Integration and Synthesis Summary for Plants, CONUS
Assessment Group 6: Monocots with biotic pollination vectors and able to use self-fertilization and/or asexual reproduction at least partially to maintain populations over time

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, 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. All plants in this group can rely on self-fertilization or asexual (vegetative) reproduction in order to maintain their populations over time. 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
Allium munzii	Munz's onion	Endangered	Unknown (NatureServe, 2015)	10 - 70% decline (NatureServe, 2015)	15 (USFWS, 2013)	It is discontinuously distributed across the Riverside-Perris area in western Riverside County, California (USFWS, 2013).	20,000 - 70,000 (NatureServe, 2015)	No Mention	No Mention	High
Brodiaea filifolia	Thread-leaved brodiaea	Threatened	Not Available	3 occurrences extirpated since listing (USFWS, 2009)	68 (USFWS, 2009)	Presently known from Riverside, Los Angeles, San Bernardino, San Diego and Orange Counties (USFWS 2009).	Unknown (USFWS, 2009)	No Mention	No Mention	Medium
Brodiaea pallida	Chinese Camp brodiaea	Threatened	Not Available	Increasing (NatureServe, 2015)	3 (USFWS, 2012)	Currently occurs in Calveras county and Tuolumne county, CA (USFWS, 2012).	Unknown (NatureServe, 2015)	No Mention	Loss of pollinators (USFWS, 2012)	Medium
Erythronium propullans	Minnesota dwarf trout lily	Endangered	Declining (USFWS, 2011)	Declining (USFWS, 2011)	~500 (USFWS, 1987)	*E. propullans* is restricted to portions of the Straight River, Cannon River, Little Cannon River, Zumbro River, and Prairie Creek watersheds in Minnesota (USFWS, 2011).	Up to 10,000 plants (USFWS, 1987)	No Mention	No Mention	High
Fritillaria gentneri	Gentner's Fritillary	Endangered	Unknown (USFWS, 2016)	Not Available	~138 (USFWS, 2016)	Scattered localities in southwest Oregon along the Rogue and Illinois River drainages in Josephine and Jackson Counties, Oregon; also known from two sites, about one mile apart, in far northern California (OBIC 2008).	6,715 - 17,684 (USFWS, 2016)	No Mention	No Mention	High
Helonias bullata	Swamp pink	Threatened	Decline of 30-50% (NatureServe, 2015)	10 - 50% decline (NatureServe, 2015)	~250 (USFWS, 2014)	Species occurs on the Coastal Plain in southern New York state (Staten Island), New Jersey, Delaware, Maryland, and Virginia. Occurs at higher elevations (primarily disjunct bog areas in the Southern Appalachians) in northern New Jersey, Virginia, North Carolina, South Carolina, and Georgia. Extant populations in all	10,000 to >1,000,000 individuals (NatureServe, 2015)	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
						states except New York. The greatest number of sites are in southern New Jersey, but the species is also locally abundant at some other sites, particularly in the Mid-Atlantic region (NatureServe, 2015).				
Iris lacustris	Dwarf lake iris	Threatened	Decline of 50-80% (NatureServe, 2015)	Stable (USFWS, 2011)	167 (USFWS, 2013)	Almost exclusively found on the northern shores of Lakes Michigan, Huron and Superior. Approximate range extent is 4100 sq. miles (NatureServe, 2015). The global population of dwarf lake iris is collectively restricted to Michigan, Wisconsin, and Ontario (USFWS, 2011).	10,000 to >1,000,000 individuals (NatureServe, 2015)	No Mention	No Mention	Medium
Isotria medeoloides	Small whorled pogonia	Threatened	Long-term trends suggest a decline of 10 to 30%, whereas short-term trends indicate a relatively stable population (NatureServe, 2015)	Not Available	209 (NatureServe, 2015)	Range extends from Maine south to Georgia with outlying occurrences in the Midwest U.S. and Ontario, Canada. (NatureServe, 2015)	2,400 (USFWS, 1992)	No Mention	No Mention	Medium
Lilium occidentale	Western lily	Endangered	Decline of 50-70% (NatureServe, 2015)	Not Available	23 (USFWS, 2009)	Several extant occurrence in Humboldt County, California. California range extent covers about 146 sq mi in 3 main areas. (NatureServe, 2015). It is restricted to a narrow strip along the immediate Pacific coast between Coos Bay, Oregon, and Eureka, California (USFWS, 2009).	9,000 - 10,000 individuals (NatureServe, 2015)	No Mention	No Mention	High
Lilium pardalinum ssp. pitkinense	Pitkin Marsh lily	Endangered	Not Available	Not Available	3 (USFWS, 2009)	Two occurrences known, near Sebastopol (Skinner and Pavlik 1994) (NatureServe, 2015). Only the southern marsh occurrence has been confirmed as extant in 2009. Both occurrences in the northern marsh are presumed extant based on aerial photographs (USFWS, 2009).	Not Available	No Mention	No Mention	High
Nolina brittoniana	Britton's beargrass	Endangered	Decreasing (NatureServe, 2015)	Not Available	21 - 80 (NatureServe, 2015)	Florida Central Ridge endemic, found in Hardee, Hernando, Highlands, Lake, Orange, Osceola, Polk, and Marion counties. (NatureServe, 2015)	1000 - 2500 individuals (NatureServe, 2015)	No Mention	No Mention	High
Piperia yadonii	Yadon's piperia	Endangered	Decreasing (NatureServe, 2015)	Not Available	21 - 80 (NatureServe, 2015)	Occurs in three distinct groups of sites. It is endemic to Monterey Co., California. (NatureServe, 2015)	10,000 - 100,000 individuals (NatureServe, 2015)	No Mention	No Mention	High
Sagittaria fasciculata	Bunched arrowhead	Endangered	Decreasing to Stable (NatureServe, 2015)	Not Available	6 - 80 (NatureServe, 2015)	Endemic to North Carolina and South Carolina. Extant in Henderson Co., North Carolina and Greenville Co., South Carolina. (NatureServe, 2015)	10,000 - 1,000,000 individuals (NatureServe, 2015)	Herbicide drift (USFWS, 2014)	No Mention	High

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
Sagittaria secundifolia	Kral's water-plantain	Threatened	NULL	Not Available	1 - 5 (NatureServe, 2015)	Known from the Little River drainage of northeast Alabama and northwest Georgia, Sipsey Fork of the Black Warrior River in northwest Alabama, and Hatchet Creek in north-central Alabama (Chafin 2007). The Town Creek population in northeast Alabama is believed to have been destroyed (USFWS 1991). (NatureServe, 2015)	Not Available	No Mention	No Mention	Medium
Spiranthes delitescens	Canelo Hills ladies'-tresses	Endangered	Declining	Not assessed, but suspected decline of 30-50% (NatureServe 2015).	1-5 sites	Known from five sites in the San Pedro River watershed in Cochise and Santa Cruz counties, Arizona; further surveys need to be completed for New Mexico. There may be sites in Mexico; however, surveys are lacking.	Unknown	No Mention	No Mention	High
Spiranthes parksii	Navasota ladies'-tresses	Endangered	Long-term trends are unknown but short-term trends indicate a decline of 10-30% (NatureServe, 2015)	Not Available	64 element occurrences (USFWS, 2009)	Texas endemic found in eastern Texas along the Navasota River, primarily in Grimes and Brazos counties. This species has recently been found at Angelina National Forest, in Jasper County, 114 miles east of the nearest population in Madison County. (NatureServe, 2015)	~3,000 individuals (USFWS, 2009)	No Mention	No Mention	High
Trillium reliquum	Relict trillium	Endangered	Not Available	Not Available	21-80 (NatureServe, 2015)	Eastern Alabama, Georgia, and South Carolina (NatureServe, 2015).	1000 - 1,000,000 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 Pollinators and Seed dispersers 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
Allium munzii	Munz's onion	No	164.47	Biotic - Asexual, Self-pollinating	Abiotic, Biotic	No	Insect	Medium
Brodiaea filifolia	Thread-leaved brodiaea	No	96.03	Biotic - Asexual, Self-pollinating	Abiotic	No	Insect	Medium
Brodiaea pallida	Chinese Camp brodiaea	No	94.13	Biotic - Asexual, Self-pollinating	Abiotic, Biotic	No	Insect	Low
Erythronium propullans	Minnesota dwarf trout lily	No	118.98	Biotic - Asexual, Self-pollinating	Abiotic, Biotic	No	Insect	Medium
Fritillaria gentneri	Gentner's Fritillary	No	25.56 (3.64)	Biotic - Asexual, Self-pollinating	Abiotic, Biotic	Unknown	Insect, Bird	Low
Helonias bullata	Swamp pink	No	123.17	Biotic - Asexual, Self-pollinating	Abiotic, Biotic	No	Insect	Medium
Iris lacustris	Dwarf lake iris	No	27.89	Biotic - Asexual, Self-pollinating	Abiotic, Insect	Unknown	Insect	Medium
Isotria medeoloides	Small whorled pogonia	No	56.83	Biotic - Asexual, Self-pollinating	Abiotic	Unknown	Insect	Medium
Lilium occidentale	Western lily	No	83.42 (8.65)	Biotic - Asexual, Self-pollinating	Abiotic	Unknown	Insect, Bird	Low
Lilium pardalinum ssp. pitkinense	Pitkin Marsh lily	No	176.73	Biotic - Asexual, Self-pollinating	Abiotic, Biotic	Unknown	Insect	Medium
Nolina brittoniana	Britton's beargrass	No	122.47 (21.03)	Biotic - Asexual, Self-pollinating	Abiotic	Unknown	Insect, Bird	Medium
Piperia yadonii	Yadon's piperia	No	154.82	Biotic - Asexual, Self-pollinating	Abiotic	No	Insect	Medium
Sagittaria fasciculata	Bunched arrowhead	No	121.76 (23.91)	Biotic - Asexual, Self-pollinating	Abiotic, Bird, Mammal	Unknown	Insect, Bird	Medium
Sagittaria secundifolia	Kral's water-plantain	No	13.70 (2.74)	Biotic - Asexual, Self-pollinating	Abiotic, Bird, Mammal	Unknown	Insect, Bird	Low
Spiranthes delitescens	Canelo Hills ladies'-tresses	No	1.19	Biotic - Asexual, Self-pollinating	Abiotic	No	Insect	Low
Spiranthes parksii	Navasota ladies'-tresses	No	45.75	Biotic - Asexual, Self-pollinating	Abiotic	No	Insect	Medium
Trillium reliquum	Relict trillium	No	112.87	Biotic - Asexual, Self-pollinating	Biotic	No	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; 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
Allium munzii	Munz's onion	139038.87	14.49	100		40.29	83.71	10.48	1.532	CalPUR	Low
Brodiaea filifolia	Thread-leaved brodiaea	1187094.47	43.91	100		27.73	55.34	3.23	1.331	CalPUR	Low
Brodiaea pallida	Chinese Camp brodiaea	150853.35	17.82	100		4.22	82.68	0.25	0.209	CalPUR	Low
Erythronium propullans	Minnesota dwarf trout lily	325231.53	0.00	0		46.42	5.94	8.76		Standard	Medium
Fritillaria gentneri	Gentner's Fritillary	4794241.02	60.98	60	Other portion of range occurs in OR	4.81	11.42	1.97	0.140	CalPUR	Low
Helonias bullata	Swamp pink	5187664.34	27.23	0		19.12	63.89	1.26		Standard	Low
Iris lacustris	Dwarf lake iris	13069502.37	8.84	0		5.79	0	1.13		Standard	Low
Isotria medeoloides	Small whorled pogonia	15967173.46	28.93	0		11.01	20.87	1.19		Standard	Low
Lilium occidentale	Western lily	938023.30	12.82	<100	No pesticide usage overlap in CA. Species also occurs in OR.	8.69	65.96	0.47	0.430	CalPUR	Low
Lilium pardalinum ssp. pitkinense	Pitkin Marsh lily	74915.31	0.54	100		31.77	100.00	15.29	0.957	CalPUR	Low
Nolina brittoniana	Britton's beargrass	5405815.56	9.77	0		21.17	78.25	5.67**		Standard	Medium
Piperia yadonii	Yadon's piperia	246831.07	3.94	100		31.16	62.33	4.42	2.871	CalPUR	Low
Sagittaria fasciculata	Bunched arrowhead	1171006.64	8.60	0		24.52	61.28	2.09		Standard	Low
Sagittaria secundifolia	Kral's water-plantain	613262.26	45.76	0		2.88	0.01	0.28		Standard	Low
Spiranthes delitescens	Canelo Hills ladies'-tresses	257586.17	59.30	0		0.20	0	0.02		Standard	Low
Spiranthes parksii	Navasota ladies'-tresses	6900288.97	0.97	0		11.20	0.06	3.01		Standard	Low
Trillium reliquum	Relict trillium	8906240.82	5.30	0		18.25	23.12	1.45		Standard	Low

*Information in this column 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 this species is above 5.0% (15%). 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 pollinators and seed dispersers of this species from mosquito control usage will be 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 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	*Erythronium propullans*	Minnesota dwarf trout lily	High	Medium	Medium	NJ
2	*Nolina brittoniana*	Britton's beargrass	High	Medium	Medium	NJ
3	*Brodiaea pallida*	Chinese Camp brodiaea	Medium	Low	Low	NJ
4	*Fritillaria gentneri*	Gentner's Fritillary	High	Low	Low	NJ
5	*Lilium occidentale*	Western lily	High	Low	Low	NJ
6	*Sagittaria secundifolia*	Kral's water-plantain	Medium	Low	Low	NJ
7	*Spiranthes delitescens*	Canelo Hills ladies'-tresses	High	Low	Low	NJ
8	*Brodiaea filifolia*	Thread-leaved brodiaea	Medium	Medium	Low	NJ
9	*Helonias bullata*	Swamp pink	Medium	Medium	Low	NJ
10	*Iris lacustris*	Dwarf lake iris	Medium	Medium	Low	NJ
11	*Isotria medeoloides*	Small whorled pogonia	Medium	Medium	Low	NJ
12	*Allium munzii*	Munz's onion	High	Medium	Low	NJ
13	*Lilium pardalinum ssp. pitkinense*	Pitkin Marsh lily	High	Medium	Low	NJ
14	*Piperia yadonii*	Yadon's piperia	High	Medium	Low	NJ
15	*Sagittaria fasciculata*	Bunched arrowhead	High	Medium	Low	NJ
16	*Spiranthes parksii*	Navasota ladies'-tresses	High	Medium	Low	NJ
17	*Trillium reliquum*	Relict trillium	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 any of the species in this assessment group (refer to Table 4).

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.

While the Minnesota dwarf trout lily (species 1) has estimated malathion usage of 8.76% within its range, the USFWS Midwest office describes the species as occurring on less than 600 acres, half of which are preserved in state or county parks or by The Nature Conservancy. The remaining half of the range occurs on private lands, but a number of landowners have entered into voluntary agreements to protect this species and manage its forested habitat. Additionally, this species predominantly reproduces by utilizing vegetative runners; the role of pollination and the overall viability and contribution to successful reproduction of any produced seed set is unknown. Some known dwarf trout lily colonies are almost exclusively dominated by large beds of sterile leaves. Furthermore, we anticipate the additional conservation measures described above will further reduce the risk of exposure of both pollinators and seed dispersers in the portion of the range where we anticipate malathion to be applied. As a result, pollinator mortality caused by malathion use within the portion of the range that is unprotected is not anticipated to cause species-level reproductive effects.

While Britton's beargrass (species 2) has anticipated malathion usage of 5.67% within its range, the number of element occurrences has increased to 111 from 72 in the 2010 5- year review. Of the 111 occurrences, 72 or 65%, are on protected public lands. For the occurrences remaining on private lands, the main threat to their existence is urban development and consequent disruption of natural fire regimes in the plant's habitat. Additionally, this species can reproduce using widespread clonal growth, and is therefore less dependent upon visitation by pollinators for successful reproduction. Britton's beargrass also relies on abiotic means for seed dispersal and is not anticipated to experience reproductive effects from loss of seed dispersers within its range. Furthermore, we anticipate the additional conservation measures described above will further reduce the risk of exposure of both pollinators and seed dispersers in the 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 Britton's beargrass. As a result, pollinator mortality caused by malathion use within the unprotected portion (35%) of this species range is not anticipated to cause species-level reproductive effects.

While species 3-7 have a mixture of high and medium vulnerabilities based on their status, distribution, and trends, the risk to these five species posed by labeled uses across the range and the estimated usage within their ranges are low. As a result we anticipate malathion usage in 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 additional conservation measures described above, such as the mosquito adulticide timing restrictions and agriculture bloom restrictions, 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. In addition, all plants in this group can utilize self-fertilization or asexual means for reproduction, thus decreasing their reliance on biotic pollination vectors and further reducing the risk of reproductive effects caused by pollinator exposure to malathion within their ranges. As a result, pollinator and/or seed disperser mortality caused by malathion exposure is not anticipated to cause species-level reproductive effects in species 3-7.

Species 8-11 all have medium vulnerabilities based on their status, distribution and trends and medium risk to the species posed by labeled uses across the range. All four species have low estimated usage within their ranges. We anticipate malathion usage in 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 additional conservation measures described above, such as the mosquito adulticide timing restrictions and agriculture bloom restrictions, 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. In addition, all of these plant species can utilize self-fertilization or asexual means for reproduction, this decreasing their reliance on biotic pollination vectors and further reducing the risk of reproductive effects caused by pollinator exposure to malathion within their ranges. As a result, pollinator and/or seed disperser mortality caused by malathion exposure is not anticipated to cause species-level reproductive effects in species 8-11.

Species 12-17 all have high vulnerabilities based on their status, distribution and trends, medium risk to the species posed by labeled uses across the range and low estimated usage within their ranges. 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 additional conservation measures described above, such as the mosquito adulticide timing restriction, 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. In addition, all of these plant species can utilize self-fertilization or asexual means for reproduction, thus decreasing their reliance on biotic pollination vectors and further reducing the risk of reproductive effects caused by pollinator exposure to malathion within their ranges. Species 12-16 rely on abiotic means for 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. Ants are noted to be an important dispersal vector for the relict trillium, however this species predominantly reproduces by clonal spread and infrequently by seed, therefore reducing its reliance on seed dispersers (USFWS, 2015). As a result, pollinator and/or seed disperser mortality caused by malathion exposure is not anticipated to cause species-level reproductive effects in species 12-17.

We do not anticipate that the use of malathion is likely to result in species-level effects to the species in this group. Therefore, we do not anticipate that the proposed action would appreciably reduce survival and recovery of the species in the wild.