stages of chaparral community have low and sparse vegetation, widely scattered shrubs, and medium-textured sandy loam such as southern coastal scrub, coastal sage scrub, or coastal sand plains and stabilized dunes. Such habitats are generally characterized by somewhat lower plant species diversity and scattered areas of bare ground. Morro Bay kangaroo rats do not occupy dense vegetation, because it lacks their food plants, and likely inhibits their movement. As the young coastal dune scrub matures, the vegetation becomes taller and denser, which inhibits germination of annual plants. The changing habitat becomes less favorable to Morro Bay kangaroo rats as succession progresses. The Morro Bay kangaroo rat is primarily solitary; however, they tend to have delayed dispersal, which leads to temporary family groups and long-term occupancy of the same home ranges.

Morro Bay kangaroo rats feed on foliage, flowers, fruits, seeds, and insects.

Allowable uses driving effects/other considerations: The species will use and occupy grazed grassland on sandy soil. Effects estimated by overlaps assume that all malathion use sites within the species range areas consist of this type of suitable habitat, and therefore, may overestimate effects.

Effects to the invertebrate 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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	155,969	45.21	0	0
Pasture	I	35	0.01	0	0
Developed	I	3,309	0.96	165	0.05
Open Space Developed	I	10,105	2.93	505	0.15
Corn	I	6	0.00	0	0
Cotton	I	7	0.00	0	0
Vegetables and Ground Fruit	I	376	0.11	187	0.05
Orchards and Vineyards	I	311	0.09	0	0
Other Grains	I	5,601	1.62	0	0
Other Crops	I	5,999	1.74	0	0
Wheat	I	57	0.02	0	0
Nurseries	I	24	0.01	3	0.001
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		25,828	7.49	860	0.251
TOTAL[4]:		181,797	52.70	860	0.251

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in mortality to prey and forage 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: 344,949 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 188,025 acres, 54.508%

[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

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Morro Bay kangaroo rat. As discussed below, although the vulnerability is high for this species, pesticides are not a known threat, the risk to the species is medium and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the proposed action, we do not expect species-level effects to occur.

The Morro Bay kangaroo rat has a high vulnerability based on its status, distribution, and trends, as described above. The species has not been captured or observed in the wild since 1986; however, observation of potential signs (e.g., burrow entrance shaped like an upside down U with a runway, tail drag mark, surface seed pit cache; Stewart 1958, Villablanca 1987, Service and California Department of Fish and Game 1996) from 2008 to 2011 suggest that some isolated colonies may still persist in pockets of suitable habitat (USFWS 2011). The risk to the species posed by labeled uses across the range is medium, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the CalPUR usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate that mortality or sublethal effects will occur on use sites or from spray drift. We anticipate a reduction of prey resources (i.e., terrestrial invertebrates) in use areas (7.5%) and in spray drift areas (up to 15%), and also a 4% decline in plant growth. We anticipate adverse

effects to the species caused by the expected reduction in prey resources, mainly due to the loss of terrestrial invertebrates. However, we do not expect that these adverse effects will reach a magnitude to cause species-level effects because of the extremely low level of usage (0.251%) within the non-Federal portion of the species range based on CalPUR usage data. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 the extremely low usage, in addition to the conservation measures will reduce the likelihood of exposure of the species and its prey to malathion. Therefore, while some individuals may experience small losses in available prey, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Morro Bay kangaroo rat in the wild.

Conclusion: Is not likely to jeopardize

ADDITIONAL REFERENCES

U.S. Fish and Wildlife Service. 2011. Morro Bay Kangaroo Rat (*Dipodomys heermanni morroensis*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Ventura, California. 33 pp.

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Reithrodontomys raviventris	Salt marsh harvest mouse	17

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 greatest historical and present threat to tidal marsh ecosystems and the salt marsh harvest mouse is the destruction and alteration of habitat. Habitat loss that threatens salt marsh harvest mice is due to filling, diking, subsidence, changes in water salinity, nonnative species invasions, sea level rise associated with global climate change and pollution. In addition, habitat suitability of many marshes is further limited by small size, fragmentation, and lack of other vital features such as sufficient refugial habitat. Larger tracts of high quality habitat are needed to maintain stable populations over time. Several projects such as the Habitat Management, Preservation, and Restoration Plan for Suisun Marsh, the San Pablo Bay National Wildlife Refuge Comprehensive Conservation Plan, and the South Bay Salt Pond Restoration Plan, which target restoration of salt marsh harvest mouse habitat, are either in preparation or in early implementation. Environmental contaminants may adversely affect the survival, growth, reproduction, health, or behavior of species. Some contaminants may affect a narrow range of organisms while others, like petroleum products, can impact a broader range of organisms. Known contaminants of concern in the San Francisco Bay Estuary include mercury, selenium, polychlorinated biphenyls, organochlorine and organophosphate pesticides, dioxins/furans, polycyclic aromatic hydrocarbons, and tributyltin from anti-fouling boat paints (State Water Resources Control Board 2006; 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. Unmonitored contaminants in San Francisco Bay include such chemicals as pharmaceuticals, plasticizers, flame retardants, and detergent additives (San Francisco Estuary Institute 2000). Toxic effects of many of these chemicals to harvest mice and other estuary biota are not known. Compared with environmentally determined mortality factors, reproduction does not appear to be a limiting factor for the species. Few major, resilient, or secure populations persist (Roberts Landing, Hayward Marsh, Baumberg, Mayhews Landing, Calaveras Point Marsh, New Chicago Marsh, Renzel/ITT Marsh, Redwood Shores, in addition to likely populations at Bair Island, Greco Island, Mowry Slough, and other sites) (Shellhammer, pers. comm. 2005). These are very small and isolated compared with the historical pattern of

distribution and abundance of the subspecies. All major population centers of the southern subspecies are remote from one another based on dispersal distances known for the species. The small populations and higher degree of isolation of the southern subspecies in Marin County indicate a high probability of local extirpation due to inability to recolonize following local extinction.

EB/CE Source: U. S. Fish and Wildlife Service. Februrary 16, 2010. Salt marsh harvest mouse (Reithrodontomys raviventris) 5-Year Review: Summary and Evaluation. Sacramento, California. 50 p.

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: Salt marsh harvest mice have a low chance of mortality (<5%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, orchards and vineyards).

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	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 terrestrial invertebrates
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects to plants, 90% terrestrial invertebrates

Risk modifiers: The salt marsh harvest mouse is a primary herbivore that will only occasionally supplement their diet with seeds and insects. Its habitat is brackish tidal marsh dominated by pickleweed (*Salicornia pacifica)* cover.

The salt marsh harvest mouse is not expected to utilize malathion use sites.

Allowable uses driving effects/other considerations Mosquito control is the only malathion use anticipated to overlap with salt marsh harvest mouse habitat, though malathion is expected to enter their habitat through spray drift.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	935,709	90.36	0	0.00
Developed	*	323,868	31.28	16,193	1.56
Open Space Developed	*	97,482	9.41	4,874	0.47
Orchards and Vineyards	*	25,208	2.43	114	0.011
Other Grains	*	19,295	1.86	0	0
Wheat	*	7,485	0.72	0	0
Other Crops	*	6,758	0.65	0	0
Nurseries	*	926	0.09	0	0
Pasture	*	851	0.08	0	0
Vegetables and Ground Fruit	*	357	0.03	14	0.001
Rice	*	136	0.01	0	0
Corn	*	108	0.01	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I):		0	0	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.

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]:		935,709	90.36	0	0

This species consumes invertebrates, therefore malathion usage on any use site has the potential to result in indirect effects 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: 1,035,522 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 75,620 acres, 7.303%

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

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: The salt marsh harvest mouse is known to rely on aquatic habitat for food resources or is otherwise closely associated with aquatic habitats and may experience effects of malathion through effects to the aquatic system. Rain restrictions (which allow for malathion to degrade before runoff events can occur) and aquatic habitat buffers required of all agricultural and residential uses will reduce the level of indirect effects impacting the salt marsh harvest mouse.

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 reduce 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, 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 and effects to the species.

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

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the salt marsh harvest mouse. As discussed below, although pesticides are a known threat to this species, and the vulnerability of the species is high, risk to the species is medium and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that a very small number of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The salt marsh harvest mouse has a high vulnerability based on its status, distribution, and trends. The risk to the species posed by labeled uses across the range is medium, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the CalPUR usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate a mortality or sublethal effects on use sites or from spray drift. We anticipate a large reduction of prey resources (i.e., terrestrial invertebrates) caused by malathion use for the purpose of mosquito control, but the usage information suggest that this is an unlikely source of exposure for the species. We anticipate only very low levels of adverse effects and we do not expect adverse effects to reach the magnitude of species-level effects because of the extremely low level of usage (0.00%) within the non-Federal portion of the species range. Furthermore, we anticipate the additional conservation measures above, including rain restrictions, aquatic habitat buffers, residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The rain restriction is expected to provide time for the pesticide to degrade before runoff into aquatic habitats can occur, decreasing exposure and risk. The aquatic habitat buffers are expected to significantly reduce exposure to aquatic organisms and subsequent risk of direct and indirect effects. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. In summary, we anticipate the absence of usage, in addition to the conservation measures will reduce the likelihood of exposure of the species and its prey to malathion. Therefore, while some very low number of individuals may experience small losses in available prey, the species is primarily an

herbivore and we do not anticipate impacts to plant forage and we do not anticipate that losses of invertebrate prey would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the salt marsh harvest mouse in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Panthera onca	Jaguar	18

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 (numerous)
Species Trends: Declining population(s) – one or more populations declining
Pesticides noted ☐

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

Historically, the jaguar inhabited 21 countries throughout the Americas, from the U.S. south into Argentina. The jaguar is fully protected at the national level across most of its range, with hunting prohibited in most of its range. Based on the available information, all detections of jaguars in the U.S. have been of males and have been located in southern Arizona and southwestern New Mexico. These jaguars are believed to be coming from the nearest core area and breeding population in the Northwestern Recovery Unit, which is approximately 130 miles south of the U.S.-Mexico border in Sonora near the towns of Huasabas, Sahuaripa (Brown and López González 2001), and Nacori Chico (Rosas-Rosas and Bender 2012). As of September 2015, one male jaguar is known to reside in southern Arizona (Culver et al. 2016). Jaguars require expansive open spaces in the southwestern U.S. of at least 100 km^2 (38.6 mi^2) in size, which: 1) provide connectivity to Mexico; 2) contain adequate levels of native prey species, including deer and javelina, as well as medium-sized prey such as coatis, skunks, raccoons, or jackrabbits; 3) include surface water sources available within 12.4 mi of each other; 4) contain from greater than 1 to 50 percent canopy cover within Madrean evergreen woodland, generally recognized by a mixture of oak (*Quercus* spp.), juniper (*Juniperus* spp.), and pine (*Pinus* spp.) trees, on the landscape, or semidesert grassland vegetation communities, usually characterized by *Pleuraphis mutica* (tobosagrass) or *Bouteloua eriopoda* (black grama) along with other grasses; 5) are characterized by intermediately, moderately, or highly rugged terrain; 6) are below 6,562 feet in elevation; and 7) are characterized by minimal to no human population density, no major roads, or no stable nighttime lighting over any 0.4-mi^2 area. Range wide, habitat destruction, modification, and fragmentation form one of the two most significant threats to the jaguar, especially deforestation. Human population growth has both direct and indirect impacts on jaguar survival and mortality. Human growth and development tend to fragment habitat and isolate populations of jaguars and other wildlife. For carnivores in general, the impacts of high road density have been well documented and thoroughly reviewed (e.g., Noss et al. 1996, Carroll et al. 2001, as cited by Menke and Hayes 2003). Small and isolated jaguar populations do not appear to be highly persistent (Haag et al. 2010, Rabinowitz and Zeller 2010). However, persistence of relatively small populations appears to increase with connectivity to other populations and reduction of threats within a corridor (Rabinowitz and Zeller 2010). Illegal

killing of jaguars is the other of the two most significant threats to the jaguar (Nowell and Jackson 1996, Medellín et al. 2002, Núñez et al. 2002, Chávez and Ceballos 2006, Medellín 2009). One of the most severe causes of mortality is the direct hunting of jaguars, either because jaguars have caused some conflict by killing livestock or to sell the jaguar as a trophy or its skin or teeth (Medellín 2009). The jaguar, as a large carnivore, is more vulnerable to extinction than many other land mammals. Loss of habitat, direct killing of jaguars, and depletion of prey are the primary factors contributing to its current status, considered to have a decreasing population trend according to the International Union for Conservation of Nature (IUCN) (Caso et al. 2008). Current levels of habitat loss indicate the species is trending toward IUCN category Vulnerable.

EB/CE Source: 2016. Jaguar Draft Recovery Plan (*Panthera onca*) 81 FR 92845

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: Jaguars have a low chance of mortality (<1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, orchards and vineyards).

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	<0.1% from birds, no effects from mammals, fish, reptiles
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	<1% (R – low effects, birds only), 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	<1% birds, reptiles, fish, and 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	0.01% fish

Risk modifiers: The range of the jaguar range consists only of the counties of Cochise, Pima, and Santa Cruz in Arizona, and Hidalgo County in New Mexico.

Home ranges for the jaguar are highly variable and depend on topography, available prey, and population dynamics. Habitat varies, including tropical and subtropical forests, lowland scrub and woodland, thorn scrub, pampas/llanos, desert, swampy savanna, mangrove swamps, lagoons, marshland, and floating islands of vegetation. At the southern extreme of the range, the species inhabits open savanna, flooded grasslands, and desert mountains. At the northern extreme it may be found in chaparral and timbered areas.

Jaguars can disperse across large distances, as they are wide-ranging, highly mobile, with a high likelihood of dispersal. Dietary items include, but are not limited to: peccaries, capybaras, pacas, agoutis, deer, opossum, rabbits, armadillos, caimans, turtles, livestock, and various other reptiles, birds, and fish. Jaguar can also consume carrion.

The jaguar are likely to travel through agricultural use areas, live and breed in managed forests, rangeland areas, and right of way use sites (Pers. Comm 2016 occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Though outputs from the MagTool include effects to terrestrial vertebrates, only birds and mammals were considered as dietary items for this assessment based on dietary preferences of the jaguar.

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	1,341	0.01	0	0
Other Crops	I	247,864	1.93	0	0
Pasture	I	31,369	0.24	30,312	0.24
Developed	*	152,465	1.19	7,623	0.06
Open Space Developed	*	128,496	1.00	6,425	0.05
Corn	I	21,800	0.17	279	0.00
Other Grains	I	14,477	0.11	3,302	0.03
Cotton	D, I	16,087	0.13	5,675	0.04
Wheat	I	10,928	0.08	3,460	0.03
Orchards and Vineyards	D, I	13,669	0.11	1,179	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	%
Vegetables and Ground Fruit	D, I	1,721	0.01	1,721	0.01
Nurseries	D, I	207	<0.01	207	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		31,683	0.25	8,782	0.07
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		110,256	0.86	46,134	0.36
TOTAL[4]:		111,597	0.87	46,134	0.36

 # acres in species range: 12,858,336 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 4,163,609 acres, 32.381%

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

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: While the Jaguar is not an aquatic species, it is known to rely on aquatic habitat for food resources or is otherwise closely associated with aquatic habitats and may experience effects of malathion through effects to the aquatic system. Rain restrictions (which allow for malathion to degrade before runoff events can occur) and aquatic habitat buffers required of all agricultural and residential uses will still reduce the level of indirect effects impacting the Jaguar.

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 reduce 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.

CONCLUSION

[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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the jaguar. As discussed below, even though the vulnerability is high for this species, pesticides are not a known threat to this species, the level of risk is low, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The jaguar has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the standard usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We anticipate very low levels of mortality (<0.1% from consumption of contaminated birds) and sublethal effects <1% reduction in reproductive success from consumption of contaminated birds) will occur on use sites. We do not anticipate mortality or sublethal effects in spray drift areas. We also anticipate an extremely small reduction in prey resource items in use areas and related to malathion usage for mosquito control purposes. However, we do not expect that adverse effects from mortality, sublethal effects, and reduction in prey resources will cause species-level effects because of the very low level of usage (<1%) within the non-Federal portion of the species range according to standard data. Furthermore, we anticipate the additional conservation measures above, including rain restrictions, aquatic habitat buffers, and residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The rain restriction is expected to provide time for the pesticide to degrade before runoff into aquatic habitats can occur, decreasing exposure and risk. The aquatic habitat buffers are expected to significantly reduce exposure to aquatic organisms and subsequent risk of direct and indirect effects. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 summary, we anticipate the very low usage, in addition to the conservation measures will reduce the likelihood of exposure of the species and its prey to malathion. Therefore, while some individuals may experience small reductions in available prey, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the jaguar in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: All populations stable, with none known to be increasing or decreasing
Pesticides noted ☐

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

The type locality for the Utah prairie dog is Buckskin Valley in Iron County, Utah (Pizzimenti and Collier 1975, p. 1). Genetic variance within Utah prairie dog populations is very low – less than half that commonly observed for black tailed prairie dogs (Chesser 1984; Ritchie and Brown 2005)). This may be the result of genetic drift in small populations (Chesser 1984). The Utah prairie dog (Cynomys parvidens), found only in southwestern and central Utah, was listed as an endangered species on June 4, 1973 (38 FR 14678). At the time of listing, the species was threatened by habitat destruction and modification, over-exploitation, disease, and predation. Subsequently, Utah prairie dog populations increased in portions of their range, and on May 29, 1984 (49 FR 22330), the species was reclassified as threatened with a special rule to allow regulated take of the species. This special rule was amended on June 14, 1991 (56 FR 27438), to increase the amount of regulated take allowed throughout the species' range. Recent Utah prairie dog population trends over the past 30 years appear to be stable to increasing, although the species remains vulnerable to several serious threats. These include habitat loss and fragmentation, plague, changing climatic conditions, unauthorized take, and disturbance from recreational and economic land uses. Urban expansion and plague comprise the most serious threats to Utah prairie dog populations. Not surprisingly, these threats also pose some of the most difficult management challenges. Either of these threats could potentially lead to extirpation of entire complexes and significantly increase extinction probabilities. Left unabated, these threats, especially in combination, would likely lead to long-term declines in range-wide population trends. Top-tier threats include plague and urban expansion. Mid-tier threats include over-grazing, cultivated agriculture, vegetation community changes, invasive plants, and Off-Highway Vehicle/recreational uses. Lowest-tier threats include climate change, energy resource exploration and development, fire management, poaching, and predation. Despite being ranked as lesser concerns on an individual basis, in combination with other threats to the species, lowest-tier threats could substantially contribute to increased extinction risk if left unabated.

EB/CE Source: U.S. Fish and Wildlife Service. 2012. Utah Prairie Dog (*Cynomys parvidens*) Revised Recovery Plan. U.S. Fish and Wildlife Service, Denver, CO. 169 pp.; 77 FR 46158

46183, August 2, 2012, Endangered and Threatened Wildlife and Plants; Revising the Special Rule for the Utah Prairie Dog.

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 Utah prairie dog is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	3% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 5% terrestrial invertebrates
Plants affected (decline in growth)	1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	6% terrestrial invertebrates

Risk modifiers:

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	332,658	5.92	0	0
Pasture	I	93,841	1.67	21,890	0.39
Open Space Developed	I	24,733	0.44	1,237	0.02
Developed	I	22,331	0.40	1,117	0.02
Other Crops	I	10,804	0.19	0	0
Other Grains	I	4,879	0.09	1,994	0.04
Corn	I	7,343	0.13	157	<0.01
Wheat	I	687	0.01	687	0.01
Orchards and Vineyards	I	17	<0.01	7	<0.01
Vegetables and Ground Fruit	I	32	<0.01	20	<0.01
Nurseries	I	74	<0.01	74	<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]		164,742	2.93	27,182	0.48
TOTAL[4]:		497,400	8.85	27,182	0.48

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: 5,617,267 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 4,115,450 acres, 73.264%

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 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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Utah prairie dog. As discussed below, even though the vulnerability is high for this species, risk to the species is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Utah prairie dog has a high level of vulnerability based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled uses across the range is low, as described above. We do not anticipate that malathion uses pursuant to the labels will result in mortality or sublethal effects.

We anticipate malathion usage within the range will be low based on the standard usage data we acquired, as decribed in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Although malathion use for mosquito control is anticipated to reduce populations of terrestrial invertebrates, a prey resource, by 6% across the range of the Utah prairie dog, estimated acreage where usage of malathion for mosquito control occurs does not overlap with the range of the species. We therefore do not anticipate that malathion use for mosquito control pursuant to the label will result in a reduction of prey resources for this species. Other effects to prey resources and plant resources in use areas and in spray drift areas due to reduced growth are estimated to be small in magnitude and not at a level that would cause a species-level effect. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. Given the lack of anticipated mortality or sublethal effects, the low risk to the species, and the low estimated usage within the non-Federal portions of the species range, we do not anticipate that small, temporary losses of invertebrate prey would result in impacts to growth, survival, or reproduction of individuals of this species and species-level effects are not anticipated.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Utah prairie dog.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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:

Tuttle (1979), U.S. Fish and Wildlife Service (1982), Mitchell (1998), Shapiro and Hohmann (2005), and Martin (2007) listed multiple factors that contributed to the initial decline of gray bats, including human disturbance, natural flooding, impoundment of waterways, and contamination from pesticides. Although human disturbance remains as the number one reason for the continued decline of some populations of gray bat (Tuttle 1979, 1987; Rabinowitz and Tuttle 1980; USFWS 1982; Mitchell 1998; Martin et al. 2000, 2003; Shapiro and Hohmann 2005; Martin 2007; Elliott 2008; Proffitt 2008) natural and man-made flooding remains a secondary threat at some gray bat sites (Sasse, pers. comm. 22 May 2008; Richard Stark, Tulsa, Oklahoma Ecological Services Field Office, pers. comm. 4 Apr 2009). Flash flooding in caves can also adversely affect gray bats by damaging gates at cave entrances that were constructed to protect roosting bats (Elliott 2008). Although pesticide contamination has been well documented in some populations of gray bats (Clark et al. 1978, 1980, 1983; Clawson and Clark 1989; Clawson 1991; Sasse 2005), Elliott (2008) suggested that the continued increase of gray bats coincided with the reduced use of pesticides in southern Missouri where the landscape was mostly covered in forest, pasture, and hay fields. Sasse (2005) noted that gray bats at four maternity caves in Arkansas remain exposed to pesticide residues but at lower levels than previously reported by others (Clark et al. 1988; Clawson and Clark 1989; Clawson 1991). Nonetheless, Sasse (2005) recommended that there should be continued periodic monitoring of pesticide residues in guano and carcasses of dead bats. Global warming/climate change could have a significant impact on gray bats. Bogan (2003) predicted that projected climate changes could impact bats by adversely affecting their food supply or the internal roosting temperature of caves. In Australia, Hughes (2003) demonstrated that the ranges of different species of flying foxes (*Pteroptus* spp.) had shifted due to recent rises in ambient temperature on that continent. Humphries et al. (2002) investigated the hibernation energetics of little brown bat (*Myotis lucifugus*) and predicted that global warming would cause climate-mediated energetic constraints on the distribution of this and other hibernating bats. It is projected that a rise in ambient temperature could make traditional and currently occupied hibernacula and maternity sites unsuitable for roosting gray bats and cause a shift in the species' range northward. This could

adversely affect the species' food supply, or affect the ability of bats to adequately deposit important fat reserves which are critical for *Myotis grisescens* to survive the hibernation season.

EB/CE Source: 2009 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: The gray bat is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	13% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 25% terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	14% terrestrial invertebrates

Risk modifiers: The range of the gray bat extends from southeastern Kansas and central Oklahoma east to western Virginia and western North Carolina, and from Missouri, Illinois, and Indiana south to southern Alabama and northern Florida.

Foraging of gray bats in summers is strongly correlated with open water of rivers, streams, lakes or reservoirs. Highly dependent on insects that emerge from aquatic habitats, especially mayflies, caddisflies, and stoneflies. The species is an opportunistic forager, however, and also consumes beetles and moths.

The species occupies cold hibernating caves or mines in winter and warmer caves during summer. It is noted that an estimated 95% of the species range wide population was confined to only nine caves. Although the species may travel up to 35 kilometers between prime feeding areas over lakes or rivers and occupied caves, most maternity colonies are usually located between 1-4 kilometers from foraging locations.

Allowable uses driving effects/other considerations: Gray bats forage mainly over water, therefore indirect effects resulting from malathion exposure on use sites and from spray drift may be over-estimated. Malathion-contaminated run-off from use areas into adjacent open water is expected to result in indirect effects if the water quality is reduced to an extent that aquatic invertebrate production is reduced.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	15,480,672	13.90	599,184	0.54
Open Space Developed	I	5,144,420	4.62	257,221	0.23
Corn	I	4,116,578	3.70	62,213	0.06
Developed	I	2,983,947	2.68	149,197	0.13
Other Crops	I	454,087	0.41	1,285	0.00
Cotton	I	448,402	0.40	48,264	0.04
Rice	I	378,099	0.34	38,055	0.03
Pine Seed Orchards	I	211,621	0.19	21,772	0.02
Wheat	I	176,244	0.16	38,851	0.03
Other Row Crops	I	77,455	0.07	10,050	0.01
Other Grains	I	77,385	0.07	25,042	0.02
Pasture	I	42,969	0.04	7,802	0.01
Sub-TOTAL (D):		0	0	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.

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]		14,111,208	12.67	659,754	0.59
TOTAL[4]:		29,591,879	26.58	1,258,938	1.13

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: 111,348,485 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 12,382,798 acres, 11.121%

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

CONSERVATION MEASURES

Rain restriction and aquatic habitat buffers: While the gray bat is not an aquatic species, it is known to rely on aquatic habitat for food resources or is otherwise closely associated with aquatic habitats and may experience effects to the prey base from malathion exposure in the aquatic system. Rain restrictions (which allow for malathion to degrade before runoff events can occur) and aquatic habitat buffers required of all agricultural and residential uses will reduce malathion exposure to these habitats and thus effects to the prey base of the gray bat.

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 reduce 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.

CONCLUSION

[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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Gray bat. As discussed below, even though the vulnerability is high for this species, risk is medium, and pesticides are a known threat to this species, the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Gray bat has a high level of vulnerability based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled uses across the range is medium, and estimated usage within the non-Federal portion of the species range is low (1.13%). We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. We do not anticipate that malathion uses pursuant to the labels will result in mortality or sublethal effects in use areas or in spray drift areas.

Foraging of Gray bats in summer is strongly correlated with open water of rivers, streams, lakes or reservoirs. This species is highly dependent on insects that emerge from aquatic habitats, especially mayflies, caddisflies, and stoneflies. The species is an opportunistic forager and also consumes beetles and moths. Open waters are not a use area where malathion is applied; however, we anticipate other malathion use areas adjacent to open waters will introduce contaminated run-off into open waters. Depending on the physical, chemical, and biological characteristics of the body of water, contaminants in run-off from adjacent use areas is anticipated to degrade water quality to the extent that production of aquatic invertebrates is adversely affected. For the purposes of this analysis, we extrapolated the data presented for reduction in terrestrial invertebrates and acknowledge that reduction in aquatic invertebrates is unlikely to be equal in magnitude, and likely will be of lesser magnitude. We anticipate some adverse effects will occur due to reduced prey resources. However, we do not expect species-level effects because of the extremely low level of usage (1.13%) within non-Federal portion of the species range. Furthermore, we anticipate the additional conservation measures above, including rain restrictions, aquatic habitat buffers, and residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The rain restriction is expected to provide time for the pesticide to degrade before runoff into aquatic habitats can occur, decreasing exposure and risk. The aquatic habitat buffers are expected to significantly reduce exposure to aquatic organisms and subsequent risk of direct and indirect effects. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. Given the lack of anticipated mortality or sublethal effects and the low estimated usage within the non-Federal portions of the species range, we do not anticipate that small, temporary losses of invertebrate prey would result in impacts to growth, survival, or reproduction of individuals of this species and species-level effects are not anticipated.

Therefore we do not anticipate that the Action would appreciably reduce survival and recovery of the Gray bat.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Herpailurus (=Felis) yagouaroundi cacomitli	Gulf Coast jaguarundi	22

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:

The Gulf Coast jaguarundi is found in the Tamaulipan Biotic Province, where it uses dense, thorny shrublands or woodlands and bunchgrass pastures adjacent to dense brush or woody cover. Caso (2013) found that radio-collared jaguarundis spent up to 40% of their time in tall, dense grass habitats but habitat analysis showed that the preferred habitat was the natural undisturbed forest. Primary known threats to the Gulf Coast jaguarundi are habitat destruction, degradation, and fragmentation associated with agriculture and urbanization, and, to some extent, border security activities. Mortality from collisions with vehicles is also a threat. Competition with bobcats may be a potential limiting factor in the northern portion of the jaguarundi's range (Sanchez-Cordero et al. 2008). Increases in temperature and decreases in precipitation resulting from climate change may also affect Gulf Coast jaguarundi populations through impacts on their habitat. Rapid population growth in the region is causing agricultural land to be converted to more urban development resulting in land and habitat fragmentation (Wilkins et al. 2000). Borderland factors that could impact Gulf Coast jaguarundis include urbanization (e.g. brush clearing for buildings, sewage dumped into the Rio Grande and its tributaries, and road construction and maintenance), water development (e.g. brush clearing, channeling, draining), agriculture (e.g. brush clearing, pesticide run-off), U.S. Border Patrol Operations (e.g. lighting; road construction and maintenance; tower construction and maintenance; brush clearing; human activity, including on and off-road vehicular activity) (Jahrsdorfer and Leslie 1988), and the construction of fences along the border (Defenders of Wildlife 2006 and 2012a,b; Gaskill 2011; McCorkle 2011). Also, there are 11 existing international bridges plus an international dam, and four more bridges under consideration within Cameron, Hidalgo, and Starr Counties in Texas that may act as east-west barriers for Gulf Coast jaguarundi movement. Barriers such as these can affect regional biodiversity, including jaguarundis, by destroying, fragmenting, and degrading habitat; disrupting the social structure of wildlife populations; reducing access to resources and habitats; and isolating and fragmenting animal populations (List 2007). The implementation of bridge projects in the region should seek opportunities to minimize potential wildlife impacts. Hunting jaguarundi is not legal in Mexico or in the U.S. However, jaguarundis may be subject to low intensity hunting pressure around settlements (Nowell and Jackson 1996).

EB/CE Source: 2013 Gulf Coast Jaguarundi Recovery Plan (*Puma yagouaroundi cacomitli*) 79 FR 661

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: Gulf coast jaguarundi have a low chance of mortality (<12%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, orchards and vineyards, cottons).

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 (from prey consumption)	0.5% birds, no effects from consumption of mammals and reptiles
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	2.5% (R, B –birds only), no effects from mammals and reptiles
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% birds, 12% reptiles and amphibians
Spray drift areas - Prey item mortality	Effects to reptiles and amphibians
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	0.2% reptiles and amphibians

Risk modifiers:

Allowable uses driving effects/other considerations: Overlap from cotton and orchards and vineyards use sites are driving anticipated direct effects to the jaguarundi, and a portion of the indirect effects. Effects resulting from exposure in both of these use sites is likely over-estimated, as the maximum application rate used in calculations is not completely representative of usage for this category within the range of the Gulf coast jaguarundi.

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 would 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	6,513,702	30.86	517,785	2.45
Other Grains	I	1,103,215	5.23	79,898	0.38
Open Space Developed	D, I	628,962	2.98	31,448	0.15
Developed	D, I	589,604	2.79	29,480	0.14
Cotton	D, I	525,554	2.49	162,115	0.77
Other Crops	I	208,297	0.99	0	0
Corn	I	195,792	0.93	4,101	0.02
Wheat	I	96,138	0.46	93,612	0.44
Vegetables and Ground Fruit	D, I	29,688	0.14	2,415	0.01
Other RowCrops	I	18,462	0.09	2,931	0.01
Orchards and Vineyards	D, I	12,698	0.06	4,438	0.02
Pasture	I	344	<0.01	344	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		1,786,507	8.46	229,897	1.09
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		3,408,754	16.15	410,782	1.95
TOTAL[4]:		3,408,754	16.15	410,782	1.95

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: 21,108,447 acres

[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.

% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 448,888 acres, 2.127%

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, which has other avoidance and minimization measures[5]), 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). In addition, the reduction in the maximum application rate for citrus (outside of California) is expected to reduce potential environmental concentrations to one-third of modeled values, reducing the effects to listed species and their prey on and adjacent to these use areas. These measures will help reduce the amount of malathion used and decrease potential exposure to the species.

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Gulf Coast jaguarundi. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Gulf Coast jaguarundi has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low

[5] See *Description of the Action* and the *Environmental Baseline* section of this Opinion for additional information on these measures.

amount of estimated usage (1.95%) within the non-Federal portion of the range of the species, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We anticipate that low levels of mortality caused by consumption of contaminated prey items, as well as low sublethal effects caused by prey consumption, will occur on use sites or from spray drift. We also anticipate a reduction in prey resources within use areas. While we do anticipate that adverse effects due to consumption of prey items and reduced prey resources will occur, we do not expect species-level effects because of the extremely low level of usage (1.95%) within the non-Federal portion of the species range. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. For cotton, as detailed in the *Environmental Baseline* for this Opinion, APHIS’ Boll Weevil Eradication Program (BWEP) includes uses of malathion that exceed application numbers and rates described here. However, we anticipate areas under the BWEP will be limited to 10 counties in the Lower Rio Grande Valley of Texas. While portions of these counties overlap habitat for the Gulf Coast jaguarundi, APHIS, through consultation with the Service, took additional species protection measures designed to avoid exposure to malathion. These measures are included in an APHIS 2018 informal consultation with the Service, where the Service concurred that the BWEP is not likely to adversely affect listed species or designated critical habitat. Thus, we anticipate that use of malathion through APHIS' BWEP will not have adverse effects on the Gulf Coast jaguarundi. In summary, while we anticipate that small numbers of individuals would be adversely affected over the duration of the Action, including low levels of sublethal reduction in reproductive success and loss of fitness from loss of prey, we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Gulf Coast jaguarundi in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Corynorhinus (=Plecotus) townsendii ingens	Ozark big-eared bat	25

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 most important factors in assuring the continuing existence of the Ozark big-eared bat are limiting human disturbance and vandalism at essential maternity sites and hibernacula, and protecting foraging areas from habitat loss. The Ozarks region is one of the fastest growing areas in the country due to relatively inexpensive land prices and the aesthetics of the area. Fragmentation and loss of foraging habitat, vandalism and increased human activity at known and undiscovered maternity roosts and hibernacula continue to be major concerns. The species was listed as endangered in 1979 due to its small population size, reduced and limited distribution, and vulnerability to human disturbance. At the time of listing, the species was known from only a few caves in northwestern Arkansas, southwestern Missouri, and northeastern Oklahoma. The entire population was estimated to consist of about 100-200 individuals. The population is estimated to currently consist of about 1,900 individual bats with 1,300 in Oklahoma and 600 in Arkansas. Since listing, additional caves have been located. Fourteen caves were considered essential (i.e., used as a maternity site and/or hibernacula) to the continuing existence of the species when the existing recovery plan was prepared in 1995. Six additional sites have been located since then for a current total of 20 known essential sites. Colonies at essential maternity sites and hibernacula have been monitored using minimal disturbance census techniques since each essential site was discovered. Mann-Kendall tests were used to determine if populations at each essential site showed a significant trend over the last 10 years. A significant increasing population trend was found at only four of 15 essential sites. Due to variability in the data from all other sites, no significant trends could be determined. Thus, population trends of individual colonies are not well explained by available monitoring data. Census counts indicate that the overall population has remained fairly stable since 1997. A recent genetics study provides further insight into the need to protect each maternity colony. Weyandt et al. (2005) examined population genetic variability and found that maternally inherited markers differed among sites, indicating very strong site fidelity and limited dispersal by females and high natal philopatry. Due to the natural tendency for limited dispersal by females and the apparent corresponding lack of connectivity among colonies, caves that experience a local extinction are unlikely to be naturally re-colonized. In conclusion, the species continues to meet

the definition of endangered, even though significant recovery accomplishments have occurred over the past 28 years since listing. Recovery criteria to downlist the species to threatened status have not yet been fully met. Based on population and distribution information and known geological formations, there are evidently essential sites that have not been discovered. Moreover, the human population in the Ozarks is rapidly increasing. As more people occur in the area and cave sites become less remote due to development, human entry and disturbance at essential sites likely will increase. Fragmentation and loss of foraging habitat due to development also remains a major threat. Therefore, the vulnerability of the species to extinction remains high because of its small population size, reduced and limited distribution, and susceptibility to human disturbance.

EB/CE Source: U. S. Fish and Wildlife Service. 2008. Ozark Big-Eared Bat (Corynorhinus townsendii ingens) 5-Year Review: Summary and Evaluation. Tulsa, Oklahoma. 44 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 species is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	4% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 11% terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	<0.1% terrestrial invertebrates

Risk modifiers: The species is an insectivorous bat that uses caves year-round. Distances between hibernacula and summer caves are known to range from 6.5 to 65 km. The range of the species was historically limited to caves in northwestern Arkansas, southwestern Missouri, and northeastern Oklahoma, although the species is believed to have been extirpated from Missouri.

The species has been shown to selectively forage in both edge and forested habitats and also to use habitats in proportion to their availability. Ozark big-eared bat prey on a wide diversity of moth species, and most of the species are dependent upon woody forest plants as a host. There is also a positive correlation between woody species richness and moth occurrence. Conservation of the Ozark big-eared bat, therefore, requires not only protection of important caves but also forested habitat that supports abundant and diverse moth populations.

Females forage relatively close to the maternity cave (about 1.0 – 2.0 km) during the early and middle portions of the maternity season. Female bats likely forage only short distances from the cave in order to return several times during the night to take care of flightless young. As the season progresses, average distance to foraging sites (up to about 7.3 km) increases. Foraging farther distances from the cave later in the summer may reduce competition with newly volant young that have begun to forage.

The species is not expected to utilize rice or developed use sites.

Allowable uses driving effects/other considerations: The Ozark big-eared bat forages on moths dependent on forested habitat therefore indirect effects predicted on use sites or from spray drift may be over-estimated.

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	2,333	0.02	88	<0.01
Open Space Developed	I	363,561	3.70	18,178	0.19
Developed	*	168,647	1.72	8,432	0.09
Rice	*	84,882	0.86	33,361	0.34
Corn	I	34,357	0.35	7,372	0.08
Other Crops	I	26,552	0.27	0	0
Wheat	I	5,277	0.05	5,277	0.05
Other Grains	I	4,538	0.05	4,538	0.05
Other RowCrops	I	2,070	0.02	341	<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	%
Pasture	I	1,040	0.01	781	0.01
Orchards and Vineyards	I	1,001	0.01	175	<0.01
Vegetables and Ground Fruit	I	32	<0.01	46	<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]		438,428	4.47	36,694	0.37
TOTAL[4]:		440,761	4.49	36,782	0.37

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: 9,818,096 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,718,760 acres, 17.506%

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 reduce 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.

CONCLUSION

[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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Ozark big-eared bat. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Ozark big-eared bat has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with an extremely low amount of estimated usage (0.37%) within the non-Federal portion of the range of the species. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use areas or in spray drift areas. This species consumes terrestrial invertebrates, mostly moths, in foraging areas that are mainly comprised of forested areas and edge habitat. Malathion usage on any use site is expected to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). We anticipate a reduction in prey resources within use areas and in spray drift areas. However, the usage within the species range includes areas where Ozark big-eared bat are unlikely to forage (i.e., rice and open space developed). Therefore, while we anticipate losses of invertebrate prey will result in effects to small numbers of individuals, we do not expect that such losses would result in impacts to growth, survival, or reproduction of individuals of this species because of the extremely low level of usage (0.38%) within the non-Federal portion of the species range and the low likelihood of foraging expected to occur in usage areas. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. In summary, we anticipate the extremely low usage, the low risk to the species, and the implementation of conservation measures will reduce the likelihood of exposure of the species and its prey to malathion. Therefore, while some individuals may experience small losses in available prey, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not expect species-level effects to occur. Based on this analysis, we do not anticipate that the Action would appreciably reduce survival and recovery of the Ozark big-eared bat in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: All populations stable, with none known to be increasing or decreasing
Pesticides noted ☐

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

Range-wide population within hibernacula and maternity colonies has increased since the time of listing. The documented range of the species has expanded from the time of listing as well. Additional caves with significant hibernacula have been discovered in North Carolina. Notable progress has been made protecting major hibernacula and maternity caves through the use of gates, fences, and signed closures and an effective periodic monitoring program has been implemented rangewide. Threats still include loss of cave habitat from quarries and mining activities, the presence of oil and brine separation pits, and the loss of foraging habitat through development and road construction. Wind farm projects are a significant emerging threat. White nose syndrome may also pose a threat to the species in the future.

EB/CE Source: U. S. Fish and Wildlife Service. 2008. Virginia Big-Eared Bat (*Corynorhinus townsendii virginianus*) 5-year Review: Summary and Evaluation. West Virginia Field Office, Elkins, West Virginia.

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 Virginia big-eared bat is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	6% terrestrial invertebrates
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	17% terrestrial invertebrates

Risk modifiers: The Virginia big-eared bat is an insectivorous bat that uses caves year-round. Distances between hibernacula and summer caves are known to range from 6.5 to 65 km. The range of the species includes Pendleton County, West Virginia; Lee County and surrounding counties, Kentucky; Carter and Johnson Counties, Tennessee; Bath, Highland, Rockingham, Bland, and Tazewell Counties, Virginia; and Avery and Watauga Counties, North Carolina.

The Virginia big-eared bat inhabits caves typically in limestone karst regions dominated by mature hardwood forests of hickory, beech, maple, and hemlock. The Virginia big-eared bat feed principally on moths, foraging over fields and woods and along forested edges. Individuals routinely travel 3-5 miles from roost cave to foraging areas.

Allowable uses driving effects/other considerations: Overlap with developed and open space developed account for most indirect effects anticipated.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	2,067,538	17.27	0	0
Open Space Developed	I	427,465	3.57	21,373	0.18
Developed	I	224,993	1.88	11,250	0.09
Corn	I	75,866	0.63	6,032	0.05
Pasture	I	7,795	0.07	1,992	0.02
Other Grains	I	6,053	0.05	1,422	0.01
Other Crops	I	3,994	0.03	1	<0.01
Wheat	I	2,196	0.02	1,404	0.01
Nurseries	I	1,066	0.01	1,066	0.01
Christmas Trees	I	693	0.01	565	<0.01
Orchards and Vineyards	I	386	0.00	370	<0.01
Vegetables and Ground Fruit	I	169	0.00	161	<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]		750,677	6.27	45,638	0.38
TOTAL[4]:		2,818,214	23.55	45,638	0.38

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: 11,968,422 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 3,682,727 acres, 30.770%

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

[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.

limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Virginia big-eared bat. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Virginia big-eared bat has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (0.38%) within the non-Federal portion of the range of the species. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use sites or from spray drift. This species consumes invertebrates, therefore malathion usage on any use site is expected to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). We therefore anticipate a reduction in prey resources within use areas and from spray drift. The largest areas of species range overlap with usage areas are developed and open space developed uses, which are noted to have less potential for spray drift than other uses. Also, the Virginia big-eared bat feeds principally on moths, foraging over fields and woods and along forested edges, and is less likely to forage in malathion use areas. We anticipate that some adverse effects due to reduced prey resources may occur. However, while we anticipate losses of invertebrate prey will result in effects to small numbers of individuals, we do not expect that such losses would result in impacts to growth, survival, or reproduction of individuals of this species because of the extremely low level of usage (0.38%) within the non-Federal portion of the species range and the low likelihood that foraging will occur in usage areas. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 summary, we anticipate the extremely low usage, the low risk to the species, and the implementation of conservation measures will reduce the likelihood of exposure of the species and its prey to malathion. Therefore, while small numbers of individuals of the species may experience small losses in available prey, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Virginia big-eared bat in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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 ocelot uses a wide range of habitats throughout its range. Ocelots have been observed in thornscrub and semi-arid vegetation, coastal grasslands and coastal tropical forests, tropical dry forests, tropical rain forests, oaks and grasslands, piedmont/montane scrub, cloud forest, pine-oak forests, and fir forests. An understanding of ocelot movements during dispersal is central to evaluating the impact of habitat fragmentation on populations, and evaluating the potential for corridors as a possible remedy for fragmentation. One study suggested that ocelots disperse between 2.5 – 9 km, mostly using narrow (5-100 m) corridors of brush during along remnants of former river meanders and drainage ditches. Rivers, former river meanders, irrigation canals, irrigation drains, natural drainages, shorelines, fencelines, and brushy road margins all provide suitable travel corridors for ocelots, especially as density and percent-cover of thornscrub vegetation increase (Tewes et al. 1995). Where a corridor of thornscrub passed through otherwise barren agricultural fields, Tewes et al. (1995) recommended grass-forb strips to enhance eastern cottontail populations. They also recommended managing for wide corridors, dense thornscrub cover, earthen ridges or rows of trees to screen corridors from urban developments, retaining vegetation on at least one side of irrigation canals and drains, and reduced frequency of prescribed fire on margins of farms and ditches.

EB/CE Source: 2016 Recovery Plan for the Ocelot (Leopardus pardalis) First Revision

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: Ocelots have a low chance of mortality (<10%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, cotton, 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 from dietary items	<1% birds, no effects from mammals and reptiles
Spray drift areas – mortality	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	2% (R, B – low effects, birds only), no effects from consumption of 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% birds, 13% reptiles and amphibians, <0.1% mammals
Spray drift areas - Prey item mortality	Effects to reptiles and amphibians
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal – growth (G), reproduction (R) and behavior (B)	No effects expected
Indirect	2% reptiles and amphibians

Risk modifiers: The current ocelot range extends from extreme southern Texas and southern Arizona (although recent documentation in Arizona is sparse) through the coastal lowlands of Mexico to Central America, Ecuador and northern Argentina. It does not occur south of the Province of Entre Rios in Argentina. The ocelot also is known from Trinidad and Isla de Margarita, Venezuela, but not from the Antilles. There are no recent verified reports of ocelots from California or Florida.

Habitats used by the ocelot throughout its range vary from tropical rainforest, pine forest, gallery forest, riparian forest, semi-deciduous forest, and dry tropical forest, to savanna, shrublands, and marshlands. In south Texas, the ocelot inhabits dense thorn scrub communities on Laguna Atascosa National Wildlife Refuge and on private lands in three Texas counties. Arizona ocelots appear to be associated with Madrean evergreen woodland, semidesert grassland, and Great Basin grassland biotic communities.

The ocelot feeds primarily on cottontail rabbits, rodents, birds, and lizards. The ocelot is moderately mobile, and will utilize or travel through pesticide use sites such as golf courses, right of ways, managed forests, rangelands, and orchards and vineyards (Pers. Comm 2016 co-occurrence information, USFWS field office request). They can travel along canal and brush corridors that border and bisect rangelands and may cut through rangelands to reach preferred habitat. Additionally, many prey species are found in rangelands to forage and/or move between other habitat patches. However, they are very cover dependent in terms of vegetation structure,

so time in open spaces for travel is likely to be as limited as possible. Prey species may be found in open spaces (especially rodents) to forage and/or move between more suitable habitat patches (Pers. Comm 2016 co-occurrence information, USFWS field office request).

Allowable uses driving effects/other considerations: Mortality and sublethal effects calculated are mostly attributable to overlap with cotton and orchards and vineyards use sites. However, as the maximum application rate used in calculations is not completely representative of usage for this category within the range of the ocelot, these effects are likely over-estimated. In addition, use of developed and open space developed use sites by the ocelot is considered possible, but unlikely. These areas were left in the analysis, but effects attributed to malathion usage in these areas are likely over-estimated.

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 would 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	6,414,951	26.20	211,271	0.86
Other Grains	I	1,087,326	4.44	81,764	0.33
Open Space Developed	D, I	663,314	2.71	33,166	0.14
Developed	D, I	601,104	2.46	30,055	0.12
Cotton	D, I	511,580	2.09	163,528	0.67
Other Crops	I	249,136	1.02	0	0
Corn	I	171,187	0.70	4,224	0.02
Wheat	I	96,190	0.39	96,190	0.39
Vegetables and Ground Fruit	D, I	29,786	0.12	2,678	0.01
Other RowCrops	I	18,462	0.08	2,931	0.01
Orchards and Vineyards	D, I	14,918	0.06	5,536	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	%
Pasture	I	5,397	0.02	5,328	0.02
Sub-TOTAL (D): *Other uses with direct effects only*[3]		1,820,702	7.44	234,964	0.96
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		3,448,399	14.09	425,400	1.73
TOTAL[4]:		9,863,350	40.29	636,671	2.59

Malathion usage on any use site has the potential to result in mortality to reptile and amphibian prey resources from spray drift to (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: 24,479,995 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,864,688 acres, 7.617%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the ocelot. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is low, and the implementation of the conservation measures are expected to further reduce the likelihood of

[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.

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

The ocelot has a high vulnerability based on its status, distribution, and trends, as described above. Pesticides are a noted threat to the species. The risk to the species posed by labeled uses is low, with a low amount of estimated usage (2.61%) within the non-Federal portion of the species range based on standard usage data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

Mortality (<1%) is anticipated to occur from consuming contaminated birds. We anticipate 2 percent or less of exposed individuals across the species range will experience sublethal effects to reproduction and behavior by consuming contaminated prey. Ocelots feed primarily on cottontail rabbits, rodents, birds, and lizards. We estimated that across the species range, annual malathion uses pursuant to the labels would result in the loss of about 4% of birds, 15% of reptiles and amphibians (with 13% on use sites and 2% due to mosquito control), and less than 0.1% of mammals on use sites; spray drift is expected to lead to additional mortality to amphibians and reptiles. Although usage is not expected on all use sites at the maximum rates allowed by the labels wherever used each year, we anticipate that usage will occur in up to approximately 2.59% of the species range annually based on standard past usage data provided above. The ocelot is moderately mobile, and will utilize or travel through pesticide use sites such as golf courses, right of ways, managed forests, rangelands, and orchards and vineyards (Pers. Comm 2016 co-occurrence information, USFWS field office request). Although prey species are found in rangelands for foraging and in open areas traversed by ocelots as they move between suitable habitat patches, ocelots are very cover dependent, thus time in open spaces for travel is likely limited. Mortality and sublethal effects calculated above are mostly attributable to range overlap with cotton and orchard and vineyard use sites. Because the maximum application rate used in calculations is not completely representative of usage for these categories within the range of the ocelot, these effects are likely over-estimated. Additionally, use of developed and open space developed use sites by ocelots is unlikely; thus, the effects attributed to malathion usage in these areas are also likely overestimated. We do not anticipate species-level effects for the ocelot because estimated usage is low (2.61%) within the non-Federal portion of the species range, time spent moving between suitable habitat patches is likely limited, and because the effects to the species based on the risk analysis are likely overestimated. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. While we anticipate that small numbers of individuals would be adversely affected, including low levels sublethal reduction in reproductive success and loss of fitness from loss of prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the ocelot in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Peromyscus polionotus allophrys	Choctawhatchee beach mouse	34

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:

In 2018, a Category 5 hurricane hit and severely affected the eastern portion of the Choctawhatchee beach mouse population's habitat and caused a decline in beach mouse numbers with a storm surge in some parts up to 18 feet. Other state parks in the western portion of the range have also shown a decline or localized extirpation. Evidence suggests this may be from non-native predators, such as outdoor/feral cats (pers. comm. K. Yanchis and E. Grendel, 2018 *in* USFWS 2019). The degree of threat to Choctawhatchee beach mouse's persistence remains high. Impacts to the Choctawhatchee beach mouse and its habitat quality have increased in the recent past from feral cat populations and residential and commercial development. With the additional stress of recent active hurricane seasons, many populations are currently fragile. Predator control programs have been in place on public lands since 1996, though non-native predators continue to pose a major threat to beach mice. track tube monitoring, which allows us to measure presence/absence of mice and an indication of trends overtime, shows currently the Choctawhatchee beach mice are present at Topsail Hill Preserve State Park, Grayton Beach State Park, St. Andrews State Park, and Shell Island/West Crooked Island (FWC 2018). These data show a sharp decline at Deer Lake State Park and may indicate possible extirpation. These data also suggests the occurrence of mice at Topsail Hill Preserve State Park is relatively stable; Grayton Beach State Park is moderately stable with sharper fluctuations since the 2012 reintroduction, St. Andrews State Park is increasing since the 2016 reintroduction, and Shell Island/West Crooked Island was severely impacted by Hurricane Michael in 2018 thus declined from previous years. We suspect there may be individiuals on some adjacent private lands as evidence has been observed by the USFWS Choctawhatchee beach mouse recovery biologist. The Grayton Beach and Deer Lake populations cannot be characterized as self-sustaining, as the occupancy continue to fluctuate since the 2012 translocation. Due to coastal development, from the Choctawhatchee beach mice historic range of 53 miles of coastal dune habitat (50 FR 23872), an estimated 10 to 15 miles remain. Approximately 2,500 acres of Choctawhatchee beach mouse habitat currently exists. While approximately 96 percent of their remaining habitat is public land, due to recent hurricanes and increasing recreational pressure on public lands, habitat loss and degradation remain as threats to beach mice. Maintaining habitat on private lands continues to be imperative to preserve connectivity and allow for population expansion (USFWS, 2019). Much

of the remaining coastal dune habitat is degraded due to fragmentation from residential and commercial development, impacts from tropical storms, recreational pressure, introduction of non-native predators, and other anthropogenic factors.

EB/CE Source: U.S. Fish and Wildlife Service. September 4, 2007. Choctawhathee Beach Mouse (Peromyscus polionotus allophrys) 5-Year Review: Summary and Evaluation. 25 pp.

U.S. Fish and Wildlife Service. 2019. Choctawhatchee Beach Mouse (*Peromyscus polionotus allophrys*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Panama City, Florida. 26 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: Choctawhatchee beach mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, 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	<0.1% across dietary items
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	28% invertebrates
Spray drift areas - Prey item mortality	Effects to invertebrates
Plants affected (decline in growth)	23%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	68% terrestrial invertebrates, no effects to plants

Risk modifiers:

Allowable uses driving effects/other considerations: Overlap with developed and pine seed orchards use sites accounts for most anticipated effects to prey species.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	11,467	67.76	836	4.94
Developed	D, I	3,335	19.71	167	0.99
Pine Seed Orchards	I	928	5.48	25	0.15
Open Space Developed	D, I	547	3.23	27	0.16
Nurseries	I	3	0.02	3	0.02
Other Crops	I	1	0.01	0	0
Other Row Crops	I	1	0.01	1	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		3,883	23	194	1.15
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		4,816	28.46	1,126	1.33
TOTAL[4]:		16,283	96.22	1,962	6.27

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: 16,922 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: 4,032 acres, 23.826%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Choctawhatchee beach mouse.

The Choctawhatchee beach mouse has a high vulnerability based on its status, distribution, and trends, as described above. The species is a narrow endemic, confined to an estimated 10 to 15 miles of coastal dune habitat across three or four populations. The Choctawhatchee beach mouse occupies frontal dunes (primary and secondary) and scrub dune habitats (USFWS 2019). The diet of the species consists mainly of plant resources found growing in frontal and scrub dune habitat, including beach grass and sea oats, which are often found stored in their burrows (USFWS 1987). The species also likely consumes invertebrates, especially when other resources are scarce (e.g., late winter or early spring) (USFWS 1987, USFWS 2010).

The risk to the species posed by labeled malathion uses across the range is medium. We anticipate a very low level of mortality and no sublethal effects within use areas, and no mortality or sublethal effects within spray drift areas. However, we anticipate that malathion usage pursuant to the label will result in a high level of reduction in terrestrial invertebrates within the non-Federal portion of the species range (28% within usage areas and 68% within mosquito control areas) upon which the species depends seasonally when plant resources are otherwise scarce. However, usage is anticipated to be 6.27% annually with exposure by mosquito control (4.94%) and developed uses (~1%) constituting the highest use categories. Any adverse effect to the species caused by malathion use pursuant to the label is therefore mostly attributed to the reduction in prey resources (i.e., terrestrial invertebrates) related to mosquito control

activities. Additionally, across the species range, annual malathion usage pursuant to the labels is anticipated to result in a 23 percent decline in growth of plants within the limited usage areas.

As described above, we anticipate a medium amount of estimated usage within the non-Federal portion of the range (6.27%) based on standard data. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Federal lands constitute approximately 24% of this species range and other public lands makeup a significant portion of the remainder. The largest malathion usage overlap with the species range is with mosquito control (4.94%) which is anticipated to result in a 68% reduction in terrestrial invertebrates in that limited portion of the species' range. Through analysis of local mosquito control district information, we believe that use at known Choctawhatchee beach mouse habitat areas in Topsail Hill Preserve State Park, Grayton Beach State Park, St. Andrews State Park, and Shell Island/West Crooked Island are likely minimal with spraying routes utilized that largely avoid these habitat areas (Okaloosa County Florida 2021a, Walton County Florida 2021a, Panama City Beach Florida 2021). In addition, malathion does not currently appear to be among the mosquito adulticides used in the counties where the species is extant (Okaloosa County Florida 2021b, Walton County Florida 2021b, Bay County Florida 2021). We acknowledge that use of malathion is possible and is not restricted from use in these areas during the lifespan of the Action. However, it appears unlikely that these public lands, where the Choctawhatchee beach mouse is extant, would be developed or experience other changes that would result in an increased likelihood of mosquito adulticide applications. Furthermore, mosquito adulticide operations are expensive and generally focused on residential and other populated areas and are less likely to occur in or in the vicinity of the species' habitat areas, especially given the anticipated continued use of the spraying routes.

The Choctawhatchee beach mouse is highly vulnerable and is reliant upon terrestrial invertebrates when plant resources are unavailable. However, given the best available information, we conclude that exposure to malathion from agricultural sources is very limited and exposure of a very small number of individuals from mosquito control efforts are possible, but are likely limited to the interface of developed areas adjacent to the remaining habitat, which we anticipate to be very limited in duration and geographic scope. The species' status as a narrow endemic reduces its resiliency and its ability to simply move to another area to seek additional food resources, but recovery and regulatory documents have identified neither pesticides nor malathion specifically as a threat to this species to date. We therefore anticipate that the reduction in food resources (i.e., terrestrial invertebrates), upon which the species relies when plant resources are scarce, will result in small reductions to the forage base of small numbers of individuals of this species during a portion of the year. However, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. While we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from seasonal loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we anticipate that the Action would not appreciably reduce survival and recovery of the Choctawhatchee beach mouse.

Conclusion: Is not likely to jeopardize

ADDITIONAL REFERENCES

Bay County Florida Mosquito Control District website. 2021. Accessed January 2021 at: https://www.baycountyfl.gov/248/Mosquito-Control-Services

Panama City Beach Florida Mosquito Control District website. 2021. Accessed January 2021 at: http://www.pcbeachmosquito.org/eventsnews/.

Okaloosa County Florida Mosquito Control District website. 2021a Accessed January 2021 at: http://www.myokaloosa.com/sites/default/files/users/pwuser/SouthCountyFWBArea2.pdf

Okaloosa County Florida Mosquito Control District website. 2021b. Accessed January 2021 at: http://www.co.okaloosa.fl.us/sites/default/files/users/pwuser/spray_schedule.pdf.

U.S. Fish and Wildlife Service. 1987. Recovery Plan for the Choctawhatchee, Perdido Key and Alabama Beach Mouse. U.S. Fish and Wildlife Service, Atlanta, Georgia. 45 pp.

U.S. Fish and Wildlife Service. 2010. Recovery plan for the St Andrews beach mouse (*Peromyscus polionotus peninsularis*). U.S. Fish and Wildlife Service, Atlanta, Georgia. 95 pp.

U.S. Fish and Wildlife Service. 2019. Recovery Plan for Choctawhatchee Beach Mouse (*Peromyscus polionotus allophyrs*). U.S. Fish and Wildlife Service, Atlanta, Georgia. 12 pp.

Walton County Florida Mosquito Control District website. 2021a. Accessed January 2021 at: https://southwaltonmosquitocontrol.org/operations/spray-zones-and-route-history/.

Walton County Florida Mosquito Control District website. 2021b. Accessed January 2021 at: https://southwaltonmosquitocontrol.org/operations/products-in-use/

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Peromyscus polionotus trissyllepsis	Perdido Key beach mouse	35

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:

Perdido Key beach mouse population numbers are at a suspected all time high largely due to the absence of recent hurricanes. There are populations at each of the three public lands on Perdido Key. The recent slump over the past several years in development within the species range has lessened the continual pressure from development and habitat loss. However, development interests on Perdido Key are starting to return. Currently, feral and outdoor cats appear to be minimized, though the threat is still relevant. Despite the current status of populations, the threats have not been abated and will likely increase as development paradigms shift on Perdido Key. Perdido Key beach mouse is mainly threatened by habitat destruction and fragmentation, and recovery Actions for the species will always be in conflict with development. In addition, they are vulnerable to feral cats and tropical storm events. Even considering their current status and quality of their habitat, populations may not be able to persist following a stochastic event (i.e., unnatural predator levels, loss of habitat, tropical storm event). Development activity is beginning to show signs of a rise, and likely to peak once again. Habitat conservation and preservation are needed to ensure the species has suitable habitat and corridors to repopulate from in the event of a threat that causes a population crash.

EB/CE Source: U.S. Fish and Wildlife Service. December 5, 2014. Perdido Key Beach Mouse (*Peromyscus polionotus trissyllepsis*) 5- Year Review: Summary and Evaluation. 32 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: Perdido key beach mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, 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	<0.1% across dietary items
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	34% terrestrial invertebrates
Spray drift areas - Prey item mortality	Effects to terrestrial invertebrates
Plants affected (decline in growth)	26%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	96% terrestrial invertebrates, no effects to plants

Risk modifiers:

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	33,836	96.01	27,773	78.81
Developed	D, I	6,012	17.06	301	0.85
Open Space Developed	D, I	3,077	8.73	154	0.44
Pine Seed Orchards	I	2,676	7.59	25	0.07
Other Crops	I	157	0.45	0	0
Corn	I	139	0.39	69	0.20
Other Row Crops	I	120	0.34	102	0.29
Cotton	D, I	74	0.21	74	0.21
Other Grains	I	26	0.07	26	0.07
Wheat	I	7	0.02	7	0.02
Orchards and Vineyards	I	6	0.02	6	0.02
Sub-TOTAL (D): *Other uses with direct effects only*[3]		9,163	26.00	527	1.50
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		12,295	34.89	3,413	2.17
TOTAL[4]:		46,131	130.89	31,186	80.98

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: 35,243 acres[5]
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,391 acres, 3.946%

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

[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] Range information gathered from existing recovery documents suggests the species range is greatly reduced from the estimate shown here. Given that statement, it appears the percentage of the range on federal lands is greatly increased, and we consider this a preliminary estimate for the purposes of the draft Biological Opinion.

limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Perdido Key beach mouse.

The Perdido Key beach mouse has a high vulnerability based on its status, distribution, and trends, as described above. The species is a narrow endemic, known primarily from three populations within public parks on Perdido Key near the Alabama and Florida border. The risk to the species posed by labeled malathion uses across the range is medium, with a high amount of estimated usage (80.98%, using the preliminary estimate) within the non-Federal portion of the species range based on standard data, as described above. While local mosquito control efforts in Escambia County Florida do not rule out mosquito adulticide control operations in Perdido Key beach mouse habitat, based on information about the pesticides that are used by the County, we expect is unlikely that malathion will be the product used (Escambia County Florida 2021). We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species in these areas, per the rationale related to usage on Federal lands as described in the Biological Opinion.

The Perdido Key beach mouse occupies frontal and scrub dune habitat, with approximately half of its range occurring within one Federally-managed area (Gulf Islands National Seashore) and two state-managed areas (one in Alabama, the other in Florida) (USFWS 2014). We anticipate that exposure on Federal lands to be infrequent and minimal at most based on the low anticipated levels of usage. The diet of the species consists mainly of plant resources found growing in frontal and scrub dune habitat, including beach grass and sea oats, which are often found stored in their burrows (USFWS 1987). The species also likely consumes invertebrates, especially when other resources are scarce (e.g., late winter or early spring) (USFWS 1987, USFWS 2010). The adverse effect to the species caused by malathion use pursuant to the label is mostly attributed to the reduction in prey resources (terrestrial invertebrates) in usage areas. We also estimate that in usage areas, annual malathion usage pursuant to the labels will result in a decline in growth of exposed plants by 26 percent. However, given the best available information, we conclude that exposure to malathion from agricultural sources is very limited, and exposure from mosquito control efforts will be limited to the interface of developed areas adjacent to the remaining habitat, if any. We anticipate the latter to be very limited in duration and geographic scope. We anticipate that malathion usage pursuant to the label will result in a high level of reduction in

terrestrial invertebrates within the non-Federal portion of the species range (34% on usage areas and 96% within mosquito control areas, based on the preliminary estimate) upon which the species depends seasonally when plant resources are otherwise scarce. However, given the species restricted range that is found within largely protected lands, we anticipate usage to be much lower than the values estimated preliminarily. We therefore do not expect species-level effects to the Perdido beach mouse. The Perdido beach mouse is seasonally reliant on terrestrial invertebrates as a food resource, and its status as a narrow endemic species reduces its resiliency and its ability to simply move to another area to seek additional food resources. However, while we anticipate some individuals will exposed to malathion (primarily from mosquito adulticide operations and effects to plant growth), we anticipate the effects of malathion on the species would be limited to effects to forage items (e.g., invertebrate prey and plants) for a few individuals and would not result in species-level effects. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. While we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from seasonal loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we anticipate that the Action would not appreciably reduce survival and recovery of the Perdido Key beach mouse.

Conclusion: Is not likely to jeopardize

ADDITIONAL REFERENCES

Escambia County Florida. 2021. Mosquito adulticide products used for county fogging operations. Website accessed January 2021: https://myescambia.com/our-services/natural-resources-management/mosquito-control/fogging-operations/products-used.

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U.S. Fish and Wildlife Service. 2014. Perdido Key Beach Mouse (*Peromyscus polionotus trissyllepsis*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Atlanta, Georgia. 32 pp.

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Dipodomys nitratoides exilis	Fresno kangaroo rat	37

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:

The Fresno kangaroo rat (*Dipodomys nitratoides exilis*) is one of three subspecies of the San Joaquin kangaroo rat (*Dipodomys nitratoides*) (Grinnell 1921). The Fresno kangaroo rat subspecies is limited in distribution to the flat valley floor of the San Joaquin Valley from Merced County to the northern border of Kings County, California and is the smallest of the three subspecies of San Joaquin kangaroo rat (Williams et al. 1993). Since 1974, over 80 percent of the suitable habitat for Fresno kangaroo rats has been lost to agriculture and development. The Fresno kangaroo rat continues to be threatened by degradation to its habitat from the on-going modification and conversion of existing habitat to agriculture, water banking projects, and development. Currently, flooding, illegal rodenticide use, competition with Heerman's kangaroo rats and climate change are threats to Fresno kangaroo rats. The Fresno kangaroo rat is also threatened by factors such as the buildup of vegetation and thatch on preserved lands. Some progress has been made toward the downlisting criteria with the preservation of 2,188 acres of Fresno kangaroo rat habitat (400 acres at the Alkali Sink Ecological Reserve and 1,788 acres at the Kerman Ecological Reserve) and the potential for preservation of between 220 and 943 acres of suitable habitat at the proposed Alkali Sinks Conservation Bank. This progress, however, is moot if populations of the Fresno kangaroo rat cannot be found. At the time of listing in 1985, there were two confirmed populations of Fresno kangaroo rats, both of them on the Alkali Sink Ecological Preserve in Fresno County. An intensive trapping effort in 1982 of 4,808 trap-nights identified seven individuals at these two sites (Hoffman and Chesemore 1982). Since the publication of the Recovery Plan in 1998, no populations of Fresno kangaroo rat have been found. The last capture of a Fresno kangaroo rat was at the Alkali Sink Ecological Reserve in 1992. Subsequent surveys by California Department of Fish and Game biologists at the Alkali Sink Ecological Reserve and the Kerman Ecological Reserve in 1993, 1994, and 1995 found no Fresno kangaroo rats (K. Thomlinson, California Department of Fish and Game, in litt. 2009). In 2004, the biologists at the Endangered Species Recovery Program conducted a scent dog survey but no Fresno kangaroo rats were found. In 2008 and 2009, California Department of Fish and Game biologists again surveyed at the preserve but there were no detections of Fresno kangaroo rats (Tomlinson, in. litt. 2009). The absence of Fresno kangaroo rats during these surveys is of great concern. It is probable that the populations on the preserved lands at the Alkali Sink

Ecological Preserve and the Kerman Ecological Preserve have been extirpated and the cause is unknown. Unsurveyed habitat exists in the heart of the range of the Fresno kangaroo rat in western Madera, eastern Merced and in Fresno County. At this time the status of the Fresno kangaroo rat remains unknown.

EB/CE Source: U. S. Fish and Wildlife Service. February 16, 2010. Fresno Kangaroo Rat (Dipodomys nitratoides exilis) 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office, Sacramento, California. 22 p.

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 Fresno kangaroo rat is not expected to enter malathion use sites and is not expected to experience mortality or sublethal effects 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 terrestrial invertebrates
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	90% terrestrial invertebrates, no effects to plants

Risk modifiers: The known historical geographic range of the Fresno kangaroo rat encompassed an area of grassland and chenopod scrub communities on the San Joaquin Valley floor, from about the Merced River, Merced County, on the north; to the northern edge of the marshes surrounding Tulare Lake, Kings County, on the south; and extending from the edge of the Valley

floor near Livingston, Madera, Fresno, and Selma, westward to the wetlands of Fresno Slough and the San Joaquin River. Currently, there are no known populations within the circumscribed historical geographic range in Merced, Madera, and Fresno counties. A single male Fresno kangaroo rat was captured twice in autumn 1992 on the Alkali Sink Ecological Reserve, west of Fresno. Trapping at other sites in Merced, Madera, and Fresno counties between 1988 and 1995 has failed to locate other extant populations. In Kings County, two populations of San Joaquin kangaroo rats were found on about 371 acres (ac.) in 1994 and 1995. One site, Lemoore Naval Air Station, is 97 ac. Whether these populations belong to the Fresno or Tipton subspecies is uncertain; historically, their ranges were contiguous.

The Fresno kangaroo rat feeds primarily on seeds from native and nonnative forbs and grasses in grassland/herbaceous and shrubland/chaparral habitats. Insects make up about 10 percent of their diet. They also eat some types of green, herbaceous vegetation. This rat is non-migratory, has low mobility and dispersal, as the remaining habitat is too fragmented for dispersal. There are approximately 32,234 hectares (ha) (79,651 ac.) remaining in natural habitat that would be suitable for the Fresno kangaroo rat. However, these parcels are fragmented and separated by large expanses of unsuitable habitat. Due to the degree of habitat fragmentation, dispersal would not be possible. Conversion of natural habitat to agriculture completely eliminates the use of the habitat by the Fresno kangaroo rat.

As the Fresno kangaroo rat is unlikely to utilize malathion use sites (Pers. Comm 2016 co-occurrence information, USFWS field office request), those uses were not considered for this assessment.

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 items exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	3,239,540	90.42	9,100	0.25
Pasture	*	226,861	6.33	32,181	0.898
Orchards and Vineyards	*	1,064,184	29.70	5,380	0.150
Other Crops	*	279,917	7.81	0	0
Wheat	*	210,122	5.87	3,504	0.098
Cotton	*	111,659	3.12	2,784	0.078
Corn	*	32,625	0.91	277	0.008
Vegetables and Ground Fruit	*	161,025	4.49	6,334	0.177
Other Grains	*	83,476	2.33	585	0.016
Developed	*	162,215	4.53	8,111	0.23
Open Space Developed	*	134,022	3.74	6,701	0.19
Rice	*	2,046	0.06	0	0
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]:		3,239,540	90.42	9,100	0.25

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: 3,582,611 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 173,541 acres, 4.844%

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

[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.

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.

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Fresno kangaroo rat. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Fresno kangaroo rat has a high vulnerability based on its status, distribution, and trends, as described above. The species has not been captured since 1998. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (0.25%) within the non-Federal portion of the range of the species. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

The species is unlikely to utilize use areas that overlap with its range. We do not anticipate mortality or sublethal effects in use areas or in spray drift areas. We anticipate a reduction in terrestrial invertebrate prey resources, most likely to cause adverse effect within spray drift areas and from mosquito control. However, we do not expect species-level effects because of the extremely low level of usage (0.25%) within the non-Federal portion of the species range and because terrestrial invertebrates are estimated to account for approximately 10 percent of the species diet. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and

reduce 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. The reduced application numbers and rate is expected to 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. We anticipate these measures will reduce the likelihood of exposure of the species and its prey to malathion. While we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Fresno kangaroo rat in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Dipodomys ingens	Giant kangaroo rat	38

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: Declining population(s) – one or more populations declining
Pesticides noted ☐

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

When the giant kangaroo rat was listed as endangered in 1987 (52 FR 283), the major threats to the species were land conversion, predation, rodent control programs, and the inadequacy of existing regulatory mechanisms (USFWS 1987). Today, land conversion continues to be the largest threat to the giant kangaroo rat although the mechanisms responsible for habitat destruction and degradation have changed from agricultural conversion to development. The establishment of the 250,000-acre Carrizo Plain National Monument was significant in protecting populations of the giant kangaroo rat on the Carrizo Plain and in the western Cuyama Valley. Genetic researchers group the giant kangaroo rat into two major populations: western Kern and eastern San Luis Obispo Counties (southern range), and western Fresno and eastern San Benito Counties (northern range) (Loew et al. 2005). These researchers also identify three satellite populations near the southern range: Cuyama Valley, San Juan Creek Valley, and Kettleman Hills. The northern range of the giant kangaroo rats consists of several disjunct populations in the Panoche Valley, Tumey Hills, Ciervo Hills, and Monocline Ridge of eastern San Benito County and western Fresno County (Loew et al. 2005). Additionally, long-term population studies show populations of the giant kangaroo rat on protected lands in the Lokern area, the Buena Vista Valley, and on the Carrizo Plain to be increasing or stable (Williams and Germano 1994; Kelly et al. 2004; Germano et al. 2005; Kelly, pers. comm. 2006; Quad Knopf 2006; Saslaw, pers. comm. 2006). No long-term studies have been done to determine the stability of giant kangaroo rat populations within the northern range; however, genetic research shows that isolated populations of giant kangaroo rat within the Tumey and Ciervo Hills continue to be at risk of local extirpation due to habitat fragmentation and the lack of protection of core areas and dispersal corridors (Loew et al. 2005). The major threats to the species are the restriction of giant kangaroo rats to less than 5 percent of their historical range on highly fragmented, suboptimal habitat; the continuation of threats from oil and gas extraction; urban and residential development; the new development threat of large solar power plants; the genetic isolation of populations in the Tumey Hills and Ciervo Hills; the lack of protection of the populations in the Panoche Valley; and the protection of less than 20 percent of populations in western Kern County. Giant kangaroo rats remain unprotected and threatened by oil and gas exploration activities, solar projects, and urban and suburban development. Approximately 50 percent of

giant kangaroo rat lands in western Kern County, and 80 percent of the giant kangaroo rat habitat in the Ciervo Panoche area remain unprotected and on private lands (Cypher, in litt. 2009).

EB/CE Source: U. S. Fish and Wildlife Service. February 12, 2010. Giant kangaroo rat (Dipodomys ingens) 5-Year Review: Summary and Evaluation. Sacramento, California. 50 p.

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 giant kangaroo rat is not expected to enter malathion use sites and is not expected to experience mortality or sublethal effects 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 56% terrestrial invertebrates
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	79% terrestrial invertebrates, no effects to plants

Risk modifiers: Currently, the giant kangaroo rat is found in Giant, Kern, Kings, San Benito, San Luis Obispo and Santa Barbara counties of California. Major population units are fragmented into more than 100 smaller populations, many of which are isolated by several kilometers/miles of barriers such as steep terrain with plant communities unsuitable as habitat; or agricultural, industrial, or urban land without habitat for this species.

This species is a granivore and omnivore. They prefer annual grassland and saltbush scrub and other shrub communities for habitat. The giant kangaroo rat feeds on seeds, green herbaceous vegetation, and occasionally insects. The giant kangaroo rat has moderate mobility, dispersal, and site fidelity life history characteristics. Limited data suggest that effective dispersal may extend over several kilometers (a couple of miles), and that individuals can disperse through highly inhospitable habitat. Estimated home range size ranges from about 60 to 350 square meters. There is no significant difference in size of home range between sexes. The core area of the territory, located over the burrow system (precinct) is the most intensely used location in the home range. This species' distribution is clumped in its remaining habitat.

The giant kangaroo rat is not expected to utilize malathion use sites (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 species taken as food items exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	5,110,016	79.29	9,100	0.14
Other Crops	*	682,044	10.58	0	0
Orchards and Vineyards	*	623,150	9.67	2	2.81
Open Space Developed	*	241,275	3.74	2,004	0.031
Vegetables and Ground Fruit	*	170,853	2.65	26,539	0.412
Wheat	*	129,008	2.00	2,337	0.036
Cotton	*	119,834	1.86	12,815	0.199
Developed	*	118,059	1.83	5,903	0.09

[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	%
Pasture	*	95,418	1.48	12,091	0.203
Other Grains	*	84,674	1.31	294	0.005
Corn	*	10,271	0.16	0	0
Rice	*	581	0.01	0	0
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]:		5,110,016	79.29	9,100	0.14

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: 6,444,329 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 964,384 acres, 14.965%

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 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 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 reduce 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 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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Giant kangaroo rat. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Giant kangaroo rat has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (0.14%) within the non-Federal portion of the range of the species. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

The species is unlikely to utilize use areas that overlap with its range. We do not anticipate mortality or sublethal effects in use areas or in spray drift areas. We anticipate a reduction in prey resources, most likely to cause adverse effect within spray drift areas. However, we do not expect species-level effects because of the extremely low level of usage (0.14%) within the non-Federal portion of the species range and because terrestrial invertebrates are a supplementary dietary item noted to be consumed occasionally. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. We anticipate these measures will reduce the likelihood of exposure of the species and its prey to malathion. While we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect

species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Giant kangaroo rat in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

VULNERABILITY

(Summary of status, environmental baseline and cumulative effects)

Status: Endangered, Five-Year Review Recommendation: Downlist to 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 Stephens' kangaroo rat was listed as endangered on September 30, 1988 and has been petitioned for downlisting and delisting in recent years. At the time of listing the Stephens' kangaroo rat was threatened by the following factors: habitat loss resulting from widespread, rapid urbanization and agricultural development; fragmented and isolated populations; reduction of habitat suitability (from anthropogenic activities including grazing, off-highway vehicle use, disking, plowing, introduction of nonnative vegetation, and rodent control programs); predation by domestic cats; and the lack of existing regulatory protections. In the 12-month finding and in a subsequent 5-year review (USFWS 2011), we found that the threats to the Stephens' kangaroo rat remain similar today to those identified at listing in 1988, with additional impacts from nonnative plant species and climate change. However, the primary and imminent threat at the time of listing, habitat destruction from urban and agricultural development resulting in isolated habitat patches, has been largely ameliorated through the implementation and design of the core reserve system in western Riverside County (through the Stephens' Kangaroo Rat Habitat Conservation Plan), through ongoing land acquisitions and easements, and with other conservation plans and efforts (Multiple Species Habitat Conservation Plan (MSHCP) and Integrated Natural Resource Management Plans (INRMPs)). The Stephens' kangaroo rat population at Camp Pendleton and Detachment Fallbrook in San Diego County is covered by active INRMPs that include actions to provide for the long-term conservation of the Stephens' kangaroo rat on Federal military lands. Significant areas of habitat have been conserved and managed in Riverside and San Diego Counties since the species was listed. Reserves in western Riverside and San Diego counties effectively have been established that address the primary and imminent threat at the time of listing, habitat destruction from urban and agricultural development. Threats to the species have been removed or their imminence, intensity, or magnitude reduced to the extent that the species is no longer in danger of extinction throughout all or a significant portion of it range. Despite this significant reduction in threats, non-conserved Stephens' kangaroo rat habitat continues to be impacted by urban and agricultural development, while nonnative species, off highway vehicles, and the potential impacts associated with climate change continue to pose a threat to the species over the long term.

EB/CE Source: U. S. Fish and Wildlife Service: 5-Year Review Short Form Summary. July 22, 2011: Species Reviewed: Stephens' kangaroo rat (Dipodomys stephensi) Current Classification: Endangered FR Notice announcing initiation of this review: 69 FR 21567. Endangered and

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 Stephen's kangaroo rat is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	16% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 27% terrestrial invertebrates
Plants affected (decline in growth)	11%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	80% terrestrial invertebrates, no effects to plants

Risk modifiers: The range of Stephen's kangaroo rat encompasses approximately 2,870 square kilometers in the San Jacinto Valley in Orange, Riverside, San Bernardino, and San Diego counties in California.

The Stephen's kangaroo rat is a granivore and herbivore, feeding primarily on seeds but they also eat insects and herbaceous vegetation in the spring. The rat occurs in grassland, herbaceous, shrubland and chaparral habitats. This species may recolonize abandoned agricultural land. It is most abundant where stands of native vegetation remain but deceases as bunchgrass density increases. This species is considered to have high site fidelity, and has the potential for dispersal.

Stephen's kangaroo rat is not expected to enter developed use sites.

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. Overlap with open spaced developed contributes the most to anticipated effects to prey, followed by wheat and other crop use categories. Because invertebrates exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	817,049	79.84	0	0
Developed	*	150,773	14.73	7,539	0.74
Open Space Developed	I	114,355	11.17	5718	0.56
Wheat	I	35,098	3.43	0	0
Other Crops	I	12,584	1.23	0	0
Pasture	I	2,824	0.28	134	0.013
Other Grains	I	2,615	0.26	0	0
Orchards and Vineyards	I	1,038	0.10	30	0.003
Nurseries	I	649	0.06	222	0.022
Vegetables and Ground Fruit	I	85	0.01	85	0.01
Cotton	I	2	<0.01	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		169,249	16.54	6,189	0.621
TOTAL[4]:		986,299	96.37	6,189	0.621

[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 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: 1,023,416 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 160,912 acres, 15.723%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Stephens' kangaroo rat. As discussed below, even though the vulnerability is high for this species and risk is medium, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Stephens' kangaroo rat has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. Pesticides are a noted threat to the species. The risk to the species posed by labeled malathion uses across the range is medium, with a low amount of estimated usage (0.629%) within the non-Federal portion of the species range based on CalPUR data. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate that mortality or sublethal effects will occur from direct exposure to malathion or from spray drift. The Stephen's kangaroo rat is a granivore and herbivore, feeding primarily on seeds but they also eat insects and herbaceous vegetation in the spring. We estimated that across the species range, annual malathion uses pursuant to the labels are expected to result in the loss of a high level of prey items, especially terrestrial invertebrates and on mosquito control sites; however, there is no reported mosquito adulticide usage within the species range. While we anticipate adverse effects to prey items would occur on other use sites, we do not expect species-level effects to occur because of the estimated low amount of malathion usage (0.629%) within the non-Federal portion of the species range and potential for alternative food resources in other suitable untreated habitats nearby. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. While we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Stephens' kangaroo rat.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	40

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 Tipton kangaroo rat is one of three subspecies of the San Joaquin kangaroo rat (*Dipodomys nitratoides* ssp.), morphologically distinguished by being larger than the Fresno kangaroo rat (*Dipodomys nitratoides exilis*) and smaller than the short-nosed kangaroo rat (*Dipodomys nitratoides brevinasus*; Best 1991). The historical geographic range of Tipton kangaroo rats was over 687,650 hectares (about 1.7 million acres; Williams 1985, 1986a,b; Figure 12). Distribution was limited to arid-land communities occupying the valley floor of the Tulare Basin. By 1985, the inhabited area had been reduced, primarily by cultivation and urbanization, to only about 4 percent of the historical acreage. Densities typically are low, but populations are known to fluctuate greatly in response to climatic conditions (precipitation) and vary across habitat type (seasonal/short-lived invasion of vegetation, particularly by non-native grasses, can exacerbate Tipton kangaroo rat declines) (Morrison et al. 1996; Williams and Germano 1992).

Current threats of habitat destruction or modifications are increasing (Bureau of Land Management 2007; DesertUSA 1996-2007; World Wildlife Fund [McGinley] 2007). Approximately 75 Tipton kangaroo rat occurrences have been reported to [California] Natural Diversity Database (2009c). Despite actions to conserve this species, its status continues to deteriorate (Best 1991; Goldingay et al. 1997; Peyton 1998; Uptain et al. 1999). When the species was originally listed as endangered in 1988 (Service 1988), the primary threat to its survival and recovery was habitat loss. The construction of dams and canals, leading to a substantial increase in lands that could then be used for agriculture or development, was principally responsible for the decline and endangerment of the Tipton kangaroo rat. Since then, industrial- and agricultural-related development, thatch accumulation, urbanization, and flooding have been identified as the specific mechanisms that drive habitat loss (Service 2007n,o). Climate change and the illegal application of rodenticides have been identified as potential new threats to the conservation status of the subspecies. Restricted to arid-land communities in the Southern San Joaquin Valley, the Tipton kangaroo rat currently occurs only in a few of the remaining small and isolated parcels of grassland and saltbrush scrub communities. About 96 percent of the original range is no longer suitable for the Tipton kangaroo rat. Despite the development of habitat conservation plans and the creation of protected areas, in part for the

benefit of this subspecies, Tipton kangaroo rat populations continue to decline. While the Tipton kangaroo rat has recently been reported to occur in at least 10 sites, not a single one of those sites could be categorized as having large tracts of occupied habitat, an effective management plan for the subspecies, or a stable or increasing population of kangaroo rats. While some population monitoring and habitat management activities are underway at Naval Air Station Lemoore, Semitropic Ridge Preserve, and Coles Levee Ecosystem Preserve, as well as a translocation project (Allensworth Ecological Reserve) and a livestock grazing study (Lokern Grazing Study [the Tipton kangaroo rat is not a study species]), the biology of the subspecies and keys to effective habitat management essentially remain poorly known.

EB/CE Source: U. S. Fish and Wildlife Service. February 16, 2010. Tipton Kangaroo Rat (Dipodomys nitratoides nitratoides) 5-Year Review: Summary and Evaluation. Sacramento Fish and Wildlife Office, Sacramento, California. 102 p.

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 Tipton kangaroo rat is not expected to enter malathion use sites and is not expected to experience direct effects from exposure to 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 terrestrial invertebrates
Plants affected (decline in growth)	No effects expected
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	84% terrestrial invertebrates

Risk modifiers: The current range of the Tipton kangaroo rat is in southern portion of the San Joaquin Valley; current occurrences are limited to scattered, isolated areas clustered west of Tipton, Pixley, and Earlimart, around Pixley National Wildlife Refuge, Allensworth Ecological Reserve, and Allensworth State Historical Park, Tulare County; between the Kern National Wildlife Refuge, Delano, and in natural lands surrounding Lamont (southeast of Bakersfield), Kern County; at the Coles Levee Ecosystem Preserve; and other, scattered units to the south in Tulare and Kern counties.

Tipton kangaroo rats are granivores and insectivores that consume mostly seeds from native and nonnative forbs and grasses, with small amounts of green, herbaceous vegetation, and supplementing their diet with insects when available. The preferred habitat of the Tipton kangaroo rat includes grassland, herbaceous, shrubland, and chaparral habitats. Physical barriers; populations are frequently separated by roads and canals that cannot be crossed by this subspecies.

The Tipton kangaroo rat is not expected to utilize malathion use sites (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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	3,291,343	83.83	9,100	0.23
Orchards and Vineyards	*	946,736	24.11	11,798	0.301
Other Crops	*	573,264	14.60	0	0
Wheat	*	271,324	6.91	4,426	0.113
Pasture	*	199,600	5.08	3,467	0.088

[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	*	169,071	4.31	8,454	0.22
Open Space Developed	*	153,855	3.92	7,693	0.20
Cotton	*	142,199	3.62	12,009	0.306
Vegetables and Ground Fruit	*	104,706	2.67	6,227	0.159
Other Grains	*	89,229	2.27	1,880	0.048
Corn	*	46,435	1.18	403	0.010
Other Row Crops	*	275	0.01	0	0
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	0.00	0	0.00
TOTAL[4]:		3,291,343	83.83	9,100	0.23

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: 3,926,000 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 177,227 acres, 4.514%

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 set 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.

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 reduce 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–

[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.

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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Tipton kangaroo rat. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Tipton kangaroo rat has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (0.23%) within the non-Federal portion of the range of the species. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

The species is unlikely to utilize use areas that overlap with its range. We do not anticipate mortality or sublethal effects in use areas or in spray drift areas. We anticipate a reduction in prey resources, most likely to cause adverse effect within spray drift areas. However, we do not expect species-level effects because of the extremely low level of usage (0.23%) within the non-Federal portion of the species range and because terrestrial invertebrates are a supplementary dietary item consumed as available. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. While we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Tipton kangaroo rat in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Peromyscus polionotus ammobates	Alabama beach mouse	41

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:

We currently have one metapopulation of Alabama beach mouse and one isolated population of Alabama beach mouse. The two populations are isolated from one another by Little Lagoon Pass (a man-made canal). The metapopulation is highly fragmented by development and occurs from Little Lagoon Pass to the tip of Fort Morgan Peninsula. The second population occurs within Gulf State Park and some lands adjacent to the park in the Cities of Gulf Shores and Orange Beach. Approximately 2,443 ac of habitat remain within these areas out of a historical estimate amount of 8,000 or 9,000 ac (Service 2011). About 63% of the remaining habitat (1,546 ac/2,443 ac) currently occurs on separated public lands of Fort Morgan State Park (FMSP), Bon Secour National Wildlife Refuge (BSNWR), and Gulf State Park (GSP) (Service 2011). Moyers' (1996) study of ABM food habits and two other beach mouse subspecies indicates that beach mice eat a wide variety of fruits and seeds, ranging from sea oats (*Uniola paniculata*) to maritime bluestem (*Schizachryium maritimum*), insects, and arachnids. Sneckenberger (2001) found that the species also eats scrub oak acorns and selects them frequently during food preference trials. Trapping data indicate that use of certain habitat types (e.g., frontal and tertiary dunes) is preferential over other habitat types (e.g., dense interior scrub, permanent wetlands and maritime forest) within their range, and the availability of storm refugia (tertiary dune habitat) is critical during hurricanes. Habitat loss and fragmentation associated with residential and commercial real estate development are the primary threats contributing to the endangered status of beach mice (Holler 1992, Humphrey 1992, 71 FR 5515, 71 FR 44976). Isolation of small local populations of beach mice reduces or precludes gene flow between these populations and can result in the loss of genetic diversity. Demographic factors, such as predation (particularly by cats), disease, and competition, are intensified in small, isolated local populations which may be rapidly extirpated by these pressures. Especially when coupled with events such as hurricanes, reduced food availability, burrow site availability and/or reduced reproductive success, isolated local populations may experience severe declines or extirpation (Caughley and Gunn 1996, Noss and Csuti 1997, Lynn 2000, 71 FR 5515). Despite the species' restricted range, a number of guidelines, conservation measures, and regulatory mechanisms are in place to minimize impacts to the species and its habitat. The Service is involved in almost all projects occurring throughout

its range via sections 7 (consultations) or 10 (habitat conservation plans) of the Endangered Species Act. Through consultation and coordination with Service biologists, many project-related impacts are avoided or minimized by the implementation of conservation measures. The current distribution along the Alabama coastline is much more restricted and fragmented as compared to historic conditions. Consequently, it is more likely that a hurricane making landfall in or near Alabama could impact the entire range of the subspecies. Natural predation of beach mouse populations that have sufficient recruitment and habitat availability is generally not a concern. However, excessive predation pressure from natural and non-native predators may result in the extirpation of small, isolated local populations of beach mice, especially after hurricanes when both predators and prey are more concentrated in smaller and often isolated habitat patches. Free-roaming and feral cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968, Linzey 1978) and are considered to be the main cause of the loss of at least one local population (Ono Island) of the species (Holliman 1983).

EB/CE Source: U.S. Fish and Wildlife Service. 2019. Alabama Beach Mouse (Peromyscus polionotus ammobates, Bowen 1968) 5-Year Review: Summary and Evaluation. 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: Alabama beach mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, 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	<0. 1%
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	37% terrestrial invertebrates
Spray drift areas - Prey item mortality	Effects to terrestrial invertebrates
Plants affected (decline in growth)	37%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected

Sublethal	No effects expected
Indirect	76% terrestrial invertebrates, no effects to plants

Risk modifiers: The Alabama beach mouse is not expected to enter agricultural areas, but is expected to utilize developed, open space developed, and pine seed orchards where appropriate habitat exists.

Allowable uses driving effects/other considerations: The Alabama beach mouse is only expected to utilize developed, open space developed, and pine seed orchard use sites where suitable habitat exists. Because not all overlapping areas within these use categories are expected to be suitable for beach mice, effects as calculated (based solely on overlaps) likely over-estimate effects to the beach mouse and prey species.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near developed or open space developed use sites, pine seed orchards, and from mosquito control applications. Because terrestrial invertebrates exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance of invertebrates in these areas, but not completely eliminate the prey base. This reduction is anticipated to be greater on developed or open space developed use sites, or in pine seeds orchards, 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	3,646	75.62	3,401	70.54
Developed	D, I	1,510	31.32	76	1.57
Open Space Developed	D, I	263	5.46	13	0.27
Pine Seed Orchards	I	36	0.75	36	0.75
Other Crops	*	3	0.05	0	0.00
Corn	*	6	0.12	4	0.07
Cotton	*	1	0.03	1	0.03
Other RowCrops	*	2	0.04	2	0.04
Wheat	*	0	0.01	0	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	*	1	0.01	1	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		1,774	36.78	89	1.84
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		1,810	37.54	125	2.59
TOTAL[4]:		5,456	113.15	3,526	73.13

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: 4,821 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,408 acres, 29.20%

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 reduce 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.

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 additional conservation measures, such as use limitation areas.

The following measure will also be specified to minimize the effects of take of the species: Where feasible, avoid application. 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

[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.

and maps of designated critical habitat 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 species-specific measures will reduce exposure and effects to the species for the following reason:

Avoidance and use limitation areas such as the species' range, critical habitat, or key habitat types and areas, are likely to be effective ways to reduce exposure to malathion by preventing use directly in these important areas, thus reducing the likelihood the species will come into contact with malathion.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Alabama beach mouse.

The Alabama beach mouse has a high vulnerability based on its status, distribution, and trends, as described above. The species is a narrow endemic, confined to an estimated 13 miles of frontal, tertiary, and interior scrub habitat along the Alabama coastline. The Alabama beach mouse occupies frontal and scrub dune habitat (USFWS 2019). The diet of the species consists mainly of plant resources found growing in frontal and scrub dune habitat, including beach grass and sea oats, which are often found stored in their burrows (USFWS 1987). However, the species also consumes invertebrates, especially when other resources are scarce (e.g., late winter or early spring) (USFWS 1987).

The risk to the species posed by labeled malathion uses across the range is medium, as described above. We do not anticipate mortality or sublethal effects within usage areas, and no mortality or sublethal effects within spray drift areas. However, we anticipate that malathion usage pursuant to the label will result in a high level of reduction in terrestrial invertebrates within the non-Federal portion of the species range (37% within usage areas and 76% within mosquito control areas) upon which the species depends seasonally when plant resources are otherwise scarce. The adverse effect to the species caused by malathion use pursuant to the label is therefore mostly attributed to the reduction in prey resources (i.e., terrestrial invertebrates). We also estimate that across the species range, annual malathion usage pursuant to the labels is expected to result in a decline in growth of plants by 37 percent. However, as described above, we anticipate that the exposure of invertebrate prey is likely overestimated both from differential invertebrate sensitivity and recovery of these populations. Thus, while malathion use is anticipated to affect invertebrate prey of the species, we expect that the effects will be to smaller numbers of invertebrates and that these will not occur in a manner that results in drastically diminished food resources all at once. We anticipate the effects to invertebrate prey will be

episodic, allowing for recovery of prey populations and coupled with availability of other less impacted prey populations.

We anticipate a high amount of estimated usage (73.13%) within the non-Federal portion of the species range based on standard data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Usage of malathion for mosquito control overlaps with 70.54% of the species range. Within this area, we anticipate that terrestrial invertebrates will be reduced by 76 percent. However, a use limitation for the entirety of the species range included as a new *Bulletins Live! Two* condition will significantly reduce the use of malathion across the range of the Alabama beach mouse for wide area uses (e.g., vector control/mosquito control districts). We anticipate that this species-specific conservation measure, along with the additional broader label restrictions that will be implemented will further reduce the likelihood of exposure. We therefore anticipate extremely limited adverse effects to individuals of the species caused by the loss of terrestrial invertebrates as a food resource.

The Alabama beach mouse is highly vulnerable and is reliant upon terrestrial invertebrates when plant resources are unavailable. The species' status as a narrow endemic reduces its resiliency and its ability to simply move to another area to seek additional food resources. However, given the best available information, we conclude that exposure to malathion from agricultural sources will be rare. We anticipate that, at most, exposure of a very small number of individuals from mosquito control efforts are expected, but would likely be confined to the interface of developed areas adjacent to the remaining habitat, which we anticipate to be very short in duration and geographic scope. The additional restrictions for mosquito control use across the species range will further reduce the likelihood of exposure from this use. We anticipate that wide area uses (e.g., mosquito or vector control districts) will be significantly reduced as a result of the mosquito adulticide use restriction and the effects to food resources (both invertebrates and plants) of the species will be likewise significantly reduced. We anticipate that the reduction in food resources (i.e., terrestrial invertebrates) upon which the species relies when plant resources are scarce will result in small reductions to the forage base of a very small numbers of individuals of this species during a portion of the year. However, we anticipate the additional conservation measures above, including species-specific measures for mosquito adulticide use and residential use label changes, will further reduce the likelihood of exposure and associated effects to the species, their food resources, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. While we anticipate that small numbers of individual mice would be adversely affected, including low levels of sub-lethal

reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we anticipate that the Action would not appreciably reduce survival and recovery of the Alabama beach mouse.

Conclusion: Is not likely to jeopardize

ADDITIONAL REFERENCES

U.S. Fish and Wildlife Service. 1987. Recovery Plan for the Choctawhatchee, Perdido Key and Alabama Beach Mouse. U.S. Fish and Wildlife Service, Atlanta, Georgia. 45 pp.

U.S. Fish and Wildlife Service. 2019. Alabama Beach Mouse (*Peromyscus polionotus ammobates*) 5-Year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Atlanta, Georgia. 36 pp.

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Sylvilagus palustris hefneri	Lower Keys marsh rabbit	46

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:

All three Lower Keys marsh rabbit metapopulations (Boca Chica area (BCHI), Sugarloaf area (SUGAR), and Big Pine area (BPK)) have continued to decline since 1988, as evidenced by patch (subpopulation) extinctions exceeding colonizations on an ongoing basis. The declines are consistent with population viability analyses that predicted extinction within 50 years. The level of extinction threat has increased steadily in recent decades, and increased annually in recent years. In BCHI, extinctions have accumulated steadily, but gradually relative to the other metapopulations. In SUGAR and especially in BPK, extinctions have accumulated more rapidly. Additionally, extant subpopulations have become more isolated (i.e., mean inter-patch distance has increased), yet less widely distributed (e.g., fringe subpopulations have been lost). Proportionate losses of subpopulations increased after Hurricane Wilma (2005), and possibly after Hurricane Georges (1998), at least on BPK. The BCHI metapopulation appeared to be more resilient to effects of Wilma, but predator control in BCHI subsequent to Wilma may have benefited the Lower Keys marsh rabbit. Controlling of predation has been identified as the most important task if Lower Keys marsh rabbit recovery is to succeed. Cats have been identified as the primary source while raccoons are a significant contributor. The ongoing reduction in the number, area, and connectivity of occupied patches leaves remaining patches at greater vulnerability to extinction due to both demographic and environmental stochasticity. Additionally, the Lower Keys marsh rabbit is thought to be less fecund than other subspecies (Forys 1995), making it less resilient to population bottlenecks and relatively more susceptible to demographic fluctuations and stochastic events. Certain threats accounted for in the recovery plan (Service 1999) are now considered to be of lesser magnitude and imminence relative to earlier periods. For example, habitat destruction has been significantly reduced, particularly in wetlands inhabited by Lower Keys marsh rabbits. With reduced population size and increasing isolation as subpopulation extinctions progressed, the magnitude and imminence of threats due to catastrophes and genetic, demographic, and environmental stochasticity has likely increased. Additionally, the probability of rescue by successful dispersal among increasingly isolated habitats has declined. The most significant threat, predation, continues unabated in much of the Lower Keys marsh rabbit range. However, predator (cat and raccoon) control was initiated on NASKW (BCHI) in 2005 and on NKDR (BPK) in 2007. In general, hurricane activity, and

specifically high intensity hurricanes, has increased. The threat of storm surges has increased as well, and is exacerbated by rising sea level. Lower Keys marsh rabbit habitat is highly fragmented in most areas. Proliferation of hardwood overstories may cause a decline in habitat quality due to reductions in food plants or preferred cover, and may alter the vulnerability of Lower Keys marsh rabbits to predation. Vehicular mortality is also an identified threat to the Lower Keys marsh rabbit.

EB/CE Source: U. S. Fish and Wildlife Service. September 21, 2007. Lower Keys marsh rabbit (Sylvilagus palustris hefneri) 5-Year Review: Summary and Evaluation. Southeast Region, Vero Beach, Florida. 30 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: Lower Keys marsh rabbits have a low chance of mortality (<3%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed).

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	<0.01%
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	No effects expected
Plants affected (decline in growth)	1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: The range of the Lower Keys marsh rabbit is only in the Lower Keys, below the Seven-mile Bridge. The Lower Keys marsh rabbit is a subspecies of the marsh rabbit, S. palustris. The Lower Keys marsh rabbit is endemic and restricted in range, occurring only in the

Lower Keys below the Seven-mile Bridge. It presently inhabits specific areas of salt marsh, transitional buttonwood habitat, freshwater wetlands, and mangrove habitats from Big Pine Key to Boca Chica Key.

In general, marsh rabbits inhabit a variety of wet areas with dense cover. The Lower Keys marsh rabbit inhabits a narrower range of cover types, occurring primarily in grassy marshes and transition zones. These include freshwater marshes and saltmarsh-buttonwood transition zones and historically, coastal beach berm communities. Coastal beach berm, a relatively rare habitat, consists of a vegetated high ridge of storm-deposited sand and shell. Lower Keys marsh rabbits select areas close to large bodies of water, with relatively high amounts of clump grass, ground cover, and bushy seaside oxeye present. They spend most of their time in the mid-marsh and high-marsh area, both of which are used for cover and foraging, while most nesting occurs in the high-marsh area. Lower Keys marsh rabbits occasionally use low shrub marshes and mangrove communities for feeding and as a corridor between patches of transitional habitats. This species feeds on grasses, sedges, succulent plants, and herbaceous shrubs.

Adult Lower Keys marsh rabbits of the same sex tend to have permanent, non-overlapping home ranges. One study found home range area to average 0.32 hectares (ha) and vary widely among individuals. This individual variability may be due to differences in habitat quality, population density, and age or social status. Juvenile Lower Keys marsh rabbits appear to establish a home range near their nest site. Studies estimate a mean home range size of 1.2 ha for nine rabbits over a minimum of 5 months. Juvenile dispersal occurs at about 9 months of age, and is male biased (Forys 1995). Dispersing rabbits travel up to 2 km from their nests.

When dispersing from their natal to permanent home ranges, Lower Keys marsh rabbits cross roads and travel through a variety of habitats, including mangroves, upland hardwood hammocks, and roadside vegetation. However, they tend to use natural habitats that include dense ground cover. The distance among habitat patches is important because the ability of rabbits to recolonize vacant habitat patches depends upon the presence of habitat corridors. The Lower Keys marsh rabbit relies on connectivity of suitable habitat for successful dispersal and species recovery. Increasing fragmentation of Keys habitat for the Lower Keys marsh rabbit increases the likelihood of juveniles dispersing through lower quality habitat (e.g. including right of ways and other areas altered by human use). This increases the likelihood of the Lower Keys marsh rabbit to occur in potential pesticide application use sites.

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	260,487	10.87	56,293	2.35
Developed	D	14,765	0.62	738	0.03
Open Space Developed	I	6,278	0.26	314	0.01
Other Crops	N	3	<0.01	0	0
Orchards and Vineyards	I	12	<0.01	7	<0.01
Other Grains	N	5	<0.01	5	<0.01
Vegetables and Ground Fruit	N	4	<0.01	4	<0.01
Nurseries	I	59	<0.01	59	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		14,765	0.62	738	0.03
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		21,126	0.88	1,128	0.05
TOTAL[4]:		21,126	0.88	1,128	0.05

 # acres in species range: 2,395,378 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,195,668 acres, 49.916%

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 reduce 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.

[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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Lower Keys marsh rabbit. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the general conservation measures described above is expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Lower Keys marsh rabbit has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled malathion uses across the range is low, with a low amount of estimated usage (0.05%) within the non-Federal portion of the species range based on standard data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We estimated that minimal mortality (<0.01%) will occur from direct contact with malathion on use sites, but we do not anticipate any mortality from spray drift or sublethal effects. This species feeds on grasses, sedges, succulent plants, and herbaceous shrubs, but we estimated that across the species range, annual malathion uses pursuant to the labels would only result in a decline in growth of plants by 1 percent. The estimated usage of malathion within the non-Federal portion of the species range is also very low (0.05%). We do not expect species-level effects due to the low estimated risk to the species and low estimated usage of malathion within the non-Federal portion of the species range. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 summary, we anticipate the extremely low usage, the low risk to the species, and implementation of the conservation measures will reduce the likelihood of exposure of the species and its prey to malathion. Therefore, while some individuals may experience small losses in available prey, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Lower Keys marsh rabbit.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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:

Hurricanes are the most catastrophic threat to the entire Anastasia Island beach mouse population. If Anastasia Island (including Anastasia State Park and Fort Matanzas National Monument) receives a direct hit from a storm, waves could completely overwash the island and eliminate habitat. This is why it is critical to establish additional populations, like the one at Guana Tolomato Matanzas Nastional Estuarine Research Reserve, within the historic range. Habitat loss and degradation, predators, and other natural factors such as hurricanes are all considered major threats to the Anastasia Island beach mouse. Predation by feral and house cats is also an important threat to the Anastasia Island beach mouse. When the Anastasia Island beach mouse was first listed, feral cats were documented on Anastasia State Park. However, Anastasia State Park has conducted an extensive feral cat removal program at the park. It is unknown if feral cats could still be considered a significant threat to the Anastasia Island beach mouse at Fort Matanzas National Monument, Guana Tolomato Matanzas Nastional Estuarine Research Reserve, and St. Johns County parks since these sites have adjacent residences where house cats could impact beach mice. Habitat loss was considered the major threat when this subspecies was first listed. Habitat loss continues to occur throughout the range mainly due to erosion caused by nor'easters and tropical storms. Coastal development has already affected most of Anastasia Island with little habitat left to be developed or acquired for conservation of the Anastasia Island beach mouse. Habitat loss has also occurred due to physical damage caused by beach driving and foot traffic through the dunes.

EB/CE Source: U. S. Fish and Wildlife Service. September 6, 2007. Anastasia Island Beach Mouse (Peromyscus polionotus phasma) 5-Year Review: Summary and Evaluation.

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: Anastasia Island beach mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on developed and open space developed 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	<0.1%
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	12% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 21% terrestrial invertebrates
Plants affected (decline in growth)	12%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	82% terrestrial invertebrates, no effects to plants

Risk modifiers: Anastasia Island beach mice may travel through developed and developed open space areas, but are not expected to utilize other malathion use sites.

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for anticipated effects to the Anastasia Island beach mouse. The analysis assumes that beach mice will utilize all developed and open space developed areas within its range equally with other habitat types. As the beach mouse is only expected to travel through these areas to more suitable habitat, effects based on their use is likely over-estimated by this analysis.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	428,909	81.58	79	0.02
Open Space Developed	D, I	32,539	6.19	1,627	0.31
Developed	D, I	32,022	6.09	1,601	0.30
Vegetables and Ground Fruit	*	11,211	2.13	1,785	0.34
Other Crops	*	2,993	0.57	0	0
Corn	*	1,632	0.31	17	<0.01
Nurseries	I	371	0.07	371	0.07
Other Grains	*	207	0.04	102	0.02
Other Row Crops	*	64	0.01	18	<0.01
Orchards and Vineyards	*	52	0.01	52	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		64,561	12.28	3,228	0.61
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		64,932	12.35	3,599	0.68
TOTAL[4]:		493,841	93.93	3,678	0.70

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: 525,732 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 0 acres, 0.000%

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 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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Anastasia Island beach mouse. As discussed below, even though the vulnerability is high for this species and risk is medium, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Anastasia Island beach mouse has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled malathion uses across the range is medium, with a low amount of estimated usage (0.7%) within the non-Federal portion of the species range based on standard data. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We estimated Anastasia Island beach mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on developed and open space developed use sites, but we do not anticipate any sublethal effects or mortality from spray drift. We estimated that across the species range, annual malathion uses pursuant to the labels is expected to result in the loss of a high amount of prey items, especially on mosquito control sites (82% terrestrial invertebrates and 7.5% reptiles and amphibians). While we expect adverse effects to prey items would occur from use of malathion, we do not expect species-level effects because of the estimated usage of malathion is very low (0.70%) within the range of this species. Mosquito control is also only estimated to occur within 0.02 percent of the non-Federal portion of the species range. Thus, there would be potential for alternative food resources in other suitable untreated habitats nearby. Our estimations also assume that Anastasia Island beach mice will utilize all developed and open space developed areas within their range equally with other habitat types, but these mice are only expected to use these areas occasionally and effects based on their use of developed and open

space developed areas is likely over-estimated. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. In summary, while we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Anastasia Island beach mouse.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Perognathus longimembris pacificus	Pacific pocket mouse	51

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 Pacific pocket mouse (*Perognathus longimembris pacificus*) is one of 16 currently recognized subspecies of the little pocket mouse (*Perognathus longimembris*); a widespread species that is distributed throughout arid regions of the western United States extending into northern part of the Baja California peninsula and west central Sonora, Mexico (Williams et al. 1993, p. 178). Historically, it was documented from near El Segundo in Los Angeles County to the vicinity of the Mexican border in San Diego County. Following 20 years with no reports of the subspecies, USFWS emergency listed the Pacific pocket mouse in February of 1994, following the rediscovery of a single population at the Dana Point Headlands in the City of Dana Point. Subsequent to the listing and prior to drafting of the Recovery Plan (Service 1998, pp. i-112), the Pacific pocket mouse was discovered at three sites: San Mateo North, San Mateo South, and north of the Santa Margarita estuary. All three of these locations fall within Camp Pendleton, an area discussed in the final rule as having the greatest potential to continue to support the subspecies (59 FR 49760). All known populations are threatened by habitat fragmentation and small size, and two of the populations are within military training areas. The Santa Margarita population is the largest of the known extant occurrences of the Pacific pocket mouse and is critical to maintenance of the subspecies since it is the only known population of appreciable size and extent where large numbers and re-colonization dynamics are likely to protect against localized extirpations. However, despite the large area circumscribed by capture locations, not all habitat within this area is suitable for the Pacific pocket mouse. Additionally, dramatic population fluctuations have been observed across the Santa Margarita population with what appears to be the near disappearance of the Pacific pocket mouse from the Lower Mesa, an area that historically supported one of the densest concentrations of Pacific pocket mice. Factors that may be associated with this decline include the drought conditions experienced across southern California over the last several years (70% of normal mean precipitation 2005-2006, 52% of normal mean precipitation 2006-2007, and 39.5% of normal mean precipitation 2007-2008) and increasing levels of ground and vegetation disturbance from increased military training within the Lower Mesa. Conservation and management of all remaining suitable habitat,

particularly areas with sandy substrates, is critical to the recovery of the subspecies, because, with the exception of Camp Pendleton and already conserved areas, coastal southern California is nearly completely urbanized. The Recovery Plan (Service 1998, p. 25) identified an additional threat to Pacific pocket mouse habitat; the invasion of coastal sage scrub vegetation by nonnative Argentine ants (Linepithema humile). Additional potential threats include predation by cats, climate change and disturbances related to recreation. With the exception of the Camp Pendleton locations, no additional Pacific pocket mouse populations have been discovered since the listing despite at least 82 targeted Pacific pocket mouse survey efforts performed across its historical range since 1993 (2009 CFWO Survey Report Data Base).

EB/CE Source: U. S. Fish and Wildlife Service. April 1, 2010. Pacific Pocket Mouse (*Perognathus longimembris pacificus*) 5-Year Review: Summary and Evaluation. 86 p.

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: Pacific pocket mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on developed and open space developed 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	<1%
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	23% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 9% terrestrial invertebrates
Plants affected (decline in growth)	23%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	49% terrestrial invertebrates, no effects to plants

Risk modifiers: The Pacific pocket mouse is not expected to enter agricultural use areas, but occurs in proximity to developed roads, dirt roads, powerlines, reservoir facilities and fuel modification zones at urban interface. Individuals may occasionally burrow and travel among these facilities, and therefore exposure in developed and developed open space use areas cannot be ruled out.

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for anticipated effects to the Pacific pocket mouse. The analysis assumes that beach mice will utilize all developed and open space developed areas within its range equally with other habitat types. As the beach mouse is only expected to use these areas occasionally, effects based on their use is likely over-estimated by this analysis.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	370,065	49.24	0	0
Developed	D, I	117,751	15.67	5,888	0.78
Open Space Developed	D, I	54,362	7.23	2,718	0.36
Nurseries	I	520	0.07	4	0.001
Other Crops	*	67	0.01	0	0
Orchards and Vineyards	*	27	<0.01	0	0
Pasture	*	21	<0.01	0	0
Vegetables and Ground Fruit	*	10	<0.01	10	0.001
Other Grains	*	8	<0.01	0	0
Wheat	*	2	<0.01	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.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Cotton	*	1	<0.01	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		172,113	22.90	8,606	1.15
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		172,633	22.97	8,610	1.15
TOTAL[4]:		542,698	72.21	8,610	1.15

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: 751,537 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 384,038 acres, 51.100%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Pacific pocket mouse. As discussed below, even though the vulnerability is high for this species and risk is medium, pesticides are not a known threat to this species, and the likelihood of exposure to

[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.

malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Pacific pocket mouse has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled malathion uses across the range is medium, with a low amount of estimated usage (1.15%) within the non-Federal portion of the species range based on CalPUR data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We estimated that mortality (<1%) will occur from direct contact with malathion on developed and open space developed use sites, but we do not anticipate any sublethal or spray drift effects. We estimated that across the species range, annual malathion uses pursuant to the labels would result in the loss of a high amount of prey items (terrestrial invertebrates, decline in growth of plants), especially on mosquito control sites; however, there is no reported mosquito adulticide usage within the species range. While we expect adverse effects to prey items would occur from other uses of malathion, we do not expect species-level effects because of the estimated low amount of usage (1.15%) within the non-Federal portion of the species range. Thus, there would be potential for alternative food resources in other suitable untreated habitats nearby. Our estimations also assume Pacific pocket mice will utilize all developed and open space developed areas within their range equally with other habitat types, but Pacific pocket mice are only expected to use these areas occasionally and effects based on their use of developed and open space developed areas is likely over-estimated. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. While we anticipate that small numbers of individuals would be adversely affected, including low levels of sublethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Pacific pocket mouse.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Zapus hudsonius preblei	Preble's meadow jumping mouse	52

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:

As summarized in the species' recovery plan, typical habitat for the Preble's mouse is composed of well-developed riparian vegetation, relatively undisturbed adjacent grassland communities, and a nearby water source. High-use areas for the Preble's mouse tend to be close to creeks and were positively associated with the percentage of shrubs, grasses, and woody debris. The Preble's mouse is a true hibernator, usually entering hibernation in September or October and emerging the following May, after a potential hibernation period of 7 or 8 months. The species diet shifts seasonally, consisting primarily of arthropods and fungus after emerging from hibernation and fungus, moss, grass seed, and pollen during mid-summer (July-August), with arthropods added again in September (pre-hibernation). The shift in diet along with shifts in mouse movements suggests that the Preble's mouse may require specific seasonal diets, especially with the physiological demands of hibernation.

The growth of the human population within the Front Range of the Rocky Mountains in Colorado and Wyoming has led to the loss and alteration of Preble's meadow jumping mouse (Preble's) habitats. This loss results from urban development, flood control, water development, aggregate mining, and other human land uses. The decline in the extent and quality of Preble's mouse habitat is considered the main factor threatening the subspecies, as reported in the species' recovery plan. As stated in the rule listing under the ESA (63 FR 26517), Preble's mouse populations face continued threats due to loss and fragmentation of their habitat from human land uses, including urban, suburban, and recreational development; highway and bridge construction; water development; instream changes due to increased runoff and flood control efforts; higher peak and sustained flows in urban areas leading to channel incision; sand and gravel mining; and overgrazing. These human land use activities affect the Preble's mouse by directly destroying its protective cover, nests, food resources, and hibernation sites; disrupting behavior; or acting as a barrier to movement. According to the species' recovery plan, since 1999, the USFWS has recommended that projects within 300 feet of the 100-year flood plain of rivers and streams, and projects that may have secondary impacts to such areas, be assessed for their potential to impact the Preble's mouse and its habitat. Factors that should also be considered, in addition to a determination of presence/absence, include the connectivity and

juxtaposition of the affected area with suitable habitat. These threats differ in magnitude in Wyoming and Colorado. For example, currently urban, suburban, and recreational development are a dominant use of Preble's mouse habitats in Colorado, while agricultural uses are a dominant use of Preble's habitat in Wyoming based on known population locations. Over time, as more areas are surveyed and more populations are detected, the locations and magnitude of these threats may change.

These threats are ongoing and will increase in magnitude as human populations in Colorado and Wyoming continue to expand. Additional threats to the Preble's include wildfire, drought, small population sizes, and modifications to habitats resulting from climate change. The Service determined that floods, agriculture, grazing, and nonnative plants are not currently threats to the Preble's, but may increase in magnitude over time as human populations expand and climate change increases the frequency and intensity of wildfires and droughts. Many of these threats act cumulatively to further degrade habitats and negatively impact Preble's populations. In September 2013, stochastic flash floods adversely affected Preble's populations, riparian and upland habitats, and designated critical habitats in Larimer, Boulder, Jefferson, Weld, and El Paso Counties, Colorado. By scouring vegetation, removing topsoil, and depositing erosion and debris, early estimates suggest that the flood disaster affected approximately 60 percent of the Preble's overall range and approximately 70 percent of its designated critical habitat in Colorado. The flash floods may have significantly decreased Preble's populations throughout the flood disaster zone by drowning mice and destroying habitats. After the floods, Preble's that escaped drowning by dispersing upslope likely encountered reduced forage, less cover, and increased predation, especially in habitats previously fragmented by urban or agricultural development. These surviving Preble's may have been unable to accumulate sufficient fat stores or locate suitable hibernacula before winter, increasing overwintering mortality and contributing to population declines. Furthermore, the flash floods likely affected the Preble's distribution if mice that dispersed or were washed downstream survived. Finally, recovery from the floods will be slow and it may take many years for the streamside habitats impacted by the floods to revegetate sufficiently to support Preble's populations. Trapping surveys, habitat evaluations, and other techniques will be necessary to gauge the full effect of the flood on Preble's populations and distribution in Colorado.

EB/CE Source: U.S. Fish and Wildlife Service. 2014. 5-Year Review for the Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*). Colorado Ecological Services Field Office.

U.S. Fish and Wildlife Service. 2018. Preble's Meadow Jumping Mouse Recovery Plan, Colorado. Region 6, Lakewood, Colorado. 148 pages.

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 Preble's meadow jumping mouse has a low chance of mortality (<1%) from exposure to malathion at maximum rates on developed and open space developed 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	<0.1%
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	23% terrestrial invertebrates,
Spray drift areas - Prey item mortality	Up to 37% terrestrial invertebrates
Plants affected (decline in growth)	7%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	77% terrestrial invertebrates

Risk modifiers:

Allowable uses driving effects/other considerations: Effects to the invertebrate prey base are anticipated from malathion exposure on agricultural and developed use sites, from spray drift, and from mosquito control applications. Because terrestrial invertebrates exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance of invertebrates in these areas, but not kill all invertebrates that are exposed. This reduction in terrestrial invertebrates is anticipated to be greater on malathion use sites where estimated environmental concentrations are higher than would be anticipated from environmental concentrations resulting from spray drift or following mosquito control. These reductions in terrestrial invertebrates are likely temporary (based on application frequency) with community recovery over a short period of time.

Moreover, in view of the usage data available with respect to mosquito control mentioned below, the overlap analysis between use sites and species range likely overestimates the extent of mortality of invertebrates due to mosquito control in Colorado.

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	1,475,086	77.35	214,729	11.26
Pasture	I	59,336	3.11	36,687	1.92
Other Crops	I	88,812	4.66	0	0.00
Wheat	I	71,552	3.75	71,552	3.75
Corn	I	57,030	2.99	2,618	0.14
Other Grains	I	10,416	0.55	10,416	0.55
Developed	D, I	68,869	3.61	3,443	0.18
Open Space Developed	D, I	72,159	3.78	3,608	0.19
Other RowCrops	I	3,833	0.20	1,470	0.08
Vegetables and Ground Fruit	I	1,797	0.09	1,764	0.09
Nurseries	I	717	0.04	717	0.04
Orchards and Vineyards	I	1	0.00	1	0.00
Sub-TOTAL (D): *Other uses with direct effects only*[3]		141,028	7	7051	0.37
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		434,523	22.79	132,276	6.93
TOTAL[4]:		1,909,608	100.14	347,005	18.19

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.

For mosquito adulticide, we expect very low levels of usage in Colorado, based on available usage data; higher levels of mosquito adulticide usage are expected in Wyoming.

 # acres in species range: 1,907,010 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 307,172 acres, 16.11%

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 groundfruit set 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 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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Preble's meadow jumping mouse.

The Preble's meadow jumping mouse has a medium vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The species' diet shifts seasonally, consisting primarily of arthropods and fungus after emerging from hibernation and fungus, moss, grass seed, and pollen during mid-summer (July-August), with arthropods added again in September, prior to the start of hibernation.

The risk to the species posed by labeled malathion uses across the range is medium, as described above. We anticipate that malathion use pursuant to the labels in use areas will result in a very low level of mortality of individuals exposed and will not result in any sublethal effects. We do not anticipate mortality or sublethal effects in spray drift areas. However, this species consumes invertebrates, and therefore, malathion usage on any use site is expected to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). From the modeled information, we might expect that malathion usage pursuant to the label will result in a high level of reduction in terrestrial invertebrates within the non-Federal portion of the species range (23% within usage areas, up to 37% within spray drift areas, and 77% within mosquito control areas). However, as described above, we anticipate that the exposure of invertebrate prey will vary, due to differential invertebrate sensitivity and relatively brief recovery periods of these populations after exposure (e.g., prey resources moving in from other areas). Thus, while malathion use is anticipated to affect invertebrate prey of the species, we expect that the effects will be to smaller numbers of invertebrates and that these will not occur in a manner that results

in drastically diminished food resources all at once. We anticipate effects to invertebrate prey will be episodic, allowing for recovery of terrestrial invertebrate prey populations and coupled with availability of other less impacted prey populations.

We anticipate a high amount of estimated usage (18.19%) within the non-Federal portion of the species range based on standard usage data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Of the usage areas described in the Usage Table above, mosquito control constitutes the largest overlap with the species range (11.26%) and is also linked to the high rate of mortality in terrestrial insects (77%). The Preble's meadow jumping mouse is seasonally reliant on terrestrial invertebrates as a food resource, especially immediately after emerging from hibernation and prior to beginning hibernation again in the fall. Additionally, its status as a narrow endemic species reduces its resiliency and its ability to simply move to another area to seek additional food resources. However, we examined the distribution of the species in both Colorado and Wyoming, carefully evaluating the proximity to malathion use sites and usage for mosquito adulticide. Whereas the habitat of the species in Colorado is much more likely to exist in proximity to urban, suburban or recreational areas where we would anticipate mosquito adulticide use, the usage data we have points strongly to Wyoming's usage being largely responsible for the high mosquito adulticide usage values above, while usage in Colorado is expected to be more limited, located in a single county with low usage levels, (0.9%), based on the available usage data. Conversely, most of the species' habitat in Wyoming exists near agricultural use sites, where we do not expect agricultural uses to be a significant driver for effects of malathion on the species, nor do we expect appreciable mosquito adulticide usage in the vicinity of the species' habitat. Thus, we anticipate that the usage information shown in the usage table above for this species, is likely the result of higher mosquito adulticide use in Wyoming and not in areas of the species preferred riparian habitat near agriculture sites, where the majority of the species' habitat exists in that state.

In addition, we anticipate the additional general conservation measures above, including residential use label changes and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to reduce the amount of malathion used and decrease potential exposure to the species, thus further decreasing the risk of exposure to the species and its prey resources. While we anticipate that small numbers of individual mice will be adversely affected, including sub-lethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur. Therefore, we anticipate that the Action would not appreciably reduce survival and recovery of the Preble's meadow jumping mouse in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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:

The primary threat to the survival and recovery of the Southeastern beach mouse is the continued loss, fragmentation, and alteration of beach dune, coastal strand, and scrub habitat. Large-scale commercial and residential development on the Atlantic coast has eliminated beach mouse habitat in Palm Beach and Broward Counties (USFWS 1999). This increased urbanization has also increased the recreational use of dunes and impacted the vegetation essential for dune maintenance and stabilization. Loss of dune vegetation results in widespread wind and water erosion and reduces the effectiveness of the dune to protect beach mouse habitat (USFWS 1999). Coastal development and construction of inlets has fragmented the habitat and limited the movement of the species to recolonize adjacent sites. All known areas that currently have the species are in county, state, or Federal ownership. Although there is no longer loss of habitat from development sites within the species range, development borders the existing protected areas and could affect the management at these sites. The species used to occupy 360 km of the Atlantic coastline from Volusia to Broward Counties (Humphrey et al. 1987). Due to habitat loss and fragmentation, the species now occupies 80.5 km of the coastline from Volusia to Indian River Counties.

Increased predation pressure on isolated beach mouse populations from natural and non-native predators can also have substantial impacts to the Southeastern beach mouse. Free-roaming and feral cats are believed to have a devastating effect on beach mouse persistence (Bowen 1968, Linzey 1978, Frank 1996) and are considered the primary cause of the extirpation of isolated populations of beach mice and a contributing factor to the extinction of the Pallid beach mouse (*P. polionotus decoloratus*) (Bowen 1968, Ehrhart 1978b, Holliman 1983, Humphrey 1992). Predation of beach mice by feral cats has been documented (Van Zant and Wooten 2003) and is considered one of the most serious threats to beach mouse populations (Gore in litt. 1994, Frank 1996). Feral cats can affect species population dynamics and depress densities. The encroachment of residential housing on the Atlantic Coast increases the likelihood of predation by domestic cats. A healthy population of the species at Sebastian Inlet State Park (north of the

inlet) in Brevard County was completely extirpated by 1972, presumably by feral cats (USFWS 1999).

Large hurricanes can cause waves to overwash the dunes and eliminate occupied habitat. However, frequent but less severe hurricanes are actually more of a threat since they occur more often and still result in impacts to occupied habitat (Frank 1996).

The establishment of additional populations within the historic range could reduce the possibility of extinction. Currently there are six sites where populations are found varying in size, from one mouse to thousands, and most are not self-sustaining populations. Only three of these sites would be considered stable with a population size of over 500 individuals. Reintroduction is being considered within the historic range to establish additional populations. The most recent data call (2007) on the status of the species indicated the population is stable.

EB/CE Source: U.S Fish and Wildlife Service. April 7, 2008. Southeastern Beach Mouse (Peromyscus polionotus niveiventris) 5-Year Review: Summary and Evaluation. 38 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: Southeastern beach mice have a low chance of mortality (<3% if exposed) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, 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	<1%
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	38% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 24% terrestrial invertebrates
Plants affected (decline in growth)	24%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected

Sublethal	No effects expected
Indirect	91% terrestrial invertebrates, no effects to plants

Risk modifiers: Southeastern beach mice are not expected to utilize agricultural areas.

Allowable uses driving effects/other considerations: Overlap with developed, open space developed, orchard and vineyards, and mosquito adulticide use sites accounts for most effects to the southeastern beach mouse. This analysis calculates effects based on the assumption that beach mice will use these areas equally with other habitat within its range, which may over-estimate effects depending on habitat preference of the mouse.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near developed, open space developed, and orchard and vineyards use sites, and from mosquito control applications. Because terrestrial invertebrates exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance of invertebrates in these areas, but not completely eliminate the prey base. This reduction is anticipated to 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	3,374,867	90.71	802,172	21.56
Developed	D, I	448,507	12.05	22,425	0.60
Other Grains	*	387,222	10.41	19,258	0.52
Open Space Developed	D, I	270,188	7.26	13,509	0.36
Orchards and Vineyards	D, I	160,550	4.32	159,571	4.29
Other Crops	*	101,667	2.73	0	0.00
Vegetables and Ground Fruit	*	4,634	0.12	1,612	0.04
Rice	*	12,465	0.34	60	0.00
Corn	*	13,164	0.35	60	0.00
	Sub-TOTAL (D):	879,245	23.63	195,506	5.25

[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]		1,400,776	37.65	218,816	5.88
TOTAL[4]:		4,775,643	100	1,020,988	27.44

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: 3,720,650 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 35,856 acres, 1.00%

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 in the maximum application rate for citrus (outside of California) is expected to reduce potential environmental concentrations to one-third of modeled values. These measures will help reduce the amount of malathion used and decrease potential exposure to the species.

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 reduce 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.

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 additional conservation measures, such as use limitation areas.

[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 following measure will also be specified to minimize the effects of take of the species: Where feasible, do not apply within the species' range. If avoidance is not feasible or impairs the ability of the mosquito control district or agency to protect the public's health and welfare, reach out to local FWS Ecological Services field offices to determine appropriate measures to minimize exposure to the affected 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 species-specific measures will reduce exposure and effects to the species for the following reason:

Avoidance and use limitation areas such as the species' range, critical habitat, or key habitat types and areas, are likely to be effective ways to reduce exposure to malathion by preventing use directly in these important areas, thus reducing the likelihood the species will come into contact with malathion.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Southeastern beach mouse. In summary, the anticipated effects to invertebrate prey are likely overestimated given both the range of invertebrate sensitivities and timing of recovery of these prey item populations. Likewise, we anticipate the incorporation of a species-specific mosquito adulticide restriction measure and general label measures including reduced application numbers and rates, and residential use label changes will significantly reduce the likelihood of exposure and resultant effects to the species, their invertebrate prey, and their habitat.

The Southeastern beach mouse has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The current distribution of the Southeastern beach mouse consists of two populations located in Smyrna Dunes Park and on the Cape Canaveral Complex (USFWS 2019). Based on its limited population size and limited geographic range, the Southeastern beach mouse is considered to be a narrow endemic species. Other species of beach mice (e.g., Choctawhatchee beach mouse, Alabama beach mouse, Perdido Key beach mouse, and St. Andrew beach mouse) have been noted to rely seasonally on insects as a food resource when their primary food resource, seeds and other plant material, are unavailable (USFWS 1987; 2010). Based on the best available information about the seasonal shifts in the diet of various beach mice species, it is reasonable to assume that the Southeastern beach mouse likewise relies on terrestrial insects as a food resource during periods when plant resources are unavailable.

The risk to the species posed by labeled malathion uses across the range is medium, as described above. In usage areas, we anticipate that malathion use pursuant to the labels will result in a very low level of mortality and will not result in any sublethal effects. We do not anticipate mortality

or sublethal effects in spray drift areas. However, 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) that will result in adverse effects to the species. We anticipate a substantial reduction in prey items (i.e. terrestrial invertebrates) in usage areas (38% in use areas, up to 24% in spray drift areas, and 91% in mosquito control areas). The adverse effects to the species caused by malathion use pursuant to the label are therefore mostly attributed to the reduction in prey resources (i.e. terrestrial invertebrates). However, as described above, we anticipate that the exposure of invertebrate prey is likely overestimated both from differential invertebrate sensitivity and recovery of these populations. Thus, while malathion use is anticipated to affect invertebrate prey of the species, we expect that the effects will be to smaller numbers of invertebrates and that these will not occur in a manner that results in drastically diminished food resources all at once. We anticipate the effects to invertebrate prey will be episodic, with recovery of prey populations coupled with availability of other less impacted prey populations.

We also estimate that across the species range, annual malathion usage pursuant to the labels would result in a decline in growth of plants by 38 percent. We anticipate a high amount of estimated usage (27.44%) within the non-Federal portion of the species range based on standard usage data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

Malathion usage pursuant to the label for mosquito control purposes has a large amount of overlap with the species range and can be expected in areas where the species is likely to be present. In fact, of all the usage areas described in the Usage Table above, mosquito control constitutes the largest overlap with the species range (21.56%) and the usage for mosquito control also causes the highest rate of mortality in terrestrial insects (91%). However, a use limitation for the entirety of the species range included as a new *Bulletins Live! Two* condition will significantly reduce the use of malathion across the range of the Southeastern beach mouse for wide area uses (e.g., vector control/mosquito control districts). We anticipate that this species-specific conservation measure, along with the additional broader label restrictions that will be implemented will further reduce the likelihood of exposure. We therefore anticipate extremely limited adverse effects to individuals of the species caused by the loss of terrestrial invertebrates as a food resource. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. While we anticipate that small numbers of

individuals would be adversely affected, including low levels of sub-lethal reduction in fitness from loss of invertebrate prey over the duration of the Action, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Southeastern beach mouse in the wild.

Conclusion: Is not likely to jeopardize

ADDITIONAL REFERENCES

U.S. Fish and Wildlife Service. 1987. Recovery Plan for the Choctawhatchee, Perdido Key and Alabama Beach Mouse. U.S. Fish and Wildlife Service, Atlanta, Georgia. 45 pp.

U.S. Fish and Wildlife Service. 1993. Recovery Plan for the Anastasia Island and Southeastern Beach Mouse. Atlanta, Georgia. 30 pp.

U.S. Fish and Wildlife Service. 2010. Recovery Plan for the St. Andrew Beach Mouse (*Peromyscus polionotus peninsularis*). Atlanta, Georgia. 95 pp.

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

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Peromyscus polionotus peninsularis	St. Andrew beach mouse	54

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:

Habitat loss and fragmentation associated with residential and commercial development is the primary threat contributing to the endangered status of St. Andrew beach mice (Holler 1992, Humphrey and Barbour1981, Holliman 1983). Coastal development has fragmented all the subspecies into disjunct populations. Isolation of habitats by imposing barriers to species movement is an effect of fragmentation that equates to reduction in total habitat (Noss and Csuti 1997). Furthermore, isolation of small populations of beach mice reduces or precludes gene flow between populations and can result in the loss of genetic diversity. Loggins et al (2008) compared population estimates, along with distribution data, and found indications that the population at East Crooked Island has grown following the translocation of mice from St. Joseph State Park in 1997-1999 and that the population in the park has not declined since previous surveys (Moyers et al. 1999). Current population estimates (Loggins et al 2008) of 3,000 mice at East Crooked Island is much larger than any previous estimate (James 1992, U. S. Fish and Wildlife Service 1998), and the estimate of 1,775 mice in the front dunes at St. Joseph State Park is much larger than the estimate of 342-655 mice extrapolated from the trapping data of Bates (1992) and Moyers et al. (1999). Impacts such as predation (especially by domestic cats), diseases, and competition with house mice, are intensified in small, isolated populations which may be rapidly extirpated by these pressures. Especially when coupled with events such as storms, reduced food availability, and/or reduced reproductive success, isolated populations may experience severe declines or extirpation (Caughley and Gunn 1996). The influence these factors have on populations or individuals is largely dependent on the degree of isolation. Protection, management, and recovery of beach mice on public areas have been complicated by increased recreational use as public lands are rapidly becoming the only natural areas left on the coast. Public land managers are under increased pressure to manage for both the recovery of endangered species and recreational use. Where protection of large contiguous tracts of beach mouse habitat along the coast is not possible, establishing multiple independent populations is the most effective defense against local and complete extinctions due to storms and other stochastic events (Danielson 2005). Protecting multiple populations increases the likelihood that at least one population within the range of a subspecies will survive episodic storm events and

persist while vegetation and dune structure recover. The threats to the St. Andrew beach mouse have in some cases been reduced and in others have increased. Habitat loss through development and other dune encroachment still threatens the species, particularly on the St. Joseph Peninsula. However, the reintroduced population at East Crooked Island has been extremely successful and faces few threats. Predation by native and non-native predators is a continuing concern but is being managed through a partnership with U.S. Department of Agriculture Wildlife Services. Inadequate regulations exist right now to protect the species. However, the Florida Fish and Wildlife Conservation Commission is leading an effort to amend Land Development Codes to better protect the species and other native wildlife.

EB/CE Source: U. S. Fish and Wildlife Service. 2009. St. Andrew beach mouse (Peromyscus polionotus peninsularis) 5-year Review: Summary and Evaluation. 28 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: St. Andrew beach mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on developed and open space developed 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	<0.1%
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	17% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 10% terrestrial invertebrates
Plants affected (decline in growth)	17%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	63% terrestrial invertebrates, no effects to plants

Risk modifiers:

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for most effects to the southeastern beach mouse. This analysis calculates effects based on the assumption that beach mice will use these areas equally with other habitat within its range, which may over-estimate effects depending on habitat preference of the mouse.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near developed and open space developed use sites, from spray drift, and from mosquito control applications. Because terrestrial invertebrates exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance of invertebrates in these areas, but not completely eliminate the prey base. This reduction is anticipated to 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	6752	63.35	5,340	50.10
Developed	D, I	1484	13.92	74	0.70
Open Space Developed	D, I	308	2.89	15	0.14
Other Row Crops	I	1	0.01	1	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		1,792	16.81	89	0.84
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		1,793	16.82	90	0.85
TOTAL[4]:		8,545	80.17	5,457	50.95

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: 10,659 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: 3,457 acres, 32.43%

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 reduce 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.

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 additional conservation measures, such as use limitation areas.

The following measure will also be specified to minimize the effects of take of the species: Where feasible, do not apply within coastal dune habitats of the species. If avoidance is not feasible or impairs the ability of the mosquito control district or agency to protect the public's health and welfare, reach out to local FWS Ecological Services field offices to determine appropriate measures to minimize exposure to the affected 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 species-specific 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 likely to be effective ways to reduce exposure to malathion by preventing use directly in these important areas, thus reducing the likelihood the species will come into contact with malathion.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the St. Andrew beach mouse. In summary, the anticipated effects to invertebrate prey are likely overestimated

given both the range of invertebrate sensitivities and timing of recovery of these prey item populations, as described above. Likewise, we anticipate the incorporation of a species-specific mosquito adulticide restriction measure and general label measures including residential use label changes will significantly reduce the likelihood of exposure and resultant effects to the species, their invertebrate prey, and their habitat.

The St. Andrew beach mouse has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The species is a narrow endemic, confined to approximately 12.4 miles of coastline on the St. Joseph Peninsula (USFWS 2010). The species diet consists mainly of a variety of plant species occupying frontal and scrub dunes, and terrestrial invertebrates which provide seasonal supplements (USFWS 2010).

The risk to the species posed by labeled malathion uses across the range is medium, as described above. In usage areas, we anticipate that malathion use pursuant to the labels will result in a very low level of mortality and will not result in any sublethal effects. We do not anticipate mortality or sublethal effects in spray drift areas. However, this species consumes invertebrates; therefore, malathion usage on any use site is expected to result in mortality to prey resources from spray drift (whether or not the species will utilize the site itself). Malathion use in mosquito control areas would result in a 63 percent reduction in terrestrial invertebrates. Additionally, we anticipate that malathion use in other use areas (i.e., non-mosquito control areas) pursuant to the label would result in a 17 percent reduction in terrestrial invertebrates within usage areas, and a reduction of up to 10 percent of terrestrial invertebrates in spray drift areas. The adverse effects to the species caused by malathion use pursuant to the label is therefore mostly attributed to the anticipated reduction in prey resources (i.e. terrestrial invertebrates) upon which the species relies during periods of time when primary food resources are unavailable. However, as described above, we anticipate that the exposure of invertebrate prey is likely overestimated both from differential invertebrate sensitivity and recovery of these populations. Thus, while malathion use is anticipated to affect invertebrate prey of the species, we expect that the effects will be to smaller numbers of invertebrates and that these will not occur in a manner that results in drastically diminished food resources all at once. We anticipate the effects to invertebrate prey will be episodic, with recovery of prey populations coupled with availability of other less impacted prey populations.

We anticipate a high amount of estimated usage (50.95%) within the non-Federal portion of the species range based on standard usage data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Malathion usage pursuant to the label for mosquito control purposes has a large amount of overlap with the species range (50.10%) and is therefore expected in areas where the species is likely to be present. However, a use limitation for the entirety of the species range included as a new *Bulletins Live! Two* condition will significantly reduce the use of malathion across the range of the St. Andrew beach mouse for wide area uses (e.g., vector control/mosquito control districts). We anticipate that this species-specific conservation measure, along with the additional broader label restrictions that will be implemented will further reduce the likelihood of exposure. We therefore anticipate extremely limited adverse effects to individuals of the species caused by the loss of terrestrial invertebrates as a food resource. Furthermore, we anticipate the additional conservation measures above,

including residential use label changes, will further reduce the likelihood of exposure of the species, their prey, and their habitat from developed and open space developed applications. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion.

In summary, the St. Andrew beach mouse is seasonally reliant on terrestrial invertebrates as a food resource when plant resources are unavailable. While its status as a narrow endemic species reduces its resiliency and its ability to simply move to another area to seek additional food resources, we anticipate that over the course of the Action, the use restrictions within and adjacent to habitat will preclude the modeled reduction in terrestrial prey insects as described above. Therefore, while we anticipate that small numbers of individuals would be adversely affected, including low levels of sub-lethal reduction in fitness from loss of invertebrate prey over the duration of the Action as described above, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the St. Andrew beach mouse in the wild.

Conclusion: Is not likely to jeopardize

ADDITIONAL REFERENCES

U.S. Fish and Wildlife Service. 2010. Recovery Plan for the St. Andrew Beach Mouse (*Peromyscus polionotus peninsularis*). Atlanta, Georgia. 95 pp.

U.S. Fish and Wildlife Service. 2019. 5-Year Review of St. Andrew Beach Mouse (*Peromyscus polionotus peninsularis*): Summary and Evaluation. Atlanta, Georgia. 29 pp.

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Sylvilagus bachmani riparius	Riparian brush rabbit	55

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:

The primary threat to the survival of the riparian brush rabbit is the limited extent of its existing habitat and the fact that there is only one extant population. Prior to the statewide reduction of riparian communities by nearly 90 percent (Katibah 1984), the riparian brush rabbit and riparian woodrat probably ranged throughout the extensive riparian forests along major streams flowing onto the floor of the northern San Joaquin Valley. The remnant population of each subspecies is in a 104.5 hectare (ha) (258 acre (ac)) fragment of riparian forest on the Stanislaus River at the Park (Williams 1993) situated on the border of San Joaquin and Stanislaus Counties, northwest of Modesto, in the northern San Joaquin Valley, California. Upstream and downstream of the Park, some original riparian habitat remains on private property. However, the fragments are small, isolated, and unlikely to be inhabited by either riparian brush rabbits or riparian woodrats. Other potential threats include wildfire, disease, predation, competition, rodenticide use, clearing of riparian vegetation, and the loss of genetic variability. Naturally occurring events, such as drought and flooding, also increase the risk to the single, small population of each subspecies. During the flooding of 1976, Park personnel used boats to rescue rabbits from bushes. During the flood of 1986, which was short lived, it was estimated that all but 10–25 rabbits at the Park were lost (D. Williams, in litt. 1997). The population rebounded to 213–312 individuals by 1993 (Williams 1993), and the Park was considered at carrying capacity under prevailing environmental conditions (following 7 years of drought). In January of 1997, the Park flooded, submerging most of the habitat of these two subspecies. Evidence of only three riparian brush rabbits and six riparian woodrats was seen immediately following this flooding episode (Daniel F. Williams, California State University, Stanislaus, in litt. 1997). In 1998, only one riparian brush rabbit and nine riparian woodrats were live-trapped (D. Williams, in litt. 1998). Such extraordinarily low population levels subject this subspecies to increased genetic risks and naturally occurring random events. The riparian brush rabbit was described as a distinct subspecies by Orr (1935, in Orr 1940) and is one of 13 subspecies of Sylvilagus bachmani (Hall 1981), 8 of which occur in California. The specimen from which the subspecies designation was described was collected from the west side of the San Joaquin River west of Modesto in Stanislaus County, California, less than 10 kilometers (km) (6 miles (mi)) from the Park. Females give birth to about 5 litters per season, averaging an estimated 9 to 16 young per

breeding season (Basey 1990). The percentage of females active during the breeding season is unknown, but in one study, 9 of 25 female adults examined showed no signs of reproductive activity (Basey 1990). Breeding of the riparian brush rabbits is restricted to the period of female receptivity, approximately January to May, putting this subspecies at a competitive disadvantage to the desert cottontails outside the Park that breed all year (Mossman 1955; Service 1997). Surveys conducted in all potential habitat along the Merced, San Joaquin, Stanislaus, and Tuolumne rivers during 1985 and 1986 failed to locate any additional populations of riparian brush rabbits (Williams 1988).

EB/CE Source: 65 FR 8881 8890, 2/23/2000, Final Rule to List the Riparian Brush Rabbit and the Riparian, or San Joaquin Valley, Woodrat as Endangered

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: Riparian brush rabbits have a low chance of mortality (<3%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., open space developed, 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	<1%
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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	36%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: The remaining range of the riparian brush rabbit consists of dense brush in the riparian forest near the San Joaquin valley. Riparian brush rabbits require nearly continuous

shrub cover and seldom move more than one meter from cover. They will not cross large, open areas, and therefore are unable to disperse beyond the dense brush of the riparian forest at Caswell Memorial State Park. Due to these circumstances, natural dispersal is not possible.

The riparian brush rabbit is an herbivore, feeding on grasses, sedges, clover, forbs, shoots, and leaves in small clearings adjacent to their riparian habitat. Riparian brush rabbits frequent small clearings, where they bask in the sun and feed on a variety of herbaceous vegetation. Food resource distribution is limited due to the need for close proximity of riparian habitat for cover in the dense understory. Riparian brush rabbits occupy riparian forest with a dense shrub layer and dense thickets close to the San Joaquin River. This rabbit lives in tunnels that run through the vines and shrubs of the riparian habitat, and require areas of higher ground that are not flooded regularly or heavily.

Remaining habitat for the riparian brush rabbit is now confined to a few small and widely scattered fragments, totaling about 2,100 hectares. Caswell Memorial State Park, on the Stanislaus River in southern San Joaquin County, is the largest remaining fragment of suitable riparian forest and home to the only extant population of riparian brush rabbit.

Currently, several types of agricultural fields are adjacent to known occupied habitat. Most species activities occur near the edges of dense brush/shrub patches, but new data shows species home range is relatively large, averaging 4.4 acres, and dispersal distances average 1.55 miles for males and 0.68 miles for females. Therefore, species is likely to forage short distances into agricultural crop fields, open spaces, or developed areas that are adjacent to suitable breeding/sheltering areas, but the species is also likely to disperse, migrate, or move along or through agricultural fields to access fragmented patches of suitable breeding and sheltering habitat (i.e. patches of dense shrubs near waterways). Developed areas are adjacent to known occupied habitat, especially in the South Delta area and the occurrences near the city of Lathrop. The brush rabbit is unlikely to forage in developed areas, but the species may disperse, migrate, or move through developed areas or along perimeter of a developed area to access fragmented patches of suitable breeding and sheltering habitat (i.e. patches of dense shrubs near waterways).

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	N	442,341	98.01	22,600	5.01

[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, I	141,154	31.28	7,578	1.679
Pasture	N	52,858	11.71	3,737	0.828
Wheat	N	20,671	4.58	12	0.003
Other Grains	N	23,460	5.20	17	0.004
Developed	*	59,283	13.14	2,964	0.66
Corn	N	27,965	6.20	43	0.010
Other Crops	N	17,135	3.80	0	0
Vegetables and Ground Fruit	D	29,660	6.57	2,658	0.589
Open Space Developed	D, I	20,612	4.57	1,031	0.23
Nurseries	I	1,664	0.37	24	0.005
Rice	N	1,648	0.37	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		191,426	42.41	11,267	2.498
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		163,430	36.21	8,633	1.914
TOTAL[4]:		191,426	42.41	11,267	2.498

 # acres in species range: 451,320 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 10,019 acres, 2.220%

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.

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 reduce 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 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 Action, and the cumulative effects, it is the Service’s biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the riparian brush rabbit. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The riparian brush rabbit has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled malathion uses across the range is low, with a low amount of estimated usage (2.498%) within the non-Federal portion of the species range based on CalPUR data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We estimated that mortality (<1%) will occur from direct contact with malathion on use sites, but we do not anticipate any sublethal or spray drift effects. We also estimated that across the species range, annual malathion uses pursuant to the labels would result in a decline in growth of plants by 36 percent. The riparian brush rabbit is an herbivore, feeding on grasses, sedges, clover, forbs, shoots, and leaves in small clearings adjacent to their riparian habitat. Although this species is likely to forage short distances into agricultural crop fields, open spaces, or developed areas that are adjacent to suitable breeding/sheltering areas, we do not expect species-level effects because the estimated usage of malathion within the non-Federal portion of the species range is very low (2.498%) and there would be potential for alternative food resources in other suitable untreated habitats nearby. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. While we anticipate that small numbers of individuals would be adversely affected, including low levels of mortality from direct exposure and sublethal reduction in fitness from loss of plant-based dietary items over the duration of the Action, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the riparian brush rabbit.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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:
When the Buena Vista Lake ornate shrew was listed as endangered in 2002, the primary threat to its survival and recovery was habitat loss (Service 2002). Since then, industrial and agricultural development, urbanization, and lack of allocation of water to riparian and wetland areas have continued to reduce and fragment the amount of suitable habitat for the shrew. Selenium toxicity continues to be a threat to the continued existence and recovery of the species. Climate change has also been identified as a potential new threat to the conservation status of the shrew. Restricted to wetland and riparian communities in the southern San Joaquin Valley, the shrew is currently known to occupy12 sites, allsmall and isolated parcels of wetland, riparian, and scrub communities. About 96 percent of the original range is no longer suitable for the shrew. Despite the development of reliable water sources for a few of its localities and creation of protected wetland areas (primarily for waterfowl), the shrew is still extremely rare. The biology of the subspecies and keys to effective habitat management remain poorly understood. Threats include its highly restricted range, the continuation of habitat loss/conversion, the persistence of threats and the identification of new threats, the current protection of only a small portion of the shrew's habitat, and the distribution of small populations in highly isolated fragments. Pesticides, including malathion, have been identified as a likely stressor, although no studies have been conducted to investigate their effects on the shrew. The species' 2020 Species Status Assessment discusses anticipated pesticide conditions (including malathion, as a cholinesterase inhibitor) in proximity to the species' known occupied sites.

EB/CE Source: Buena Vista Lake Ornate Shrew (Sorex ornatus relictus) 5-Year Review: Summary and Evaluation. Sacramento, CA. September 2011.
Buena Vista Lake Ornate Shrew Species Status Assessment. Sacramento, CA. August 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 Bueno Vista shrew is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	Mortality of terrestrial invertebrates
Spray drift areas - Prey item mortality	Mortality of terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: Buena Vista Lake ornate shrews have most commonly been found near open water, in areas with a dense vegetative understory or a deep layer of leaf litter. Such areas have moist soil and dense cover from riparian or emergent marsh vegetation such as rushes (*Juncus* spp.), sedges (*Carex* spp.), or cattails (*Typha* spp). The dense vegetation provides protection from predators for the shrew and also supports prey items such as insects and other invertebrate species. Other invertebrate prey species, such as earthworms, burrow in soil, and so are more prevalent and more accessible to the shrew where soils are moist. Buena Vista Lake ornate shrews of all ages require a large and diverse base of invertebrate prey.

The Bueno Vista Lake ornate shrew occurs in remnant patches of wetland or moist-soil vegetation, most of which are surrounded by agricultural development. They may move into surrounding agricultural land on occasion, but there is little data on their movements. The shrew is not expected to utilize developed or open space developed use sites.

Allowable uses driving effects/other considerations: Prior to finalizing this Biological Opinion, we discovered that the overlap of malathion use sites with the species range was calculated based on an inaccurate range map for this species. As a result, we did not carry forward the overlap

values from the draft Opinion into this final Opinion. Instead, we qualitatively estimated the types and extent of malathion use sites occurring within the range by visually examining mapped crop data layers in proximity to the species range and considering information regarding habitat preferences and likely locations of individuals and populations, as described in the species' 2020 Species Status Assessment.

A visual inspection of cropland data layers indicates that crops within the orchards and vineyard, other crops, vegetables and ground fruit, wheat, and cotton UDLs have the most overlap with the range of this species. While shrews could enter these use sites on occasion, we anticipate that spray drift from agricultural fields adjacent to the shrew's preferred wetland and riparian habitats would result in the greatest risk of mortality to the shrew's invertebrate prey base.

Effects to the invertebrate prey base are anticipated from malathion exposure on or near agricultural use sites. Because invertebrates exhibit a range of sensitivities to malathion, exposure is expected to reduce the abundance in these areas, but not completely kill all terrestrial invertebrates exposed in these portions of the range. This reduction in terrestrial invertebrates is anticipated to be greater on malathion use sites, where estimated environmental concentrations are higher than concentrations that would be anticipated from spray drift. These reductions are likely temporary (based on application frequency) with community recovery over a short period of time. In addition, habitat characteristics such as a dense vegetative understory or a deep layer of leaf litter are likely to provide a level of protection to invertebrates inhabiting these areas by providing cover from malathion that may drift into adjacent areas.

Overall Risk: ☐ High ☒ Medium ☐ Low

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

For estimation of usage, we considered county-level CalPUR data for agriculture, county level sales and usage data for mosquito adulticide, and developed and open space developed usage consistent with our overall estimates for listed species.

Information from CalPUR indicates that malathion usage has occurred on crops within the range of the Buena Vista Lake ornate shrew within the pasture, vegetables and ground fruit, orchards and vineyards, cotton, and wheat UDLs. Because known locations of shrews within the range occur in relatively small, fragmented units that are often adjacent to or surrounded by agricultural fields, any usage in these areas could impact a disproportionately large percentage of occupied habitat.

We estimate that up to 5% of developed and open space developed use sites within the species range could undergo some level of treatment with malathion. However, given the habitat preferences of the Buena Vista Lake ornate shrew and limited utilization of these use sites, this usage is unlikely to be of significance to the shrew.

For mosquito adulticide, neither CalPUR data nor sales data indicate past usage of malathion within the counties where the shrew's range is located for the 5 years of data available.

 # acres in species range: not available
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: not available

Overall Usage: ☐ High ☒ Medium ☐ Low

CONSERVATION MEASURES

Rain restriction: Given the relatively short half-life of malathion and rapid degradation via hydrolysis and other processes, persistence of malathion in storm run-off into most aquatic habitats is not anticipated to last longer than 48 hours under typical pH values, (i.e., 6.5-8.5) and water temperatures corresponding to growing season. Restricting malathion application to periods where rain is not forecasted for at least 48 hours or when the soil is not saturated will provide time for the pesticide to degrade before runoff into aquatic habitats can occur, decreasing exposure and risk.

Aquatic habitat buffers: Application buffers, which specify on the label a distance from water bodies where pesticides are not to be applied, are designed to reduce spray drift from entering sensitive non-target areas, thereby providing protection to aquatic species. While the exact amount of spray drift reduction depends on the physical traits of the aquatic ecosystem (e.g. flow rate, volume, etc.) as well as the application method, we can expect (based on AgDRIFT modeling) spray drift reductions ranging from 40 to 91%, with low flow and low volume aquatic habitats receiving the most reduction in spray drift deposition. We anticipate that, in many cases, these buffers will significantly reduce exposure to aquatic organisms and subsequent risk of direct and indirect effects.

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.

Reduced application number and rate: New restrictions on corn, cotton, 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). We anticipate that this

measure will 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.

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 an additional conservation measure:

For the Buena Vista Lake ornate shrew, EPA has incorporated the following species-specific measure: Apply by ground application only (i.e., do not apply aerially) within 100 feet of occupied sites (as described in the 2020 Species Status Assessment).

In combination with the general conservation measures, we anticipate that this species-specific measure will further reduce the amount of malathion entering occupied habitat of the shrew, especially in areas where the aquatic buffers are not applicable. Since the shrew's occupied habitat consists of habitats that may not always be clearly identifiable as wetland areas (which would be protected by the aquatic habitat buffers described above), this measure will provide an additional buffer to these areas from aerial applications when aquatic habitat buffers are not otherwise required or used. While some malathion may drift into the shrew's habitat from ground applications under certain conditions, the extent of this drift is expected to be greatly reduced by offsetting any aerial applications at least 100 feet from occupied areas.

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 Buena Vista Lake ornate shrew. As discussed below, even though the vulnerability is high for this species, and risk and usage are medium, conservation measures are expected to reduce the amount of malathion entering the shrew's habitat. While we anticipate that small numbers of individuals will be affected over the duration of the proposed Action, we do not expect species-level effects to occur.

The Buena Vista Lake ornate shrew has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. Though overlap information was not available to quantitatively evaluate risk and usage, we anticipate medium risk to the species posed by labeled malathion uses across the range based on mortality to the invertebrate prey base, and a medium amount of estimated usage within the non-Federal portion of the range based on CalPUR data. For both of these factors, the proximity of occupied sites to agricultural areas influenced our estimates. Buena Vista Lake ornate shrews are not expected to enter developed or developed open space use sites within the range, but could inhabit adjacent areas. Past usage data indicates that malathion has not been used for mosquito control within the range of the species, and we anticipate the same lack of usage for these areas in the future. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we

assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

Because occupied sites of the Buena Vista Lake ornate shrew are often adjacent to or surrounded by agricultural fields, and data demonstrate malathion usage within the range of the species, exposure via spray drift from crops was initially of particular concern. We do not anticipate that mortality or sublethal effects would occur to the shrew from this exposure, but reductions in prey base from mortality of invertebrate prey items is expected when exposure occurs. We do not anticipate malathion applications will eliminate the prey base where exposure occurs due to differential sensitivity of invertebrate species, particularly as exposure to spray draft results in lower concentrations than on-field exposure. However, since Buena Vista Lake ornate shrews require a large and diverse base of invertebrate prey at all life stages, temporary reductions in the amount of prey or in species richness could affect individuals of the species.

Several factors reduced our concern for mortality to invertebrates from malathion applications, including protection from exposure to drift in preferred habitat types due to the dense vegetation or deeply layered leaf litter that is generally present, and the implementation of several conservation measures that have been incorporated into the Action. For example, where applications occur in developed or open space developed areas in proximity to occupied sites, we do not expect residues to drift or run off into the shrew's habitat based on measures on the residential label limiting applications to spot treatments in developed and open space developed areas, establishing buffers from aquatic habitats, and restricting applications before rain events. In agricultural areas, conservation measures related to aquatic buffers are expected to reduce spray drift into wetland areas near agricultural fields, and measures instructing users to avoid applications within 48 hours of rainfall are anticipated to decrease runoff. In agricultural areas near occupied habitat where aquatic measures are not in effect (due to distance from waterbodies), we expect the species-specific measure restricting application method to ground only 100 feet of shrew habitat will limit drift into the shrew's habitat. While some limited malathion residues may still enter the occupied sites of the Buena Vista Lake ornate shrew from runoff or drift from ground applications, we anticipate that the combination of the general and species-specific measures will serve to substantially reduce the amount of exposure and subsequent mortality of invertebrates in these location such that food is not limited due to malathion exposure.

We estimated that across the species range, annual malathion uses pursuant to the labels would result in small reductions in prey, particularly in or adjacent to occupied sites in proximity to agriculture. However, based on the reduction of malathion exposure expected as a result of general and species-specific conservation measures, we do not expect species-level effects. Therefore, we do not anticipate that the proposed Action would appreciably reduce survival and recovery of the Buena Vista Lake ornate shrew.

Conclusion: Is not likely to jeopardize

REFERENCES

U.S. Fish and Wildlife Service. 2020. Buena Vista Lake Ornate Shrew Species Status Assessment. U.S. Fish and Wildlife Service Region 10 Sacramento, California. August 2020.

Integration and Synthesis Summary: Mammals

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

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:

There are two known populations of the riparian woodrat in the same general area of California: one within Caswell Memorial State Park (CMSP), and the other approximately five miles away within the San Joaquin River National Wildlife Refuge (SJRNWR)(Kelly et al. 2009, Kelly et al. 2011). At both sites, the riparian woodrat prefers to occupy multi-storied riparian habitat, consisting of a shrubby understory, a midstory of willows or vines, and a well-developed overstory of valley oaks or other large trees (Gerber et al. 2003, Kelly et al. 2011). At this time, based upon trapping success, it is thought that CMSP has both a higher population density and more individuals than the population at the SJRNWR (Kelly et al. 2009, Kelly et al. 2011). Abundance at CMSP is assumed to be similar to that when the species was listed, although fluctuations may have occurred in the population in response to fire and flood events. Since it was listed, an additional population has been discovered on the SJRNWR south of the confluence of the Stanislaus and San Joaquin Rivers (Kelly et al. 2009, Kelly et al. 2011, Matocq 2002a). Between March, 2003, and November 2011, 34 individuals have been captured at the SJRNWR, which suggests a small population size. Further support for this is the fact that no stick lodges typical of the species have been observed at the SJRNWR (Kelly et al. 2011). Based on these observations, this population is believed to be vulnerable. These two populations are the only known populations of this species. Since 2000, the nonprofit River Partners has collaborated with the U.S. Fish and Wildlife Service through CALFED grant funding to restore riparian habitat on the SJRNWR. Some of this restoration will directly benefit the riparian woodrat by expanding the amount of riparian forest habitat available for the species to inhabit. Little peer-reviewed research has been conducted on the species since its listing. Due to the continued small population size, as well as the relative isolation and constriction of the populations to a small geographic area, fires, floods, disease, exotic species, inbreeding depression, and genetic drift remain a significant threat to the extinction of this species. A wildfire event in 2004 and major flood events in 2006 and 2011 may have significantly reduced the riparian woodrat population at SJRNWR (Kelly et al. 2011).

EB/CE Source: 78 FR 19510 19514, 4/1/2013, Notice of 5-Year Review Completion. U.S. Fish and Wildlife Service. June 20, 2012. Riparian Woodrat (Neotoma fuscipes riparia) 5-Year Review: Summary and Evaluation. 25 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 riparian woodrat is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	39%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers:

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	N	53,083	94.47	22,600	40.22
Orchards and Vineyards	I	17,574	31.28	323	0.575
Pasture	N	9,735	17.33	448	0.798
Other Grains	N	6,237	11.10	0	0
Wheat	N	3,712	6.61	0	0
Corn	N	1,095	1.95	6	0.010
Other Crops	N	2,079	3.70	0	0
Vegetables and Ground Fruit	N	2,499	4.45	71	0.125
Developed	I	2,199	3.91	110	0.20
Open Space Developed	I	1,870	3.33	93	0.17
Nurseries	I	152	0.27	15	0.026
Rice	N	24	0.04	0	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		21,795	38.79	541	0.971
TOTAL[4]:		21,795	38.79	541	0.971

 # acres in species range: 56,189 acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 3,709 acres, 6.601%

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 groundfruit set 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.

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 reduce 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 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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the riparian woodrat. As discussed below, even though the vulnerability is high for this species and risk is medium, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The riparian woodrat has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled malathion uses across the range is medium, with a low amount of estimated usage (<1%) within the non-Federal portion of the species range based on CalPUR data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate that mortality or sublethal effects will occur on use sites, from spray drift, or from mosquito control. We estimated that across the non-Federal portion of the species range, annual malathion uses pursuant to the labels would result in a decline in growth of plants (39%); however, we do not expect species-level effects because the estimated usage of malathion is very low (0.971%). This estimated usage is also likely overestimated because decline in growth of plants is mostly attributed to orchards and vineyards, but the riparian woodrat prefers to occupy multi-storied riparian habitat (Gerber et al. 2003, Kelly et al. 2011). Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate

is expected to 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. In summary, we anticipate the very low usage and that the conservation measures will reduce the likelihood of exposure of the species and its forage to malathion. Therefore, while some individuals may experience small reductions in available food items, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the riparian woodrat.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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:

There are three recognized subspecies of Merriam's kangaroo rat within California: *Dipodomys merriami merriami, D. m. collinus,* and *D. m. parvus* (San Bernardino Merriam's kangaroo rat). As identified in the final listing rule, habitat for the San Bernardino Merriam's kangaroo rat has been severely reduced and fragmented by development, aggregate mining, and related activities in the San Bernardino and San Jacinto valleys (USFWS 1998b, p. 51013). Development within floodplain habitat will continue to increase as a result of population growth within western San Bernardino County and the demand for a larger water supply in southern California, and aggregrate minining is a continuing threat. Flood control structures often confine, isolate, or fragment populations of the San Bernardino Merriam's kangaroo rat, thereby predisposing these populations to catastrophes and other risks inherent to small populations. Historically, the San Bernardino Merriam's kangaroo rat occupied floodplains and adjacent upland habitat areas containing appropriate physical and vegetative characteristics. Animals from the upper terraces of the floodplain and adjacent uplands were historically available to recolonize extirpated areas that were flooded and scoured during storm events. However, conversion of floodplains into narrow, monotypic channels has removed the physical structure (i.e., terracing) as well as areas of the active floodplain. An overall reduction in the amount of habitat available to the SBKR and greater habitat fragmentation will continue to occur. San Bernardino Merriam's kangaroo rats are primarily granivorous and often store large quantities of seeds in surface caches (Reichman and Price 1993, p. 543). Although seeds are the primary food source, green vegetation and insects appear to be important seasonal food and water sources (Reichman and Price 1993, p. 540). Seed caching may enable them to endure temporary shortages of food, as has been documented for other species of Dipodomys (Reichman and Price 1993, p. 543; Brown and Harney 1993, p. 624). Although reproductive activities peak in June and July, San Bernardino Merriam's kangaroo rats appear to have a prolonged breeding season. Pregnant or lactating females have been captured between January and November while males in reproductive condition have been captured between January and August (McKernan 1997, p. 50). Females are capable of having more than one litter per year, and litter sizes probably average between two and three young (MEC Analytical Systems 2000, p. 77). Because of the high level of habitat loss (habitat already reduced by 96% by the time the San Bernardino Merriam's kangaroo rat was emergency listed),

our conservation and recovery strategy is to conserve as much remaining habitat as possible. Management and coordination with Federal, State, and local government agencies and mining operations will be needed to protect the San Bernardino Merriam's kangaroo rat from habitat fragmentation and loss due to urban development, OHV use, trash dumping, aggregate mining, and an increase in predators such as domestic and feral cats associated with urban development. The San Bernardino Merriam's kangaroo rat faces a high degree of threat with a low recovery potential.

EB/CE Source: U.S. Fish and Wildlife Service. August 14, 2009. San Bernardino kangaroo rat (Dipodomys merriamii parvus) 5-Year Review: Summary and Evaluation. 32 p. ; 75 FR 28636 28642, Endangered and Threatened Wildlife and Plants; Initiation of 5-Year Reviews of 34 S

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 Bernardino Merriam's kangaroo rats have a low chance of mortality (<2%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., open space developed, 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	<0.1%
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	12% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 17% terrestrial invertebrates
Plants affected (decline in growth)	9%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	60% terrestrial invertebrates, no effects to plants

Risk modifiers: The majority of the remaining San Bernardino Merriam's kangaroo rat populations are primarily found in three areas: the Santa Ana Wash, the San Jacinto Wash, and Lytle Creek and Cajon Wash. Other smaller populations of the San Bernardino kangaroo rat are documented in washes and hills in the areas surrounding the three main population centers. The range of the San Bernardino Merriam's kangaroo rat exists in the California San Joaquin valley.

The San Bernardino Merriam's kangaroo rat is a granivore and omnivore. Although seeds are the primary food source, green vegetation and insects appear to be important seasonal food and water sources. Insects, when available, have been documented to constitute as much as 50 percent of a kangaroo rat's diet. The San Bernardino kangaroo rat in alluvial sage scrub and associated vegetation, such as coastal sage scrub and chamise chaparral, with a moderately open canopy. Habitat fragmentation due to development and related activities in the San Bernardino and San Jacinto valleys act as a habitat restraint. This species has moderate to medium mobility/dispersal, and high site fidelity.

The San Bernardino Merriam's kangaroo rat will occupy and use (breed, travel, forage) dirt roads in row crop areas, and will occupy active and abandoned citrus orchards with suitable soils. This species will not use lawn or developed areas, but will occupy (shelter, travel, breed, forage) areas landscaped areas with sparse shrubs, and dirt parking lots w/ suitable soils in open space developed areas.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	1,071,133	60.09	0	0
Pasture	I	3,032	0.17	89	0.005
Developed	*	338,350	18.98	16,917	0.95

[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	%
Open Space Developed	D, I	154,300	8.66	7,715	0.43
Wheat	I	35,935	2.02	0	0
Other Crops	I	11,431	0.64	0	0
Other Grains	I	2,727	0.15	0	0
Vegetables and Ground Fruit	I	117	0.01	117	0.01
Nurseries	I	693	0.04	19	0.001
Orchards and Vineyards	D, I	863	0.05	4	<0.001
Cotton	I	3	0.00	0	0.00
Sub-TOTAL (D): *Other uses with direct effects only*[3]		155,164	8.71	7,719	0.43
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		209,101	11.73	7,944	0.446
TOTAL[4]:		1,280,234	71.83	7,944	0.446

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: (1,782,427) acres
% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 685,973 acres, 38.485%

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 reduce 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 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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the San Bernardino Merriam's kangaroo rat. As discussed below, even though the vulnerability is high for this species and risk is medium, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The San Bernardino Merriam's kangaroo rat has a high vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled malathion uses across the range is medium, with a low amount of estimated usage (<1%) within the non-Federal portion of the species range based on CalPUR data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We estimated that mortality (<0.1%) will occur from direct contact with malathion on use sites, but we do not anticipate any sublethal or spray drift effects. The San Bernardino Merriam's kangaroo rat is a granivore and omnivore. Although seeds are the primary food source, green vegetation and insects appear to be important seasonal food and water sources. Insects have also been documented to constitute as much as 50 percent of a kangaroo rat's diet. We estimated that across the species range, annual malathion uses pursuant to the labels would result in the loss of some prey items (terrestrial invertebrates), especially on mosquito control sites; however, there is no reported mosquito adulticide usage within the species range. While we anticipate adverse effects to prey items would occur, we do not expect species-level effects because of the estimated low amount of usage (0.446%) within the non-Federal portion of the species range, and potential for alternative food resources in other suitable untreated habitats nearby. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. While we anticipate that small numbers of individuals would be adversely affected,

including low levels of mortality from direct exposure and sublethal reduction in fitness from seasonal loss of plant-based and invertebrate dietary items over the duration of the Action, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the San Bernardino Merriam's kangaroo rat.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Urocyon littoralis catalinae	Santa Catalina Island Fox	1237

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:

In August 2016, USFWS published a Final Rule (81 FR 53315 53333), removing the San Miguel Island Fox, Santa Rosa Island Fox, and Santa Cruz Island Fox from the Federal List of Endangered and Threatened Wildlife, and reclassifying the Santa Catalina Island Fox from endangered to threatened. In 2004, the U.S. Fish and Wildlife Service (FWS) listed four of the six subspecies of island fox endemic to the California Channel Islands as endangered under the Endangered Species Act of 1973, as amended (Act), following catastrophic population declines (69 FR 10335). The Santa Catalina Island fox (*U. l. catalinae*) declined from over 1,300 to 103. The Channel Islands inhabited by island foxes are owned by four major landowners: the National Park Service (NPS), the U.S. Navy (Navy), The Nature Conservancy (TNC), and the Santa Catalina Island Conservancy (CIC). Like the Santa Cruz Island fox subspecies, Santa Catalina Island foxes recovered fairly quickly from the population lows in 1999-2000, with a total population estimate (including pups) in 2013 of 1,852 individuals, of which 1,594 were adults (King, Santa Catalina Island Conservancy, pers. comm. 2014). The population has steadily increased since 2000, and may be approaching carrying capacity, with a total population estimate (including pups) of around 1,500 foxes in 2011 and 2012. Disease remains a concern for Santa Catalina Island foxes, since the island has high accessibility and a sizable human population with domestic dogs and cats, many likely unvaccinated. Furthermore, seven raccoons and two opossums were removed from the island between 2007 and 2013, typically arriving as stowaways on boats (King and Duncan 2014). The strain of canine distempur virus (CDV) that caused the catastrophic decline of Santa Catalina Island foxes in 1999-2000 was most closely related to that observed in raccoons (Timm et al. 2009). The CIC vaccinates over 300 foxes annually (about 80 percent of all foxes captured) against CDV and rabies. Recent serology indicated low, but nonetheless present, seroprevalence to CDV in Santa Catalina Island foxes, and some seroprevalence to canine adenovirus, canine parvovirus and canine corona virus (King and Duncan 2014). Santa Catalina Island foxes continue to have an unusually high incidence of ceruminous gland tumors, cancers occurring in the ear canal and associated with inflammation from ear mites. Treatment with ivermectin has been found to reduce inflammation and incidence of cancer (Coonan 2011). Other sources of mortality include, but are not limited to, effects from competition with feral cats and mortality from vehicle strikes. Additionally, all island fox

subspecies currently have annual survival estimates greater than 80 percent. At present, golden eagles are not known to prey upon Santa Catalina Island foxes. If mortality as a result of golden eagle predation becomes a threat to the Santa Catalina Island fox, the golden eagle management strategy will be implemented.

EB/CE Source: U.S. Fish and Wildlife Service. 2015. Recovery Plan for Four Subspecies of Island Fox (Urocyon littoralis). U.S. Fish and Wildlife Service, Sacramento, California. xiv + 180 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 Santa Catalina Island fox have a low chance of mortality (up to 1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates from consuming birds and grass on developed and open space developed use sites. Consumption of other food items on these sites is not expected to result in direct effects.

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% from consumption of birds and grass, no effects expected from consumption of other dietary items
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	19% invertebrates, reptiles, amphibians; 10% birds, <0.1% mammals
Spray drift areas - Prey item mortality	Up to 8% invertebrates
Plants affected (decline in growth)	19%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	52% invertebrates, 5% reptiles and amphibians, no effects to birds, mammals, and plants

Risk modifiers: The Santa Catalina Island fox forages and travels through developed areas.

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 would 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	374,460	51.91	0	0
Developed	D, I	92,861	12.87	4,643	0.64
Open Space Developed	D, I	44,595	6.18	2,230	0.31
Other Crops	I	69	0.01	0	0
Pasture	I	20	<0.01	0	0
Vegetables and Ground Fruit	I	16	<0.01	10	<0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		137,456	19.05	6,873	0.95
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		137,562	19.07	6,913	0.96
TOTAL[4]:		512,022	70.97	6,913	0.96

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: 721,430 acres

[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.

% of range in California (i.e., where CalPUR data is available): 100%
Range overlap with Federal lands: 349,243 acres, 48.410%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Santa Catalina Island fox. As discussed below, the vulnerability and risk are medium for this species, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. Therefore, while we anticipate that small numbers of individuals will be affected over the duration of the Action, we do not expect species-level effects to occur.

The Santa Catalina Island fox has a medium vulnerability ranking based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled malathion uses across the range is medium, with a low amount of estimated usage (<1%) within the non-Federal portion of the species range based on CalPUR data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We estimated that mortality (0.96%) will occur from consuming contaminated birds and grass on developed and open space developed use sites, but we do not anticipate any sublethal or spray drift effects. We estimated that across the species range, annual malathion uses pursuant to the labels would result in the loss of some prey items, especially on mosquito control sites; however, there is no reported mosquito adulticide usage within the species range. While we anticipate adverse effects to prey items would occur, we do not expect species-level effects because of the

estimated low amount of usage (0.96%) within the non-Federal portion of the range, and potential for alternative food resources in other suitable untreated habitats nearby. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. While we anticipate that small numbers of individuals would be adversely affected, including low levels of mortality from direct exposure and sublethal reduction in fitness from seasonal loss of plant-based and invertebrate dietary items over the duration of the Action, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Santa Catalina Island fox in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Brachylagus idahoensis	Columbia Basin Pygmy Rabbit	1240

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:

Large-scale loss and fragmentation of native shrub steppe habitats, primarily for agricultural development, likely played a primary role in the long-term decline of the Columbia Basin pygmy rabbit. However, it is unlikely that these factors alone directly influenced the eventual extirpation of all known subpopulations from the wild. Once a population declines below a certain threshold, it is at risk of extirpation from a number of influences including chance environmental events (e.g., extreme weather), catastrophic habitat loss or resource failure (e.g., from wildfire or insect infestations), predation, disease, demographic limitations, loss of genetic diversity, and inbreeding. At the time of our emergency listing action in 2001, the Columbia Basin pygmy rabbit was imminently threatened by its small population size, loss of genetic diversity, and inbreeding depression, coupled with a lack of suitable, protected habitats in the wild. To varying degrees, all of the above influences continue to impact the Columbia Basin pygmy rabbit and, in combination, have resulted in the population's endangered status. The species has been placed in several genera since it was first classified in 1891 as *Lepus idahoensis* (Washington Department of Fish and Wildlife [WDFW] 1995). More recent examination of dentition (Hibbard 1963) and analysis of blood proteins (Johnson 1968) suggest that the pygmy rabbit differs significantly from species within either the *Lepus* or *Sylvilagus* genera. The pygmy rabbit is now generally considered to be within the monotypic genus *Brachylagus*, and is again classified as *B. idahoensis* (Green and Flinders 1980a; WDFW 1995). There are no recognized subspecies of the pygmy rabbit (Dalquest 1948; Green and Flinders 1980a). The winter diet of pygmy rabbits is comprised of up to 99 percent sagebrush (Green and Flinders), which is unique among leporids (White et al. 1982). During spring and summer in parts of their historical range, their diets consist of up to 51 percent sagebrush, 39 percent grasses (particularly native bunch grasses, such as Agropyron spp. and Poa spp.), and 10 percent forbs (herbaceous plants) (Green and Flinders 1980b). The annual mortality rates of adult pygmy rabbits may be as high as 88 percent, and over 50 percent of juveniles may die within roughly 5 weeks of their emergence (Wilde 1978; WDFW 1995). However, the mortality rates of adult and juvenile pygmy rabbits can vary considerably between years, and even between juvenile cohorts within years (Wilde 1978). Starvation and environmental stress likely account for some mortality in wild pygmy rabbits (Wilde 1978); however, predation is generally considered to be the main cause of mortality (Green 1979).

Potential predators include fossorial and terrestrial mammals such as badgers, long-tailed weasels (*Mustela frenata*), coyotes (*Canis latrans*), and bobcats (*Felis rufus*), and a variety of avian predators such as great horned owls (*Bubo virginianus*), long-eared owls (*Asio otus*), ferruginous hawks (*Buteo regalis*), northern harriers (*Circus cyaneus*), and common ravens (*Corvus corax*) (Janson 1946; Gashwiler et al. 1960; Green 1978; WDFW 1995; M. Hallet, WDFW, pers. comm. 2002). Population cycles are not known in pygmy rabbits, although local, rapid population declines have been noted in several states (Bradfield 1974; Weiss and Verts 1984; WDFW 1995). After initial declines, pygmy rabbit populations may not have the same capacity for rapid increases in numbers as other leporids due to their close association with specific components of sagebrush ecosystems, and the relatively limited availability of their preferred habitats (Wilde 1978; Green and Flinders 1980b; WDFW 1995).

EB/CE Source: U.S. Fish and Wildlife Service. 2012. Recovery Plan for the Columbia Basin Distinct Population Segment of the Pygmy Rabbit (Brachylagus idahoensis). Portland, Oregon. ix + 109 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: Columbia basin pygmy rabbits have a low chance of mortality (up to 2%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., orchards and vineyards, developed, open space developed).

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%
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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	6.5%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected

Indirect	No effects expected

Risk modifiers: The range of the Columbia basin pygmy rabbit is located in the Columbia basin in the state of Washington. Pygmy rabbits occur in the semiarid shrub steppe biome of the Great Basin and adjacent intermountain regions of the western United States. Within this broad biome, pygmy rabbits are typically found in habitat types that include tall, dense stands of sagebrush (Artemisia spp.), on which they are highly dependent to provide both food and shelter throughout the year. The pygmy rabbit is one of only two native rabbit species in North America that digs its own burrows and, therefore, is most often found in areas with relatively deep, loose soils that allow burrowing (USFWS, 2012).

High ecological integrity of the community and site fidelity as well as low tolerance ranges are inferred based on the specific habitat needs of the species and the fact that the species has always been thought to be scarce and limited in numbers. Information from a study in Idaho indicates that pygmy rabbits have a greater dispersal capability than previously known (Rachlow and Estes-Zumpf 2005, pages 1-3). This species utilizes smaller home ranges during winter (30 m of burrows), than in spring/summer during breeding season (females 3 hectares (7 acres) and males 20 hectares (50 acres). More recent records indicate that juvenile pygmy rabbits often undertake a single, rapid dispersal movement between 4 to 12 weeks of age, and that some juvenile animals may disperse over 6 miles (10 kilometers) during this period. In addition, adult pygmy rabbits may disperse over 7.5 miles (12 kilometers) between their more restricted, seasonal use sites. While these movements are considerably longer than those previously documented, it should also be noted that they are maximum estimates and there appear to be large differences in the propensity of individual pygmy rabbits to disperse, with many animals remaining relatively sedentary. Reflecting this, median recorded dispersal distances for the Idaho pygmy rabbits were 0.7 mile (1.1 kilometers) and 1.9 miles (3.0 kilometers) for males and females, respectively (USFWS, 2010). Because of the juvenile dispersal, and potential for adults to forage, pygmy rabbits are not precluded from the possibility of occurring on use sites.

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	4,330,807	56.70	145,200	1.90
Pasture	N	239,050	3.13	11,288	0.15
Wheat	N	1,188,313	15.56	67,194	0.88
Other Crops	N	973,005	12.74	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.

Use type	Risk to species[1]	Use overlap with range		Estimated usage in range[2]	
		Acres	%	acres	%
Vegetables and Ground Fruit	N	281,999	3.69	102,910	1.35
Corn	N	137,045	1.79	435	0.01
Orchards and Vineyards	D, I	211,890	2.77	107,906	1.41
Other Grains	N	48,066	0.63	5,199	0.07
Open Space Developed	D, I	166,132	2.18	8,307	0.11
Developed	D, I	118,397	1.55	5,920	0.08
Other RowCrops	N	9,449	0.12	1,128	0.01
Nurseries	I	656	0.01	656	0.01
Sub-TOTAL (D): *Other uses with direct effects only*[3]		496,420	6.50	122,132	1.60
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		497,076	6.51	122,789	1.61
TOTAL[4]:		497,076	6.51	122,789	1.61

 # acres in species range: 7,638,202 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 754,488 acres, 9.878%

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 groundfruit set 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 the maximum application rate for citrus (outside of California) is expected to reduce potential environmental concentrations to one-third of modeled values. These measures will help reduce the amount of malathion used and decrease potential exposure to the species.

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 reduce 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–

[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.

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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Columbia Basin pygmy rabbit. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Columbia Basin pygmy rabbit has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses is low, with a low amount of estimated usage (1.61%) within the non-Federal portion of the species range based on standard usage data. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We anticipate that malathion use pursuant to the labels in use areas will result in a very low level of mortality (<0.1%) and will not result in any sublethal or spray drift effects. As a sagebrush (*Artemisia* spp.) obligate, this species is found in sagebrush habitat, which it depends on for food and cover. Up to 99 percent of the species' winter diet consists of sagebrush, whereas during spring and summer, its diet consist of up to 51 percent sagebrush, 39 percent grasses (particularly native bunch grasses, such as Agropyron spp. and Poa spp.), and 10 percent forbs (Green and Flinders 1980b). Because the Columbia Basin pygmy rabbit is herbivorous we do not anticipate a loss of prey resources. Ultimately, malathion usage is not anticipated to cause species-level effects. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. We anticipate the low usage, low risk to the species, and the implementation of the conservation measures will reduce the likelihood of exposure of the species and its food resources to malathion. Therefore, while some small number of individuals may experience small losses in available forage, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we anticipate that the Action will not appreciably reduce survival and recovery of the Columbia Basin pygmy rabbit in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: Declining population(s) – one or more populations declining
Pesticides noted ☒

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

Although the four Thurston/Pierce subspecies of the Mazama pocket gopher are not known to have low genetic diversity, small population sizes at most sites, coupled with disjunct and fragmented habitat, may contribute to further population declines. Little is known about the local or rangewide reproductive success of the four Thurston/Pierce subspecies of the Mazama pocket gopher. The Roy Prairie pocket gopher is found in the vicinity of the Roy Prairie and on Joint Base Lewis- McChord (JBLM) in Pierce County. The subspecies was described as plentiful in 1983 but by 1993 the extent of activity at the type locality was described as a "small population" (Steinberg 1996, p. 24). The Roy Prairie pocket gopher is known to occur across a large expanse of prairie on JBLM, which is currently secure from the threat of development. JBLM has committed to operational restrictions on military training areas, in order to avoid and minimize potential negative impacts to Roy Prairie and Yelm pocket gophers on portions of the base. Currently-occupied areas will be buffered from training activities, with an emphasis on occupied habitat in "priority habitat" areas. Regular surveys will be conducted with a goal of determining distribution of Mazama pocket gophers, protecting gophers and their habitat from disturbance or destruction, and determining population status. Our review of the best available scientific and commercial data found no evidence to indicate that disease is a threat to the Mazama pocket gopher subspecies found in Washington. The existing regulatory mechanisms are not sufficient to significantly reduce or remove the negative threats presently experienced by the four Thurston/Pierce subspecies of the Mazama pocket gopher. Lack of essential habitat protection under State laws leaves these subspecies at continued risk of habitat loss and degradation. On JBLM, regulations applying to the Mazama pocket gopher are covered by the current Integrated Natural Resources Management Plan and Endangered Species Management Plan (ESMP). We conclude that military training, as it currently occurs, causes direct mortality of individuals and negatively affects habitat for the Roy Prairie and Yelm subspecies of the Mazama pocket gopher in all areas where training and the subspecies overlap. Both the Roy Prairie pocket gopher and the Yelm pocket gopher are known to occur on JBLM. Within the estimated range of the Roy Prairie pocket gopher, more than 80 percent of the soils known to be used by the subspecies are within JBLM's boundaries. The Mazama pocket gopher is not known to be impacted by pesticides or herbicides directly, but may be affected by the equipment used to dispense them.

We find that both development and fire suppression have caused the loss of a majority of prairie habitats or made such habitat unavailable to the four Thurston/Pierce subspecies of the Mazama pocket gopher due to conversion of land to incompatible uses (e.g., residential and commercial development) and the encroachment of native and nonnative species of woody plants. These significant impacts are expected to continue into the foreseeable future. Impacts from military training, affecting large expanses of areas occupied by the Roy Prairie and Yelm pocket gopher on JBLM, were expected to increase under the Department of Defense's Grow the Army initiative, although JBLM's Mazama pocket gopher ESMP provides an overall conservation benefit to the subspecies. Predation of gophers by feral and domestic cats and dogs has occurred and is expected to increase with increased residential development on prairie soils occupied by gophers, and to continue to occur where people recreate with their dogs in areas occupied by Mazama pocket gophers. However, the Roy Prairie pocket gopher is less at risk on JBLM.

EB/CE Source: April 9, 2014, 79 FR 19759 19796 Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Olympia Pocket Gopher, Roy Prairie Pocket Gopher, Tenino Pocket Gopher, and Yelm Pocket Gopher, With Special Rule

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 Roy Prairie pocket gopher is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	8%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected

Indirect	No effects expected

Risk modifiers: The Roy Prairie pocket gopher is one of the four Thurston/Pierce (County) subspecies of the Mazama pocket gopher, which are found west of the Cascade Mountain Range, in the Olympic Mountains and in the Puget Sound trough, with an additional single locality known from Wahkiakum County, Washington. Their populations are concentrated in well-drained friable soils often associated with glacial outwash prairies in western Washington, and alpine and subalpine meadows and other meadow-like openings at lower elevations. Prairie and meadow habitats used by pocket gophers have a naturally patchy distribution. Within these prairie habitats, there is an even patchier distribution of soil rockiness which may further restrict the total area that pocket gophers can utilize.

The species has a very limited distribution in Pierce County on prairies in rapidly developing areas and this conversion of habitat has resulted in widely separated populations lacking habitat corridors which impede natural recolonization that historically occurred. Pocket gophers are often considered a pest because they sometimes damage crops and seedling trees, and their mounds can create a nuisance. Local populations that survive commercial and residential development are potentially vulnerable to extirpation by domestic and feral cats, dogs and mole trapping or poisoning. Pocket gophers from Thurston County were used in a rodenticide experiment as recently as 1995. In Washington State it is currently illegal to trap or poison Mazama pocket gophers, or to trap or poison moles where they overlap with Mazama pocket gopher populations but it is reasonable to believe that still a threat where their ranges overlap residential properties.

The species is a generalist herbivore; diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers.

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for most effects to growth of plants in the range of the RPPG.

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	0	0
Developed	I	3,609	3.78	180	0.19
Pasture	N	0	0.00	0	0.00
Open Space Developed	I	4230	4.44	212	0.22

[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	N	9	0.01	9	0.01
Other Crops	N	9	0.01	<1	<0.01
Christmas Trees	N	52	0.05	24	0.03
Corn	N	2	0.00	<1	<0.01
Other Grains	N	2	0.00	2	<0.01
Nurseries	I	1	0.00	1	<0.01
Orchards and Vineyards	I	9	0.01	13	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]		7,849	8.23	406	0.43
TOTAL[4]:		7,849	8.23	406	0.43

 # acres in species range: 95,375 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 59,859 acres, 62.761%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that 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.

registration of malathion, is not likely to jeopardize the continued existence of the Roy Prairie pocket gopher. As discussed below, vulnerability is medium for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. Therefore, while we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Roy Prairie pocket gopher has a medium vulnerability based on its status, distribution, and trends, as described above. Although there is only a single, constrained population of this species remaining, there is a net conservation benefit to the species on Joint Base Lewis- McChord (JBLM) due to conservation measures implemented on-base per in the JBLM Endangered Species Management Plan. Approximately 80% of the soil type utilized by the species occurs within JBLM. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (0.43%) within the non-Federal portion of the range of the species, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use sites or from spray drift. This species is a generalist herbivore, and we anticipate an 8% decline in plant growth. However, we do not expect species-level effects because of the extremely low level of usage (0.43%) within the non-Federal portion of the species range. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 the low usage, low risk to the species, and the implementation of the conservation measures will reduce the likelihood of exposure of the species and its food resources to malathion. Therefore, we anticipate very low numbers of individuals may experience small losses in available forage; however, we do not expect that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Roy Prairie pocket gopher in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Tamias minimus atristriatus	Penasco least Chipmunk	4228

VULNERABILITY

(Summary of status, environmental baseline and cumulative effects)

Status: Proposed 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:

Penasco least chipmunk is endemic to the White Mountains, Otero and Lincoln Counties, and the Sacramento Mountains, Otero County, New Mexico. The Penasco least chipmunk historically had a broad distribution throughout the Sacramento Mountains within ponderosa pine forests. The last verification of persistence of the Sacramento Mountains population of Penasco least chipmunk was in 1966, and the subspecies appears to be extirpated from the Sacramento Mountains. The only remaining known distribution of the Penasco least chipmunk is restricted to open, high-elevation talus slopes within a subalpine grassland, located in the Sierra Blanca area of the White Mountains in Lincoln and Otero Counties, New Mexico. The Penasco least chipmunk faces threats from present or threatened destruction, modification, and curtailment of its habitat from the alteration or loss of mature ponderosa pine forests in one of the two historically occupied areas. The documented decline in occupied localities, in conjunction with the small numbers of individuals captured, is linked to widespread habitat alteration. Moreover, the highly fragmented nature of its distribution is a significant contributor to the vulnerability of this subspecies and increases the likelihood of very small, isolated populations being extirpated. As a result of this fragmentation, even if suitable habitat exists (or is restored) in the Sacramento Mountains, the likelihood of natural recolonization of historical habitat or population expansion from the White Mountains is extremely remote. Because the one known remaining extant population of Penasco least chipmunk in the White Mountains is particularly susceptible to extinction as a result of small, reduced population sizes, and its isolation due to the lack of contiguous habitat, even a small impact on the White Mountains could have a very large impact on the status of the subspecies as a whole. The combination of its restricted range, apparent small population size, and fragmented historical habitat make the White Mountains population inherently vulnerable to extinction due to effects of small population sizes (e.g., loss of genetic diversity). These impacts are likely to be seen in the population at some point in the foreseeable future, but do not appear to be affecting this population currently as it appears to be stable at this time.

EB/CE Source: 81 FR 87246 87272, NOR Endangered and Threatened Wildlife and Plants; Review of Native Species That Are Candidates for Listing as Endangered or Threatened; Annual Notification of Findings on Resubmitted Petitions; Annual Description of Progress on Listing

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: Penasco least chipmunks have a low chance of mortality (<1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, 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 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	<1% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 1% terrestrial invertebrates
Plants affected (decline in growth)	<1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	<0.1% terrestrial invertebrates, no effects to plants

Risk modifiers: 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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	1,256	0.02	0	0.00
Pasture	I	1,009	0.01	1,152	0.02
Open Space Developed	I	19,524	0.27	976	0.01
Developed	I	7,561	0.10	378	0.01
Other Crops	I	1,049	0.01	0	0
Orchards and Vineyards	I	304	<0.01	204	<0.01
Corn	I	11	<0.01	0	0
Other Grains	I	39	<0.01	39	<0.01
Cotton	I	3	<0.01	0	0
Wheat	I	23	<0.01	0	0
Vegetables and Ground Fruit	I	22	<0.01	22	<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]		29,544	0.40	2,771	0.04
TOTAL[4]:		30,800	0.42	2,771	0.04

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: 7,333,892 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 4,160,135 acres, 56.725%

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

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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Penasco least chipmunk. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low. While we anticipate that small numbers of individuals may be affected over the duration of the proposed Action, we do not expect species-level effects to occur.

The Penasco least chipmunk has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (0.04%) within the non-Federal portion of the range of the species, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use sites or from spray drift. We anticipate reduction of less than 1% to prey resources (i.e., terrestrial invertebrates) in use areas and from spray drift, and also a less than 1% decline in plant growth. We do not expect impacts to individuals of this species due to this reduction in prey resources and plant growth because of the very low level of reduction, and also because of the extremely low level of usage within the non-Federal portion of the species range. Usage overlaps on only 0.04% of the species range according to standard data. Therefore, while small number of individuals may experience small losses in available prey, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Penasco Least Chipmunk in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Pekania pennanti	Fisher (Southern Sierra Nevada DPS)	4648

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)
Pesticides noted ☒

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

The southern Sierra Nevada DPS of fisher is small and geographically separated from the remainder of the species. The southern Sierra Nevada (SSN) DPS of fisher is one of two DPSs on the west coast of North America and represents the southern-most range of the species. Currently the DPS occurs from the Tuolumne River in Yosemite National Park south through the forested lands abutting the Kern River Canyon. The eastern limit is the high-elevation, granite-dominated mountains of the Sierras, while the western boundary of the range is the low elevation extent of mixed conifer forests. Historically, the DPS likely extended north of their current occupied range but may have contracted due to unregulated trapping, predator-control efforts, habitat loss and fragmentation, and/or climatic changes; however, genetics indicate this DPS has been isolated from other populations since prior to European settlement. Fisher habitat in the SSN consists of core habitat areas separated primarily by major river canyons, across which fishers may occasionally disperse via linkage areas. Primary habitat for the SSN DPS of fisher consists primarily of dense, mature mixed-conifer and ponderosa pine forests that support many large trees and do not accumulate as much deep or persistent snow as higher elevations; individuals occupy distinct but sometimes overlapping home ranges. Areas with moderate or greater canopy cover, denning trees and resting sites, adequate prey availability, and protection from predators are necessary to support the species' life history.

Approximately 39 percent of the range of the SSN DPS of fisher occurs on National Forest Lands. The Forest Service has identified the SSN DPS of fisher as a species of conservation concern; therefore, all Forest Plans within the DPS include Standards and Guidelines designed to benefit fisher, and, per the National Forest Management Act of 1976, as amended, planning rules must consider the maintenance of viable populations of species of conservation concern. In 2004, the Forest Service amended all Forest Plans within the range of the DPS. This amendment included a number of measures to retain and increase features that are characteristic of fisher habitat (e.g., late successional forest, large diameter snags). In addition, the amendment established an approximately 1.5 million-acre Southern Sierra Fisher Conservation Area, with additional requirements intended to maintain and expand the fisher population in the southern Sierra Nevada.

Approximately 14 percent of the range of the SSN DPS of fisher overlaps lands managed by the National Park Service. Land management plans for National Parks within California do not currently contain specific measures to protect fishers; however, areas not developed specifically for recreation or camping are managed towards natural processes and species composition and are therefore anticipated to maintain existing fisher habitat.

The major threats for the SSN DPS of fisher are loss and fragmentation of habitat resulting from climate change, high-severity wildfire and wildfire-suppression activities, vegetation management, and forest insects and tree diseases, as well as direct impacts that include high mortality rates from predation, exposure to toxicants, and potential effects associated with small population size. The threat of toxicants is due to exposure of fishers to rodenticides, primarily from illegal marijuana grow sites within the range, though exposure from legal uses of these pesticides may also be occurring. Reduced availability of prey due to habitat loss is also considered a potential threat to the species.

EB/CE Source: U.S. Fish and Wildlife Service. 2020. Recovery Outline for the Southern Sierra Nevada Distinct Population Segment of Fisher (*Pekania pennanti*). June, 2020.

U.S. Fish and Wildlife Service. 2020. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Southern Sierra Nevada Distinct Population Segment of Fisher. Final Rule. Federal Register. May 15, 2020.

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: Fishers not expected to experience direct effects from exposure to malathion at maximum rates on use sites or from spray drift.

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	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 mammals, mortality of birds
Spray drift areas - Prey item mortality	No effects expected
Plants affected (decline in growth)	Effects to plants
MOSQUITO CONTROL	

Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: Fishers within the SSN DPS are associated with dense, mature mixed-conifer and ponderosa pine forests that support many large trees, and areas with moderate or greater canopy cover. Fisher diets consist primarily of small mammals, but they may also consume birds, carrion and plant material (e.g., berries).

Allowable uses driving effects/other considerations: Fishers primarily occur within forests, and could be found in or near open space developed use sites within these areas. Fishers are not expected to be found near agricultural use sites.

Overall Risk: ☐ High ☐ Medium ☒ Low

USAGE

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

Information regarding past usage of malathion indicates that up to 5% of open space developed areas within the species range could undergo some level of treatment with malathion. However, given the habitat preferences of the fisher, this is likely to represent a low percentage of the species range overall.

For mosquito adulticide, data indicated past usage of malathion in 2 of the 11 counties within the range of the fisher SSN DPS. For one of these counties, data indicate that sales or usage occurred only once in these counties for the 5 years of data available.

We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the fisher (SSN DPS). As discussed below, even though the vulnerability is high for this species, and while pesticides are a known threat to this species (specifically rodenticides), the risk to the species and the likelihood of exposure to malathion are low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The fisher (SSN DPS) has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat from uses within developed and open spaced developed areas. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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.

Given the species high elevation and forested habitat preference, we anticipate a very low number of individuals may be exposed in and near developed and open space developed use sites over the duration of the Action, but the anticipated effects from this exposure are not likely to result in impacts to growth, survival, or reproduction to the very low number of individuals affected, and thus, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the fisher (SSN DPS) in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Zapus hudsonius luteus	New Mexico meadow jumping mouse	5210

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:

The past and current habitat loss has resulted in the extirpation of historical populations, reduced the size of existing populations, and isolated existing small populations. Ongoing and future habitat loss is expected to result in additional extirpations of populations. The primary sources of past and future habitat losses are from grazing pressure (which removes the needed vegetation), water management and use (which causes vegetation loss from mowing and drying of soils), lack of water due to drought (exacerbated by climate change), and wildfires (also exacerbated by climate change). Additional sources of habitat loss are likely to occur from scouring floods, loss of beaver ponds, highway reconstruction, residential and commercial development, coalbed methane development, and unregulated recreation. These multiple sources of habitat loss are not acting independently, but likely produce cumulative impacts that magnify the effects of habitat loss on jumping mouse populations. Historically, larger connected populations of jumping mice would have been able to withstand or recover from local stressors, such as habitat loss from drought, wildfire, or floods. However, the current condition of small populations makes local extirpations more common. The isolated state of existing populations makes natural recolonization of impacted areas highly unlikely or impossible in most areas. In addition to past sources of habitat loss, ongoing grazing, water shortages, and high-impact wildfire (the latter two exacerbated by climate change), and localized actions will continue to put all of the remaining locations at considerable risk to extirpation in the near term (between now and the next 10 years) and increasing over the long term.

EB/CE Source: Department of the Interior Fish and Wildlife Service 50 CFR Part 17 [Docket No. FWS–R2–ES–2013–0023; 4500030113] RIN 1018–AY50. Endangered and Threatened Wildlife and Plants; Listing Determination for the New Mexico Meadow Jumping Mouse Agency: Fish and Wildlife Service

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: New Mexico meadow jumping mice have a low chance of mortality (<1%) from exposure to malathion at maximum rates on use sites with higher allowable use rates (i.e., developed, open space developed, 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 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	2% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 5% terrestrial invertebrates
Plants affected (decline in growth)	1%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	27% terrestrial invertebrates, no effects to plants

Risk modifiers:

*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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	8,927,146	27.70	407,950	1.27
Pasture	I	226,409	0.70	32,842	0.10
Open Space Developed	I	168,662	0.52	8,433	0.03
Developed	I	148,910	0.46	7,446	0.02
Other Crops	I	48,916	0.15	0	0.00
Other Grains	I	21,699	0.07	21,152	0.07
Wheat	I	21,883	0.07	32,620	0.10
Vegetables and Ground Fruit	I	9,816	0.03	2,738	0.01
Corn	I	3,656	0.01	1,150	<0.01
Orchards and Vineyards	I	1,140	<0.01	824	<0.01
Other Row Crops	I	86	<0.01	99	<0.01
Cotton	I	32	<0.01	<1	<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]		651,209	2.02	107,304	0.33
TOTAL[4]:		9,578,355	29.72	515,254	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: 32,230,163 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 12,327,031 acres, 38.247%

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

[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.

limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the New Mexico meadow jumping mouse. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The New Mexico meadow jumping mouse has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (1.60%) within the non-Federal portion of the range of the species. We do not anticipate mortality or sublethal effects will occur on use sites or from spray drift. We anticipate a small reduction of prey resources (i.e., terrestrial invertebrates) in use areas and in spray drift areas, and also a small decline in plant growth. We do not expect species-level effects due to the reduction in prey resources and decline in plant growth because of the very low level of adverse effect, and also because of the low level of usage within the non-Federal portion of the species range. Usage overlaps on 1.6% of the species range according to standard data. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. Therefore, while some individuals may experience small, temporary reductions in available invertebrate prey or forage resources, we do not anticipate that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur. Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the New Mexico meadow jumping mouse in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: Declining population(s) – one or more populations declining
Pesticides noted ☒

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

Much of the habitat originally used by the four Thurston/Pierce subspecies has been fragmented and/or lost to development. Rapid residential and commercial development in the restricted remaining range of the four Thurston/Pierce subspecies is expected to continue into the future, and is likely to result in substantial negative impacts to the subspecies' habitat and populations. Development removes forage vegetation, renders soils unsuitable for burrowing by covering them with impervious surfaces or compacting them, or by grading or removing them. Local populations that survive commercial and residential development (adjacent to and within habitat) are potentially vulnerable to extirpation by domestic and feral cats and dogs (Henderson 1981, p. 233; Case and Jasch 1994, p. B– 21). As stated previously, predation is a natural part of the Mazama pocket gopher's life history; however, the effect of predation may be magnified when populations are small and habitat is fragmented. Unlike the Roy Prairie pocket gopher, no military training occurs in the range of the Olympia or Tenino subspecies of the Mazama pocket gopher. In summary, although there is some evidence of historical mortality from overutilization of the Mazama pocket gopher, and there may have been some recent mortality from utilization of the Mazama pocket gopher for research purposes, we have no information to indicate that these activities have negatively impacted the subspecies as a whole, and have no information to suggest that overutilization is presently occurring or will become a significant threat in the future. All of the data we currently have indicates that Mazama pocket gophers are short lived (1–2 years), have a single reproductive event per year, and average five young. If predation and disease pressures are low and reproductive success is high, this could result in a fairly large population increase, but without the means to monitor population numbers, it is a difficult assertion to either support or disprove. Since there is only a weak correlation between the number of pocket gopher mounds and the number of resident pocket gophers (Olson 2011a, p. 37), and since there are many different scenarios under which an individual pocket gopher may increase the number of mounds it makes (optimal foraging, re-excavation, new excavation, etc.), the Service believes it is currently impossible to document fluctuations in population size. In arriving at our determination that the four Thurston/Pierce subspecies of the Mazama pocket gopher meet the definition of "threatened" under the Act, we note our conclusion is not based on

estimates of population size, but on the reduction in range and numbers of populations due to past threats, and the negative impact of ongoing threats to those few populations that remain.

EB/CE Source: April 9, 2014, 79 FR 19759 19796 Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Olympia Pocket Gopher, Roy Prairie Pocket Gopher, Tenino Pocket Gopher, and Yelm Pocket Gopher, With Special Rule

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 Olympia pocket gopher pocket gopher is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	21%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers: The Olympia pocket gopher is one of the four “Thurston/Pierce (County) subspecies of the Mazama pocket gopher, which are found west of the Cascade Mountain Range, in the Olympic Mountains and in the Puget Sound trough, with an additional single locality known from Wahkiakum County, Washington. Their populations are concentrated in well-drained friable soils often associated with glacial outwash prairies in western Washington, and alpine and subalpine meadows and other meadow-like openings at lower elevations. Prairie and meadow habitats used by pocket gophers have a naturally patchy distribution. Within these

prairie habitats, there is an even patchier distribution of soil rockiness which may further restrict the total area that pocket gophers can utilize.

Olympia pocket gopher have a very limited distribution on the prairie on and around the Olympia Airport. This is a rapidly developing area and conversion of habitat has resulted in widely separated populations lacking habitat corridors which impede natural recolonization that historically occurred. Pocket gophers are often considered a pest because they sometimes damage crops and seedling trees, and their mounds can create a nuisance. Local populations that survive commercial and residential development are potentially vulnerable to extirpation by domestic and feral cats, dogs and mole trapping or poisoning. Pocket gophers from Thurston County were used in a rodenticide experiment as recently as 1995. In Washington State it is currently illegal to trap or poison Mazama pocket gophers, or to trap or poison moles where they overlap with Mazama pocket gopher populations but it is reasonable to believe that still a threat where their ranges overlap residential properties.

The species is a generalist herbivore; diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers.

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for most effects to growth of plants in the range of the pocket gopher.

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	33	0.01	1	<0.01
Open Space Developed	I	37,594	10.41	1,880	0.52
Developed	I	36,473	10.10	1,824	0.50
Christmas Trees	N	1,424	0.39	1,109	0.31
Nurseries	I	356	0.10	356	0.10
Vegetables and Ground Fruit	N	319	0.09	482	0.13
Orchards and Vineyards	I	235	0.06	347	0.10
Other Crops	N	176	0.05	0	0
Corn	N	119	0.03	81	0.02
Pasture	N	39	0.01	16	<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 Grains	N	11	0.00	7	<0.01
Wheat	N	3	0.00	<1	<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]		74,658	20.67	4,407	1.22
TOTAL[4]:		74,658	20.67	4,407	1.22

 # acres in species range: 361,180 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 21,969 acres, 6.083%

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Olympia pocket gopher. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

[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 Olympia pocket gopher has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (1.22%) within the non-Federal portion of the range of the species, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use sites or from spray drift. The species is a generalist herbivore; its diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers. We anticipate that malathion usage pursuant to label will result in a decline in plant growth, however we do not expect species-level effects because the very low level of usage (1.22%) within the non-Federal portion of the species range according to standard data. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 the low usage, low risk to the species, and the implementation of the conservation measures will reduce the likelihood of exposure of the species and its food resources to malathion. Therefore, we anticipate very low numbers of individuals may experience small losses in available forage; however, we do not expect that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Olympia pocket gopher in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: Declining population(s) – one or more populations declining
Pesticides noted ☒

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

USFWS determined that the Tenino pocket gopher (as a subspecies of the Mazama pocket gopher) is specifically negatively impacted by the following factors: habitat loss through conversion and degradation of habitat, particularly from development; successional changes to grassland habitat, and the spread of woody plants; predation; inadequate existing regulatory mechanisms that allow the impacts of significant threats such as habitat loss; and other natural or manmade factors, including small or isolated populations, declining population or subpopulation sizes, and control as a pest species. Unlike the Roy Prairie pocket gopher, no military training occurs in the range of the Olympia or Tenino subspecies of the Mazama pocket gopher. In summary, although there is some evidence of historical mortality from overutilization of the Mazama pocket gopher, and there may have been some recent mortality from utilization of the Mazama pocket gopher for research purposes, we have no information to indicate that these activities have negatively impacted the subspecies as a whole, and have no information to suggest that overutilization is presently occurring or will become a significant threat in the future. As of 2014, the Tenino pocket gopher is not currently surrounded by properties subject to increasing development, and thus predation pressure for the Tenino pocket gopher is likely restricted to that of native predators, such as coyotes and birds of prey. All of the data we currently have indicates that Mazama pocket gophers are short lived (1–2 years), have a single reproductive event per year, and average five young. If predation and disease pressures are low and reproductive success is high, this could result in a fairly large population increase, but without the means to monitor population numbers, it is a difficult assertion to either support or disprove. Since there is only a weak correlation between the number of pocket gopher mounds and the number of resident pocket gophers (Olson 2011a, p. 37), and since there are many different scenarios under which an individual pocket gopher may increase the number of mounds it makes (optimal foraging, re-excavation, new excavation, etc.), the Service believes it is currently impossible to document fluctuations in population size. In arriving at our determination that the four Thurston/Pierce subspecies of the Mazama pocket gopher meet the definition of ‘‘threatened’’ under the Act, we note our conclusion is not based on estimates of population size,

but on the reduction in range and numbers of populations due to past threats, and the negative impact of ongoing threats to those few populations that remain.

EB/CE Source: April 9, 2014, 79 FR 19759 19796 Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Olympia Pocket Gopher, Roy Prairie Pocket Gopher, Tenino Pocket Gopher, and Yelm Pocket Gopher, With Special Rule

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 Tenino pocket gopher is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	21%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers:

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for most effects to growth of plants in the range of the pocket gopher.

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	33	0.01	1	<0.01
Open Space Developed	I	37,594	10.41	1,880	0.52
Developed	I	36,473	10.10	1,824	0.50
Christmas Trees	N	1,424	0.39	1,109	0.31
Nurseries	I	356	0.10	356	0.10
Vegetables and Ground Fruit	N	319	0.09	482	0.13
Orchards and Vineyards	I	235	0.06	347	0.10
Other Crops	N	176	0.05	0	0
Corn	N	119	0.03	81	0.02
Pasture	N	39	0.01	16	<0.01
Other Grains	N	11	<0.01	7	<0.01
Wheat	N	3	<0.01	<1	0
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		74,658	20.67	4,407	1.22
TOTAL[4]:		74,658	20.67	4,407	1.22

 # acres in species range: 361,180 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 21,969 acres, 6.083%

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 reduce 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 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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Tenino pocket gopher. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Tenino pocket gopher has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (1.22%) within the non-Federal portion of the range of the species. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use sites or from spray drift. The species is a generalist herbivore; its diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers. We anticipate that malathion usage pursuant to label will result in a decline in plant growth, however we do not expect species-level effects because the very low level of usage within the non-Federal portion of the species range according to standard data. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 the low usage, low risk to the species, and the implementation of the conservation measures will reduce the likelihood of exposure of the species and its food resources to malathion. Therefore, we anticipate very low numbers of individuals may experience small losses in available forage; however, we do not

expect that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Tenino pocket gopher in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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: Declining population(s) – one or more populations declining
Pesticides noted ☒

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

Yelm pocket gophers are currently threatened by habitat loss, primarily caused by development and woody plant encroachment, throughout the range of the subspecies. Fragmentation reduces their ability to disperse to the decreasing and shrinking patches of suitable habitat. Additionally, most sites used by Yelm pocket gophers require some level of management to maintain suitable habitat conditions. The natural disturbance processes that historically maintained grasslands (principally fire) are now suppressed under modern land management practices. Predation is also a significant ongoing threat, especially from domestic animals associated with residential development and recreation. Predation has a population-level impact on Yelm pocket gophers (79 FR 19781). Residential development in the action area has increased exposure of gophers to feral and domestic cats and dogs, which are known and effective predators. The action area is undergoing rapid urbanization. Industrial, light industrial, and residential land uses have steadily increased and this trend is expected to continue. The result is intensive habitat fragmentation throughout the action area and ongoing habitat loss. Habitat conditions around the covered lands are likely to impose some challenges to dispersing juveniles. Immediately off covered lands, roadways and incompatible land-uses fragment habitat. Habitat adjacent to the covered lands is predominantly in isolated parcels amid mixed commercial, residential, agriculture, and open-space. Paved areas, compacted soils, excavations, and encroaching shrubs and trees degrade the habitat value on most of the remaining unbuilt parcels. Habitat quality, quantity, and connectivity are degraded in the action area.

EB/CE Source: 2016 Biological Opition

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 Yelm pocket gopher is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	N/A
Spray drift areas - Prey item mortality	N/A
Plants affected (decline in growth)	21%
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	No effects expected

Risk modifiers:

Allowable uses driving effects/other considerations: Overlap with developed and open space developed use sites accounts for most effects to growth of plants in the range of the pocket gopher.

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	33	0.01	1	<0.01
Open Space Developed	I	37,594	10.41	1,880	0.52
Developed	I	36,473	10.10	1,824	0.50

[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	%
Christmas Trees	N	1,424	0.39	1,109	0.31
Nurseries	I	356	0.10	356	0.10
Vegetables and Ground Fruit	N	319	0.09	319	0.09
Orchards and Vineyards	I	235	0.06	347	0.10
Other Crops	N	176	0.05	0	0
Corn	N	119	0.03	81	0.02
Pasture	N	39	0.01	16	0.00
Other Grains	N	11	0.00	7	0.00
Wheat	N	3	0.00	0	0.00
Sub-TOTAL (D): *Other uses with direct effects only*[3]		0	0	0	0
Sub- TOTAL (I): *Other uses with indirect effects only*[3]		74,658	20.67	4,227	1.16
TOTAL[4]:		74,658	20.67	4,227	1.16

 # acres in species range: 361,180 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 21,969 acres, 6.083%

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 reduce 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.

CONCLUSION

[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 Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Yelm pocket gopher. As discussed below, even though the vulnerability is high for this species, risk is low, pesticides are not a known threat to this species, and the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Yelm pocket gopher has a high vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage (1.16%) within the non-Federal portion of the range of the species, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use sites or from spray drift. The species is a generalist herbivore; its diet includes a wide variety of plant material, including leafy vegetation, succulent roots, shoots, and tubers. We anticipate that malathion usage pursuant to label will result in a decline in plant growth, however we do not expect species-level effects because the very low level of usage within the non-Federal portion of the species range according to standard data. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 the low usage, low risk to the species, and the implementation of the conservation measures will reduce the likelihood of exposure of the species and its food resources to malathion. Therefore, we anticipate very low numbers of individuals may experience small losses in available forage; however, we do not expect that such losses would result in impacts to growth, survival, or reproduction of individuals of this species, and we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Yelm pocket gopher in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

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

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:

Based upon available data and information, the Florida bonneted bat occurs within a restricted range and in apparent low abundance (Marks and Marks 2008a, p. 15; 2012, pp. 9–15; Timm and Arroyo-Cabrales 2008, p. 1; FWC 2011a, pp. 3–4; FWC 2011b, pp. 3, 6; R. Timm, pers. comm. 2012, in litt. 2012). Actual population size is not known, and no population viability analyses are available (FWC 2011a, p. 4; 2013, p. 16; K. Bohn, in litt. 2012). However, population size is thought to be less than that needed for optimum viability (Timm and Arroyo-Cabrales 2008, p. 1; K. Bohn, in litt. 2012). As part of their evaluation of listing criteria for the species, Gore et al. (2010, p. 2) found that the extent of occurrence appears to have decreased on the east coast of Florida, but trends on the west coast could not be inferred due to limited information. The Service has identified a number of threats to the habitat of the Florida bonneted bat which have occurred in the past, are impacting the species now, and will continue to impact the species in the future. Habitat loss, fragmentation, and degradation, and associated pressures from increased human population are major threats; these threats are expected to continue, placing the species at greater risk. The species' use of conservation areas tempers some impacts, yet the threats of major losses of habitat remains. In natural or undeveloped areas, the Florida bonneted bat may be impacted when forests are converted to other uses or when old trees with cavities are removed. Routine land management activities (e.g., thinning, prescribed fire) may also impact unknown roost sites. In urban areas, suitable roost sites may also be lost when buildings are demolished or when structures are modified to exclude bats.

EB/CE Source: 78 FR 61003 61043

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 bonneted bat is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	24% terrestrial invertebrates
Spray drift areas - Prey item mortality	Up to 19% terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	75% terrestrial invertebrates

Risk modifiers: The range of the Florida bonneted bat appears to be restricted to south and southwest Florida.

Roosting and foraging areas appear varied, with the species occurring in forested, suburban, and urban areas. The species has been found to roost in trees and manmade structures. The species forages over ponds, streams, and wetlands and drinks when flying over open water. The species is well-adapted for efficient, rapid, and prolonged flight in open areas and is a ‘‘fast hawking’’ bat that rely on speed and agility to catch target insects in the absence of background clutter seldom occur below 10 m in the air.

Malathion-contaminated run-off from use areas into adjacent open water is expected to result in indirect effects if the water quality is reduced to an extent that aquatic invertebrate production is reduced.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	8,484,952	75.29	321,499	2.85
Developed	I	757,350	6.72	37,868	0.34
Orchards and Vineyards	I	666,521	5.91	260,588	2.31
Open Space Developed	I	616,184	5.47	30,809	0.27
Other Grains	I	493,321	4.38	18,255	0.16
Other Crops	I	110,103	0.98	0	0
Vegetables and Ground Fruit	I	16,199	0.14	1,785	0.02
Nurseries	I	5,843	0.05	5,843	0.05
Corn	I	2,221	0.02	158	<0.01
Other RowCrops	I	385	<0.01	385	<0.01
Pasture	I	57	<0.01	15	<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]		2,668,185	23.68	355,706	3.16
TOTAL[4]:		11,153,137	98.96	677,204	6.01

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: 11,269,929 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 1,180,879 acres, 16.689%

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

[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.

CONSERVATION MEASURES

Reduced application number and rate: New restrictions on corn, cotton, orchards and vineyards, pasture, other crops, and vegetables and groundfruit set 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 the maximum application rate for citrus (outside of California) is expected to reduce potential environmental concentrations to one-third of modeled values. These measures will help reduce the amount of malathion used and decrease potential exposure to the species.

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Florida bonneted bat. As discussed below, even though the vulnerability is high for this species and the likelihood of exposure to malathion is medium, risk is low and pesticides are not a known threat to this species, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Florida bonneted bat has a high level of vulnerability based on its status, environmental baseline, and cumulative effects, as described above. The risk to the species posed by labeled uses across the range is low, and estimated usage within the non-Federal portion of the species range is medium (6.01%) based on standard data, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate that malathion usage pursuant to the labels will result in mortality or sublethal effects in use areas or in spray drift areas. The species forages over ponds, streams, and wetlands, where main prey items include aquatic invertebrates. Open waters where foraging occurs are not a use area where malathion is applied, however other malathion use areas adjacent to open waters are expected to introduce contaminated run-off into open waters. Depending on

the physical, chemical, and biological characteristics of the body of water, we anticipate contaminants in run-off from adjacent use areas will degrade water quality to the extent that production of aquatic invertebrates is adversely affected. For the purposes of this analysis, we extrapolated the data presented for reduction in terrestrial invertebrates and acknowledge that reduction in aquatic invertebrates is unlikely to be equal in magnitude, and likely will be of lesser magnitude. We therefore anticipate some adverse effects will occur due to reduced aquatic invertebrate prey resources, but do not expect species-level effects because of the limited scope of adverse effects within usage areas. Furthermore, we anticipate the additional conservation measures above, including residential use label changes, and reduced numbers of applications and application rates will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. The reduced application numbers and rate is expected to 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. We anticipate these measures will reduce the likelihood of exposure of the species and its prey to malathion. Given the lack of anticipated mortality or sublethal effects and the species preference for feeding over water (where malathion is not labelled for use), we do not anticipate that small, temporary losses of invertebrate prey would result in impacts to growth, survival, or reproduction of individuals of this species and species-level effects are not anticipated.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Florida bonneted bat.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Myotis septentrionalis	Northern Long-Eared Bat	10043

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:

The northern long-eared bat ranges across much of the eastern and north central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993, p. 89; Caceres and Pybus 1997, p. 1; Environment Yukon 2011, p. 10). In the United States, the species' range reaches from Maine west to Montana, south to eastern Kansas, eastern Oklahoma, Arkansas, and east to the Florida panhandle (Whitaker and Hamilton 1998, p. 99; Caceres and Barclay 2000, p. 2; Wilson and Reeder 2005, p. 516; Amelon and Burhans 2006, pp. 71–72). The species' range includes the following 39 States (including the District of Columbia, which we count as one of the ''States''): Alabama, Arkansas, Connecticut, Delaware, the District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, the species has been most frequently observed in the northeastern United States and in Canadian Provinces, Quebec and Ontario, with sightings increasing during swarming and hibernation (Caceres and Barclay 2000, p. 2). However, throughout the majority of the species' range it is patchily distributed, and historically was less common in the southern and western portions of the range than in the northern portion of the range (Amelon and Burhans 2006, p. 71).Although they are typically found in low numbers in inconspicuous roosts, most records of northern long-eared bats are from winter hibernacula surveys (Caceres and Pybus 1997, p. 2) (for more information on use of hibernacula, see Biology below). More than 780 hibernacula have been identified throughout the species' range in the United States, although many hibernacula contain only a few (1 to 3) individuals (Whitaker and Hamilton 1998, p. 100). Known hibernacula (sites with one or more winter records) include: Arkansas (n=20), Connecticut (n=5), Georgia (n=1), Illinois (n=36), Indiana (n=25), Kentucky (n=90), Maine (n=3), Maryland (n=11), Massachusetts (n=7), Michigan (n=94), Minnesota (n=11), Missouri (n=>111), Nebraska (n=2), New Hampshire (n=9), New Jersey (n=8), New York (n=58), North Carolina (n=20), Oklahoma (n=4), Ohio (n=3), Pennsylvania (n=112), South Carolina (n=2), South Dakota (n=7), Tennessee (n=11), Vermont (n=13 (23 historical)), Virginia (n=8), West Virginia (n=104), and Wisconsin

(n=45). Other states within the species' range have no known hibernacula (due to no suitable hibernacula present or lack of survey effort). They are typically found roosting in small crevices or cracks on cave or mine walls or ceilings, thus are easily overlooked during surveys and usually observed in small numbers (Griffin 1940, pp. 181–182; Barbour and Davis 1969, p. 77; Caire et al. 1979, p. 405; Van Zyll de Jong 1985, p. 9; Caceres and Pybus 1997, p. 2; Whitaker and Mumford 2009, pp. 209–210). The U.S. portion of the species range can be described in four parts, as discussed below: the eastern population, Midwestern population, the southern population, and the western population. The primary threat to the species is attributable to White-Nose Syndrome (WNS), a disease caused by the fungus *Geomyces destructans* that is known to kill bats. The disease has led to dramatic and rapid population declines in northern long-eared bats of up to 99 percent from pre-WNS levels in some areas. WNS has spread rapidly throughout the East and is currently spreading through the Midwest. We have no information to indicate that there are areas within the species' range that will not be impacted by the disease or that similar rates of decline (to what has been observed in the East, where the disease has been present for at most 8 years) will not occur throughout the species' range. Other sources of mortality to the species include wind-energy development, habitat modification, destruction and disturbance (e.g., vandalism to hibernacula, roost tree removal), effects of climate change, and contaminants. Although no significant decline due to these factors has been observed, they may have cumulative effects to the species in addition to WNS.

EB/CE Source: 78 FR 61045 61080

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 northern long-eared bat is not expected to experience direct effects from exposure to malathion at maximum rates on use sites or 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	22% terrestrial invertebrates

Spray drift areas - Prey item mortality	Up to 44% terrestrial invertebrates
Plants affected (decline in growth)	N/A
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	21% terrestrial invertebrates

Risk modifiers: The Northern long-eared bat is widely but patchily distributed in the eastern and northcentral United States and adjacent southern Canada, from eastern British Columbia and southern Yukon eastward across southern Canada to eastern Quebec, Prince Edward Island, and Newfoundland, and southward to southern Texas, Louisiana, Alabama, Georgia, and the panhandle of Florida. It also extends westward in the United States generally to the eastern margin of the Great Plains region. The overall summer and winter ranges are essentially the same.

Foraging is extremely varied. These bats capture flying insects and also glean prey from plants or the forest floor. Foraging occurs within forests, along forest edges, over forest clearings, and occasionally over ponds. Prey composition varies widely among sites and seasons; diet includes *Lepidoptera*, *Coleoptera*, *Neuroptera*, *Diptera*, *Hymenoptera*, *Homoptera*, and *Hemiptera* and *Arachnids*.

Individuals roost solitarily and frequently coalescing to form loose groups in the summer, with individuals frequently departing to be solitary or to form smaller groups before returning to the main unit.

Recent studies indicate that these bats can exploit relatively isolated and small forest fragments, although this bat generally is associated with old-growth forests composed of trees 100 years old or older. It relies on intact interior forest habitat, with low edge-to-interior ratios. Relevant late-successional forest features include a high percentage of old trees, uneven forest structure (resulting in multilayered vertical structure), single and multiple tree-fall gaps, standing snags, and woody debris.

Hibernation occurs primarily in caves, mines, and tunnels, typically those with large passages and entrances, relatively constant and cool temperatures, high humidity, and no air currents.

This species is anticipated to forage on the edge of agricultural sites and in developed areas.

Allowable uses driving effects/other considerations: The northern long-eared bat is not expected to utilize the full extent of agricultural areas, just edges. Therefore anticipated effects to prey may be over-estimated based on consideration of the entire overlap of these areas.

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, exposure is expected to reduce the abundance in these areas, but not completely eliminate the prey base in these portions of the range. This reduction is anticipated to 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	162,444,348	20.59	2,158,388	0.27
Pasture	I	8,659,598	1.10	360,922	0.05
Corn	I	77,305,415	9.80	177,027	0.02
Wheat	I	18,033,538	2.29	817,198	0.10
Open Space Developed	I	32,914,523	4.17	1,645,726	0.21
Developed	I	22,861,318	2.90	1,143,066	0.14
Other Crops	I	3,775,196	0.48	7,091	<0.01
Other Grains	I	5,200,612	0.66	277,379	0.04
Vegetables and Ground Fruit	I	2,525,579	0.32	132,404	0.02
Other RowCrops	I	2,068,693	0.26	62,715	0.01
Cotton	I	1,022,732	0.13	115,633	0.01
Rice	I	547,354	0.07	48,196	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]		174,914,558	22.17	4,787,358	0.61
TOTAL[4]:		337,358,906	42.77	6,945,746	0.88

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: 788,857,863 acres
% of range in California (i.e., where CalPUR data is available): 0%
Range overlap with Federal lands: 56,478,926 acres, 7.160%

[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

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Northern long-eared bat. As discussed below, although pesticides are a known threat to this species and the vulnerability and risk are medium for this species, the likelihood of exposure to malathion is very low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Northern long-eared bat has a medium vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is medium, with a low amount of estimated usage (0.88%) within the non-Federal portion of the range of the species, as described above. We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

We do not anticipate mortality or sublethal effects will occur on use areas or in spray drift areas. This species consumes a wide variety of terrestrial and aquatic invertebrates and forages in forests, forest edges and clearings, and occasionally over ponds. Malathion usage on any use site is expected to result in mortality to terrestrial invertebrate prey resources from spray drift (whether or not the species will utilize the site itself). Open waters are not a use area where malathion is applied, however we anticipate other malathion use areas adjacent to open waters will introduce contaminated run-off into open waters. Depending on the physical, chemical, and biological characteristics of the body of water, we expect contaminants in run-off from adjacent use areas would degrade water quality to the extent that production of aquatic invertebrates is

adversely affected. For the purposes of this analysis, we extrapolated the data presented for reduction in terrestrial invertebrates and acknowledge that reduction in aquatic invertebrates is unlikely to be equal in magnitude, and likely will be of lesser magnitude. We therefore anticipate a reduction in prey resources within use areas, spray drift areas, and over open water. However, the usage area within the species range is extremely limited (<1%). Risk to the species within the limited areas where usage overlaps with the species range is also likely overestimated given the species is likely to forage on edges of usage areas rather than within usage areas. Therefore, we do not expect species-level effects because of the extremely low level of usage within the non-Federal portion of the species range. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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 measures will reduce the likelihood of exposure of the species and its prey to malathion. Given the lack of anticipated mortality or sublethal effects, the low estimated usage within the non-Federal portions of the species range, and the implementation of conservation measures we do not anticipate that small, temporary losses of invertebrate prey would result in impacts to growth, survival, or reproduction of individuals of this species and species-level effects are not anticipated.

Based on this analysis, we do not anticipate that the Action would appreciably reduce survival and recovery of the Northern long-eared bat in the wild.

Conclusion: Is not likely to jeopardize

Integration and Synthesis Summary: Mammals

Scientific Name:	Common Name:	Entity ID:
Martes caurina	Pacific marten (Coastal DPS)	10078

VULNERABILITY

(Summary of status, environmental baseline and cumulative effects)

Status: Threatened
Distribution: Species/Populations neither constrained or widespread
Number of Populations: Multiple populations (few)
Species Trends: Declining population(s)
Pesticides noted ☒

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

The coastal marten is a mammal in the weasel family and is native to forests of coastal Oregon and coastal California. They occur primarily in older forests, although there is one remnant population occupying the coastal dune forest of central Oregon. North American martens are considered dietary generalists; however, their diet changes with seasonal prey availability, and during particular seasons they may become specialists on a few prey species. North American martens require 15–25% of their body mass in prey daily to meet their metabolic requirements. Overall, the diet of North American marten species is dominated by mammals, but birds, insects, and fruits are seasonally important.

Studies drawn from both Pacific and American martens demonstrate that marten select habitat at four primary spatial scales: micro–habitat, stand, home range, and landscape scales. At the micro–habitat scale, martens select specific structures to use for foraging or resting, such as large logs, which they run along searching for prey, or cavities in snags that provide thermal benefits and reduce predation risk while resting. At the stand–scale, martens select stands with adequate structural features that provide for one or more life–history requirements (e.g., prey populations, foraging structures, and resting structures). At the home–range scale, martens position their home ranges to include enough habitat of sufficient quality to provide for year round life history needs (e.g., seasonal prey bases, den sites) and access to mates, while avoiding overlap of home ranges with same–sex individuals. At the landscape–scale, dispersing individuals select suitable portions of the landscape that do not overlap but that are close enough to allow for metapopulation structure.

Threats to martens include wildfire (the severity of which can increase vulnerability to predation and increased competition), vegetation management, roadkill, rodenticides, trapping, disease, climate change, and earthquake/tsunami effects.

EB/CE Source:

U.S. Fish and Wildlife Service. 2018. Species status assessment report for the coastal marten (*Martes caurina*), Version 2.0. July 2018. Arcata, CA.

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: Pacific martens are not expected to experience direct effects from exposure to malathion at maximum rates on use sites or from spray drift.

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	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	Mortality of invertebrates, birds
Spray drift areas - Prey item mortality	Mortality of invertebrates
Plants affected (decline in growth)	Reduced growth of plants
MOSQUITO CONTROL	
Direct (mortality)	No effects expected
Sublethal	No effects expected
Indirect	Mortality of invertebrates, birds

Risk modifiers:

Pacific martens occur primarily in forests. Their diet is dominated by mammals, but birds, insects, and fruits are seasonally important.

Allowable uses driving effects/other considerations: Martens occur within forests, and could be found in or near open space developed use sites within these areas. Martens are not expected to be found near agricultural use sites.

Overall Risk: ☐ High ☐ Medium ☒ Low

USAGE

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

Information regarding past usage of malathion indicates that up to 5% of open space developed areas within the species range could undergo some level of treatment with malathion. However, given the habitat preferences of the Pacific marten, this is likely to represent a low percentage of the species range overall.

For mosquito adulticide, data indicate that sales or usage of malathion has not occurred in any of the counties within the coastal DPS of the Pacific marten for the 5 years of data available.

We did not quantitatively evaluate use or usage on Federal lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion.

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 reduce 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.

CONCLUSION

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the Action, and the cumulative effects, it is the Service's biological opinion that the registration of malathion, is not likely to jeopardize the continued existence of the Pacific marten (Coastal DPS). As discussed below, the vulnerability is medium for this species, and pesticides are a known threat to this species (specifically rodenticides), but the risk to the species and the likelihood of exposure to malathion are low, and the implementation of the conservation measures are expected to further reduce the likelihood of exposure. While we anticipate that small numbers of individuals may be affected over the duration of the Action, we do not expect species-level effects to occur.

The Pacific marten (Coastal DPS) has a medium vulnerability based on its status, distribution, and trends, as described above. The risk to the species posed by labeled uses across the range is low, with a low amount of estimated usage within the non-Federal portion of the range of the species, based primarily on the usage data we acquired, as described in the Opinion and summarized for this species above. We did not quantitatively evaluate use or usage on Federal

lands that overlap with the species range, but we assume only low levels of usage for this species, per the rationale related to usage on Federal lands as described in the Biological Opinion. Furthermore, we anticipate the additional conservation measures above, including residential use label changes will further reduce the likelihood of exposure of the species, their prey, and their habitat from uses within developed and open spaced developed areas. The residential use label changes will ensure that applications in developed and open space developed areas are limited to spot treatments only (rendering spray drift offsite unlikely) and reduce 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. Given the species forested habitat preference, the low usage and the low risk of malathion exposure to the species, we anticipate a very low number of individuals may be exposed in and near developed and open space developed use sites over the duration of the Action. We anticipate the effects from this exposure are not likely to result in impacts to growth, survival, or reproduction to the very low number of individuals affected, and thus, we do not expect species-level effects to occur.

Therefore, we do not anticipate that the Action would appreciably reduce survival and recovery of the Pacific marten (Coastal DPS) in the wild.

Conclusion: Is not likely to jeopardize

Marine Mammals

The following two species were addressed qualitatively, as described in the Integration and Synthesis section of the Biological Opinion. Thus, we include only the species' status, vulnerability factors, environmental baseline, and cumulative effects for these species in this appendix. For our conclusions for these species, see the "Marine Mammals" section of the Integration and Synthesis section of the Opinion.

Scientific Name:	Common Name:	Entity ID:
Trichechus manatus	West Indian Manatee	7

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: All populations at least stable, and one or more increasing populations
Pesticides noted ☐

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

Manatees are aquatic herbivores that consume algae and aquatic plants in fresh and marine water. Florida manatees can be found throughout the southeastern United States. Because they are a sub-tropical species with little tolerance for cold, they remain in the vicinity of warm-water sites in peninsular Florida during the winter. During periods of intense cold, manatees will remain at these sites; during warm interludes, they move from the warm-water areas to feed, and return once again when the water temperature is too cold (Hartman 1979, Stith et al. 2007). During warmer months, manatees may disperse great distances. They have been sighted as far north as Massachusetts and as far west as Texas and in all states in between (Rathbun et al. 1982, Fertl et al. 2005, USFWS Jacksonville Ecological Services Office, unpub. data 2006). Warm weather sightings are most common in Florida and coastal Georgia. Florida manatees are exhibiting positive population growth rates on the Atlantic Coast, in the upper St Johns River, and in the Northwest regions of peninsular Florida. Manatee populations in southwest Florida may be slightly declining though statistical confidence intervals are broad. The minimum estimate of the statewide population is approximately 3,300 animals (USFWS 2007). More recently within the southeastern United States, Martin et al. (2015 entire) provide an abundance estimate for the Florida subspecies of 6,350 manatees (with a 95 percent CI (confidence interval) between 5,310 and 7,390) (82 FR 16668).

There is a significant level of uncertainty with regard to threat levels outside of the U.S. and information regarding population size, demographic characteristics, etc., are lacking. Despite the lack of information outside the U.S., information from the 2007 5-year review regarding the status of the Florida manatee suggests that this population is growing in most areas of the southeastern U.S. The most predictable and controllable threat to manatee recovery remains human-related mortality. The primary human-related threats include watercraft-related strikes

(direct impact and/or propeller) which cause injury and death (Rommel *et al.* 2007, Lightsey *et al.* 2006), and entanglement in fishing lines, crab pot lines, *etc.* Previously entrapment and/or crushing in water control structures (gates, locks, *etc*.) was a primary threat. However, recent advances in protection/detection technology have nearly eliminated this threat to Florida manatees. Natural threats include exposure to cold and red tide. Mortality associated with these natural threats are cold stress syndrome and brevitoxicosis, respectively.

Historically, manatees relied on the warm, temperate waters of south Florida and on natural warm-water springs scattered throughout their range as buffers to the lethal effects of cold winter temperatures. In part, as a result of human disturbance at natural sites (Laist and Reynolds 2005a, b), manatees expanded their winter range to include industrial sites and their associated warm-water discharges as refuges from the cold. Today, nearly two-thirds of the manatee population winters at industrial warm-water sites, which are now made up almost entirely of power plants (FWC FWRI, unpub. synoptic aerial survey data, 2007).

A significant habitat threat to the Florida manatee is the potential loss of warm water at power plants and natural, warm-water springs (Laist and Reynolds 2005a, b). Natural springs are threatened by potential reductions in flow and water quality and by factors which affect manatee access and use of the springs (Florida Springs Task Force 2001). Power plants, which provide winter refuges for a majority of the Florida manatee population, are not permanent reliable sources of warm water.

CE/BE Source: U.S. Fish and Wildlife Service. 2007. West Indian Manatee (*Trichechus manatus*) 5-year Review: Summary and Evaluation: U.S. Fish and Wildlife Service. Atlanta, Georgia. 79 pp.; U.S. Fish and Wildlife Service. Endangered and Threatened Wildlife and Plants; Reclassification of the West Indian Manatee From Endangered to Threatened. 82 FR 16668-16704. Published April 5, 2017.

Scientific Name:	Common Name:	Entity ID:
Enhydra lutris nereis	Southern Sea Otter	45

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: All populations at least stable, and one or more increasing populations
Pesticides noted ☒

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

The sea otter (*Enhydra lutris*) is the largest member of the family Mustelidae and the smallest species of marine mammal in North America. An important predator in the nearshore marine ecosystems of the North Pacific Ocean, the sea otter is generally considered to be a "keystone" species in these communities. Sea otters exert a strong limiting influence on their prey populations, including a wide variety of nearshore marine invertebrates, and have large-scale community effects disproportionate to their abundance (Estes and Palmisano 1974, Palmisano and Estes 1977, Estes et al. 1978, Duggins 1980, Palmisano 1983, Estes and Harrold 1982).

Sea otters are, also, primarily aquatic but spend some time in terrestrial habitats. They consume invertebrates and fish.

Sea otters once ranged along the North Pacific rim from the northern Japanese islands to mid-Baja California, Mexico. Following near-extinction as a result of the fur trade during the 18th and 19th centuries, sea otters were legally protected in 1911 by the International fur Seal Treaty (Service 2003). There are three recognized subspecies of sea otters: the Russian or Asian sea otter (*E. 1. lutris*); the Alaskan or northern sea otter (*E. 1. kenyoni*); and the California or southern sea otter (*E. 1. nereis*). The southern sea otter has the most southerly range of the three recognized subspecies and currently occurs in only two areas of California, the mainland coastline from San Mateo County to Santa Barbara County and San Nicolas Island, Ventura County. Historically, 16,000-20,000 sea otters are believed to have resided in the area that is now California (California Department of Fish and Wildlife, formerly the California Department of Fish and Game) 1976). The population index for 2014 is 2,944 animals (U.S. Geological Survey-Western Ecological Research Center (USGS WERC) 2014).

In the listing rule, we identified oil spill risk as the most serious potential threat to the species (42

FR 2965). Sea otters are particularly vulnerable to oil contamination. When sea otters come into contact with oil, it causes their fur to mat, which prevents it from insulating their bodies. Without this natural protection from the frigid water, sea otters can quickly die from hypothermia. The toxicity of oil can also be harmful to sea otters, causing liver and kidney failure and damage to their lungs and eyes (Kooyman and Costa 1979, Siniff et al. 1982, Lipscomb et al. 1993).

In the listing rule, we did not explicitly identify mortality in fishing gear as a threat to southern sea otters. However, it is clear that sea otters may become entangled/entrapped and drown in commercial fishing gear that is deployed or abandoned in the nearshore marine environment. A period of decline in the southern sea otter population from 1976 to 1984 was likely due to incidental mortality in set-net fisheries (Estes et al. 2003), although gill and trammel nets have since been restricted throughout most of the range of the southern sea otter.

Climate change is a threat that has been identified since listing. Coastal zones are particularly vulnerable to climate variability and change. In addition to sea level rise, climate change is also expected to affect rainfall-runoff patterns, with expected trends towards increased annual river runoff in the wintertime (Southern California Coastal Water Research Project 2009). Climate change may thus affect southern sea otters by modifying hydrological processes that influence the transport of pathogens and contaminants from land to the nearshore marine environment (Waither et al. 2002). It also has the potential to alter (in unknown ways) the frequency of algal blooms in both freshwater and the marine environment. Increasing ocean temperatures may increase the incidence and spread of disease among marine organisms (Burge et al. 2014), with potentially negative or positive effects on sea otters depending on the particular ecological relationships affected. In addition to increasing ocean temperatures, changes in the carbonate chemistry of the oceans due to increasing atmospheric CO2 levels (ocean acidification) may pose a serious threat to marine organisms, particularly calcifying organisms (Kroeker et al. 2010, Kurihara et al. 2004, Kurihara et al. 2004, Stumpp et al. 2011, Gazeau et al. 2013), many of which are important prey for sea otters. Because of the apparent synergistic relationship between food limitation and disease, potential climate-driven declines in food availability may in turn result in increased susceptibility to disease.

CE/BE Source: U.S. Fish and Wildlife Service. 2015. Southern Sea Otter (*Enhydra lutris nereis*) 5-year Review: Summary and Evaluation: U.S. Fish and Wildlife Service. Ventura, California. 42 pp.