Integration and Synthesis Summary for Plants, CONUS
Plant Assessment Group 7 - Monocots with biotic pollination vectors; reproductive mechanism otherwise unknown

The tables below contain summaries of the information and data we used to determine the ranking (high, medium, low) for vulnerability, risk and usage indicators. Information in most of the columns was used directly in the ranking determination (green fill). Where indicated, information in other columns was not used directly in the ranking calculation, but provided additional information about the species that fed into one of the ranking metrics or was used to make the draft determination when relevant. The summary for this assessment group also includes new conservation measures[1] that have been incorporated into the Action since the draft biological opinion was released. The measures and our related assumptions are incorporated into our analysis (immediately above Table 4), and also factor into the rationales for our conclusions for each species, as described below.

All species in this assessment groups are monocots, a class of angiosperm flowering plant defined by having only one cotyledon (embryonic seed leaves). There are a large variety of monocot species, though typical monocot plants include grasses, lilies and palms. The monocots in this assessment group utilize biotic vectors to accomplish pollination, such as insects, birds and mammals; other aspects of their reproductive mechanism are unknown. Seed dispersal for the species in this group is achieved by biotic (dispersal by animals) and/or abiotic (dispersal by wind, water or gravity) means.

Table 1: Summarizing Data and Information for Vulnerability Ranking

Data Sources: Status of the Species (SOS) accounts updated as of November 2019 (Appendix C); NA=Not Applicable

Scientific Name	Common Name	Status	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
Chlorogalum purpureum	Purple amole or Camatta Canyon amole	Threatened	Stable (USFWS, 2008); #2 Stable to increasing (USFWS, 2008)	Not Available	Not Available	The Camatta Canyon amole *Chlorogalum purpureum var. reductum* is endemic to the La Panza Range in central San Luis Obispo County. The type locality for the Camatta Canyon amole is 18 miles east of Creston on La Panza road, San Luis Obispo County, California. The taxon is known only from a small geographic area. The main population is approximately 0.8 km (0.5 mi) east of the southern end of Camatta Canyon. (USFWS 2008). The purple amole, *Chlorogalum purpureum var. purpureum*, the purple amole, is endemic to the Santa Lucia Range of Monterey and San Luis Obispo counties, California. The taxon is known from two properties: several localities on Fort Hunter Liggett, southern Monterey County; and one locality on Camp Roberts in northern San Luis Obispo County	100,000 to 500,000 (USFWS, 2008); #2 ~260,000 (inferred from USFWS, 2008)	No Mention	No Mention	Medium
Harperocallis flava	Harper's beauty	Endangered	Decline of <70% to relatively stable (NatureServe, 2015)	Unknown (USFWS, 2016)	23 (USFWS, 2016)	Occurs in Franklin, Liberty and Bay Counties, Florida (NatureServe, 2015).	~7,600 (NatureServe, 2015)	No Mention	No Mention	High
Platanthera integrilabia	White fringeless orchid	Threatened	Declining	Declining	65 occurrences over 6 states	U.S.: Alabama (9), Georgia (8), Kentucky (8), Mississippi (2), South Carolina (1), Tennessee (37). The species currently occurs within the Appalachian Plateau Physiographic Province in Kentucky, Tennessee, Georgia, and Alabama; the Coastal Plain Physiographic Province in Alabama and Mississippi; the Blue Ridge Province in Georgia and	Unknown	No Mention	No Mention	Medium

[1] Additional information on these new conservation measures can be found in the Description of the Action section of this biological opinion.

Scientific Name	Common Name	Status	Population Level Trends	Species Level Trends	Number of Populations	Distribution	Number of Individuals*	Pesticides Listed as a Threat	Pollinator Loss Listed as a Threat	Vulnerability Ranking
						Tennessee (Shea 1992, page 19); and primarily in the Piedmont Physiographic Province in Georgia (Medley 1980; White 1998, pers. com. 1999; A. Shea pers. com. 1999; McCoy 2008, 2012; and Patrick pers. com. 2012).				
Sisyrinchium dichotomum	White irisette	Endangered	NatureServe notes a long-term decline of 30-70% (NatureServe, 2015)	Not Available	21 - 80 (NatureServe, 2015)	A narrow endemic, the species is known from 4 counties in North Carolina and South Carolina (Greenville, SC; Henderson, NC; Polk, NC; Rutherford, NC) (NatureServe, 2015).	1000 - 10,000 total individuals (NatureServe, 2015)	No Mention	No Mention	High

*Information in this column was used to inform the ranking metrics or the draft determination when relevant.

Table 2: Summarizing Data and Information for Risk Ranking
Data Sources: SOS accounts (Appendix C); R Plot Appendices; NA=Not Applicable

Risk to Individuals and Pollinators if exposed: The individual plants in this assessment group are not expected to experience effects to growth or survival from exposure to malathion.

Mortality is expected for insect pollinators and seed dispersers exposed to malathion on use sites, via spray drift, and from mosquito control applications. Because terrestrial invertebrates exhibit a range of sensitivities to malathion, insect abundance is expected to be reduced where exposure occurs, but not completely eliminated. However, some species are likely to incur greater levels of mortality than others based on their sensitivity. As plants often have unknown or specific pollinators and seed dispersers for which toxicity data is unavailable, we assume insects that pollinate or disperse the seeds of listed plants are sensitive to malathion, and that exposure will cause mortality. In field studies, reductions of common insect species following pesticide exposure are often temporary with recovery over a short period of time. However, since listed plants may be reliant on insect pollinators or seed dispersers that are limited in range or abundance, these insect species may be less likely to recover following pesticide exposure. Some bird pollinators and seed dispersers exposed to malathion on use sites may experience mortality or sublethal effects, depending on the site of exposure and size of the bird. Smaller birds exposed on use sites with higher allowable use rates (e.g., developed, open space developed, orchards and vineyards) have a greater chance of being affected. Exposure to spray drift is not expected to result in effects to bird seed dispersers. No mortality or sublethal effects are expected for mammalian pollinators or seed dispersers from malathion exposure either on use sites or from spray drift.

Scientific Name	Common Name	Direct Effects to Mortality or Growth Expected (yes or no; reduction in dry weight when exposed in use areas that may have effects)	Effects to Pollinators, % insect pollinator mortality (% bird pollinator mortality)	Method of Reproduction (risk modifier)	Seed Dispersal Vector (risk modifier)	Obligate or Specific Pollinator (risk modifier)	Pollination Vector*	Risk Ranking
Chlorogalum purpureum	Purple amole	No	105.51	Biotic - Unknown	Abiotic, Biotic	No	Insect	Medium
Harperocallis flava	Harper's beauty	No	82.80	Biotic - Unknown	Abiotic, Biotic	Unknown	Insect	Medium
Platanthera integrilabia	White fringeless orchid	No	47.12	Biotic - Unknown	Abiotic	Unknown	Insect	Medium

Scientific Name	Common Name	Direct Effects to Mortality or Growth Expected (yes or no; reduction in dry weight when exposed in use areas that may have effects)	Effects to Pollinators, % insect pollinator mortality (% bird pollinator mortality)	Method of Reproduction (risk modifier)	Seed Dispersal Vector (risk modifier)	Obligate or Specific Pollinator (risk modifier)	Pollination Vector*	Risk Ranking
Sisyrinchium dichotomum	White irisette	No	89.96	Biotic - Unknown	Abiotic, Insect, Bird, Mammal	Unknown	Insect	Medium

*Information in this column was used to inform the ranking metrics or the draft determination when relevant.

Volatilization: We do not expect transport from volatilization to be an appreciable source of exposure for most or all species in this assessment group. For species that occur at high elevations, we expect additional exposure to malathion that may vaporize from application sites. However, the magnitude of increased exposure is uncertain due to the unpredictability of weather events, along with variability of the geographical features across the landscapes that influence transport and deposition, though the information available does not allow us to conclude that concentrations from this route alone will rise to the level where effects are expected.

Table 3: Summarizing Data and Information for Usage Ranking

Data Sources: R Plots Appendices for individual plant species; Federal lands overlap analysis; California (CA); NA=Not Applicable

Scientific Name	Common Name	Acres in Species Range*	% Range Overlap with Federal Lands*	% Range in CA*	Comments for % Range in CA*	Total overlap % (All Agricultural and Residential Uses)*	Total Overlap % (Mosquito Adulticide)*	Anticipated Usage within Range (agricultural data based on SUUM): total % of range for all uses	Anticipated Usage within Range (agricultural data based on CalPUR): total % of range for all uses	Ranking: Confidence Level	Usage Ranking
Chlorogalum purpureum	Purple amole	931078.79	22.81	100		14.56	54.27	4.30	0.275	CalPUR	Low
Harperocallis flava	Harper's beauty	1864608.27	18.59	0		5.70	60.16	0.36		Standard	Low
Platanthera integrilabia	White fringeless orchid	12264072.79	16.97	0		9.97	18.49	0.73		Standard	Low
Sisyrinchium dichotomum	White irisette	1878241.81	12.32	0		17.63	38.19	1.43		Standard	Low

*Information in these columns was used to inform the ranking metrics or the draft determination when relevant.

Cumulative Effects and Environmental Baseline: Please refer to the Status of the Species accounts (Appendix C) and overarching Environmental Baseline and Cumulative Effects sections of this Opinion.

Additional Conservation Measures:

Additional information on these new conservation measures can be found in the *Description of the Action* section and Appendix A-2 of this biological opinion, and further information on the anticipated impacts of each measure in the *Effects of the Action* section.

General Conservation Measures

Several additional conservation measures have been recently provided by EPA and will be implemented as part of the Action. These measures will apply to all species in this assessment group with corresponding use type overlap and usage (i.e., mosquito adulticide, agricultural and residential uses, see Table 3). All measures are anticipated to limit the exposure of pollinators and seed dispersers to malathion in the described use area where it occurs in or around the range of the species, thus further reducing the risk of reproductive effects to the species. We summarize the new measures and our related assumptions below.

Mosquito adulticide timing restrictions: Conservation measures for mosquito adulticide use will prohibit application during most daylight hours (from two hours after dawn until two hours before sunset). This period is when many diurnal insect pollinators and seed dispersers are most active and would mostly likely be exposed to malathion applications. This measure is anticipated to limit the exposure of insect pollinators/seed dispersers present in and around the range of the species to malathion when used as a mosquito adulticide.

Bloom restrictions: New restrictions on orchards and vineyards, pasture, and other crops UDLs will prohibit application of malathion within three days prior to bloom, during bloom, and until petal fall is complete on certain crops. This measure is anticipated to limit the exposure of pollinators/seed dispersers to malathion in this use area where it occurs in or around the range of the species, reducing the risk of impacts to reproduction.

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 (previously ranging from 3-13 applications per year, depending on the specific crop) to 2-4 per year, as described in the Description of the Action of this Opinion.. This is anticipated to reduce the amount of malathion used and decrease exposure to the species and its pollinators/seed dispersers, thus decreasing the risk of impacts to reproduction and direct impacts to the plant itself.

Reduced citrus application rate: For citrus applications outside of California, label restrictions will include a reduction in the maximum application rate , which is anticipated to reduce potential environmental concentrations to one-third of modeled values, reducing the effects to species and their seed dispersers on and adjacent to these use areas. For citrus applications in California, instead of reducing application rates, users can only apply once per year, and by ground application only.

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

Table 4: Summary of Conclusions

Number	Scientific Name	Common Name	Vulnerability Ranking	Risk Ranking	Usage Ranking	Species Conclusion (J, NJ)*
1	*Chlorogalum purpureum*	Purple amole	Medium	Medium	Low	NJ
2	*Platanthera integrilabia*	White fringeless orchid	Medium	Medium	Low	NJ
3	*Harperocallis flava*	Harper's beauty	High	Medium	Low	NJ
4	*Sisyrinchium dichotomum*	White irisette	High	Medium	Low	NJ

*NJ = No Jeopardy; J = Jeopardy

Rationale for Species Conclusions

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 plant species in this assessment group.

The individual plants in this assessment group are not expected to experience effects from direct exposure to malathion (on use sites or as spray drift), as discussed in the General Effects section of this Opinion. The species in this assessment group have either high or medium vulnerabilities based on their status, distribution, and trends, medium risk posed by labeled uses across the range, and low estimated usage within their ranges. As a result, we anticipate malathion usage on only a very small portion of the ranges of these species, resulting in a low level of pollinator and seed disperser mortality. Furthermore, we anticipate the conservation measures described above will further reduce the risk of exposure of both pollinators and seed dispersers in the very small portion of the range where we anticipate malathion to be applied. For example, the conservation measure limiting mosquito adulticide applications during most daytime hours is anticipated to substantially reduce exposure and therefore mortality of diurnal pollinators and seed dispersers, which are important for the reproductive success of the listed plants. The main threats to these species include habitat loss and disturbance, competition from non-native plants, and drought and climate change. These species rely on abiotic means for all or a portion of their seed dispersal, giving these species the capability to reproduce successfully even in the absence of a portion of their biotic seed dispersal vectors. In particular, in the latest 5-year review for Harper's beauty in 2016, it was reported that this species may reproduce mainly through self-pollination and production of offshoot ramets (clonal propagation). As a result, pollinator services may not be necessary for this species, and we anticipate the effects of malathion exposure on pollinator populations in its range will be minimal.

As such, we do not anticipate that the use of this pesticide will have species-level effects on the species in this assessment group. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of these species in the wild.