Appendix A. Listed plant and obligate information, overlap analysis and species included and excluded from Pesticide Use Limitation Areas

Contents

Attached excel spreadsheet includes Tables A1, A2, and A3.

A.1. Introduction

Step 3 of the Herbicide Strategy framework involves using Pesticide Use Limitation Areas (PULAs) for listed plants and obligate animals. EPA may identify additional spray drift and/or runoff/erosion mitigation beyond the instructions on the general product label which apply in specified geographic areas to protect listed species of plants or animals with an obligate relationship with plants. For the Herbicide Strategy, an obligate is a listed animal species that relies on one plant species or genus for survival. There are approximately 450 listed plants located within the contiguous United States (CONUS) and 30 listed animal species that are obligates to plants. Not all of these species are included in the PULAs for the Herbicide Strategy. Those species included in the PULAs have medium or high overlap (of their ranges and/or critical habitats) with known agricultural herbicide usage areas and are found in habitats where exposure is a concern for potential population level impacts from spray drift and/or runoff/erosion. In this case, EPA considers medium overlap as >5% and high overlap as >10% of the species range and/or critical habitat overlapping with the herbicide usage areas. Where species had similar mitigations (based on common habitat and taxonomy), EPA grouped species into the same PULA (*e.g.*, dicot plants that live in terrestrial habitats). The final Herbicide Strategy includes 8 PULA groups that cover a total of 227 listed species. Species are not included in PULAs if they are found in habitats where exposures from spray drift and runoff/erosion from agriculture are not expected to lead to potential population level impacts (see **Section A.3.2**).

This approach represents a refinement to the draft Herbicide Strategy, where species were included in the PULAs if their ranges had 5% or more overlap with cultivated lands. When identifying species to be included in the PULAs for the final Herbicide Strategy, EPA included 2017 herbicide usage data (from the United States Department of Agriculture Census of Agriculture (USDA CoA)[1] and the 2012-2021 California Department of Pesticide Regulation Pesticide Use Reporting (CDPR PUR)[2]) and species-specific habitat considerations. These refinements are consistent with approaches used by EPA and FWS in recent Biological Evaluations (BEs)[3] and Biological Opinions (BiOps)[4,5].

The purposes of this appendix are to:

- Provide species information and overlap data for listed plants and listed obligate animals relevant to the Herbicide Strategy,
- Identify the 227 listed species with potential population level impacts from herbicides (that are included in the PULAs), and

[1] USDA National Agricultural Statistics Service. 2017. Census of Agriculture. Complete data available at: www.nass.usda.gov/AgCensus

[2] California Department of Pesticide Regulation. 2024. Pesticide Use Reporting. Data available online at: https://www.cdpr.ca.gov/docs/pur/purmain.html

[3] For example: USEPA. 2023. Sulfoxaflor Biological Evaluation: Effects Determination for Endangered and Threatened Species and Designated Critical Habitats. U.S. Environmental Protection Agency. Office of Pesticide Programs. Available at: https://www.regulations.gov/document/EPA-HQ-OPP-2010-0889-0675

[4] USFWS. 2022. *Final Biological and Conference Opinion on the Registration of Malathion Pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act*. February 28, 2022. U.S. Fish and Wildlife Service. Ecological Services Program. Available at: https://fws.gov/media/biological-and-conference-opinion-registration-malathion.

[5] USFWS. 2023. *Biological Opinion on the Registration of Enlist One and Enlist Duo Pursuant to the Federal Insecticide, Fungicide, and Rodenticide Act*. November 30, 2023. U.S. Fish and Wildlife Service. Ecological Services Program. Available at: https://www.regulations.gov/document/EPA-HQ-OPP-2021-0957-0047.

- Provide the basis for why each of the 227 species are assigned to their respective PULA group(s)[6].

Species identified in this appendix are those that have the potential for population level impacts from agricultural uses of herbicides based on habitat and degree of overlap. This does not mean that EPA has determined that a particular chemical would have a potential for population level impacts to these species. Rather, it means that these 227 listed species (of plants and obligate animals) represent the maximum number of species where EPA may find a potential for population level impacts and therefore, identify mitigations.

A.2. Method

This approach applies to species in the Herbicide Strategy that would potentially be included in the PULA groups, which includes listed plants and obligate animals located within CONUS. **Tables A1** and **A2** (of the attached Excel workbook) include the full list of species that were considered, and the overlap and habitat information discussed in this appendix. **Table A3** includes the overlap information for the critical habitats of these species. Generalist listed animal species (that rely on a variety of plant species for food and shelter) are not considered in the Herbicide Strategy for PULAs (Discussed in **Section 3.3.1**). EPA included all listed plants and obligate animals that were federally listed or proposed as endangered or threatened as of 12/1/23. Obligate animals were identified based on their habitat information provided by FWS (Appendix C of USFWS 2022). This analysis does not include species that are part of the Vulnerable Species Action Plan. EPA plans to identify mitigations for those species that are considered "vulnerable,[7]" including mitigations for herbicides used on agriculture (which may be informed by the Herbicide Strategy). The listed plants that are included in the Vulnerable Species Action Plan will be addressed through PULAs developed for that Action Plan.

A.2.1. Overlap analysis

EPA conducted three overlap analyses of listed plant and obligate species ranges or critical habitats and potential herbicide exposure areas. The first overlap analysis was with species ranges or critical habitats and EPA's Cultivated Layer[8]. EPA buffered the cultivated landcover to 1000 ft to account for potential areas that may receive runoff/erosion. Second, EPA applied usage data for all herbicides from the USDA CoA[9] to the cropland[10] landcover, as defined by the CoA, to determine the overlap with known usage areas and the offsite transport area. Third, for those species with ranges and critical habitats entirely

[6] In some cases, the same species may be assigned to multiple PULA groups because it uses different types of habitat. During PULA development, EPA intends to derive separate spatial locations for the different types of habitat.

[7] https://www.epa.gov/endangered-species/implementing-epas-workplan-protect-endangered-and-threatened-species-pesticides#species

[8] The cultivated layer includes crops, orchards, and fallow areas, but excludes grasses, sod farms, and pasturelands. Available online at: https://epa.maps.arcgis.com/home/item.html?id=fbcb44eab58b4a508ae4d890f330a7d1

[9] USDA National Agricultural Statistics Service. 2017. Census of Agriculture. Complete data available at: www.nass.usda.gov/AgCensus

[10] The cropland landcover includes all cultivated land, orchards and pastureland. This landcover is used with the CoA because they capture similar herbicide use sites.

contained within California, EPA conducted an overlap analysis of herbicide use sites included in CDPR's PUR Database[11]. More detailed information on the PUR overlap analysis is included in USEPA 2024[12].

A.2.2. Identifying species with potential population level impacts

EPA incorporated elements of FWS's approach to developing BiOps for pesticides and identifying mitigations (*e.g.,* FWS 2022, FWS 2024). Two major considerations were the degree of overlap between species ranges or critical habitats and herbicide exposure areas and the likelihood of exposure given the species habitat (*e.g.,* prairie*,* forested, montane, coastal, etc.). EPA concludes that species have potential population level impacts when their ranges or critical habitats have a medium (>5 to 10%) or high (>10%) degree of overlap with known herbicide usage areas and when they occur in habitats where exposure is considered likely (*e.g.,* prairies, fields, wetlands).

A.2.2.1. Overlap

EPA considered overlap data for both the species ranges and critical habitats and potential herbicide exposure areas. FWS defines medium overlap as 5-10% and high as >10%. EPA used these definitions to identify those species with potential population level impacts from herbicides. EPA considered all species with 5% or more overlap of ranges/critical habitats and herbicide usage on cropland. If a species has <5% overlap of its range/critical habitat and herbicide usage areas (defined by FWS as "low" overlap), EPA concluded that potential population level impacts are not likely. For these species, more than 95% of their ranges and critical habitats are in areas where herbicide exposure is not expected. EPA defined another overlap category as "very low", for cases when the most refined overlap (*i.e.,* considering usage data) is <1%.

A.2.2.2. Habitat modifiers

EPA considered the habitats of the species with medium or high overlap and whether potential exposure to the population is likely or not (from spray drift and/or runoff/erosion). EPA concluded that those species with habitats that would limit their exposures from these transport routes are not likely impacted at the population level from agricultural uses of herbicides. This approach is consistent with FWS's BiOps. When the species habitat differs substantially from EPA's standard exposure models, EPA adjusts its understanding of exposure potential. For example, one of EPA's spray drift assumptions included in the AgDRIFT model assumption is that there is short vegetation adjacent to treated areas and thus limited interception by spray drift. Forested habitats are expected to intercept spray drift, limiting exposure to interior forest areas. that limits spray drift interception allowing drift to occur farther off-field).

Limited exposure from spray drift and runoff/erosion

[11] California Department of Pesticide Regulation. 2024. Pesticide Use Reporting. Data available online at: https://www.cdpr.ca.gov/docs/pur/purmain.html

[12] USEPA. 2024. Assessment of Usage data from California Department of Pesticide Regulation to support the Herbicide Strategy. U.S. Environmental Protection Agency. Office of Pesticide Programs. Biological and Economic Analysis Division.

Habitat types with limited exposures include forests (with closed canopies), cliff/rocky outcrop, high elevation[13], and montane areas. For interior forest species, EPA expects pesticide exposure to be extremely unlikely from agricultural uses of herbicides because the forest trees will intercept any drift from agricultural fields and the landscape features of a forest are such that they are not represented well by the EPA's runoff assumptions (see discussions in **Ecological Mitigation Support Document**). For cliff, rocky outcrop, high elevation, and montane species, EPA expects that pesticide exposure to species in these habitats would be extremely unlikely because agriculture is expected to occur at areas below where these species are located. Pesticides transported via spray drift and runoff/erosion generally move to areas that are lower in elevation than the application sites. Although spray drift may move to higher elevations based on wind direction (*e.g.*, winds from lower elevation valleys up the sides of mountains), such drift is not expected to occur at levels that would result in potential population level impacts. Therefore, if a species primarily inhabits these types of areas, EPA concluded that potential population level impacts are not likely from spray drift and runoff/erosion exposure.

Limited or refined runoff/erosion exposure

For some species, habitat modifiers were also used when there was potential for population level impacts, but exposures generated using EPA's Step 1 analysis likely overestimate exposures in their habitats. Specifically, listed species in desert, xeric, beach, and sand dune habitats may be exposed to herbicides via spray drift; however, runoff/erosion exposure is not expected to result in potential population level impacts due to limited transport via this route. In xeric dryland/desert habitats, there is little precipitation and likely little runoff of pesticides from treated agricultural fields (especially given irrigation water management in these drier habitats). Similarly in beach or sand dune habitats, surface runoff of pesticides to these terrestrial environments is expected to be extremely unlikely given the sandy soils of beaches, and high-water infiltration rates and low surface water flow potential of sand dunes. Therefore, for species in these habitats, EPA expects low runoff/erosion exposure to herbicides from agricultural uses and thereby does not expect potential population level impacts from these exposure pathways.

Additionally, EPA expects that runoff/erosion exposures in flowing wetlands (*e.g.,* riparian areas associated with streams and rivers, tidal marshes, estuaries, etc.) are overestimated using EPA's standard models based on non-flowing wetlands (*e.g.,* inland marshes, vernal pools, etc.) where dilution and washout are limited. EPA identified those species that are found in flowing wetlands to determine the appropriate levels of mitigation given the expected overestimation of modeled exposure compared to actual exposure.

[13] EPA analyzed elevation and use data layer (UDL) distributions using USDA's 30 m digital elevation model (DEM; https://datagateway.nrcs.usda.gov/GDGOrder.aspx) and EPA's UDL data (refer to OCSPP UDL Dashboard and Advancing Transparency of Endangered Species Act Evaluations Through Publicly Available Data) using ArcGIS Pro (version 3.1.3) for 11 western states in CONUS. Because at least 97% of agricultural pixels analyzed occur at <2000 m elevation, EPA used 2000 m as the initial cutoff for determining when a species occurs only at high elevations to where runoff/erosion and drift exposure from agricultural pesticides are not expected. This conclusion is consistent with findings from the U.S. Geological Survey that about 1% of crops are grown at elevations above 2000 m (Baker, N.T., & Capel, P.D. 2011. *Environmental Factors That Influence the Location of Crop Agriculture in the Conterminous United States*. Available at: https://pubs.usgs.gov/sir/2011/5108/pdf/SIR2011_5108.pdf.).

A.2.2.3. Consideration of overlap and habitat modifiers for species and CH PULA assignment

For those species that have <5% overlap with herbicide usage areas and/or inhabit an area where spray drift and runoff/erosion are not likely to result in potential population level impacts (*e.g.,* forests (with closed canopies), cliff/rocky outcrop, high elevation, and montane areas), EPA concluded that potential population level impacts are not likely. These species were not included in the PULAs. Those species with medium or high overlap and potential exposure via spray drift and/or runoff/erosion are included in the PULAs so that mitigations can be identified to address potential population level impacts identified for a specific herbicide. The approach to assigning individual species to PULA groups is discussed in the following section.

A.2.3. Assigning species to PULA groups

Step 1 of the Herbicide Strategy framework involves identifying potential population level impacts to plants by calculating the Magnitude of Difference (MoD) based on taxonomy (dicots and monocots) and habitat (terrestrial and wetland[14] areas). **Table A4** summarizes the PULA groups used in Step 3 of the framework that represent different combinations of species taxonomy and habitat. The majority of listed plants are herbaceous; however, some listed terrestrial species are woody. For terrestrial habitats, EPA is categorizing woody species into separate PULA groups because data may be available for specific chemicals to indicate that woody species are less sensitive to herbicides than herbaceous species. Therefore, EPA can require levels of mitigation (for spray drift and/or runoff exposure) to address potential population level impacts in the locations where listed herbaceous species occur and less mitigation (as appropriate) where listed woody species occur. Currently there is a limited number of woody species in wetland habitats. Therefore, to simplify the PULAs, EPA grouped woody plants with herbaceous species in wetland areas.

Table A4. Summary of eight herbicide species groups for Herbicide Strategy Pesticide Use Limitation Areas.

HS Group (PULA) #	Habitat Description	Taxon	MoD Level Where There is Potential for Population Level Impacts	Types of Mitigations[1]
1	Terrestrial	All taxa[1]	≥1	Spray drift
2		Dicots + non-flowering plants	≥1	Spray drift and runoff/erosion
3		Monocots + non-flowering plants		
4		Woody plants		
5	Wetlands	Dicots[2]	≥1	Spray drift and runoff/erosion
6		Monocots		
7	Flowing wetlands and riparian areas	Dicots[2] + non-flowering plants	≥10 (wetland)	Spray drift and runoff/erosion
8		Monocots + non-flowering plants		

HS = Herbicide Strategy; PULA = Pesticide Use Limitation Area; MoD = magnitude of difference

[1]The majority of these species are dicots. For simplicity, all taxa are included in one group.

[2]Herbaceous and woody plants are lumped into this group due to a low number of woody plant species.

[14] All of the currently listed plants that may occur in aquatic habitats also occur in wetlands. EPA only calculates MoDs for these species using the wetland model because it is considered protective for both wetland and aquatic habitats.

Different levels of runoff/erosion mitigations may be identified for terrestrial and wetland areas. EPA grouped species by these habitat types to account for different levels of mitigations. EPA used habitat information from FWS (Appendix C of USFWS 2022) to assign the listed plants and obligate animals to habitat categories where mitigations are similar. EPA also defined some habitat types where mitigations to address spray drift exposure may be identified, but runoff/erosion is not expected to be a substantial exposure pathway. These habitats include deserts, xeric environments, beaches, and sand dunes (as explained above in **Section A.2.2)**. EPA also identified some types of wetland habitats where exposures estimated using EPA's standard models are expected to overestimate exposures, which include flowing wetlands and tidal areas. To account for this overestimation, EPA assumes that an MoD of 10 or higher indicates a potential population level concern. This 10x value is used because EPA assumes that exposure may be overestimated by an order of magnitude given the dilution and washout of the herbicide in such flowing systems.

Listed animals that are obligates to plants are grouped into PULAs based on the plant that they depend upon (*e.g.,* dicot herbaceous, woody plant) and habitat where that plant occurs. Therefore, obligate animals are included with listed plants in the 8 PULA groups in **Table A4**.

A.3. Results and Discussion

In the draft Herbicide Strategy, EPA proposed to include 380 species in the Strategy's 4 PULA groups. The number of species included all listed plants and obligate animals with >5% overlap with cultivated lands (with a buffer of 300 m). EPA received public comments suggesting EPA refine this approach using other available information. EPA included two refinements: first, EPA included additional refinements (*e.g.*, herbicide usage data) when identifying the species with potential population level concerns and second, EPA considered additional factors (*e.g.,* modifiers) that may be relevant to define different levels of mitigation. After these refinements were applied, EPA identified 213 listed plants and 14 listed obligate animals for inclusion in 8 PULA groups.

For identifying the total species list, EPA has included substantial refinements in the species analysis to include herbicide usage data as well as species specific considerations. These refinements are consistent with those that EPA and FWS consider in their BEs and BiOps. When these refinements are included, EPA identified 227 listed species with potential population level impacts from herbicides. These will be included in the PULA groups so that potential population level impacts can be mitigated through spatially specific herbicide use limitations (**Tables A1** and **A2** identify the specific species). EPA has a higher degree of confidence that these species may have potential population level impacts because their ranges or critical habitats have medium or high overlap with known herbicide usage areas and they inhabit areas where spray drift and/or runoff/erosion transport has the potential to occur. EPA expects to revisit these species in the future (*e.g.,* as PULAs are developed, as the Herbicide Strategy is implemented, through 7(a)(2) consultation), so, this list of species may change over time. This section provides more information below on EPA's overlap analysis, discussion of species that do and do not have potential population level impacts from herbicides, and the assignment of the 227 species with potential impacts to the 8 PULA groups.

A.3.1. Overlap analysis

EPA evaluated 480 listed species to determine whether there are potential population level impacts from agricultural uses of herbicides. This included 450 listed plants and 30 listed obligate animals located within CONUS; 19 of these listed plant species are covered by the Vulnerable Species Action Plan and are not discussed considered further in **Sections A.3.2**, **A.3.3**, **and A.3.4**. **Figure A1** depicts the overlaps for the listed plants and obligate animals. **Figure A2** presents the numbers of listed plants and obligate animals in CONUS that have very low, low, medium or high overlap. **Tables A1-A3** (in the attached Excel spreadsheet) include the overlap values (ranges and available critical habitats) for the 480 listed plants and obligate animals.

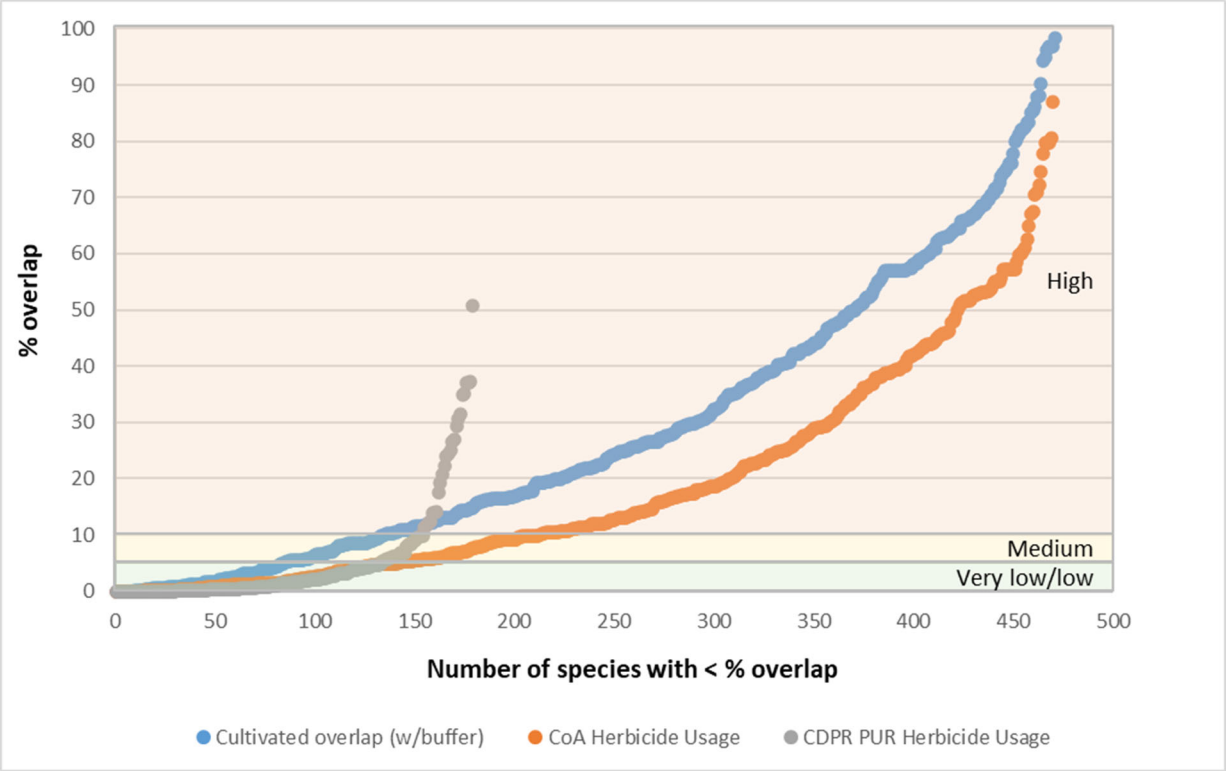

Figure A1. Overlap of listed plant and obligate animal (within the contiguous United States) range overlap with cultivated land (with a 1000 ft buffer), the USDA Census of Agriculture (CoA) herbicide usage data, and the California Department of Pesticide Regulation Pesticide Use Reporting (CDPR PUR) herbicide usage data. Note that CDPR PUR data only apply to those species and that are located entirely within California.

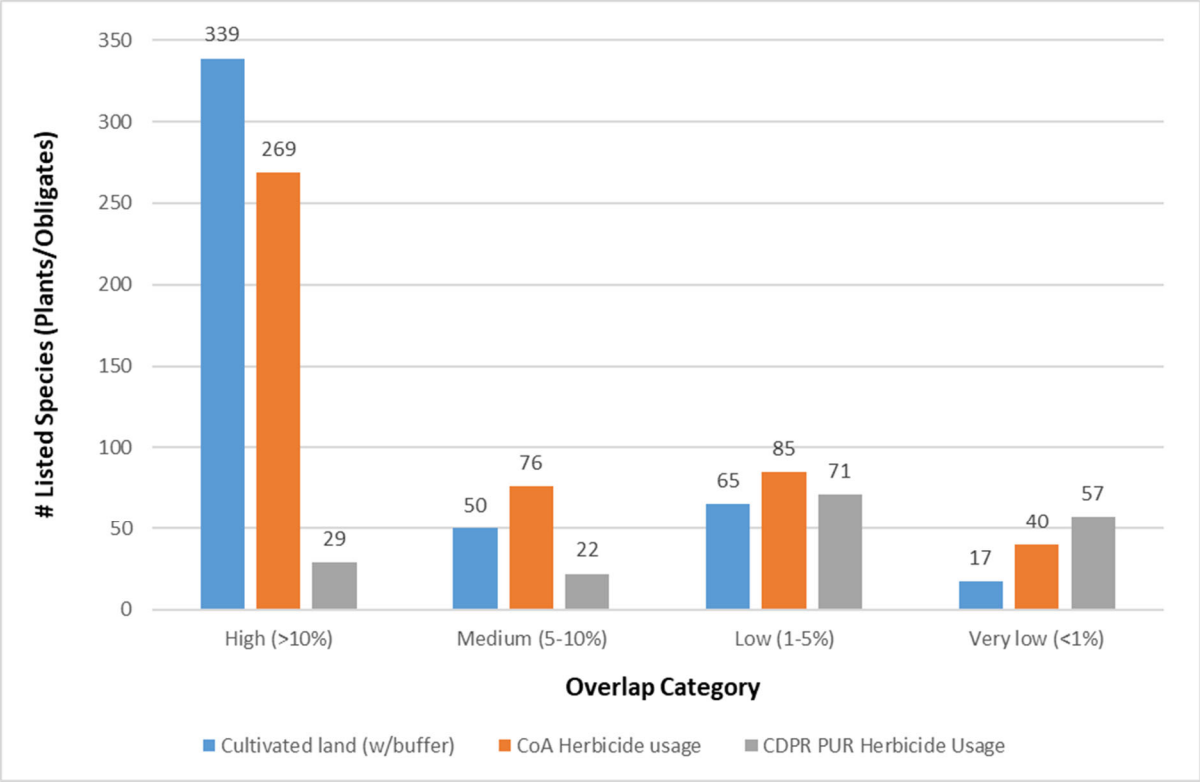

Figure A2. Number of listed plant and obligate animal (within the contiguous United States) species with high, medium, low and very low range overlap with cultivated land (with a 1000 ft buffer), the USDA Census of Agriculture (CoA) herbicide usage data, and the California Department of Pesticide Regulation Pesticide Use Reporting (CDPR PUR) herbicide usage data. Note that CA PUR data only apply to those species that are located entirely within California.

For this analysis, overlap values for both the species range and critical habitat were calculated. When summarizing the overlap results, EPA used the higher overlap between the range and critical habitat for species where the overlap category differs for range and critical habitat. This was done because a species may have low overlap for its range but medium or high overlap for its critical habitat and EPA determined that it was appropriate to consider such species for the PULA group assignments (as described in **Section A.3.3**). For species where overlap values are not available or are not sufficiently robust for quantitative analysis, EPA assumed that overlap could be at least medium (*i.e.*, >5%) and these species are included in the PULA groups at this time.

There are 186 listed plants and 9 listed obligate animals with high overlap with cultivated lands and based on known usage data (from USDA CoA and/or CDPR PUR). There are 61 listed plants and 4 listed obligate animals with medium overlap with cultivated land and/or usage data. The higher the degree of overlap, the greater the likelihood is of exposure at the population level. Therefore, EPA will consider further the listed species with high and medium overlap with known herbicide usage areas.

Over 200 listed plants and obligate animals have low or very low overlap. Eighty-two listed species have very low or low overlap with cultivated lands, and 116 listed plants and 9 obligate animals have very low or low overlap with herbicide usage data from the USDA CoA. When the CDPR PUR data are considered, an additional 86 species have very low or low overlap (*i.e.*, these species have medium or high overlap with cultivated land and USDA CoA usage data). In total, the ranges for 196 listed plants and 16 obligate

animals have very low or low overlap with cultivated land and/or usage data for all herbicides (from USDA CoA and/or CDPR PUR). **Tables A1** and **A2** include the listed species with low overlap and their specific overlap values for cultivated land and usage data. **Table A3** includes the overlap for critical habitats of listed plants and obligates. Despite low or very low overlap based on the species range, the critical habitats of 11 of listed plant species, and the critical habitat for one of the listed obligate animals, have medium or high overlap with cultivated land and/or the usage data. For these 12 species, EPA concluded that there is a possibility of population-level impacts.

The Herbicide Strategy relies on overlap of species ranges or critical habitats with cultivated lands. These represent potential agricultural use sites of a single herbicide. EPA buffered these areas by 1000 ft to account for potential off-site transport via runoff/erosion. These potential use sites represent the upper bound extent of where exposures may occur from agricultural uses of pesticides. The buffered areas include some areas that are upslope and upwind of pesticide exposures. Therefore, all overlaps with the cultivated lands are interpreted as less than the absolute value for a given species (*e.g.*, if overlap is 5.6%, the overlap is really some value less than 5.6%). EPA also considered usage data for all herbicides. The USDA CoA reports the total number of acres treated with any herbicide. Similarly, the CDPR PUR data represent the maximum amount of acres treated with herbicides over multiple years. These usage values are more than any single herbicide active ingredient. When overlap with cultivated land and/or usage data is very low or low, there is strong support for concluding that potential population level impacts are not likely. Therefore, for the 200 listed plant and obligate animal species where overlap is low or very low for both the range and critical habitat, EPA concludes that there is a low likelihood of potential population level impacts to these species.

A.3.2. Habitat modifiers

EPA used two kinds of habitat modifiers. One set of modifiers was used to identify those species where herbicide exposure from spray drift and runoff/erosion from agricultural uses is not likely to result in potential population level impacts. These specific modifiers include forests (with closed canopies), cliffs, rocky outcrops, high elevation areas, and montane areas. EPA also considered modifiers for species that may be exposed but that their habitat would reduce exposures compared to EPA's standard assessment approaches. For the second set of modifiers, less mitigation may be identified within the PULAs representing these species' locations. EPA evaluated the habitat information from FWS to assign the appropriate modifiers.

1. *Modifiers where potential population level impacts are not likely:* A total of 52 listed species (48 listed plants and 4 listed obligate animals) inhabit areas where herbicide exposure (via spray drift and runoff/erosion) from agricultural uses is not likely to result in potential population level impacts. About a third of these species also have low overlap. **Tables A1** and **A2** (in the attached Excel spreadsheet) include the habitat descriptions of the listed plants and obligate animals in CONUS. These tables indicate when a species uses a habitat (*i.e.,* forests (with closed canopies), cliffs, rocky outcrops, high elevation areas, montane areas) where a modifier applies and exposure resulting in potential population level impacts would be extremely unlikely.

2. *Modifiers where less mitigations may be identified to address potential population level impacts:* EPA identified 51 species that occur in desert, xeric, beach, or sand dune habitats. Many of these species have also low overlap. Overall, 32 species have potential spray drift exposures that have potential to impact the population, but runoff/erosion exposure is not expected. Additionally,

EPA identified 138 listed plants and obligate animals that use wetland habitats. Of these, 90 have medium or high overlap. EPA evaluated whether these species use static wetlands and/or flowing wetlands. About two-thirds of these species with medium or high overlap occur in no flow wetlands and a third occur in flowing wetlands. Several species occur in both types of wetlands. **Tables A1** and **A2** include the species-specific habitat information from FWS (USFWS 2022) and EPA's assignments of these species to terrestrial, wetland and aquatic habitats and modifiers.

A.3.3. Assigning species to PULA groups

A total of 227 listed plants and obligate animals have medium or high overlap and occur in habitats where spray drift and/or runoff/erosion exposure has the potential to impact the populations. EPA reviewed the habitat information from FWS (FWS 2022, see **Tables A1** and **A2**). The majority of these species are dicots that occur in terrestrial areas (126 species). Many species occur in multiple habitat categories. **Table A5** includes the number of species that are included in each PULA group. **Tables A1** and **A2** identify the PULA group(s) for each species. Species with modifiers that result in concerns for spray drift only were assigned to PULA group 1. Species with the habitat modifier for flowing wetlands were applied to PULA groups 7 and 8, depending on whether or not they are dicots or monocots. There were not enough woody plant species in flowing wetlands (1 listed plant and 1 listed obligate animal) to assign a separate woody plant flowing wetland PULA; therefore, these species are grouped with dicots (based on their taxonomy).

Table A5. Summary of eight herbicide species groups for Herbicide Strategy PULAs.

HS Group (PULA) #	Habitat Description	Taxon	# of Species	Types of Mitigations[1]
1	Terrestrial	All taxa[1]	32	Spray drift
2		Dicots + non-flowering plants	108	Spray drift and runoff/erosion
3		Monocots + non-flowering plants	12	
4		Woody plants	21	
5	Wetlands	Dicots[2]	40	Spray drift and runoff/erosion
6		Monocots	24	
7	Flowing wetlands and riparian areas	Dicots[2] + non-flowering plants	21	Spray drift and runoff/erosion
8		Monocots + non-flowering plants	10	

[1]The majority of these species are dicots. For simplicity, all taxa (*e.g.*, monocots, dicots, non-flowering plants) are included in one group.

[2]Herbaceous and woody plants are lumped into this group due to a low number of woody plant species.

A.3.4. Next steps and future changes to species included in PULAs

EPA is developing an approach to refine the spatial areas and maps that EPA plans to use for PULAs. Through this developing approach, PULAs would be created for the species relevant to the Herbicide Strategy. EPA would then create grouped PULAs by combining the species-specific PULAs where the same mitigations have been identified. If needed, EPA may revise the specific species included in the Herbicide Strategy or the groupings based on lessons learned from development of the species-specific PULAs. For example, during the PULA development process, EPA may find that a species occurs in areas where herbicide exposures are not a concern for potential population level impacts. EPA expects that refinement of PULAs over time will result in more focused protections for listed species and less impact on growers (in areas where mitigations are not needed for a species).

EPA expects the list of species included in the Herbicide Strategy PULAs to evolve over time. The list of federally listed and proposed endangered and threatened species changes regularly. The species included in this appendix is relevant to species listed or proposed as of 12/1/2023. EPA expects to update the list over time as needed. Therefore, some species may be added or removed if they are listed or delisted after 12/1/2023. EPA may also update this species list through lessons learned during consultations with FWS. EPA may update this species list if EPA finds that a species is suited to the Vulnerable Species Action Plan. For example, after the Vulnerable Species Pilot, EPA identified additional species that are considered Vulnerable Species. Two of those species are the Spring Creek bladderpod and the whorled sunflower. EPA plans to include those species into the Vulnerable Species Action Plan. The list of species may also change in the future if new information becomes available to change EPA's conclusions on the potential population level impacts from herbicides. For example, overlap information is not available for about 10 species. These species were conservatively included in the PULA groups, but this could change in the future if their overlap is low. EPA anticipates updating overlap analyses and revisiting species over time as data sets that describe where commodities are produced, pesticide usage, and where listed species are located evolve.