Integration and Synthesis Summary for Plants, CONUS
Plant Assessment Group 8 – Dicots with abiotic pollination vectors

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 dicots, a class of angiosperm flowering plant defined by having two cotyledons (embryonic seed leaves). Dicots are a hugely diverse class of flowering plants, with tens of thousands of species. Familiar dicots include plants such as daisies, roses and oak trees. The dicots in this assessment group utilize abiotic vectors to accomplish pollination, such as wind and water. 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
Amaranthus pumilus	Seabeach amaranth	Threatened	Declining (USFWS, 2007)	Declining (USFWS, 2007)	21 - 300 (NatureServe, 2015)	Extant from vicinity of Cape Hatteras, NC, to vicinity of Cape Romain, SC, and at scattered sites on Long Island, NY, and in coastal Delaware, Maryland, Virginia, and New Jersey. (NatureServe, 2015) Populations in the latter four states were not known at the time of listing, but were subsequently rediscovered. (USFWS, 2007)	10,000 - 100,000 individuals (NatureServe, 2015)	No Mention	No Mention	Medium
Ambrosia cheiranthifolia	South Texas ambrosia	Endangered	Not available.	Not available.	6 (5 in Texas, 1 in Mexico) (USFWS, 2010)	North central Nueces County, Texas, to south central Kleberg County, Texas. One population in Tamaulipas, Mexico (USFWS, 2010).	Uncertain (USFWS, 2010)	Effects of pesticide drift (USFWS, 2010)	No Mention	High
Ambrosia pumila	San Diego ambrosia	Endangered	Not available	Not available	16 (USFWS, 2010)	Occurs in southern California from northwestern Riverside County, south through western San Diego County, to northwestern Baja California, Mexico (USFWS, 2010).	Unknown (USFWS, 2010)	No Mention	No Mention	High
Atriplex coronata var. notatior	San Jacinto Valley crownscale	Endangered	Decline of 50 - 90% (NatureServe, 2015)	50 - 70% decline (NatureServe, 2015)	4 (USFWS, 2012)	Restricted to the San Jacinto, Perris, Menifee, and Elsinore Valleys of western Riverside County, California. Occurrences are associated primarily with the San Jacinto River and Old Salt Creek tributary drainages, with an additional occurrence near Lake Elsinore (USFWS 2008) (NatureServe, 2015).	106,000; variable depending on year (USFWS, 2012)	No Mention	No Mention	High

[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
Betula uber	Virginia round-leaf birch	Threatened	Stable (USFWS, 2006)	Stable (inferred from USFWS, 2006)	1 - 5 (NatureServe, 2015)	Known from a 700-m stretch of highly disturbed, second-growth forest less than 100 m wide along the banks of Cressy Creek, near the town of Sugar Grove, in Smyth County, Virginia (USFWS, 1990).	1 - 1000 individuals (NatureServe, 2015)	No Mention	No Mention	High
Camissonia benitensis	San Benito evening-primrose	Threatened	Slight increase	Not Available	69 (USFWS, 2009)	Local endemic to serpentine alluvial terraces in the Clear Creek and San Carlos Creek drainages, California. (NatureServe, 2015)	2500 - 10,000 individuals (NatureServe, 2015)	No Mention	No Mention	Medium
Quercus hinckleyi	Hinckley oak	Threatened	Not available.	Not Available	10 (USFWS, 1992)	Known from the Chihuahuan Desert of West Texas. All of the populations known are in Presidio County. Other reports exist of additional populations in the area of Shafter, Texas, but these localities have not been recently verified. (USFWS, 1992)	1 - 1000 individuals (NatureServe, 2015)	No Mention	No Mention	High
Suaeda californica	California seablite	Endangered	Not available	Not Available	Nine (USFWS, 2013)	Extirpated from the San Francisco Bay area; now known only from Morro Bay, San Luis Obispo County. May have once occured in Sonoma County as well (Skinner and Pavlik 1994). Does NOT occur in southern California or Baja California - plants of these areas are referable to *S. esteroa* &/or *S. taxifolia* (Skinner and Pavlik 1994, USFES 1994). (NatureServe, 2015)	1 - 1000 individuals (NatureServe, 2015); ~500 (NatureServe, 2015)	No Mention	No Mention	High

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

Risk to Individuals and Pollinators if exposed: The individual plants in this assessment group are estimated to experience up to a 12% decrease in dry weight if exposed to malathion on the following use sites, based on labeled application rates: orchards and vineyards, developed, nurseries, open space developed and Christmas trees. No effects are expected on other use sites. The dicots in this assessment group do not rely on animal species for pollination, thus no effects are expected to these plants from loss in pollinator populations from malathion exposure across use sites within their ranges. Mortality is expected for insect seed dispersers exposed to malathion on use sites, via spray drift, and from mosquito control applications. Some bird 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 seed dispersers from malathion exposure either on use sites or from spray drift.

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

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
Amaranthus pumilus	Seabeach amaranth	Yes (12%)	NA	Abiotic - Pollinating Agent	Abiotic, Insect, Bird, Mammal	NA	Abiotic	Low
Ambrosia cheiranthifolia	South Texas ambrosia	Yes (12%)	NA	Abiotic - Pollinating Agent	Insect, Bird, Mammal	NA	Abiotic	Low
Ambrosia pumila	San Diego ambrosia	Yes (12%)	NA	Abiotic - Pollinating Agent	Abiotic, Biotic	NA	Abiotic	Low
Atriplex coronata var. notatior	San Jacinto Valley crownscale	Yes (12%)	NA	Abiotic - Pollinating Agent	Abiotic	NA	Abiotic	Low
Betula uber	Virginia round-leaf birch	Yes (12%)	NA	Abiotic - Pollinating Agent	Abiotic	NA	Abiotic	Low
Camissonia benitensis	San Benito evening-primrose	Yes (12%)	NA	Abiotic - Pollinating Agent	Abiotic	NA	Abiotic	Low
Quercus hinckleyi	Hinckley oak	Yes (12%)	NA	Abiotic - Pollinating Agent	Mammal	NA	Abiotic	Low
Suaeda californica	California seablite	Yes (12%)	NA	Abiotic - Pollinating Agent	Abiotic	NA	Abiotic	Low

*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 Plot 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
Amaranthus pumilus	Seabeach amaranth	9744849.73	9.55	0		13.49	51.60	0.86**		Standard	Low
Ambrosia cheiranthifolia	South Texas ambrosia	2816321.72	5.36	0		37.01	59.01	9.61		Standard	Medium
Ambrosia pumila	San Diego ambrosia	282835.81	10.55	100		46.05	89.49	3.02	2.281	CalPUR	Low
Atriplex coronata var. notatior	San Jacinto Valley crownscale	89238.43	1.01	100		51.45	89.10	23.14	0.1285	CalPUR	Low
Betula uber	Virginia round-leaf birch	149.60	100.00	0		0	0	0		Standard	Low
Camissonia benitensis	San Benito evening-primrose	268370.12	29.93	100		2.63	67.52	0.17	0.085	CalPUR	Low
Quercus hinckleyi	Hinckley oak	6426739.99	12.64	0		0.30	0	0.02		Standard	Low
Suaeda californica	California seablite	224132.02	9.36	98	100% range is in CA.	49.40	90.15	3.41	2.507	CalPUR	Low

*Information in these columns was used to inform the ranking metrics or the draft determination when relevant.
**Usage anticipated from mosquito control applications was not included as a data column in this table. The anticipated usage for mosquito control for these species is above 5.0% (14%). Although the numbers are not all listed here, as described in the Analysis for Plants and Effects of the Action sections of this Opinion, we considered usage from mosquito control in our analysis of all species. We expect the effects to the seed dispersers of this species from mosquito control usage will be substantially reduced by the mosquito adulticide timing restriction conservation measure described below, thus substantially limiting reproductive effects to this species.

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 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 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 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 seed dispersers, thus decreasing the risk of impacts to reproduction and sub-lethal impacts to the plant itself.

Table 4: Summary of Conclusions

Scientific Name	Common Name	Vulnerability Ranking	Risk Ranking	Usage Ranking	Species Conclusion (J, NJ)*
Amaranthus pumilus	Seabeach amaranth	Medium	Low	Low	NJ
Ambrosia cheiranthifolia	South Texas ambrosia	High	Low	Medium	NJ
Ambrosia pumila	San Diego ambrosia	High	Low	Low	NJ
Atriplex coronata var. notatior	San Jacinto Valley crownscale	High	Low	Low	NJ
Betula uber	Virginia round-leaf birch	High	Low	Low	NJ
Camissonia benitensis	San Benito evening-primrose	Medium	Low	Low	NJ
Quercus hinckleyi	Hinckley oak	High	Low	Low	NJ
Suaeda californica	California seablite	High	Low	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.

While the species in this assessment group have high and medium vulnerabilities based on their status, distribution, and trends, the risk to all species in this group posed by labeled uses across the range is low. In addition, the estimated usage within the range for all species in this group is low, except for South Texas ambrosia which is medium. We expect some individual plants will experience reduced growth due to direct exposure to malathion, but we do not anticipate this reduction in growth to result in species-level effects.

Pollinating animals do not play a role in the life cycle of this group of dicot plants, they utilize wind or water to transport pollen between individuals and populations. As a result, we expect there will be no effects to the reproduction and survival of these species due to loss of pollinators from malathion exposure in the plants' range. In addition, the San Jacinto Valley crownscale, Virginia round-leaf birch, San Benito evening-primrose and California seablite utilize abiotic seed dispersal vectors; therefore, we do not anticipate effects to the reproduction and survival of these species due to loss of animal seed dispersers from malathion exposure in their ranges. However, the seabeach amaranth, South Texas ambrosia, San Diego ambrosia and Hinckley oak rely on animals to disperse some portion of their seeds. The Hinckley oak relies solely on mammals for seed dispersal. As mammalian seed dispersers are not expected to experience effects from malathion exposure either on use sites or from spray drift, we anticipate there will be no reproductive effects to the Hinckley oak from seed disperser loss. The seabeach amaranth, South Texas ambrosia and San Diego ambrosia utilize a variety of seed dispersal mechanisms, both biotic (insects, birds, mammals) and abiotic (wind) for the seabeach amaranth and San Diego ambrosia. Given the low to medium estimated usage within the range for these species, and the fact that these species also partially rely on abiotic seed dispersal mechanisms and mammalian seed dispersers, we do not anticipate the level of seed disperser mortality or sub-lethal effects would cause species-level effects. Furthermore, we anticipate the conservation measures described above will further reduce the risk of exposure of seed dispersers in the portion of the range where we anticipate malathion to be applied. For example, exposure of biotic seed dispersers such as ants and birds to malathion will be reduced in areas of residential use, as applications in these areas can only be made as spot treatments (no broadcast use), and the number of treatments per year has been reduced to two from "repeat as necessary," reducing the likelihood of exposure and effects to these taxa and the corresponding effects to the listed plants.

Thus, we do not anticipate that the use of this pesticide is likely to result in species-level reproductive effects to 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.