

Appendix K

K-D. Integration and Synthesis Summaries: Hawaii and the Pacific Islands

Integration and Synthesis Summaries for Hawaii and Pacific Island species in this appendix are divided into the following sections:

K-D1. Animals - Hawaii and Pacific Islands

K-D2. Plants¹ - Hawaii and Pacific Islands:

- Ferns and Allies (Group 2) and Conifers and Cycads (Group 3)
- Monocots, Abiotic Pollination vectors (Group 4)
- Monocots, Outcrossers with Biotic Pollination vectors (Group 5)
- Monocots, Biotic Pollination vectors; asexual reproduction or self-fertilization (Group 6)
- Monocots, Biotic Pollination vectors; other reproductive mechanisms unknown (Group 7)
- Dicots, Abiotic Pollination vectors (Group 8)
- Dicots, Outcrossers with Biotic Pollination vectors (Group 9)
- Dicots, Biotic Pollination vectors; asexual reproduction or self-fertilization (Group 10)
- Dicots, Biotic Pollination vectors, other reproductive mechanisms unknown (Group 11)

Overview of the Analysis

The following integration and synthesis analyses for animal and plant species are done in a step-wise approach that begins with both narrative and ranking values for vulnerability, risk, and usage, respectively. Information on how preliminary rankings were done for these three sections (or corresponding tables for plants) is found in Appendix J (worksheet). We then discuss any applicable conservation measures (i.e., new label changes) that will be implemented and that are relevant to the species, and link all of this information together for the species in the conclusion section. Our analysis is described across the taxa groups and geographic groups as follows:

- **Vulnerability Section:** First, we show a summary of information related to the species status, vulnerability, and environmental baseline and cumulative effects. Additional supporting information on the status and related topics can be found in Appendix C of this Biological Opinion (Opinion) for each species. We end this section (or table for plants) with a vulnerability ranking of high, medium or low.
- **Risk:** Next, we describe the anticipated risk to individuals and to the species across its range from malathion use as authorized by labels. The risk section serves as a summary of the types of effects we expect across the different uses of malathion as applicable to the species, such as mortality, sublethal effects, and indirect effects (i.e., to prey or other host or food resources). The extent of the risk presented is based on exposure from malathion as

authorized by the label (i.e., overlap of malathion use sites and species range) combined with taxa-specific toxicity information. This section also presents any applicable risk modifiers for the species, such as any specific considerations from the species life history, assumptions about food resources or habitat types, assumptions about certain types of uses, or other factors that would affect the likely risk previously described. It is important to note that the risk analysis is *described prior to any consideration about how the expected effects would be mitigated* through assumptions about anticipated usage or the inclusion of conservation measures. Thus, the risk portion of the analysis serves as an initial description of the kinds of effects that would be expected with exposure to malathion (i.e., it does not reflect our assumptions about what the net risk to the species or individuals of the species will be once the usage and conservation measures are factored in).

- **Usage:** For the usage section, we describe the anticipated usage (i.e., expected applications of malathion) that applies to the species, often according to different use types (e.g., agriculture, developed/open spaced developed, mosquito control (which includes mosquito adulticide use). For plants we included a narrative regarding usage that was applicable to the entire Assessment Group and provided exposure rankings in Table 3 (described in detail in the Approach for Pacific and Caribbean Islands Plants section of this Opinion). We also include any additional considerations or qualifiers related to our assumptions about usage, and denote, where applicable, overlap with Federal lands (where we anticipate usage will be low, as described in the Opinion).
- **Conservation Measures:** This section lists any conservation measures that are now being incorporated into the action that are applicable to the species and describes the types of label changes that will be incorporated. More detail on the measures are found in Appendix A-2. For most species, general conservation measures will apply. For some species, species-specific measures were identified to further reduce effects to the species. All of the measures in this section of the species account apply to this species.
- **Conclusion:** For this section, we summarize the main points of the preceding sections, describing anticipated vulnerability, risk from exposure across its range, and our assumptions about usage. We then consider, where applicable, examples of the conservation measures that are expected to reduce the effects and/or exposure of the listed species, its food resources, host species (e.g., fish hosts for mussels), and habitats.

Although the presentation of all of these sections varies slightly across species, the analysis for each species was considered independently and has been provided its own conclusion, as shown within its taxa or geographic grouping.

Other notes:

U.S. Fish and Wildlife Service listing and recovery documents (i.e. listing rules, five-year reviews and other status reviews, recovery plans, etc.) supporting this appendix are available on the species profile pages at <https://ecos.fws.gov/ecp/>.

¹ Note: No species in “Lichens (Group 1)” in this Opinion occur in Hawaii and the Pacific Islands.