

EXECUTIVE SUMMARY

This final Biological Opinion (Opinion) evaluates the effects of the Environmental Protection Agency's (EPA) registration of malathion (hereafter, the *action*) on endangered and threatened species and designated critical habitats under U.S. Fish and Wildlife (Service) jurisdiction, in accordance with section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.). The document also serves as a conference report for proposed and candidate species and proposed critical habitats. Current product labels authorize malathion to be used for both agricultural (e.g., corn, wheat, vegetables) and non-agricultural (e.g., developed areas, pine seed orchards, pasture) applications, which we refer to as "uses" and "use sites" for those areas where malathion is authorized to be used under the label. Additionally, malathion is registered for use as a mosquito adulticide that can be applied to a wide array of land types nationwide. This pesticide belongs to the organophosphate class of insecticides and is highly toxic to many terrestrial invertebrates (insects and arachnids), fish, and aquatic invertebrates (insects and crustaceans) and less toxic to plants and some vertebrate species such as mammals.

Consistent with the ESA Section 7 implementing regulations' definition of "effects of the action" that requires effects caused by the action to be "reasonably certain to occur," the Service worked with EPA, National Marine Fisheries Service, and the U.S. Department of Agriculture (USDA) to acquire additional sources of usage data. "Usage," distinct from "use," describes where and how malathion is applied on the landscape. Thus, we gathered the best scientific and commercial data sources available for usage to better predict "effects of the action." Using additional usage data to inform our analyses of "effects of the action," we preliminarily concluded in our draft Biological Opinion the proposed action was likely to jeopardize 78 species and destroy or adversely modify 23 critical habitats.

Following the transmission of our draft Opinion in April 2021, we collaborated with EPA and the malathion technical registrants¹, with assistance from USDA, on the development of general and species-specific conservation measures that addressed many of the effects to listed species and their critical habitats that we described in our draft Opinion. In coordination with the registrants, EPA agreed to incorporate these measures as label language changes into their proposed action. Following the transmission of our draft Opinion, we also revised our analyses and approaches for some species (e.g., snails) to make sure we incorporated the best scientific and commercial data available. These efforts resulted in revisions to some of our conclusions contained in the draft Opinion. In this final Opinion, primarily due to changes in EPA's action (i.e., label changes), the Service finds that the proposed registration of malathion is not likely to jeopardize any of the listed species or destroy or adversely modify any of the critical habitats addressed in this Opinion.

¹ EPA identified several technical registrants, represented largely by FMC Corporation (FMC), that were considered to be applicants in this consultation, pursuant to section 7 of the Endangered Species Act.

Key Findings

Our analysis of the effects of the action considers the information on the malathion label, including the new measures that will be incorporated on product labels and in *BulletinsLive! Two*. In addition, our analysis of the effects of the action was informed by usage data provided in the BE, procured subsequently to better estimate effects of the action that are “reasonably certain to occur,” or in some cases, received during coordination with EPA, the registrants, and USDA. As part of this coordination, we considered information received from EPA and the registrants, as well as other information from stakeholders, non-governmental organizations, and other members of the public that had been provided through EPA’s public comment process.

EPA’s Biological Evaluation (BE) for malathion addressed 1,778 listed, proposed and candidate species, and 784 proposed and designated critical habitats that they determined were likely to be adversely affected. EPA also requested concurrence with their determination that the action may affect, but is not likely to adversely affect 41 species and 10 critical habitats. EPA determined there would be no effect from the proposed action to 16 species. EPA requested conferencing on proposed and candidate species and proposed critical habitats.

Since the time the BE was submitted, there have been a number of species status changes, including reclassifications and delistings for listed species, and listing decisions for proposed and candidate species. We removed from consideration listed species that were in the BE from this consultation that have since been delisted, along with proposed or candidate species for which listing was determined to be not warranted. We also added newly proposed and listed species and proposed and designated critical habitats into the Opinion that were not addressed in the BE.

This final Opinion covers 1,614 threatened, endangered, proposed and candidate species and 782 designated and proposed critical habitats². Although our April 2021 draft Opinion made preliminary findings³ that the Action was likely to jeopardize a number of listed and proposed species and destroy or adversely modify critical habitats, we have worked with EPA, the registrants, and USDA, to identify additional information and conservation measures that have addressed many the effects we described in our draft Opinion. As described herein, with implementation of new conservation measures incorporated in EPA’s Action and reflected in changes to the label language, we now find that the action is not likely to jeopardize listed species or destroy or adversely modify their critical habitats.

This document also includes our conference opinion on 23 proposed species, 7 candidate species, and 28 proposed critical habitats. While conferencing is not required for candidate species, and

² Figures include 16 species and 4 designated critical habitats addressed in the concurrence section of this consultation, for which we concurred with EPA’s “may affect, not likely to adversely affect” determinations.

³ The Service preliminarily concluded in our April 2021 draft Opinion that EPA’s proposed registration of malathion was likely to jeopardize the continued existence of 78 listed or proposed species was likely to destroy or adversely modify 23 proposed or designated critical habitats.

section 7 consultations do not generally address candidate species, the EPA and the Service agreed it would be prudent to include candidate species to avoid the need to reinitiate the consultation for any of these species that may become listed before the next registration review in 15 years. Our findings suggest that no proposed species or candidate species would experience species-level effects from the action, and, therefore, are not likely to be jeopardized. We also conclude the proposed action is not likely to destroy or adversely modify any proposed critical habitats.

The following paragraphs provide a summary of our analysis and methods, our results, the conservation measures developed between the draft and final biological opinion, and our conclusions. As part of our conclusion section below, we summarize the rationale supporting the determinations that changed from “is likely to jeopardize”/“is likely to destroy or adversely modify” in the draft Opinion to “is not likely to jeopardize”/“is not likely to destroy or adversely modify” in the final Opinion. The rationales are described in greater detail in the final Opinion and its appendices.

Analysis and Methods

We followed an ecological risk assessment framework to determine effects to species and their critical habitats. The *Approach to the Assessment* section of the Opinion provides a description of the methodology used throughout this Opinion for each of the taxa groups. The core of our effects analysis, described in the *Effects of the Action* section of the Opinion, used information presented in EPA’s BE, namely pesticide exposure estimates and toxicological response data, to predict the resulting effects to the species and their critical habitats. The analysis also considered usage data. When evaluating the effects of the action (i.e., the registration of malathion) on listed species and their critical habitats, we considered many pieces of information including the toxicity of each chemical to taxa groups (i.e., animals: amphibians, arachnids, birds, bivalves, crustaceans, fish, insects, mammals, reptiles and snails; plants: conifers and cycads, dicots, ferns and allies, lichens and monocots) as measured by numerous endpoints including lethal effects (i.e., mortality) and sublethal effects (i.e., growth, behavior, and reproduction). We also considered effects to other resources listed species rely on for survival, such as pollinators or seed dispersers for plant species, host fish for mussel larvae, and prey or other forage items. We considered similar types of effects to any physical and biological features of the critical habitat, such as impacts to habitat quality (including water quality for aquatic species), and other resources on which listed species depend that are identified as essential features of the critical habitat. For example, where forage base, pollinators, seed dispersers or host species were identified as physical and biological features, our analysis considered anticipated uses, usage and any applicable general or specific conservation measures that had been incorporated as part of the Action to determine what effects we expected on these physical biological features.

In our effects analysis, we integrated several pieces of data for each species and critical habitat. We used the estimated environmental concentrations (EECs, referring to the levels of malathion anticipated in the environment following applications) EPA generated that are based on applicable exposure routes for malathion for each species (e.g., dietary items, generic aquatic habitats). We used this information in conjunction with current pesticide product label information that specifies where malathion can be used and on what resources (e.g., crops or non-agricultural uses). For our species analysis, we compared this information with maps of listed species' ranges to create the spatial overlap extent and determine the percent malathion use sites comprise within a species range. We then incorporated the usage information we gathered from various sources, including EPA's State Use and Usage Summary report, the California Pesticide Use Reporting Database for species wholly or partially in California, Federal agencies, and information related to mosquito adulticide applications from FMC and the American Mosquito Control Association. This information was used to further refine our assessment of the degree of exposure anticipated from malathion applications that are reasonably certain to occur. During our review of this information, we found that malathion applications on Federal lands generally occur at low levels; thus, while we anticipate there will be limited usage on Federal lands, our analysis considered such usage qualitatively as part of our analyses, as described further in the Opinion. Similar considerations were included in our analysis for critical habitats.

For some species, we also considered additional information that helped us to further refine our analysis. For example, we updated our methodology for snails in the final Opinion to use a more closely related surrogate species for this taxon for which data was available, the aquatic snail *Viviparus bengalensis*, which is less sensitive than honeybees and the aquatic invertebrate HC₀₅, but is a more appropriate surrogate for both terrestrial and aquatic snails (see the *Effects of the Action* section of the biological opinion for more details). Similarly, during coordination with EPA, we also reassessed some of our assumptions related to aquatic habitat, and found some environmental concentrations were overestimated. We aligned our estimates to be more consistent with EPA's revised methodology, which was created after the release of their malathion BE. Based on the additional information, some of the species for which we had made preliminary conclusions of "is likely to jeopardize" (14 species) or "is likely to destroy/adversely modify" (4 critical habitats) in our draft Opinion now warrant an "is not likely to jeopardize" or "is not likely to destroy/adversely modify" conclusion in our final Opinion, with our rationales described in greater detail in the *Effects of the Action* section and in individual species and critical habitat rationales.

In our *Integration and Synthesis* section, we considered the effects of the action together with the status of the species and their critical habitats, environmental baseline, and cumulative effects in our jeopardy analyses and destruction and adverse modification analyses for species and critical habitats, respectively. For our species analysis, we evaluated species-specific information such as vulnerability, status, and population level trends to determine the effects of malathion exposure to each species, organized by taxa groups (i.e., animals and certain plants) or assessment groups

(i.e., for most of the plants). We employed both qualitative and quantitative assessment tools, as appropriate based on the available data. For our quantitative assessments, we used R-Plots (using the software program R) for invertebrates, aquatic vertebrate species and plants, and EPA's MagTool for terrestrial vertebrates (an integrated spreadsheet calculator that combines exposure and magnitude of effects to certain species based on the residue of malathion on the dietary item a species will consume).

Our focus for analyzing effects to plant species centered on the impacts of malathion to plant pollinator species. While the majority of listed plants are flowering dicot plants with insect pollinators, many are monocots or use differing mechanisms other than seed development or pollination for propagation. We determined that the most effective approach to analyzing effects for all listed plants was to categorize them into eleven different assessment groups based on their reproductive strategies due to the likelihood of malathion exposure impacting this aspect of a given plant's life history. Plant assessment groups 1 and 2 are those species that do not rely on a pollination mechanism for continued survival. They reproduce sexually via spores, or asexually via vegetative propagation. Assessment group 3 are conifers and cycads that rely on wind dispersed pollen for reproduction. The remaining assessment groups (4-11) are monocots and dicots that have varying pollination and propagation strategies, including groupings where some of the information on these aspects of life history are unknown at this time.

For designated critical habitats a separate analysis was conducted. We identified four categories of physical and biological features (PBFs) that may be impacted by malathion exposure (referred to as "relevant PBFs"): (1) water quality for aquatic or water-dependent species, or conditions related to pollution-levels for terrestrial habitats to function for the species (i.e., habitat function), (2) arthropod prey (e.g., for insectivorous species), (3) non-arthropods as prey for omnivorous or carnivorous animal species, pollinators/seed dispersers for plants, or host fish for mussels, and (4) insect pollinators/seed dispersers for plants. We based our analyses for critical habitats on the degree to which effects to relevant PBFs would likely affect the conservation value of the critical habitat as whole for the associated species. Our final determinations for designated and proposed critical habitats are discussed in the Integration and Synthesis section and in the review of each critical habitat summarized in Appendix L.

Results

Animals

The proposed action will have variable effects on species addressed in the Opinion, depending on the degree to which use sites overlap with species ranges and the level of anticipated usage of malathion. Overall toxicity of malathion to individuals varies among taxa groups, as sensitivities to malathion ranged from high (e.g., for most aquatic and terrestrial invertebrate groups) to low (e.g., for mammals and mussels). These sensitivities relate to both mortality and sub-lethal

effects to a given species, as well as their forage base, hosts, or other resources on which they depend.

We found overlaps of use sites with species ranges varied considerably based on species and use category. While anticipated usage is also variable, we found that usage within species ranges generally tended to be low (i.e., overlapping with <5% of the species' ranges), but for some species, anticipated usage would be at moderate or high levels, leading to a greater likelihood of exposure and effects. For example, for moderately or highly vulnerable species (e.g., where populations were generally small, isolated and/or trending downward), effects were greatest where uses of malathion pose a medium or high risk to the species and usage of malathion is anticipated to be medium or high. We also considered the effects to each animal species in light of any applicable general or species-specific measures (discussed further below) that had been recently incorporated into the action. After examining all of the relevant information, we determined that the action is not expected to result in species-level effects and is, thus, not likely to jeopardize any listed animal species.

Plants

We used similar considerations for our listed plants analysis: evaluating species vulnerabilities, use site overlaps with species ranges, and usage data, as described above. We observed that pollinators and seed dispersers were an important aspect of our analysis. For example, for many plant species, if a plant did not rely on pollination or had other alternative methods to rely on as its main source for successful reproduction, the species tended to be less impacted by malathion exposure than to those species highly reliant on pollination, particularly those species that required insect pollinators, or even more definitively, if a species required a specific species of pollinator. Similar to animals, where populations were disjointed or small, vulnerability tended to be moderate or high for a given plant. Where use and/or usage was moderate to high within a species range, plant species highly reliant on an insect pollinator were found to be at higher risk of reproductive effects from malathion exposure to their pollinators. We also considered the effects to each plant species in light of any applicable general or species-specific measures (discussed further below) that had been recently incorporated into the action. After examining all of the relevant information, we determined that the action is not expected to result in species-level effects and is, thus, not likely to jeopardize any listed plant species.

Species outside of the Coterminous United States

For some species, such as those animals and plants in the Pacific Islands (including the state of Hawai'i) and the Caribbean Islands (including the U.S. Virgin Islands and Puerto Rico), we used a qualitative approach to the assessment using the information gathered on broad, non-specific pesticide use in these areas. With limited overlap and usage data available for these geographic areas (e.g., one year of usage data representing all insecticides total in the Pacific Islands), we relied on proximity to anticipated use sites in agricultural or developed areas based on habitat

and life history traits and estimated likely usage. We assumed no usage for mosquito adulticide in the Pacific and Caribbean Islands based on our information gathering efforts and confirmation from local resources in these respective areas. Similarly, plants and animals in Alaska were assessed qualitatively based on a lack of anticipated usage within species ranges and low risks to the species.

Critical Habitat

The proposed action is likely to have variable effects on critical habitats addressed in the Opinion depending on the PBFs of the critical habitat and anticipated effects to those found to be susceptible to the effects of malathion. Sensitivity of PBFs to malathion varied based on a number of factors, such as taxa group (for arthropod and non-arthropod PBFs), habitat type (for water quality and habitat function PBFs), and other considerations such as whether or not pollinator or fish host PBFs are specialists or generalists. Overlaps of use sites with critical habitats also varied considerably. While anticipated usage was also variable, we found that usage generally tended to be low (i.e., overlapping with <5% of the critical habitat, based on usage in species' ranges as an approximation), but for some critical habitats, anticipated usage was high, leading to a greater likelihood of exposure and effects to PBFs, especially those most sensitive to malathion. However, after general and species-specific conservation measures (described below) were factored in, we determined the Action is not likely to destroy or adversely modify any of the critical habitats in the Opinion.

Conservation Measures

Following the release of the draft Opinion, the Service worked collaboratively with EPA, USDA, and FMC to discuss the draft Opinion, and to identify measures to mitigate the impacts of the action to species and critical habitats, particularly those for which we made preliminary conclusions of “is likely to jeopardize” or “is likely to destroy/adversely modify” in our draft Opinion. With the support of the registrants, EPA agreed to amend their Action with a series of general and species/critical habitat-specific conservation measures that would mitigate the impacts of malathion to these species and critical habitats. General conservation measures are those that will appear on labels for malathion use on agriculture, in residential settings and other types of developed areas, or for mosquito control. These mitigations include changes that will reduce the likelihood of exposure and effects to listed species and their critical habitats, such as reductions in the maximum number of allowable applications per year, establishment of buffers from aquatic habitats, restriction from application when rain is forecasted or when certain crops are in bloom, and daytime limitations on mosquito adulticide applications. For numerous species and critical habitats, these mitigations are sufficiently protective to avoid the likelihood of jeopardy or destruction/adverse modification for species and critical habitats, respectively. Additionally, these general conservation measures, which apply to all malathion use, are

expected to broadly reduce exposure to non-target species and habitat, including all listed species in proximity to malathion use sites.

In cases where general conservation measures were not adequately protective of certain listed species or their critical habitats, additional species-specific or critical habitat-specific measures were developed to avoid the likelihood of jeopardy and destruction or adverse modification. Examples of such measures include buffers from suitable habitat for the species, restrictions from application within species' ranges or critical habitats, avoidance areas to protect important occupied areas, and application limitations during certain times of the year that coincide with critical periods of the species' life history. Malathion users will access these species- and critical habitat-specific measures through mandatory label instructions that direct them to EPA's *Bulletins Live! Two* website, where any relevant restrictions will be identified based on the geographic location in which the user plans to apply malathion. As a result of these measures, we no longer conclude that the registration of malathion is likely to jeopardize or destroy or adversely modify the species and critical habitat, respectively.

Tables 1 and 2 below include the species (Table 1) and critical habitats (Table 2) for which we made preliminary conclusions "is likely to jeopardize" or "is likely to destroy/adversely modify," in the draft opinion. The final column in each table indicates whether the changes in our conclusion were primarily based on 1) revisions to data assumptions and analyses, 2) EPA's adoption of general conservation measures, or 3) EPA's adoption of additional species-specific measures⁴. More information on general and species-specific conservation measures can be found in the *Integration and Synthesis* summaries for each species in Appendix K or within the *Additional Measures* section of the *Conservation Measures* section in the main body of the Opinion.

Table 1. Species with Draft Jeopardy Determinations. The final column describes whether changes in draft jeopardy determinations were primarily based on 1) revisions to data assumptions and analyses, 2) adoption of general conservation measures to reduce the likelihood of exposure and effects to listed species, or 3) addition of species-specific measures to reduce the likelihood of malathion exposure and effects to listed species.

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures that changed the effects analysis
Amphibians	<i>Bufo hemiophrys baxteri</i>	Wyoming toad	Endangered	Species-specific measures
Amphibians	<i>Bufo houstonensis</i>	Houston Toad	Endangered	Species-specific measures

⁴ In many cases, a combination of revisions to data assumptions and analyses and conservation measures led to changes in our conclusion.

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures that changed the effects analysis
Amphibians	<i>Eleutherodactylus Juanariveroi</i>	Llanero coqui	Endangered	General conservation measures
Birds	<i>Ammodramus savannarum floridanus</i>	Florida grasshopper sparrow	Endangered	Species-specific measures
Birds	<i>Grus canadensis pulla</i>	Mississippi sandhill crane	Endangered	General conservation measures
Birds	<i>Polyborus plancus audubonii</i>	Audubon's crested caracara	Threatened	General conservation measures
Birds	<i>Rostrhamus sociabilis plumbeus</i>	Everglade snail kite	Endangered	No measures needed; revisions to data assumptions and analyses
Birds	<i>Tympanuchus cupido attwateri</i>	Attwater's greater prairie-chicken	Endangered	Species-specific measures
Bivalves	<i>Epioblasma obliquata perobliqua</i>	White catspaw (pearlymussel)	Endangered	Species-specific measures
Bivalves	<i>Hemistena lata</i>	Cracking pearlymussel	Endangered	General conservation measures
Bivalves	<i>Medionidus penicillatus</i>	Gulf moccasinshell	Endangered	Species-specific measures
Bivalves	<i>Medionidus simpsonianus</i>	Ochlockonee moccasinshell	Endangered	General conservation measures
Bivalves	<i>Medionidus walkeri</i>	Suwannee moccasinshell	Threatened	General conservation measures
Bivalves	<i>Plethobasus cicatricosus</i>	White wartyback (pearlymussel)	Endangered	General conservation measures
Bivalves	<i>Pleurobema curtum</i>	Black clubshell	Endangered	General conservation measures
Bivalves	<i>Pleurobema hanleyianum</i>	Georgia pigtoe	Endangered	General conservation measures
Bivalves	<i>Pleurobema taitianum</i>	Heavy pigtoe	Endangered	Species-specific measures

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures that changed the effects analysis
Bivalves	<i>Quadrula petrina</i>	Texas pimpleback	Candidate	Species-specific measures
Bivalves	<i>Truncilla macrodon</i>	Texas fawnsfoot	Candidate	Species-specific measures
Bivalves	<i>Villosa trabalis</i>	Cumberland bean (pearlymussel)	Endangered	General conservation measures
Crustaceans	<i>Gammarus acherondytes</i>	Illinois cave amphipod	Endangered	Species-specific measures
Crustaceans	<i>Palaemonetes cummingsi</i>	Squirrel Chimney Cave shrimp	Threatened	Species-specific measures
Crustaceans	<i>Spelaeorchestia koloana</i>	Kauai cave amphipod	Endangered	Species-specific measures
Fishes	<i>Chrosomus saylori</i>	Laurel dace	Endangered	General conservation measures
Fishes	<i>Etheostoma chermocki</i>	Vermilion darter	Endangered	Species-specific measures
Fishes	<i>Etheostoma wapiti</i>	Boulder darter	Endangered	General conservation measures
Fishes	<i>Notropis buccula</i>	Smalleye Shiner	Endangered	General conservation measures
Fishes	<i>Notropis oxyrhynchus</i>	Sharpnose Shiner	Endangered	General conservation measures
Fishes	<i>Speoplatyrhinus poulsoni</i>	Alabama cavefish	Endangered	Species-specific measures
Flowering Plants	<i>Astrophytum asterias</i>	Star cactus	Endangered	General conservation measures
Flowering Plants	<i>Ayenia limitaris</i>	Texas ayenia	Endangered	Species-specific measures
Flowering Plants	<i>Callirhoe scabriuscula</i>	Texas poppy-mallow	Endangered	Species-specific measures
Flowering Plants	<i>Catesbaea melanocarpa</i>	No common name	Endangered	Species-specific measures

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures that changed the effects analysis
Flowering Plants	<i>Cereus eriophorus var. fragrans</i>	Fragrant prickly-apple	Endangered	Species-specific measures
Flowering Plants	<i>Conradina brevifolia</i>	Short-leaved rosemary	Endangered	Species-specific measures
Flowering Plants	<i>Crotalaria avonensis</i>	Avon Park harebells	Endangered	Species-specific measures
Flowering Plants	<i>Dicerandra christmanii</i>	Garrett's mint	Endangered	Species-specific measures
Flowering Plants	<i>Dicerandra frutescens</i>	Scrub mint	Endangered	Species-specific measures
Flowering Plants	<i>Dicerandra immaculata</i>	Lakela's mint	Endangered	Species-specific measures
Flowering Plants	<i>Hypericum cumulicola</i>	Highlands scrub hypericum	Endangered	Species-specific measures
Flowering Plants	<i>Liatris ohlingerae</i>	Scrub blazingstar	Endangered	Species-specific measures
Flowering Plants	<i>Lupinus aridorum</i>	Scrub lupine	Endangered	Species-specific measures
Flowering Plants	<i>Polygonella basiramia</i>	Wireweed	Endangered	Species-specific measures
Flowering Plants	<i>Warea amplexifolia</i>	Wide-leaf warea	Endangered	Species-specific measures
Flowering Plants	<i>Ziziphus celata</i>	Florida ziziphus	Endangered	Species-specific measures
Insects	<i>Apodemia mormo langei</i>	Lange's metalmark butterfly	Endangered	Species-specific measures
Insects	<i>Batrisodes texanus</i>	Coffin Cave mold beetle	Endangered	Species-specific measures
Insects	<i>Batrisodes venyivi</i>	Helotes mold beetle	Endangered	Species-specific measures

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures that changed the effects analysis
Insects	<i>Cicindela puritana</i>	Puritan tiger beetle	Threatened	Species-specific measures and label changes
Insects	<i>Cicindelidia floridana</i>	Miami tiger beetle	Endangered	Species-specific measures
Insects	<i>Drosophila heteroneura</i>	[Unnamed] pomace fly	Endangered	Species-specific measures
Insects	<i>Drosophila mulli</i>	[Unnamed] pomace fly	Threatened	Species-specific measures
Insects	<i>Heraclides aristodemus ponceanus</i>	Schaus swallowtail butterfly	Endangered	Species-specific measures
Insects	<i>Hylaeus facilis</i>	Easy yellow-faced bee	Endangered	Species-specific measures
Insects	<i>Hylaeus mana</i>	Hawaiian yellow-faced bee	Endangered	Species-specific measures
Insects	<i>Manduca blackburni</i>	Blackburn's sphinx moth	Endangered	Species-specific measures
Insects	<i>Megalagrion pacificum</i>	Pacific Hawaiian damselfly	Endangered	Species-specific measures
Insects	<i>Megalagrion xanthomelas</i>	Orangeblack Hawaiian damselfly	Endangered	Species-specific measures
Insects	<i>Rhadine exilis</i>	[Unnamed] ground beetle	Endangered	Species-specific measures
Insects	<i>Rhadine infernalis</i>	[Unnamed] ground beetle	Endangered	Species-specific measures
Insects	<i>Rhadine persephone</i>	Tooth Cave ground beetle	Endangered	Species-specific measures
Insects	<i>Texamaurops reddelli</i>	Kretschmarr Cave mold beetle	Endangered	Species-specific measures
Mammals	<i>Peromyscus polionotus ammobates</i>	Alabama beach mouse	Endangered	Species-specific measures

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures that changed the effects analysis
Mammals	<i>Peromyscus polionotus niveiventris</i>	Southeastern beach mouse	Threatened	Species-specific measures
Mammals	<i>Peromyscus polionotus peninsularis</i>	St. Andrew beach mouse	Endangered	Species-specific measures
Mammals	<i>Zapus hudsonius preblei</i>	Preble's meadow jumping mouse	Threatened	Species-specific measures
Snails	<i>Campeloma decampi</i>	Slender campeloma	Endangered	Revisions to data assumptions and analyses
Snails	<i>Discus macclintocki</i>	Iowa Pleistocene snail	Endangered	Revisions to data assumptions and analyses
Snails	<i>Lanx sp.</i>	Banbury Springs limpet	Endangered	Revisions to data assumptions and analyses
Snails	<i>Orthalicus reses (not incl. nesodryas)</i>	Stock Island tree snail	Threatened	Revisions to data assumptions and analyses
Snails	<i>Partula gibba</i>	Humped tree snail	Endangered	Revisions to data assumptions and analyses
Snails	<i>Partula radiolata</i>	Guam tree snail	Endangered	Revisions to data assumptions and analyses
Snails	<i>Physa natricina</i>	Snake River physa snail	Endangered	Revisions to data assumptions and analyses
Snails	<i>Pyrgulopsis (=Marstonia) pachyta</i>	Armored snail	Endangered	Revisions to data assumptions and analyses
Snails	<i>Pyrgulopsis ogmorhappe</i>	Royal marstonia (snail)	Endangered	Revisions to data assumptions and analyses
Snails	<i>Samoana fragilis</i>	Fragile tree snail	Endangered	Revisions to data assumptions and analyses
Snails	<i>Succinea chittenangoensis</i>	Chittenango ovate amber snail	Threatened	Revisions to data assumptions and analyses
Snails	<i>Taylorconcha serpticola</i>	Bliss Rapids snail	Threatened	Revisions to data assumptions and analyses

Table 2. Critical Habitat with Draft Destruction or Adverse Modification Determinations. The final column describes whether changes in draft destruction or adverse modification determinations were primarily based on 1) revisions to data assumptions and analyses, 2) adoption of general conservation measures, or 3) addition of critical habitat-specific measures to reduce the likelihood of malathion exposure and effects to critical habitats species.

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures
Arachnids	<i>Adelocosa anops</i>	Kauai cave wolf or pe'e pe'e maka 'ole spider	Endangered	Critical habitat- specific measures
Arachnids	<i>Cicurina baronia</i>	Robber Baron Cave meshweaver	Endangered	Critical habitat- specific measures
Arachnids	<i>Cicurina madla</i>	Madla's Cave meshweaver	Endangered	Critical habitat- specific measures
Arachnids	<i>Cicurina venii</i>	Braken Bat Cave meshweaver	Endangered	Critical habitat- specific measures
Arachnids	<i>Cicurina vespera</i>	Government Canyon Bat Cave meshweaver	Endangered	Critical habitat- specific measures
Arachnids	<i>Neoleptoneta microps</i>	Government Canyon Bat Cave spider	Endangered	Critical habitat- specific measures
Arachnids	<i>Texella cokendolpheri</i>	Cokendolpher Cave harvestman	Endangered	Critical habitat- specific measures
Bivalves	<i>Amblema neislerii</i>	Fat three-ridge (mussel)	Endangered	Critical habitat- specific measures
Bivalves	<i>Elliptio chipolaensis</i>	Chipola slabshell	Threatened	Critical habitat- specific measures
Bivalves	<i>Lampsilis subangulata</i>	Shinyrayed pocketbook	Endangered	Critical habitat- specific measures
Bivalves	<i>Medionidus penicillatus</i>	Gulf moccasinshell	Endangered	Critical habitat- specific measures

Taxa Group	Scientific Name	Common Name	Status	Newly agreed upon measures
Bivalves	<i>Medionidus simpsonianus</i>	Ochlockonee moccasinshell	Endangered	General conservation measures
Bivalves	<i>Medionidus walkeri</i>	Suwannee moccasinshell	Threatened ⁵	General conservation measures
Bivalves	<i>Pleurobema hanleyianum</i>	Georgia pigtoe	Endangered	General conservation measures
Fishes	<i>Chrosomus saylora</i>	Laurel dace	Endangered	Critical habitat- specific measures
Fishes	<i>Etheostoma chermocki</i>	Vermilion darter	Endangered	Critical habitat- specific measures
Fishes	<i>Notropis buccula</i>	Smalleye Shiner	Endangered	General conservation measures
Fishes	<i>Notropis oxyrhynchus</i>	Sharpnose Shiner	Endangered	General conservation measures
Fishes	<i>Chasmistes liorus</i>	June sucker	Threatened	Critical habitat- specific measures
Fishes	<i>Elassoma alabamae</i>	Spring pygmy sunfish	Threatened	Critical habitat- specific measures
Flowering Plants	Chorizanthe pungens var. pungens	Monterey spineflower	Threatened	Critical habitat- specific measures
Insects	<i>Anaea troglodyta floridalis</i>	Florida leafwing butterfly	Endangered	Critical habitat- specific measures
Insects	<i>Batrisodes venyivi</i>	Helotes mold beetle	Endangered	Critical habitat- specific measures
Insects	<i>Rhadine exilis</i>	[Unnamed] ground beetle	Endangered	Critical habitat- specific measures
Insects	<i>Rhadine infernalis</i>	[Unnamed] ground beetle	Endangered	Critical habitat- specific measures

⁵ Critical habitat is proposed for the Suwannee moccasinshell.