Integration and Synthesis Summary for Plants, CONUS

Monocot and dicot flowering plants that use biotic pollination vectors, but other characteristics of their reproductive mechanisms are unknown

Assessment Groups 7 & 11

This Integration and Synthesis Summary includes our jeopardy analysis for any species that we or EPA determined will "likely be adversely affected" by the proposed action. Our jeopardy analysis of the proposed action's impacts to listed species is split into three major factors: vulnerability, exposure, and toxicity. The tables below contain summaries of our rankings (high, medium, low) for vulnerability, exposure, and toxicity. Data and information used to determine individual species' rankings and a template worksheet to show how rankings were assessed and combined are in Appendix E. All plants in this appendix (plant assessment groups 7 & 11) 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. All species in these assessment groups are found inside the conterminous United States (CONUS).

Vulnerability

For the plant species that we or EPA determined are "likely to be adversely affected" by the proposed action, we considered several factors for each listed plant to summarize the current vulnerability of that species to additional stressors. This effort allows us to consider whether a species' current condition is moving toward recovery or further decline. In general, we expect the species' vulnerability to additional stressors to be higher if they are moving toward further decline than if their condition is improving. We also identify which species are most (and least) susceptible to additional stressors in general based on information that could be surmised from species listing and recovery documents, or other sources as cited and considered in the *Status* section of this biological opinion.

Our assessment of vulnerability focuses on seven factors: (1) the species listing status and recent 5-year status review recommendation (if available), (2) distribution, (3) number of populations, (4) species population trends, (5) if pesticides have been noted as a threat, (6) if pollinator loss has been noted as a threat, and (7) impacts from activities associated with environmental baseline and cumulative effects. We obtained the information to create the vulnerability summary from the Status of the Species accounts (Appendix B), overarching Environmental Baseline section of this Opinion, 5-year species status reviews, species recovery plans, species status assessments, and other sources containing the best available scientific information for the species.

We scored each of the seven vulnerability components with high, medium, or low scores. We assigned a high vulnerability ranking to a species if all vulnerability components were scored as medium or high. We assigned a medium vulnerability ranking if a species' scores were a mix of high and low (though exceptions were allowed for species that have a low status score or have an uplisting recommendation). We assigned a low vulnerability ranking to species with only low or medium scores. Considerations regarding specific aspects of the species vulnerability, or beyond what was included in the vulnerability ranking were applicable for some species depending on unique aspects of their life history. This information is reflected in the rationales for conclusion below.

Exposure

We anticipate plants and their pollinators will primarily be exposed to methomyl through direct contact, either as the result of exposure to pesticide applications on-field or through spray drift off-field. Methomyl degrades quickly in the environment (i.e., within a few days) and as such is not likely to persist on surfaces or in the air for prolonged periods of time.

We characterize the expected level of exposure using overlap data, past usage data, and any species-specific considerations such as life history information (e.g., habitat preferences, pollinator preferences) and existing protections or conservation actions. Species with greater than 10% overlap between their range and methomyl use sites are assigned a high overlap score, species with 5-10% overlap are assigned a medium overlap score, and species with less than 5% total overlap are assigned a low overlap score. In addition to range overlaps with methomyl use sites, we considered past methomyl usage data within a species' range to determine how much of a species' range we expect to be treated with methomyl each year of the proposed action. Except where otherwise noted, usage data is provided by EPA applying data from their National and State Summary Use and Usage Matrix, as described in the *Usage Analysis* section of this biological opinion. Species that data indicate will have a large portion of their range (>10%) treated with methomyl each year are assigned a high usage score. Species that will have a medium portion of their range (5-10%) treated with methomyl each year are assigned a medium usage score, and species that data indicate will have a low portion of their range (<5%) treated with methomyl each year are assigned a low usage score.

We determine the overall exposure ranking by qualitatively considering both the total overlap and total usage, as well as any additional exposure considerations that might modify the level of exposure likely to occur. When overlap and usage scores are the same, we assign the overall exposure ranking the same score (e.g., if both overlap and usage is high, the overall exposure ranking is high). In cases where overlap is high and usage is medium or when overlap is medium and usage is low, we use the overlap score as the overall exposure ranking to maintain conservative exposure assumptions. (As usage is a subset of overlap, the overlap score will always be greater than the usage score.) In cases where overlap is high, but usage is low, we anticipate a large portion of the range may be treated over the duration of the proposed action even if only a small portion of the range is treated in any given year (particularly if the areas treated occur in different locations each year), leading to an overall exposure ranking of medium. For species where there are additional exposure considerations, we adjust the overall exposure ranking to reflect this additional information, as appropriate.

Toxicity

We characterize the expected toxic effect to species based on the anticipated level of direct and indirect[1] adverse effects to individuals. Our analysis of toxicity assumes individuals are exposed to methomyl at levels estimated by EPA's environmental exposure modeling and is focused on determining the level of adverse effect expected to occur once exposure has taken place. Direct effects are based on the anticipated level of mortality and sublethal effects (e.g., reduced growth) likely to occur in exposed individuals. Indirect effects are based on the impact a listed species is likely to experience when the organisms they rely on, such as those that act as pollinators or seed dispersers, are exposed to methomyl and experience adverse effects.

Available toxicity data indicate that plants will not experience any direct adverse effects to survival, growth, or reproduction with exposure to methomyl. In contrast, available toxicity data indicate that insects, including those that act as pollinators and seed dispersers for listed plants, are sensitive to methomyl at estimated environmental concentrations and are likely to die from exposure on both application sites and adjacent areas exposed via drift. However, we expect insect species to exhibit a range of sensitivities to methomyl and do not anticipate the entire insect pollinator community will die. Plants that rely on a select few species of pollinators or seed dispersers (i.e., specialists) are likely to experience high levels of indirect effect as high mortality in a few insect pollinator species can significantly reduce pollination and seed dispersal. In contrast, generalist plants that can use a wide range of insect species are likely able to recover more quickly from temporary losses of some insect species, resulting in lower levels of indirect effects from the proposed action.

Bird and mammal pollinators/seed dispersers are less sensitive to methomyl exposure than insects. While methomyl exposure in birds and mammals can cause mortality under specific circumstances (e.g., by consuming exclusively contaminated food items on or adjacent to methomyl use sites) we do not t methomyl use is likely to appreciably diminish the availability of bird or mammal pollinators or seed dispersers. For species where the relationship with pollinators and seed dispersers is unknown, we make the conservative assumption that the species has a specialist-type relationship exclusively with insect pollinators and seed dispersers.

[1] While our Opinion considers all consequences of the proposed action (per the definition of effects of the action at 50 CFR Part 402.02), the terms "direct" and "indirect" effects were used in EPA's BE, and are used in environmental risk assessment terminology in general, and do not have the same meaning as used in ESA regulations. As used in the effects analysis section, direct effects to species are those caused by the pesticide itself through dietary, dermal, or inhalation routes of exposure. Indirect effects occur when the pesticide acts on elements of the ecosystem that are required by the species, such as alterations to prey or shelter. Thus, in the effects analysis section, we may use these terms to link back to the analysis in EPA's BE.

We evaluate indirect effects by assessing (1) how critical biotic outcrossing is to the species, (2) the type of pollination vector required, (3) the type of seed dispersal vector required, and (4) how strict the pollinator and seed disperser requirement is for the species (e.g., can the species use a wide range of insect species or is the species a pollinator obligate or specialist?). Species that score the same on all toxicity factors are given the same overall toxicity ranking (e.g., species scores high on all factors has a high overall toxicity ranking). Species that only have medium or low scores are given a low overall toxicity ranking. Species that have a mix of high and low scores are given a medium overall toxicity ranking, and species with a mix of high and medium scores are given a high overall toxicity ranking.

Summary of Conclusions for Plants in Assessment Groups 7&11, CONUS

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed registration of methomyl, and the cumulative effects, it is the Service's biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the plant species in this appendix.

In our analysis below, some species that had the same or very similar rationales for their conclusions were grouped together, to increase efficiency and avoid repetition. Relevant information and data unique to each individual species was considered when assigning species to groups and incorporated into the rationales as appropriate. Species-specific information (e.g., environmental baseline, cumulative effects, status of the species, exposure, and toxicity) was considered for all species, including those species in the grouped analyses, and are presented in full in Appendices B and E. Species with rationales that did not fit in a group, or warranted a separate rationale because of their life history, conservation status, or other information indicated that effects could be different, have an individual discussion to provide additional explanation. This approach allowed us to streamline our discussion in this Opinion by avoiding repeating our findings when species in the respective groupings would be expected to be affected similarly. The use of these groupings, therefore, does not mean that our evaluation failed to evaluate each individual species. On the contrary, our process and analysis for each species remained the same, regardless of the format of the discussion presented below.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Species with low concern of adverse effects

The species in Table 1 are grouped together as they have low concern of adverse effects due to either 1) low exposure and low toxicity with high vulnerability or 2) low exposure with low or medium vulnerability and variable toxicity. While we present some specific information about the species in Table 1 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 1. Plant species in groups 7 and 11 (i.e., biotic pollination vectors with other reproductive mechanisms unknown) with low to high vulnerability, low to high toxicity, and low concern of adverse effects due to low exposure as informed by low overlap between the species' range and agricultural land uses where methomyl is registered for use.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Action Area Overlap (%)	Determination
Baccharis vanessae	Encinitas baccharis	Medium	Low	Low	0.5	No Jeopardy
Castilleja grisea	San Clemente Island indian paintbrush	Medium	Low	Medium	0.1	No Jeopardy
Chlorogalum purpureum	Purple amole	Medium	Low	High	4.1	No Jeopardy
Chorizanthe robusta var. *hartwegii*	Scotts Valley spineflower	Medium	Low	High	0.4	No Jeopardy
Clematis morefieldii	Morefield's leather flower	Medium	Low	High	4.18	No Jeopardy
Deeringothamnus rugelii	Rugel's pawpaw	Medium	Low	Medium	0.41	No Jeopardy
Delphinium luteum	Yellow larkspur	High	Low	Low	4.1	No Jeopardy
Delphinium variegatum ssp. *kinkiense*	San Clemente Island larkspur	Medium	Low	Medium	0.1	No Jeopardy
Dudleya setchellii	Santa Clara Valley dudleya	Medium	Low	High	1.5	No Jeopardy

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Scientific Name	**Common Name**	**Vulnerability Ranking**	**Exposure Ranking**	**Toxicity Ranking**	**Total Action Area Overlap (%)**	**Determination**
Echinocereus triglochidiatus var. *arizonicus*	Arizona hedgehog cactus	High	Low	Low	0.05	No Jeopardy
Euphorbia telephioides	Telephus spurge	Medium	Low	High	1	No Jeopardy
Geocarpon minimum	No common name	Low	Low	Medium	4.7	No Jeopardy
Graptopetalum bartramii	Bartram stonecrop	Medium	Low	Medium	0.13	No Jeopardy
Helianthus paradoxus	Pecos (=puzzle, =paradox) sunflower	Medium	Low	High	2.03	No Jeopardy
Malacothamnus clementinus	San Clemente Island bush-mallow	Medium	Low	High	0.1	No Jeopardy
Paronychia chartacea	Papery whitlow-wort	Low	Low	High	3.04	No Jeopardy

In our review of the current status of the species, and the environmental baseline and cumulative effects for the action area, the Service determined that the vulnerability of most species in Table 1 is low or medium (the few with high vulnerability are discussed below). Our evaluation of the effects of the proposed action on these species indicates a low extent of exposure due to the low overlap of the action area within the range of these species. Toxicity is expected to be medium or high for many of the plant species in this group, mainly due to their reliance on insect pollinators for successful reproduction. However, plants in Table 1 use abiotic vectors for seed dispersal (with one exception, Rugel's pawpaw, which uses birds or mammals that are unlikely to experience a drop in abundance from methomyl exposure), and all plants in Table 1 can use a variety of insect species for pollination and seed dispersal (i.e., pollinator generalists). As such, they are likely to recover more quickly from temporary losses of a small portion of the pollinator community.

While toxicity is high or medium for many species in Table 1, given that exposure is anticipated to be low (as demonstrated by the low percent overlap between the action area and species' ranges), the risk of indirect adverse reproductive effects to the listed plants from loss of pollinators and/or seed dispersers is low. The total overlap metric we use is a conservative estimate of exposure as it does not fully account for redundancy between use site layers, assumes exposure is occurring in all possible overlapping areas, and does not consider information on past methomyl usage. Thus, we have high confidence that the pollinators and seed dispersers of these plant species will have minimal exposure to methomyl. Furthermore, because many of these species have low or medium vulnerabilities, they are more likely to be able to withstand additional stressors in their environment, including temporary declines in their pollinator and seed disperser populations in very small portions of their ranges from methomyl exposure. The three species in this group that have high vulnerabilities (yellow larkspur and Arizona hedgehog cactus) have both low exposure and toxicity. As such, even though these species may be less likely to be able to withstand additional stressors in their environment, their likelihood of adverse effects in the small portion of the range where exposure is expected is low. Therefore, we anticipate a minimal level of adverse reproductive effects for all species in this group.

As a result, while we anticipate minimal adverse effects due to the loss of insect pollinators and seed dispersers and resultant loss of reproductive success from methomyl exposure, we do not expect that these adverse effects will cause species-level effects due to low expected exposure of pollinators and seed dispersers, the plant species' ability to withstand temporary declines in pollinator and seed dispersers in very small portions of their ranges, and reliance on a variety of pollinator species for successful reproduction. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 1.

Species with low exposure (informed by low overlap with agriculture), high vulnerability, and medium or high toxicity

The species in Table 2, below are grouped together as they all have high vulnerability, medium or high toxicity, and low exposure informed by low overlap with agricultural sites where methomyl is registered for use. While we present some specific information about the species in Table 2 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 2. Plant species in groups 7 and 11 (i.e., biotic pollination vectors with other reproductive mechanisms unknown) with high vulnerability, medium or high toxicity, and low exposure as informed by low overlap between the species' range and agricultural land uses where methomyl is registered for use.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Action Area Overlap (%)	Determination
Arctomecon humilis	Dwarf Bear-poppy	High	Low	High	1.2	No Jeopardy
Ceanothus ferrisae	Coyote ceanothus	High	Low	High	1.9	No Jeopardy
Cirsium fontinale var. *obispoense*	Chorro Creek bog thistle	High	Low	Medium	1.2	No Jeopardy
Calyptridium pulchellum	Mariposa pussypaws	High	Low	Medium	0.2	No Jeopardy
Castilleja mollis	Soft-leaved paintbrush	High	Low	Medium	2.31	No Jeopardy
Ceanothus ophiochilus	Vail Lake ceanothus	High	Low	High	0.91	No Jeopardy
Ceanothus roderickii	Pine Hill ceanothus	High	Low	High	0.51	No Jeopardy
Clarkia speciosa ssp. *immaculata*	Pismo clarkia	High	Low	Medium	3.1	No Jeopardy
Conradina brevifolia	Short-leaved rosemary	High	Low	High	2.3	No Jeopardy
Dicerandra frutescens	Scrub mint	High	Low	High	2.3	No Jeopardy
Dudleya traskiae	Santa Barbara Island liveforever	High	Low	High	0.0	No Jeopardy

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Scientific Name	**Common Name**	**Vulnerability Ranking**	**Exposure Ranking**	**Toxicity Ranking**	**Total Action Area Overlap (%)**	**Determination**
Galium californicum ssp. *sierrae*	El Dorado bedstraw	High	Low	High	0.62	No Jeopardy
Hypericum cumulicola	Highlands scrub hypericum	High	Low	High	2.3	No Jeopardy
Lesquerella pallida	White bladderpod	High	Low	High	<0.1	No Jeopardy
Lesquerella tumulosa	Kodachrome bladderpod	High	Low	High	0.4	No Jeopardy
Lupinus tidestromii	Clover lupine	High	Low	Medium	1.93	No Jeopardy
Malacothamnus fasciculatus var. *nesioticus*	Santa Cruz Island bush-mallow	High	Low	High	0.44	No Jeopardy
Navarretia leucocephala ssp. *pauciflora (=N. pauciflora)*	Few-flowered navarretia	High	Low	Medium	4.0	No Jeopardy
Parvisedum leiocarpum	Lake County stonecrop	High	Low	Medium	1.7	No Jeopardy
Pectis imberbis	Beardless chinch weed	High	Low	Medium	0.2	No Jeopardy
Pediocactus (=Echinocactus,=Utahia) sileri	Siler pincushion cactus	High	Low	High	0.1	No Jeopardy
Penstemon haydenii	Blowout penstemon	High	Low	High	3.0	No Jeopardy
Phacelia insularis ssp. *insularis*	Island phacelia	High	Low	High	1.26	No Jeopardy
Polygonum hickmanii	Scotts Valley Polygonum	High	Low	Medium	1.75	No Jeopardy
Schoenocrambe argillacea	Clay reed-mustard	High	Low	High	1.8	No Jeopardy
Schoenocrambe suffrutescens	Shrubby reed-mustard	High	Low	High	0.8	No Jeopardy
Sidalcea keckii	Keck's Checker-mallow	High	Low	High	3.9	No Jeopardy
Sidalcea oregana ssp. *valida*	Kenwood Marsh	High	Low	High	3.9	No Jeopardy

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Total Action Area Overlap (%)	Determination
	checker-mallow					
Sphaeralcea gierischii	Gierisch mallow	High	Low	High	0.1	No Jeopardy
Thlaspi californicum	Kneeland Prairie penny-cress	High	Low	High	0.23	No Jeopardy

In our review of the current status of the species, and the environmental baseline and cumulative effects for the action area, the Service determined that the vulnerabilities of the species in Table 2 are high. Our evaluation of the effects of the proposed action on these species indicates a low extent of exposure due to the low overlap of the action area within the range of these species. Toxicity is expected to be medium or high for the plant species in this group, mainly due to their reliance on insect pollinators for successful reproduction. However, the plants in Table 2 use abiotic vectors for some or all seed dispersal and most plants in Table 2 can use a variety of insect species for pollination and seed dispersal (i.e., pollinator generalists), and are therefore likely to recover more quickly from temporary losses of a small portion of their pollinating insect species. The only exception is the scrub mint, which while highly dependent on a single pollinator, and it is unlikely that this is a factor contributing to its endangerment (USFWS 2021) as bee-flies are very common and abundant.

While all species listed in Table 2 have high vulnerability rankings and toxicity is high or medium, given that exposure is anticipated to be low (as demonstrated by the low percent overlap between the action area and species' ranges), the risk of indirect adverse reproductive effects to the listed plants from loss of pollinators and/or seed dispersers is low. Furthermore, the total overlap metric we use is a conservative estimate of exposure as it does not fully account for redundancy between use site layers, assumes exposure is occurring in all possible overlapping areas, and does not consider information on past methomyl usage. Thus, while these species' vulnerability and toxicity rankings may be high, we have high confidence that the pollinators and seed dispersers of these plant species will have minimal exposure to methomyl.

As a result, while we anticipate minimal adverse effects due to the loss of insect pollinators and seed dispersers and resultant loss of reproductive success from methomyl exposure, we do not expect that these adverse effects will cause species-level effects due to low expected exposure to methomyl, reliance on a variety of pollinator species for successful reproduction, and use of abiotic vectors for some or all seed dispersal. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 2.

References:

U.S. Fish and Wildlife Service. 2021. Scrub mint (*Dicerandra frutescens*) 5-Year Review, Summary and Evaluation. Columbia, Missouri. 36 pp.

Species with low exposure (confirmed by low past usage from USDA Census of Agriculture), high vulnerability, and medium or high toxicity

The species in Table 3 are grouped together as they all have low exposure (% range treated) confirmed by low levels of past usage within their ranges, as informed by the USDA's Census of Agriculture (CoA) data. While we present some specific information about the species in Table 3 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 3. Plant species in groups 7 and 11 (i.e., biotic pollination vectors with other reproductive mechanisms unknown) with high vulnerability, medium or high toxicity, and low exposure confirmed by low past methomyl usage according to the U.S. Department of Agriculture's Census of Agriculture data.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated	Draft Determination
Arabis perstellata	Braun's rock-cress	Medium	Low	High	2.55	No Jeopardy
Cardamine micranthera	Small-anthered bittercress	High	Low	High	1.2	No Jeopardy
Chamaesyce deltoidea ssp. deltoidea	Deltoid spurge	High	Low	High	2.9	No Jeopardy
Chamaesyce garberi	Garber's spurge	High	Low	High	1.1	No Jeopardy
Justicia cooleyi	Cooley's water-willow	High	Low	Low	1.24	No Jeopardy
Leavenworthia exigua laciniata	Kentucky glade cress	Medium	Low	High	2.7	No Jeopardy
Lesquerella perforata	Spring Creek bladderpod	High	Low	High	0.8	No Jeopardy
Lesquerella thamnophila	Zapata bladderpod	High	Low	High	1.5	No Jeopardy
Limnanthes floccosa ssp. *grandiflora*	Large-flowered woolly meadowfoam	High	Low	Medium	1.9	No Jeopardy
Linum arenicola	Sand flax	High	Low	High	1.5	No Jeopardy
Lomatium cookii	Cook's lomatium	High	Low	Medium	1.1	No Jeopardy

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated	Draft Determination
Platanthera integrilabia	White fringeless orchid	Medium	Low	Medium	1.89	No Jeopardy
Ranunculus aestivalis (=acriformis)	Autumn Buttercup	High	Low	Medium	1.0	No Jeopardy
Scutellaria montana	Large-flowered skullcap	Low	Low	Low	1.23	No Jeopardy
Sideroxylon reclinatum ssp. *austrofloridense*	Everglades bully	Low	Low	Medium	1.64	No Jeopardy
Sisyrinchium dichotomum	White irisette	High	Low	High	0.9	No Jeopardy

All the species listed in Table 3 have high vulnerability rankings, indicating that they may not be able to withstand additional stressors in their environment, including reduced reproductive capability of individuals from methomyl exposure. Toxicity is expected to be medium or high for the plant species in this group, mainly due to their reliance on insect pollinators successful reproduction. However, all the plants in Table 3 use abiotic vectors for some or all seed dispersal and all plants can use a variety of insect species for pollination and seed dispersal (i.e., pollinator generalists) and are therefore likely to recover more quickly from temporary losses of a small portion of their pollinating insect species.

While all species listed in Table 3 have high vulnerability rankings and toxicity is high or medium, we anticipate only a small number of individuals are likely to be exposed to methomyl given the low insecticide usage in the past across their ranges. Low CoA usage indicates that very little insecticide usage (of any type) occurred in the past in the counties where these species' ranges occur. Given that this reporting broadly includes all insecticide usage, we consider CoA data to be conservative estimates of methomyl usage that indicate very little of the species' ranges are likely to be treated. Thus, while these species' vulnerability and toxicity rankings may be high, we have high confidence that the pollinators and seed dispersers of these plant species will have minimal exposure to methomyl.

As a result, while we anticipate minimal adverse effects due to the loss of insect pollinators and seed dispersers and resultant loss of reproductive success from methomyl exposure, we do not expect that these adverse effects will cause species-level effects due to low expected exposure, reliance on a variety of pollinator species for successful reproduction, and use of abiotic vectors for some or all seed dispersal. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 3.

Species with low exposure (informed by low past usage from the California Department of Pesticide Regulation, CalPUR), medium or high vulnerability, and medium or high toxicity

The species in Table 4 are grouped together because they all occur completely within California and they all have low exposure rankings determined by low levels of past usage within their ranges, as informed by the California Department of Pesticide Regulation. While we present some specific information about the species in Table 4 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 4. Plant species in groups 7 and 11 (i.e., biotic pollination vectors with other reproductive mechanisms unknown) with medium or high vulnerability, medium or high toxicity, and low exposure (confirmed by low past usage from California Department of Pesticide Regulation (CalPUR) data).

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated	Draft Determination
Astragalus clarianus	Clara Hunt's milk-vetch	High	Low	High	0	No Jeopardy
Castilleja campestris ssp. succulenta	Fleshy owl's-clover	Low	Low	High	0.1	No Jeopardy
Caulanthus californicus	California jewelflower	Medium	Low	High	1	No Jeopardy
Chamaesyce hooveri	Hoover's spurge	Low	Low	High	0.4	No Jeopardy
Chorizanthe valida	Sonoma spineflower	High	Low	Medium	0	No Jeopardy
Cirsium hydrophilum var. *hydrophilum*	Suisun thistle	High	Low	High	0	No Jeopardy
Cirsium loncholepis	La Graciosa thistle	High	Low	Medium	4.4	No Jeopardy
Clarkia springvillensis	Springville clarkia	High	Low	Medium	0.2	No Jeopardy
Eriodictyon capitatum	Lompoc yerba santa	High	Low	High	0.9	No Jeopardy

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	% Range Treated	Draft Determination
Eriogonum apricum (incl. var. prostratum)	Ione (incl. Irish Hill) buckwheat	High	Low	High	0	No Jeopardy
Eryngium constancei	Loch Lomond coyote thistle	Medium	Low	High		No Jeopardy
Navarretia leucocephala ssp. *plieantha*	Many-flowered navarretia	High	Low	Medium	0	No Jeopardy
Plagiobothrys strictus	Calistoga allocarya	High	Low	High	0.1	No Jeopardy

The species listed in Table 4 have high vulnerability rankings, indicating that they may not be able to withstand additional stressors in their environment, including reduced reproductive capability of individuals from methomyl exposure. Toxicity is expected to be medium or high for the plant species in this group, mainly due to their reliance on insect pollinators for successful reproduction. However, the plants in Table 4 use abiotic vectors for some or all seed dispersal and all can use a variety of insect species for pollination and seed dispersal (i.e., pollinator generalists). As such, they are likely to recover more quickly from temporary losses of a small portion of their pollinating insect species.

While all species listed in Table 4 have high vulnerability rankings and toxicity is high or medium, we anticipate only a small number of individuals are likely to be exposed to methomyl given the low methomyl usage in the past across their range. Mandatory pesticide usage reporting data collected by the state of California indicates very little methomyl has been used in the agricultural sections where these species' ranges occur. Given that reporting of pesticide usage in agricultural areas is mandated by the state of California and that data are available with relatively high spatial resolution, we have high confidence that these species will experience, at most, low exposure to methomyl as a result of the proposed action. Thus, while these species' vulnerability and toxicity rankings may be high, we have high confidence that the pollinators and seed dispersers of these plant species will have minimal exposure to methomyl.

As a result, while we anticipate minimal adverse effects due to the loss of insect pollinators and seed dispersers and resultant loss of reproductive success from methomyl exposure, we do not expect that these adverse effects will cause species-level effects due to low expected exposure, reliance on a variety of pollinator species for successful reproduction, and use of abiotic vectors for some or all seed dispersal. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce survival and recovery of these species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the species in Table 4.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Species with medium exposure, medium vulnerability, and medium toxicity

In Table 5, we grouped species together that have a medium exposure ranking, while having low or medium vulnerability. However, since there is only one species in this group, we have provided an individual rationale below the table. While we present some specific information about the species in Table 5 below, we provide additional information on vulnerability (including environmental baseline and cumulative effects), exposure, and toxicity in Appendix E. The status of the species accounts can be found in Appendix B.

Table 5. Plant species in groups 7 and 11 (i.e., biotic pollination vectors with other reproductive mechanisms unknown) with medium exposure, low or medium vulnerability, and medium toxicity.

Scientific Name	Common Name	Vulnerability Ranking	Exposure Ranking	Toxicity Ranking	Determination
Asclepias meadii	Mead's milkweed	Medium	Medium	Medium	No Jeopardy

Rationale for Species Conclusion: Mead's milkweed

Scientific Name:	Common Name:	Entity ID:
Asclepias meadii	Mead's milkweed	636

Preliminary Conclusion:

Mead's milkweed historically occurred in the tallgrass upland prairie of 46 counties throughout Kansas, Missouri, Illinois, Iowa, Indiana, and Wisconsin. At the time of listing, it was considered extirpated from Wisconsin and Indiana, and from 7 counties in Illinois. Before 2012, nineteen reintroductions occurred in Illinois (7), Indiana (1), and Wisconsin (11). Since then, additional plantings have occurred in Missouri and Illinois, resulting in a total of 375 recorded populations across 15 physiographic regions and two plant community types. There have been a total of 29 reintroductions as of 2022. However, a major issue for the continued management and restoration of Mead's milkweed across its range is the lack of long-term data and regular surveys. Nearly one-third of all populations have not had observations or have not been surveyed in 30 years. Given poor recruitment, previous population declines, and changing environmental conditions, it's likely some populations have disappeared (USFWS 2022).

The Mead's milkweed can spread clonally (vegetatively), but also requires pollination primarily by large bees, including the European honeybee (*Apis melifera*), rusty patched bumblebee (*Bombus affinis*), brown-belted bumblebee (*B. griseocollis*), Southern Plains bumblebee (*B. fraternus)* and the chimney bee (*Anthrophora abrupta*). In North America, losses of bees in grasslands commenced in the early 19th century, while a largescale bee decline in the U.S. Midwest occurred as agriculture practices intensified between the 1940s and 1960s. Mead's milkweed pollinators, particularly bumblebees, have declined throughout the United States. The Southern Plains bumblebee suffered population declines across 70% of its range and is considered at high risk for extinction due to its small geographic range. The brown-belted bumblebee remains in only 72% of its historical range. Furthermore, rusty-patched bumblebee, previously identified as a pollinator of Mead's milkweed, has experienced a large decline across its range and was listed as endangered in 2017 (82 FR 3186 3209). Recovery efforts for pollinators are ongoing through a variety of partnerships across the nation, and maintaining pollinator populations will be essential for the recovery of Mead's milkweed.

The mosaic agricultural landscape of the species' range currently presents a barrier to gene flow among populations of Mead's milkweed, preventing pollinator dispersal and reducing the likelihood that attempted dispersals will result in successful transport of gametes elsewhere. Furthermore, a loss of fecundity is reported for the species. Herbicide and pesticide use are described as a threat to the species. Indirect effects of increased pesticide use can result in the direct decline of the Mead's milkweed primary pollinators (USFWS 2022).

Overlap of spray drift areas from methomyl use sites with the range of the species is 34% and past usage data indicate that up to 3.5% of the species' range has been treated with methomyl annually, leading us to conclude there will be moderate exposure of mead's milkweed pollinators within its range. Exposure to pollinators on agricultural crops is expected to be minimal as there is no on-field overlap with methomyl registered crops with the range of the species.

We expect pollinators to die in portions of the range exposed to methomyl via spray drift. The pre-existing decline in pollinators of this species and lack of pollinator dispersal is likely to be exacerbated by the loss of insect pollinators from exposure to methomyl. As this species relies on a relatively narrow spectrum of pollinator species (large bees) that are already in reduced numbers, even a moderate additional loss in the populations of these species is likely to have a disproportionately large effect on the reproductive capacity of the species because it cannot use other species of insect for pollination, and it is already experiencing reproductive declines.

We anticipate that adverse effects to pollinators will cause species-level effects to the Mead's milkweed over the duration of the action. The species' reproductive success is dependent upon the presence of particular insect pollinators for reproduction which are already in decline.

Final Conclusion (with Species-Specific Conservation Measures):

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Mead's milkweed:

Methomyl must be applied using the following buffers: 320 feet for aerial applications, 105 feet for ground applications, and 160 feet for airblast applications. Based on AgDRIFT modeling, the buffers will reduce spray drift from entering habitat for Mead's milkweed and its pollinators by

>95% for terrestrial habitat. These buffer distances may be reduced using other measures identified as equivalent mitigations (i.e., reducing spray drift by similar magnitude) as specified in EPA's Draft Insecticide Strategy and as described in Appendix A-1 of this Opinion.

The PULA for the Mead's milkweed will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action (i.e., additional options and mitigations for end users). In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.

After incorporation of the specific conservation measures above, we expect exposure for the pollinators of the Mead's milkweed to be low. Upon review of the current status of the listed species, environmental baseline for the action area, effects of the proposed action, cumulative effects, and species-specific conservation measures, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Mead's milkweed.

References:

U.S. Fish and Wildlife Service. 2022. 5-Year Review Mead's milkweed (*Asclepias meadii*). Columbia, Missouri. 36 pp.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Species with Individual Integration and Synthesis summaries

For the species in Table 6, our preliminary vulnerability, exposure, and toxicity rankings indicated that the proposed action may result in moderate to high adverse effects. As such, we discuss each species in more detail in individual Rationales for Conclusion below. In some cases, we modified initial exposure and toxicity rankings due to additional information regarding exposure and effects for individual species, as described below.

Table 6. Plant species in groups 7 and 11 (i.e., biotic pollination vectors with other reproductive mechanisms unknown) with moderate to high adverse effects anticipated from the proposed action. We addressed each species in individual Integration and Synthesis summaries.

Scientific Name	Common Name	Determination
Lesquerella lyrata	Lyrate bladderpod	No Jeopardy
Thalictrum cooleyi	Cooley's meadowrue	No Jeopardy
Chorizanthe pungens var. *pungens*	Monterey spineflower	No Jeopardy
Jacquemontia reclinata	Beach jacquemontia	No Jeopardy
Scutellaria floridana	Florida skullcap	No Jeopardy
Thelypodium howellii spectabilis	Howell's spectacular thelypody	No Jeopardy
Hymenoxys texana	Texas prairie dawn-flower	No Jeopardy
Monolopia (=Lembertia) congdonii	San Joaquin wooly-threads	No Jeopardy
Erigeron decumbens var. *decumbens*	Willamette daisy	No Jeopardy
Hexastylis naniflora	Dwarf-flowered heartleaf	No Jeopardy

Rationale for Species Conclusion: Lyrate bladderpod

Scientific Name:	Common Name:	Entity ID:
Lesquerella lyrata	Lyrate bladderpod	750

Conclusion:

Lyrate bladderpod is a threatened, early-successional annual endemic to three counties in northern Alabama. All known populations are found adjacent to limestone outcrops supporting cedar glades, all of which are disturbed (i.e., they are all cultivated fields, roadsides, and cattle pastures). There are three known extant occurrences; two populations are relatively small (i.e., 16-300 per site) and declining, and one population is partially on land managed and protected by The Nature Conservancy and appears to be stable at an estimated “thousands” of individuals.

The two declining populations occur along a county road on private, unprotected lands. Population estimates vary widely between years due to changes in environmental conditions. Some agricultural practices, like plowing and mowing, may benefit the species and many individuals are on pastureland where grazing prevents succession, which is also beneficial to the species. Lyrate bladderpods are threatened by habitat loss and fragmentation (e.g., agriculture including herbicide use, development, road construction) and effects of small populations (USFWS 2019).

Flowering occurs from mid-March to April, and seeds are dispersed from April until mid-May. Other details of its reproductive strategy, self-compatibility, and potential reliance on insect dispersers or pollinators is unknown. Due to the lack of more specific information, we assume the species depends on insect pollinators and seeds dispersers for reproduction. Lyrate bladderpod has a long-lived (10+ years) seed bank and seeds typically germinate after disturbance when seeds are brought to the ground's surface (e.g., mowing, fire). This fact also tells us that reproduction leading to adequate seed production is occurring, indicating that a pollinator shortage is not likely within the range (USFWS 1996, 2019).

There is a high overlap between the species' range and methomyl use sites (31.26%), but past annual methomyl usage indicates a low portion of the range (2%) has been treated annually, leading us to determine there will be moderate exposure to insect pollinators. Even though insect pollinators are expected to die within the range of this species, we do not expect a loss of pollinating insects will lead to significant adverse effects to the reproductive capacity of this species due to the existence of the majority of individuals on land where we do not anticipate methomyl exposure to occur (The Nature Conservancy lands) and the indication that a pollinator shortage within the range is not likely. As such, we anticipate that adverse effects to pollinators will not cause species-level effects to the lyrate bladderpod over the duration of the action. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce the survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the lyrate bladderpod.

References:

U.S. Fish and Wildlife Service. 2019. Lyrate bladderpod (*Lesquerella lyrata*) 5-Year Review: Summary and Evaluation. Daphne, Alabama. 15 pp.

U.S. Fish and Wildlife Service. 1996. Recovery Plan for the Lyrate bladderpod (*Lesquerella lyrata*). Atlanta, Georgia. 33 pp.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Rationale for Species Conclusion: Cooley's meadowrue

Scientific Name:	**Common Name:**	**Entity ID:**
Thalictrum cooleyi	Cooley's meadowrue	852

Conclusion:

Cooley's meadowrue is an endangered perennial found in the Coastal Plain of Georgia, North Carolina, and possibly Florida. It is typically found in wet pine savannas, grass-sedge bogs, and savanna-like areas, often at the border of intermittent drainages or swamp forests. There are 24 extant subpopulations across ten populations and one extirpated population in North Carolina; four subpopulations did not have observable plants during the last site visit. Five subpopulations (four populations) in North Carolina are protected by State, non-profit, or conservation programs. In Georgia, there are two populations (seven species occurrences) and one is monitored regularly and managed by The Nature Conservancy (Dry Creek Swamp Preserve). There was one population in Florida that was burned in 2008 and the population had an unknown status in 2020. The Florida population is on Nokuse Plantation, which is protected by a conservation easement. The primary threat to Cooley's meadowrue is habitat modification or destruction (e.g., fire suppression, succession, timber operations, herbicide use, mowing, development, land conversion) (USFWS 2020).

Cooley's meadowrue flowers from mid-June to early July. Plants that are mowed or burned during the growing season have been observed resprouting and flowering later in the same season. Fruits mature in August and September and remain on the plant until at least October. The plants are likely polygamodioecious, meaning they have male, female, and bisexual flowers. They show characteristics of wind pollination (e.g., smooth pollen, elaborate stigma, reduced perianth, terminal inflorescences in an open habitat) and some suggestion of insect pollination (e.g., conspicuous stamens with somewhat expanded filaments), but pollinators only visit male flowers. Therefore, we and others believe pollination is primarily abiotic (Fortner et al. 2016). Cooley's meadowrue is also known to spread through rhizomes; small plants discovered in the field were offshoots of rhizomes from nearby, larger plants (rather than seedlings). Seeds are short-lived and there is no known seed bank for Cooley's meadowrue (USFWS 1994). The species appears to lack seed dispersal mechanisms (USFWS 1989).

Cooley's meadowrue is pollinated by wind and is unlikely to be pollinated or dispersed by insects. Even though insect pollinators are expected to die within the range of this species, we do not expect a loss of pollinating insects will lead to adverse effects to the reproductive capacity of this species. We anticipate that adverse effects to pollinators will not cause species-level effects to the Cooley's meadowrue over the duration of the action. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce the survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Cooley's meadowrue.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

References:

Fortner, A.R., C. L. Jolls, and C. Goodwillie. 2016. Important biological knowledge for management of Cooley's meadowrue (*Thalictrum cooleyi*), a Federally endangered endemic of pine savannas. Natural Areas Journal 36(3): 288-301.

U.S. Fish and Wildlife Service. 2020. Cooley's Meadowrue (*Thalictrum cooleyi*) 5-Year Review: Summary and Evaluation. Raleigh, North Carolina. 30 pp.

U.S. Fish and Wildlife Service. 1994. Recovery Plan Cooley's Meadowrue (*Thalictrum cooleyi* Ahles). Atlanta, Georgia. 34 pp.

U.S. Fish and Wildlife Service. 1989. Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for *Thalictrum Cooleyi* (Cooley's Meadowrue). Final Rule. Federal Register 54(24):5935-5938.

Rationale for Species Conclusion: Monterey spineflower

Scientific Name:	Common Name:	Entity ID:
Chorizanthe pungens var. *pungens*	Monterey spineflower	903

Preliminary Conclusion:

Monterey spineflower is a threatened annual species that occurs in dune systems and in sandy openings in chaparral. It is found from the Monterey Peninsula northward to extreme southern Santa Cruz County, and inland into the Salinas Valley in California. Annual abundance fluctuates widely (100 to 10,000 individuals), likely because of the species' responses to annual variations in weather and subsequent seed set. The largest population of Monterey spineflower is found on the former Fort Ord military base. As of 2020, there were 51 occurrences of the species; 19 have experienced habitat loss or fragmentation and nine have been developed or converted to agriculture. Three of the developed occurrences are believed to be extirpated. Of 51 occurrences, 23 are assumed present as discovered and 21 (41%) occur on land that is owned and managed by an entity with conservation objectives (State parks, Elkhorn Slough Foundation, The Nature Conservancy, federal lands, etc.). The other 30 occurrences are on private lands. The species is covered by a multi-species Habitat Conservation Plan (2020-2050) for Pacific Gas and Electric Company and there is a Habitat Conservation Plan in draft for the former Fort Ord. Threats to the species include habitat destruction (e.g., development, agricultural land conversion, invasive species, habitat succession, sand mining) and recreation (USFWS 2020).

No studies of the breeding system of the species have been conducted; however, a pollination ecology study was conducted on the closely related robust spineflower (*Chorizanthe robusta* var. *robusta*). It found that, although the robust spineflower may self-pollinate, pollinator access to flowers significantly increased seed set. A high diversity of potential pollinators, including sweat bees (Halictidae), bumblebees (*Bombus* spp.), wasps (Sphecidae), honeybees (*Apis mellifera*), and soft-winged flower beetles (Dasytidae) transported *Chorizanthe* pollen. These results suggest that protecting pollinator habitat and diversity is important to the recovery of *Chorizanthe* species. Flowering occurs from late March to June, and seeds are dispersed in mid-summer. Monterey spineflower relies on birds and mammals as seed dispersers to maintain populations and colonize new sites in its range (USFWS 2009).

Monterey spineflower likely uses two methods of reproduction, pollen transfer between individual plants and self-fertilization. We expect that insect pollinators are involved in Monterey spineflower reproduction, and cross-pollination increases seed set. There is a high overlap between the species' range and the action area (25%) and past annual methomyl usage indicates a moderate portion of the range (8.2%) has been treated annually. In addition, pollinators of Monterey spineflower are likely to be attracted to certain blooming crops registered for methomyl use, and there is appreciable overlap of the range with these on-field use sites (4.3%).Because birds and mammals are less sensitive to methomyl than other taxa groups, we expect that the proposed action is not likely to result in exposure levels that will appreciably diminish the availability of bird or mammal seed dispersers. We expect methomyl use to be minimal on the 41% of populations that are on protected lands, but unprotected populations may experience methomyl use and subsequent pollinator declines. Even though Monterey spineflower is believed to use a wide variety of pollinators, we expect a loss of pollinating insects will lead to significant adverse effects to the reproductive capacity of this species. We anticipate that adverse effects to pollinators will cause species-level effects to the Monterey spineflower over the duration of the action.

Final Conclusion (with Species-Specific Conservation Measures):

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Monterey spineflower:

1. *Methomyl must be applied using the following buffers: 320 feet for aerial applications, 105 feet for ground applications, and 160 feet for airblast applications. Based on AgDRIFT modeling, the buffers will reduce spray drift from entering habitat for Monterey spineflower and its pollinators by >95% for terrestrial habitat. These buffer distances may be reduced using other measures identified as equivalent mitigations (i.e., reducing spray drift by similar magnitude) as specified in EPA's Draft Insecticide Strategy and as described in Appendix A-1 of this Opinion.*
2. *Methomyl will not be applied within three days prior to bloom, during bloom, and until petal fall is complete on all methomyl-registered crops in the 'other orchards' UDL in order to minimize exposure to pollinators attracted on field during bloom of these crops.*

The PULA for the Monterey spineflower will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering *public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action (i.e., additional options and mitigations for end users). In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.*

After incorporation of the specific conservation measures above, we expect exposure for the pollinators of the Monterey spineflower to be low. Upon review of the current status of the listed species, environmental baseline for the action area, effects of the proposed action, cumulative effects, and species-specific conservation measures, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Monterey spineflower.

References:

U.S. Fish and Wildlife Service. 2020. Monterey spineflower (*Chorizanthe pungens* var. *pungens*) 5-Year Review: Summary and Evaluation. Ventura, California. 16 pp.

U.S. Fish and Wildlife Service. 2009. Monterey spineflower (*Chorizanthe pungens* var. *pungens*) 5-Year Review: Summary and Evaluation. Ventura, California. 21 pp.

Rationale for Species Conclusion: Beach jacquemontia

Scientific Name:	Common Name:	Entity ID:
Jacquemontia reclinata	Beach jacquemontia	953

Preliminary Conclusion:

Beach jacquemontia is an endangered perennial vine of the morning glory family (Convolvulaceae). They are found in coastal strand and other open dune habitats, typically on leeward sides and crests of stable dunes, in southern Florida, including the Florida Keys. There are eight extant natural populations with an estimated 734 individuals. There are also twelve extant introduced populations. Few populations are monitored regularly, but most populations show declining trends and small abundances (<6 plants). Five additional populations were extirpated after 2007. The largest natural population (Crandon Park: 589 plants) increased in abundance and had positive recruitment between 2007-2021. At Crandon Park, hardwood and exotic species are removed from the stabilized dune habitat, allowing beach jacquemontia to persist. Over 2,000 plants have been introduced to 13 sites across the species historic range, and introduced populations outnumber natural populations. Two introduced populations increased (Bill Baggs Cape Florida State Park: 865 plants; Virginia Key Coastal Hammock: 229 plants) and one introduced population is extirpated. Because of the species' dynamic habitat, population sizes fluctuate over time. Threats to the species include vegetation encroachment, invasion of non-native plants, habitat loss from development and lack of appropriate management, and effects of climate change (USFWS 2021).

Beach jacquemontia flowers from November to May and may vegetatively propagate all year. At some sites, beach jacquemontia sets fruit and disperses seed prolifically; however, few seedlings or young plants are ever found near adult plants (USFWS 1999). Beach jacquemontia uses a generalist pollination system and at least twenty insect species have been observed visiting flowers. Pollinators were primarily from the orders Hymenoptera (bees and wasps; 94%), Diptera (flies; 4%) and Lepidoptera (butterflies and skippers; 2%). Beach jacquemontia has relatively low genetic diversity. The species is capable of self-crossing but crosses between different populations had greater pollination success and greater genetic diversity. Determined through plant introduction studies, plant survival and growth are greater for progeny from mixed-populations than for single-source populations, further indicating the species' reliance on pollinators for reproductive success. Remaining habitat for this species is heavily fragmented, which could prevent pollinators from dispersing among populations (USFWS 2021). Seed dispersal is through dehiscence (ejection of the seeds from seed pods).

Beach jacquemontia uses two methods of reproduction, pollen transfer between individual plants and self-fertilization. Insect pollinators are necessary for beach jacquemontia reproduction, and cross-pollination increases progeny survival and growth, seed set, and genetic diversity. There is 11.2% overlap between spray drift areas from methomyl use sites and the species' range, and past usage data indicate that only up to 6.1% of the species' range has been treated with methomyl annually. Exposure to pollinators on agricultural crops is expected to be minimal as there is no on-field overlap with methomyl registered crops with the range of the species. We expect the loss of pollinating insects from methomyl use within the range will lead to significant adverse effects to the reproductive capacity of this species and we anticipate that adverse effects to pollinators will cause species-level effects to the beach jacquemontia over the duration of the action.

Final Conclusion (with Species-Specific Conservation Measures):

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the beach jacquemontia:

Methomyl must be applied using the following buffers: 320 feet for aerial applications, 105 feet for ground applications, and 160 feet for airblast applications. Based on AgDRIFT modeling, the buffers will reduce spray drift from entering habitat for the beach jacquemontia and its pollinators by >95% for terrestrial habitat. These buffer distances may be reduced using other measures identified as equivalent mitigations (i.e., reducing spray drift by similar magnitude) as specified in EPA's Draft Insecticide Strategy and as described in Appendix A-1 of this Opinion.

The PULA for the beach jacquemontia will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action (i.e., additional options and mitigations for end users). In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.

After incorporation of the specific conservation measures above, we expect exposure for the pollinators of the beach jacquemontia to be low. Upon review of the current status of the listed species, environmental baseline for the action area, effects of the proposed action, cumulative effects, and species-specific conservation measures, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the beach jacquemontia.

References:

U.S. Fish and Wildlife Service. 2021. Beach jacquemontia (*Jacquemontia reclinata*) 5-Year Review: Summary and Evaluation. Vero Beach, Florida. 29 pp.

U.S. Fish and Wildlife Service. 1999. South Florida multi-species recovery plan. Atlanta, Georgia. 2172 pp.

Rationale for Species Conclusion: Florida skullcap

Scientific Name:	**Common Name:**	**Entity ID:**
Scutellaria floridana	Florida skullcap	997

Conclusion:

Florida skullcap is a perennial mint endemic to four counties in the Florida panhandle (Bay, Franklin, Gulf, and Liberty). It grows in fire-dependent habitats such as longleaf pine wet forests and wet meadows and has a strong response to fire. It can also occur in appropriate habitats within road/transportation and/or transmission rights-of-ways that are maintained. Currently, there are 19 extant, protected species occurrences. These occurrences continue to be threatened by urban development, timber farming, and fire suppression (herbicides are no longer considered a threat). The species is particularly concentrated in a few locations, specifically in the Apalachicola National Forest. The nine occurrences at Apalachicola National Forest are protected and adequately managed; these represent 47% of the 19 protected occurrences. Habitat on private lands has deteriorated in quality and extent due to conversion of much of the forest land to pulpwood plantations and some to cattle grazing (USFWS 2024).

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Florida skullcap populations consist of a mixture of both asexually and sexually reproducing individuals. Substantial clonal reproduction was observed, since 92% of the studied populations were found to be multiclonal (USFWS 2024). Bumblebees, megachilids (leafcutter, mason, and resin bees) and halictids (sweat bees) are probably important pollinators. Plants flower from mid-April through early December and principally after a fire. Pollinators are critical to the long-term persistence of many flowering plant species because they provide a mechanism for ensuring seed set (USFWS 2019). Seed dispersal mechanisms are unknown for this species; however, we anticipate minimal effects from seed disperser loss as most dispersal of individuals occurs clonally, and seeds are also likely dispersed through abiotic means (wind or water).

There is moderate overlap between the species' range and methomyl use sites (5.9%), while past usage data indicate that only a small portion of the species range has been treated with methomyl (up to 1.3% annually). While there is a low level of usage expected, given the uncertainties associated with this usage data and the moderate percent overlap, we determined the species has a medium exposure ranking. Thus, we anticipate a loss of insects in the pollinator community within a moderate portion of the range of the species.

Though we anticipate a loss of insects in the pollinator community within a moderate portion of the range, we anticipate low adverse reproductive effects to the species as it is capable of reproducing clonally, thus decreasing its reliance on insect pollinators for reproduction. It can also use a variety of bees for pollination, thus reducing its reliance on a particular species if there is a temporary loss of sensitive pollinator species from methomyl exposure in a portion of the range. Furthermore, the majority of occurrences are found on land that is protected and managed for the species and where methomyl use is unlikely (Apalachicola National Forest). As such, we do not anticipate species-level reproductive effects to the species from loss of pollinators or seed dispersers due to methomyl exposure. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce the survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Florida skullcap.

References:

U.S. Fish and Wildlife Service. 2019. *Scutellaria floridana* (Florida skullcap) 5-Year Review: Summary and Evaluation. Panama City, Florida. 21 pp.

U.S. Fish and Wildlife Service. 2024. *Scutellaria floridana* (Florida skullcap) 5-Year Review. Panama City, Florida. 14 pp.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Rationale for Species Conclusion: Howell's spectacular thelypody

Scientific Name:	Common Name:	Entity ID:
Thelypodium howellii spectabilis	Howell's spectacular thelypody	1008

Preliminary Conclusion:

Howell's spectacular thelypody is a threatened, herbaceous biennial endemic to mesic, alkaline habitats in the Baker-Powder River Valley region of northeast Oregon. Some populations are near pasturelands. The current range is restricted to about 175 sq. km. and includes 15 occurrences loosely comprising six populations (five naturally occurring and one introduced). The Oregon Department of Agriculture's Native Plant Conservation Program monitored most sites between 2021-2023, and all surveyed sites either declined or disappeared over the last 10-25 years. The Clover Creek Valley population is inaccessible on private lands. At the North Powder Population, one site declined from >36,000 plants in 2000 to 17,500 plants in 2023, two sites were not accessed, three sites occur on transportation rights-of-way (only one had plants), and one additional site was surveyed, and no plants were found. At the Haines Population, one site had confirmed presence and a larger protected site and had 10,681 plants in 2021 and 13,500 plants in 2023. The North Baker Population has not been accessed since the 1990s. For the Pocahontas Road Population, no plants were visible from the access point on a nearby road (private, inaccessible property). The Baldock Slough Introduced Population had about 120 plants across five areas surveyed in 2021 and 2022. Threats to the species include livestock grazing, urban and agricultural development and activities, road maintenance and construction, hydrological alterations, non-native species invasion, habitat fragmentation, and herbicide and pesticide use (USFWS 2023). We mentioned in the recovery plan (USFWS 2002) that pesticide use could impact thelypody pollinators, as can spraying to control noxious weeds.

Howell's spectacular thelypody flowers in late May through July and set seed in July. They reproduce entirely by seeds, which are released by pods splitting open to discharge seeds. A variety of seed dispersers are used to maintain populations and colonize new sites in its range, including birds, insects, mammals, wind, and water. Although this taxon is self-compatible, successful reproduction occurs primarily by outcrossing facilitated by insect vectors such as bumblebees (*Bombus* spp.) (USFWS 2002).

Howell's spectacular thelypody uses two methods of reproduction, pollen transfer between individual plants and self-fertilization. Though the species can be self-compatible, they rely primarily on outcrossing facilitated by insects, including bumblebees. As there is 65.5% overlap between spray drift areas from methomyl use sites and the species' range, and past usage data indicate that up to 18.4% of the species' range has been treated with methomyl annually, we expect a large portion of the range to be exposed to methomyl. Exposure to pollinators on agricultural crops is expected to be minimal as there is no on-field overlap with methomyl registered crops with the range of the species. Because birds and mammals are less sensitive to methomyl than other taxa groups, we do not expect that the proposed action is likely to appreciably diminish the availability of bird or mammal seed dispersers. However, we expect insect pollinators to die from methomyl exposure. Most of the known populations of Howell's spectacular thelypody are unprotected, and as such may be exposed to methomyl use and subsequent insect pollinator and insect disperser declines. We expect a loss of insects will lead to significant adverse effects to the reproductive capacity of this species and we anticipate that adverse effects to insects will cause species-level effects over the duration of the action.

Final Conclusion (with Species-Specific Conservation Measures):

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Howell's spectacular thelypody:

Methomyl must be applied using the following buffers: 320 feet for aerial applications, 105 feet for ground applications, and 160 feet for airblast applications. Based on AgDRIFT modeling, the buffers will reduce spray drift from entering habitat for Howell's spectacular thelypody and its pollinators by >95% for terrestrial habitat. These buffer distances may be reduced using other measures identified as equivalent mitigations (i.e., reducing spray drift by similar magnitude) as specified in EPA's Draft Insecticide Strategy and as described in Appendix A-1 of this Opinion.

The PULA for the Howell's spectacular thelypody will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action (i.e., additional options and mitigations for end users). In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.

After incorporation of the specific conservation measures above, we expect exposure for the pollinators of the Howell's spectacular thelypody to be low. Upon review of the current status of the listed species, environmental baseline for the action area, effects of the proposed action, cumulative effects, and species-specific conservation measures, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Howell's spectacular thelypody.

References:

U.S. Fish and Wildlife. 2023. 5-Year Review Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*). Oregon. 12 pp.

U.S. Fish and Wildlife. 2002. Recovery Plan for Howell's spectacular thelypody (*Thelypodium howellii* ssp. *spectabilis*). Portland, Oregon. 57 pp.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Rationale for Species Conclusion: Texas prairie dawn-flower

Scientific Name:	Common Name:	Entity ID:
Hymenoxys texana	Texas prairie dawn-flower	1045

Conclusion:

Texas prairie dawn-flower has a medium vulnerability based on its status as an endangered species and distribution among 40 to 50 populations across six counties in Texas. With an additional county record (Madison County) and its population surveyed in 2022, the species has now been identified in six counties. While only a few of the extant populations occur on federal lands, several of the largest of these populations reside on private conservation properties in Harris County and Waller County. The populations known from Addicks and Barker Reservoirs, federally constructed and maintained flood control projects controlled by the U.S. Army Corps of Engineers, have declined since 2005 due in part to competing recreational land use, lack of mowing restrictions, or lack of invasive species control (USFWS 2022). However, conservation protection mechanisms now cover 12 of the 13 confirmed sites of over 1,000 ac (404.7 ha) that support the species (USFWS 2015), and there is a current effort underway to study Texas prairie dawn-flower reproductive biology, genetics, pollinators, and seed dispersal mechanisms through ESA Section 6 funding from the Service to Texas Parks and Wildlife Department (see WSFR Grant F22AP03103-00, Ecosphere reference 2022-0024702).

The risk to the species posed by methomyl toxicity to its pollinators is anticipated to be high given our uncertainty with the exact mechanism of pollination. While little has been confirmed about how the plant is pollinated, researchers believe there may be some correlation between the carpenter ant *Camponotus* spp. and the continued existence of the species (USFWS 2015). Other potential pollinators hypothesized for the species include composite thrips *Microcephalothrips abdominalis* and more recently, harvester ants in the genus *Pogonomyrmex*, were observed and recorded within many of the saline barrens supporting populations (USFWS 2022). Insects are expected to die within portions of the range of this species from exposure to methomyl from application on agricultural use sites and from spray drift from these sites. However, conservation of many of these private lands, including active management on several sites reduces the concern for several important populations.

The species relies on a variety of seed dispersers to maintain populations and colonize new sites in its range. It can disperse seeds using biotic vectors such as birds, insects, and mammals in addition to abiotic vectors such as wind and water. While we anticipate insects to die from methomyl exposure, we do not expect that the proposed action is likely to appreciably diminish the availability of bird or mammal seed dispersers. Given that this species can rely on a variety of seed dispersal vectors, we do not anticipate effects to its insect seed dispersers to cause significant adverse effects to the reproductive capacity of this species.

There is 17.2% overlap between the action area and the species' range, and past usage data indicate that only up to 1.3% of the species' range has been treated with methomyl annually. Nearly half of occurrences are currently protected. We anticipate adverse effects in the form of loss of insect pollinators from exposure to methomyl that will be expected to occur over the duration of the action. However, because of the number of populations and their resilience, given current levels of methomyl usage and the portion of occupied range that is currently protected, we do not expect that these adverse effects will rise to the level of species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce the survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the Texas prairie dawn-flower.

References:

U.S. Fish and Wildlife. 2022. 5-Year Review Texas prairie dawn-flower (*Hymenoxys texana*). Houston, Texas. 38 pp.

U.S. Fish and Wildlife. 2015. 5-Year Review Texas prairie dawn-flower (*Hymenoxys texana*). Houston, Texas. 34 pp.

Rationale for Species Conclusion: San Joaquin wooly-threads

Scientific Name:	**Common Name:**	**Entity ID:**
Monolopia (=Lembertia) congdonii	San Joaquin wooly-threads	1123

Conclusion:

San Joaquin wooly-threads is an herbaceous annual and member of the Asteraceae (sunflower family). The common name "woolly-threads" is derived from the many long (up to 18 inches), trailing stems covered with tangled hairs. This species occurs in the grasslands of the hills and plateaus west of the San Joaquin Valley and is associated with the valley saltbrush scrub habitat in the valley floor (USFWS 2020).

The species occurs in seven counties in California (Fresno, Kern, Kings, San Benito, San Luis Obispo, and Santa Barbara). Currently, there are 87 extant and presumed extant Diversity Database occurrences, and 24 extirpated and possibly extirpated occurrences. The Bureau of Land Management has established long-term monitoring of 29 sub-occurrences throughout the species' range. However, it is difficult to determine trends in population sizes because emergence is variable from year to year and there is not enough evidence to show how closely this variation is tied to annual precipitation or other environmental factors. The sub-occurrences being monitored have declined in size in the past five years, despite above-average rainfall in 2017 and 2019. Currently, the primary threats to San Joaquin woolly-threads throughout its range include habitat loss and fragmentation due to agricultural and urban development, oil, gas, and other mining exploration, competition with non-native grasses, and climate change (USFWS 2020).

San Joaquin wooly-threads has tiny yellow flower heads which are clustered at the tips of the stems and branches. Seed dispersal agents are unknown, but possible candidates include wind, water, and animals. Insect pollinators are not known to be required for seed-set. We assume this to mean the species can rely on self-pollination for successful seed-set (USFWS 2010).

There is a high overlap between the species' range and methomyl use sites (19%), and past usage data indicate that a moderate extent of the species range (up to 6.4%) has been treated annually. While there is a medium level of usage expected, given the uncertainties associated with this usage data and the high percent overlap, we determined the species has a high exposure ranking, thus we anticipate a high loss of the pollinator community within the range of the species.

Though we anticipate a loss of the pollinator community within a large portion of the range of this species, we anticipate low adverse reproductive effects to the species as it is capable of producing viable seeds without insect pollinators (assumably through self-fertilization) and can use a variety of methods for seed dispersal (including wind and water where we expect no indirect adverse effects to the species). As such, we do not anticipate species-level reproductive effects from loss of pollinators or seed dispersers due to methomyl exposure. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce the survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the San Joaquin woolly-threads.

References:

U.S. Fish and Wildlife Service. 2020. *Monolopia (=Lembertia) congdonii* (San Joaquin woolly-threads) 5-Year Review. Sacramento, California. 7 pp.

U.S. Fish and Wildlife Service. 2010. *Monolopia (=Lembertia) congdonii* (San Joaquin woolly-threads) 5-Year Review: Summary and Evaluation. Sacramento, California. 32 pp.

Rationale for Species Conclusion: Willamette daisy

Scientific Name:	Common Name:	Entity ID:
Erigeron decumbens var. *decumbens*	Willamette daisy	1233

Preliminary Conclusion:

The Willamette daisy is a perennial herb endemic to the Willamette Valley of western Oregon. As of 2019, the species occurs in Benton, Lane, Linn, Marion, and Polk Counties. Population size may fluctuate substantially from year to year. Although the most recent range wide assessment indicates there have been some new populations discovered or established, and some populations have increased in abundance since the species was last evaluated in 2010, these gains are offset by the apparent extirpation of many of the smaller sites that were known at the time of listing or declines in other populations. Six Recovery Zones with a total of 81,346 +/- 25, 826 individuals exist in 46 sites. The Salem East recovery zone harbors fifty-nine percent of known extant individuals on private property. Seed collection and plant propagation efforts continue for Willamette daisy, and outplantings to augment or reintroduce the species in appropriate habitats within the Willamette Valley are ongoing. Although recovery efforts for the species are progressing, they have not yet resulted in a significant change in the status of the species across its range (USFWS 2019). Improperly applied pesticides are described as a threat to the species through indirect impacts to pollinators (USFWS 2010).

The Willamette daisy occurs as single plants or clumps of genetically identical ramets. Large plants appear to spread vegetatively, but this spread is localized around the established plant. The fruits are single-seeded achenes and have a number of small capillary bristles attached to the top, which allow them to be dispersed by the wind. A variety of insects have been observed to visit the flowers of the species; potential pollinators include solitary bees (C*eratina sp., Megachile sp., Nomada sp., Halictus ligatus,* and *Ashmeadiella sp*.), beetles (*Meligethes nigrescens* and *Acanthoscelides pauperculus*), flies (T*oxomerus marginata, T. occidentalis and Tachina* sp.), and butterflies (*Phyciodes campestris*). Populations with fewer than 20 individuals appear to suffer a high rate of reproductive failure due to inbreeding depression and reduced probability of being pollinated by a compatible mate (USFWS 2010).

There is 62.3% overlap between the action area and the species' range, and past usage data indicate that up to 43.2% of the species' range has been treated with methomyl annually. In addition, pollinators of Willamette daisy are likely to be attracted to certain blooming crops registered for methomyl use, and there is high overlap of the range with these on-field use sites (11%). As such, we conclude there will be significant exposure to methomyl of the Willamette daisy's pollinators within the range of the species. Exposed pollinators will die, so we anticipate significant mortality in a large portion of the range. In addition, the species' Recovery Plan describes the use of pesticides as a threat because of indirect impacts to pollinators. Furthermore, small populations have a pre-existing high rate of reproductive failure due in part to pollination failure. This reproductive failure is likely to be exacerbated by the loss of insect pollinators from exposure to methomyl. Even though this species relies on a relatively diverse spectrum of pollinator species, a substantial loss in the populations of these species in a large portion of the range is likely to have a proportionately large effect on the reproductive capacity of the species.

We anticipate that significant adverse effects to pollinators will cause species-level reproductive effects to the Willamette daisy over the duration of the action. Pollinators of the species are expected to die across a significant portion of the range, leading to a substantial decline in reproductive success.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Final Conclusion (with Species-Specific Conservation Measures):

Because of the effects described in our preliminary conclusion above (Preliminary Conclusion), EPA and the applicant agreed to incorporate the following measures as part of the action. Within the Pesticide Use Limitation Area (PULA) for the Willamette daisy:

1. *Methomyl must be applied using the following buffers: 320 feet for aerial applications, 105 feet for ground applications, and 160 feet for airblast applications. Based on AgDRIFT modeling, the buffers will reduce spray drift from entering habitat for the Willamette daisy and its pollinators by >95% for terrestrial habitat. These buffer distances may be reduced using other measures identified as equivalent mitigations (i.e., reducing spray drift by similar magnitude) as specified in EPA's Draft Insecticide Strategy and as described in Appendix A-1 of this Opinion.*
2. *Methomyl will not be applied from two hours after sunrise until two hours before sunset on mint and cucurbits. This measure will minimize on-field exposure to pollinators of the species during their most active foraging period. In addition, methomyl will not be applied within three days prior to bloom, during bloom, and until petal fall is complete on snap beans, peas, dry beans, chickpeas, fresh beans, and blueberries and all methomyl-registered crops in the 'other orchards' UDL in order to minimize exposure to pollinators attracted on field during bloom of these crops.*

The PULA for the Willamette daisy will be developed as described in the Description of the Proposed Action section of the main Opinion and Appendix A-1. EPA is currently considering public comments received on the Draft Insecticide Strategy. If additional mitigation options become available during finalization of the Insecticide Strategy or in the future, this might warrant re-initiation to incorporate those measures into the action (i.e., additional options and mitigations for end users). In that case, EPA will provide documentation that these measures provide equivalent conservation for listed species, including reduction in off-site transport. Upon confirmation by the Service, those options will be added to the acceptable mitigations listed for end users of methomyl.

After incorporation of the specific conservation measures above, we expect exposure for the pollinators of the Willamette daisy to be low. Upon review of the current status of the listed species, environmental baseline for the action area, effects of the proposed action, cumulative effects, and species-specific conservation measures, it is our biological opinion that the registration of methomyl, as proposed, is not likely to jeopardize the continued existence of the Willamette daisy.

References:

U.S. Fish and Wildlife Service. 2019. 5-Year Review Willamette daisy (*Erigeron decumbens*). Portland, Oregon. 40 pp.

U.S. Fish and Wildlife Service. 2010. Recovery Plan for the Prairie Species of Western Oregon and Southeastern Washington. Portland, Oregon. 255 pp.

C-B4. CONUS Flowering Plants: Biotic Pollination vector; other reproductive mechanisms unknown (Groups 7&11)

Rationale for Species Conclusion: Dwarf-flowered heartleaf

Scientific Name:	Common Name:	Entity ID:
Hexastylis naniflora	Dwarf-flowered heartleaf	734

Conclusion:

The dwarf-flowered heartleaf is a low-growing herbaceous perennial plant endemic to the upper Piedmont region of western North Carolina and upstate South Carolina. Although dwarf-flowered heartleaf is restricted in range, it is not as rare as once thought. When dwarf-flowered heartleaf was federally listed in 1989, the listing rule described 24 extant "populations" distributed across eight counties in the upper Piedmont of North and South Carolina. Since then, the range has expanded to include five additional counties in North Carolina. As of 2018, the distribution of this species consisted of 119 populations distributed across 13 counties in these two states (USFWS 2019).

Of the 78 populations assessed in the Species Status Assessment (USFWS 2019), 28 have very high resiliency, five have high resiliency, 26 have moderate resiliency, and 19 have low resiliency. Furthermore, over 50% if populations occur on protected lands. Due to the expanded distribution, level of protection, improving resiliency of many populations, and the reduction of current threats (development and invasive exotic species), this species was proposed for delisting in 2021. These findings also led us to arrive at a low vulnerability for this species.

There is 32.4% overlap between the action area and the species' range, and past usage data indicate that up to 4.7% of the species' range has been treated with methomyl annually. However, despite the potential reduction of insects within the range of the dwarf-flowered heartleaf, information presented in the Species Status Assessment demonstrates gains in numbers and distribution of the species. As a result, we do not anticipate the loss of pollinators and seed dispersers from exposure to methomyl will result in consequential reductions to the species' reproductive capacity and lead to species-level effects. After adding the effects of the action and cumulative effects to the environmental baseline, and in light of the status of the species, we have determined the proposed action is not expected to appreciably reduce the survival and recovery of the species in the wild. Thus, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the dwarf-flowered heartleaf.

References:

U.S. Fish and Wildlife Service. 2019. Species Status Assessment for Dwarf-flowered Heartleaf (*Hexastylis naniflora*). Atlanta, Georgia. 82 pp.