Qualified Applicator Certificate (QAC) per BMP #4 (**Table 4**), oral exposure is not expected due to the assumption that the MLA is properly trained not to consume pesticide.

As described in the 2014 EIR, the U.S. Environmental Protection Agency (USEPA) oversees pesticide use through the Worker Protection Standard (WPS), a regulation for agricultural pesticides for the purpose of reducing the risk of pesticide poisonings and injuries among agricultural workers and pesticide handlers (i.e., MLAs). The WPS contains requirements for pesticide safety training, notification of pesticide applications, use of personal protective equipment, restricted-entry intervals after pesticide application, decontamination supplies, and emergency medical assistance. Furthermore, the Occupational Safety & Health Administration (OSHA) provides general information on respirator use and OSHA standards that may apply with the use of other chemicals.

In addition to existing regulations that reduce potential effects of exposure of pesticides on MLAs, numerous BMPs (BMPs 1–10 and 34-36, **Table 4**) have been incorporated into the IPMP to minimize the potential for adverse impacts on both MLAs and the general public, including District workers who perform hand labor tasks in areas that have been treated with pesticides. In summary, the BMPs require that pesticides be applied under the guidance of QALs/QACs and according to the District's recommendations and label requirements; storage, loading, and mixing be conducted away from aquatic features, special status species or their habitat, and sensitive natural communities; application be restricted during times with high wind or when precipitation is likely or is occurring; drift avoidance measures be employed; application notification signs be posted prior to and following application for a specified period; cleanup of used containers be conducted according to guidelines that prevent contamination of any body of water within the treatment areas or adjacent watersheds; all appropriate laws and regulations pertaining to the use of pesticides and safety standards for employees and the public be followed, as governed by USEPA, DPR, and local jurisdictions; alternative treatment methods be considered for IPM projects currently utilizing glyphosate as a management tool; no-spray trail buffers are established; and annual pesticide literature reviews be conducted. These BMPs would also reduce the potential for increased risk of fire through the use of herbicides because this use reduces the buildup of flammable vegetation. Furthermore, removal of flammable vegetation through the use of herbicides would reduce fire fuel loads on District lands, thereby decreasing wildland fire hazards compared to existing conditions.

The general public within and near District preserves can be exposed to pesticides via inhalation, dermal contact with treated areas, or hand-to-mouth behavior following dermal contact with treated areas; however, these exposures are expected to be minimal or inconsequential due to the posting and notification requirements required by BMP #8 (**Table 4**), which indicates that signs providing information pertaining to planned pesticide applications shall be posted 24 hours prior to the start of treatment and remain in place for 72 hours after treatment is complete. Notification signs must contain the following information: product name, signal word, manufacturer, active ingredient, and USEPA registration number; target pest; preserve name; treatment location in preserve; date and time of application; date which notification sign may be removed; and contact person with telephone number. Furthermore, application requirements described in BMP #7 (**Table 4**) reduce risk of pesticide off-site movement by identifying weather and spray nozzle parameters which must be employed during herbicide applications. Once the applied pesticide has dried, transfer of pesticide residue is unlikely.

The culmination of the protective measures and regulatory requirements provides a foundation for assuring the most effective, yet relatively safe, use of pesticides when treatment is determined to be needed; therefore, the proposed modifications to the project would not result in new or more significant impacts compared to those disclosed in the 2014 EIR.

4.8 HYDROLOGY AND WATER QUALITY

The 2014 EIR identified potentially significant impacts related to potential manual control-related soil erosion and water quality impairment and chemical control-related water quality impacts. These impacts would be reduced to a less-than-significant impact with implementation of Mitigation Measure 4.2-3 of the 2014 EIR (Draft EIR, p. 4.2-23). The 2014 EIR identified a less-than-significant impact associated with flooding of on- or off-site areas.

Proposed project modifications include use of three new pesticide active ingredients (i.e., triclopyr BEE, triclopyr TEA, prallethrin) and three new herbicide application methods (basal bark, wick, frill/injection) for pest control activities within proposed areas of disturbance that were analyzed in the 2014 EIR. None of the proposed pesticide uses would result in the alteration of drainage patterns or stream courses. While the proposed modifications expand the annual treatment area for removal of invasive species, no new mechanical vegetation management, earthmoving, or recontouring activity is proposed. If needed, placement of ground cover, or seeding of native perennial grasses and pasture grasses would occur after herbicide use or manual or mechanical treatment to stabilize exposed soils and to reduce the potential for increased runoff as a result of this project as required under BMP #28. With implementation of this BMP, and appropriate timing of herbicide use or manual or mechanical treatment not to coincide with the rainy season, no significant erosion or siltation impacts would occur. The project would not cause an increase in runoff that would result in flooding; however, because the District may use herbicides on rare occasions in wetlands (dry season) and along stream banks, the IPMP would have the potential to result in residual aquatic pesticide discharges to Waters of the United States. Note, however, that BMPs 19, 20, and 32 mandate that no IPM activities occur within 15 feet of aquatic resources. If IPM activities must be undertaken within 15 feet of aquatic resources, only pesticides and adjuvants approved for aquatic use can be used. For the reasons described in the 2014 EIR (Draft EIR, p. 4.4-9 – 4.4-10), issues not resulting in adverse impacts will not be addressed further in this Addendum.

Refer to **Table 7** for a summary of the environmental fate properties of the active ingredients proposed for inclusion in the IPMP.

Table 7. Summary of Pesticide Active Ingredient Environmental Fate Properties

Active Ingredient	Solubility (mg/L)[1]	Water Half-Life (days)	Soil Half-Life (days)	K_{OC}
HERBICIDES				
Triclopyr BEE	7.4_{salt} 440_{acid}	0.5_{salt}[2] 1.7_{acid}[3]	$<0.2_{salt}$[4] $8\text{-}18_{acid}$[5]	$640\text{-}1{,}650_{salt}$ $25\text{-}134_{acid}$
Triclopyr TEA	$4.12 \times 10^5_{salt}$ 440_{acid}	$<0.01_{salt}$[6] 1.7_{acid}[3]	$5.6\text{-}13.7_{salt}$[7] $8\text{-}18_{acid}$[5]	$24\text{-}144_{salt}$ $25\text{-}134_{acid}$
INSECTICIDES				
Prallethrin	8.03	0.57[8]	3-29[9]	3,082

1 At 25°C unless otherwise specified.

2 Half-life via hydrolysis to triclopyr acid.

3 Half-life via photolysis in river water to oxamic acid. Stable to hydrolysis.

4 Half-life via hydrolysis to triclopyr acid.

5 Half-life via aerobic biotic metabolism to 3,5,6-trichloro-2-pyridinol (TCP) and 3,5,6-trichloro-2-methoxypyridine (TMP).

6 Half-life via dissociation to triclopyr acid.

7 Half-life via aerobic biotic metabolism to triclopyr acid.

8 Half-life via photolysis. Stable to hydrolysis.

9 Half-life of 3-9 days via aerobic biotic metabolism; half-life of 29 days via photolysis.

Sources: SERA, 2011; USEPA, 1998, 2009, 2014

Triclopyr BEE is included on the California Department of Pesticide Regulation's (DPR's) Groundwater Protection List, indicating that it is recognized as a chemical with the potential to pollute groundwater (3 CCR § 6800(b), 2014). Chemicals are added to the Groundwater Protection List if they are both mobile (i.e., solubility >3 mg/L, K_{OC} <1,900) and persistent (i.e., hydrolysis half-life >14 days, aerobic soil metabolism half-life >610 days, anaerobic soil metabolism half-life >9 days), and applied in certain ways (i.e., applied to soil via ground-based application equipment or chemigation, or applications are followed by flood or furrow irrigation; DPR, 2013). Because triclopyr BEE may be rapidly converted to triclopyr acid, the latter is typically the focus of research pertaining to environmental fate. Triclopyr acid is moderately persistent and very mobile, with persistence increasing with increasing anaerobic conditions. Its degradation product 3,5,6-trichloro-2-pyridinol (TCP) is also relatively mobile and persistent and has the potential to degrade groundwater in areas where soils are permeable, particularly where the water table is shallow. Such areas are identified as Groundwater Protection Areas by DPR. No Groundwater Protection Areas have been established in San Mateo, Santa Clara, or Santa Cruz Counties (DPR, 2018); therefore, use of products containing triclopyr BEE are not expected to impact groundwater quality when used according to label instructions within the District footprint. Furthermore, label language specifies that triclopyr BEE is not to be applied directly to water, to areas where surface water is present, or to intertidal areas below the mean high-water mark, and indicates that applicators must avoid contaminating surface water when cleaning equipment or disposing of equipment wash waters (Garlon 4 Ultra Label, 2008). The potential for impacts to surface water is further reduced by the requirements of BMP #19, which mandates the use of a 15-foot buffer around aquatic features during herbicide application, and Mitigation Measure 4.2-3 of the 2014 EIR, which states that the District shall obtain a National Pollutant Discharge Elimination System (NPDES) permit from the San Francisco Bay Regional Water Quality Control Board (RWQCB) and comply with design and operational BMPs required under the permit. The requirement for the District to obtain Statewide NPDES Permit for Residual Aquatic Pesticide Discharges to Waters of the US from Algae and Aquatic Weed Control Applications (General Permit # CAG 990005 and Water Quality Orders 2014-0078-DWQ and 2015-0029-DWQ) would only be applicable if the District intends to make intentional applications of pesticides directly to waters of the United States. If the District chooses to continue treatment actions within the designated buffer zone, it shall use pesticides and adjuvants labeled for aquatic use and follow the requirements of the mitigation measure for special-status wildlife species and the California Department of Fish and Wildlife (CDFW) Streambed Alteration Agreement. Further, consistent with BMP #20, the District complies with the California Red-Legged Frog Injunction that mandates that in known or potential California red-legged frog habitat, specified pesticides including triclopyr shall not be applied within 15 feet of aquatic features (including areas that are wet at time of spraying or areas that are dry at time of spraying but subsequently might be wet during the next winter season), utilize only spot-spraying techniques and equipment by a certified applicator or person working under the direct supervision of a certified applicator, and not be sprayed during precipitation or if precipitation is forecast to occur within 24 hours before or after the proposed application. Thus, use of products containing triclopyr BEE are not expected to result in unacceptable risk relating to the impairment of surface water quality.

Triclopyr TEA is also included on the Groundwater Protection List per 3 CCR § 6800(b) (2014). Like triclopyr BEE, triclopyr TEA may be rapidly converted to triclopyr acid and can further break down to TCP; however, because no Groundwater Protection Areas have been established in San Mateo, Santa Clara, or Santa Cruz Counties (DPR, 2018), use of products containing triclopyr TEA are not expected to impact groundwater quality when used according to label instructions within the District footprint. Although triclopyr TEA as found in Garlon 3A or other products containing triclopyr TEA as the sole active ingredient are registered for aquatic use and may be applied directly to water, triclopyr TEA in Capstone is formulated with aminopyralid TIPA and may not be applied directly to water, to areas where surface water is present, or to intertidal areas below the mean high-water mark. Further, individuals using Capstone must avoid contaminating surface water when cleaning equipment or disposing of equipment wash waters. Approved application sites for Capstone may include seasonably dry wetlands (including flood plains, marshes, swamps, or bogs) and areas around standing water on sites such as deltas and riparian areas (Capstone Label, 2015). This label language, in conjunction with the requirements of BMP #19, BMP #20, and Mitigation Measure 4.2-3 of the 2014 EIR described above, leads to a conclusion that the use of triclopyr TEA is not expected to result in unacceptable risk relating to the impairment of surface water quality.

Because of its very limited mobility in soil (i.e., high K_{OC}) and label language excluding application to soil, prallethrin is not on the Groundwater Protection List (3 CCR § 6800(b), 2014) or expected to impact groundwater quality when used according to label instructions within the District footprint. As with triclopyr BEE, label language specifies that prallethrin is not to be applied directly to water, to areas where surface water is present, or to intertidal areas below the mean high-water mark and indicates that applicators must avoid contaminating surface water when cleaning equipment or disposing of equipment wash waters (PT Wasp-Freeze II Label, 2013). This label language, in conjunction with its relatively low solubility and the requirements of BMP #19 and Mitigation Measure 4.2-3 of the 2014 EIR described above, leads to a conclusion that the use of products containing prallethrin is not expected to result in unacceptable risk relating to the impairment of surface water quality.

In addition to the factors above, pesticide applications, when done, are implemented consistent with written recommendations prepared annually by a DPR-licensed Pest Control Adviser (PCA) and conducted in accordance with the BMPs presented in Table 4. The PCA recommendation addresses numerous topics including the criteria used to determine the need for pesticide use, potential hazards and restrictions, crop and site restrictions, proximity to people, pets and livestock and a statement indicating that alternatives and mitigation measures that would substantially lessen any significant adverse impact on the environment have been considered and if feasible, adopted. The BMPs also require that pesticide applications be conducted under the supervision of a person holding a QAL or QAC for pesticides; require all storage, loading, and mixing of herbicides be set back at least 300 feet from any aquatic feature and all mixing and transferring occur within a contained area; require that application cease when weather parameters do not meet label specifications, when wind at site of application exceeds seven miles per hour, or when precipitation occurs or is forecasted with greater than a 40 percent probability in the next 24-hour period.

For the reasons described above, the proposed modifications to the project would not result in any new or more severe impacts pertaining to hydrology and water quality.

4.9 LAND USE AND PLANNING

As described in Chapter 1 of the 2014 EIR (Draft EIR, p. 1-5), land use and planning impacts would occur if the IPMP would physically divide an established community (e.g., a freeway dividing a populated residential community), if it would conflict with a land use policy adopted for the purpose of avoiding an environmental impact, or if it would conflict with an applicable habitat conservation plan or natural community conservation plan. There are no approved habitat conservation plans or natural community conservation plans that apply to District lands. Implementation of the project would not involve any new development that would physically divide a community and actions covered under the proposed IPMP would not change the overall natural landscape of the site and no impact would occur. Therefore, no impacts would occur.

The District’s purpose is to purchase, permanently protect, and restore lands forming a regional open space greenbelt, preserve unspoiled wilderness, wildlife habitat, watershed, viewshed, and fragile ecosystems, and provide opportunities for low-intensity recreation and environmental education. The primary objective of the IPMP is to control damage from pests through formal and consistent implementation of IPM principles to protect and restore the natural environment and provide for human safety and enjoyment while visiting and working on District lands. The proposed modifications to the IPMP would not meaningfully differ in this regard compared to the project as described in the 2014 EIR. Therefore, the proposed modifications to the project would not result in new significant impacts to land use and planning.

4.10 MINERAL RESOURCES

As discussed in Chapter 1 of the 2014 EIR (Draft EIR, p. 1-6), there are no known mineral resource recovery sites on District lands. Therefore, the proposed project modifications are not anticipated to alter the availability of any economic mineral resources. As discussed in the 2014 EIR, the project would have no impact on mineral resources and the project modifications do not alter this conclusion.

4.11 NOISE

Generally, District properties are located in rural parts of their respective counties and are not in close proximity to sensitive receptors. Noise-sensitive receptors on or adjacent to District preserves would include recreational visitors and occupied residences, although the latter are scattered in low-density development patterns, primarily along SR-35. The 2014 EIR found that any noise impacts resulting from the IPMP would be subject to BMP #29, which requires that any noise generating equipment, including vehicles and manual and mechanical equipment such as chainsaws, brushcutters, or masticators, would need to abide by local noise ordinances if the noise activities would be audible to any receptors. Any impacts would not be significant. Further, the use of noise generating equipment for fuel management throughout the year would not result in significant impacts as implementation of BMP #22 would prevent disturbance of nesting birds by requiring nesting bird surveys prior to treatment, establishment of nest buffers during nesting bird season, and nest monitoring by a District biologist during and after treatment activities if the activity has potential to adversely affect the nest.

The activities contemplated by the proposed modification do not introduce any additional sources or noise or increase the possibility of any impacts to sensitive receptors. Noise-generating equipment that may be used under the proposed herbicide application modifications (trucks, ATVs, pumps, etc.) would be similar or identical to those already used under the project, and would not generate increased noise in comparison to the existing project. As discussed above in Section 4.4, “Biological Resources,” the expansion of acreage for manual and mechanical treatments was contemplated and approved in the 2014 EIR. For these reasons, and with implementation of BMP #22 and BMP #29, the proposed modifications would not result in new significant noise impacts.

4.12 POPULATION AND HOUSING

As discussed in Chapter 1 of the 2014 EIR (Draft EIR, p. 1-6 – 1-7), no elements of the project would alter population growth. No construction activities or addition of residences are part of the IPMP. The IPMP does not induce population growth because it does not involve any alteration of existing land uses or the introduction of new land uses associated with population increases (e.g., housing, employment centers). Moreover, the IPMP does not involve new infrastructure or services that would draw new residents to the area.

The proposed project modifications include three new pesticide application methods and three additional pesticide product formulations. Similar to the approved project, the proposed project modifications would not necessitate the construction of replacement housing and would result in no impact related to population and housing.

4.13 PUBLIC SERVICES AND UTILITIES

The 2014 EIR found that the IPMP would result in no significant impacts to public services. It concluded that actions under the IPMP would not result in an increase in District employees or the number of visitors at District preserves. Further, it determined that the project would not result in the construction of additional housing, commercial, or industrial development, nor would the project directly or indirectly increase the local population, and therefore, no new or altered governmental facilities would be needed to provide public services as a result of the project, nor would the project result in increased demand for public services.

The 2014 EIR also found there would be no impacts to utilities as a result of the IPMP. It determined that implementation of the IPMP would not be anticipated to result in any change in the level of solid waste generated at a District preserve and therefore would not affect permitted capacity of local or regional solid waste disposal services serving the District lands. District facilities are not typically served by municipal storm drain facilities, so there would be no increased demand for storm water facilities.

The proposed modifications would similarly not result in any increases in District employees or visitors on District lands, nor would it result in the construction of housing, commercial, or industrial development. In addition, there would be no increased levels of solid waste or other utility services. The proposed modifications would not result in any new or more significant impacts to public services and utilities.

4.14 RECREATION

Recreation is one of the predominant land uses on District preserves, including a 220-mile network of hiking, bicycling, and equestrian trails on District lands. The IPMP is designed to include a long-term, science-based decision-making system that uses a specific methodology to manage damage from pests, and was developed in accordance with the District's mission to acquire and preserve a regional greenbelt of open space land in perpetuity, protect and restore the natural environment, and provide opportunities for ecologically sensitive public enjoyment and education. The IPMP is designed to enhance and preserve recreational opportunities and would therefore have no adverse impacts to recreation.

The proposed modifications are similarly designed to manage pests and invasive species, consistent with the District's goals of enhancing and preserving recreation. There would be no new or more significant impacts.

4.15 TRAFFIC AND TRANSPORTATION

As discussed in Chapter 1 of the 2014 EIR (Draft EIR, p.1-7 – 1-8), the IPMP would not have any significant effects on traffic and transportation. The IPMP describes pest management activities. The 2014 EIR found that these activities were consistent with existing levels of operation and maintenance activities and would not substantially increase throughout the duration of the plan (approximately one percent increase in pest management on an annual basis), and therefore would not result in any significant increases to traffic. The District determined that activities under the IPMP would not create changes in air traffic patterns, result in population increases that could adversely affect area traffic, or alter the level of emergency access. No oversized equipment would be used requiring special transport precautions on local streets, roads, or highways. No changes to access points or roadway design would occur with implementation of the IPMP. In addition, there are no policies or plans within the District preserves that pertain to public transit, bicycle, or pedestrian facilities.

The proposed modifications consist of three new pesticide formulations ,three additional methods of pesticide application, and some minor acreage changes for some treatment types. All of the vehicles that would be used as part of these modifications are already in use on District facilities and such use was approved in the 2014 EIR. In addition, these applications would be infrequent and intermittent and would not contribute substantially to any traffic, transportation, or emergency access. The proposed modifications would have no new or more significant impacts.

5 CONCLUSION

The proposed addition of three additional pesticide active ingredients, three additional methods of pesticide application, and treatment acreage and timing modifications to the District's IPMP would not alter any of the conclusions of the 2014 EIR. Additionally, the IPMP together with the proposed modifications thereto would have no significant impacts on the two additional Species of Special Concern. No new significant environmental effects or a substantial increase in the severity of previously identified significant effects would result.

The additions also would not affect any of the mitigation measures, including their feasibility or implementation, although one mitigation measure has been clarified. As discussed above in Section 4.4, the 2014 EIR included mitigation measures to protect special status reptiles and amphibians, including pre-treatment surveys and consultation with USFWS, NMFS, and CDFW, as appropriate. While the 2014 EIR identified each of the special status amphibians and reptiles that were listed at the time of the EIR, this Addendum includes the two newly listed additional Species of Special Concern. These revisions are not a result of newly identified adverse impacts and do not substantially affect the current IPMP or other proposed program modifications.

As described above, this Addendum also provides a revised list of BMPs that clarify existing language, outline practices already being carried out by District staff, and further increase the protection and safety of humans and the environment. These revisions are not a result of newly identified adverse impacts and do not substantially affect the current IPMP or other proposed program modifications.

As mentioned above, none of the conditions listed in section 15162 of the CEQA Guidelines exist for the project modification described herein. Therefore, pursuant to section 15164 of the CEQA Guidelines, the differences between the approved project described in the 2014 EIR and the modification of the project as currently proposed and described in this Addendum are minor and this Addendum provides sufficient environmental documentation. No subsequent or supplemental MND or EIR is needed to address the project modifications or additional Species of Special Concern.

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Appendix 1

Midpeninsula Regional Open Space District

Screening-Level Ecological Risk Assessment

Integrated Pest Management Program (Updated)

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Ac .... Acre
a.i. .... Active Ingredient
ATSDR .... Agency for Toxic Substances Disease Registry
BMP .... Best Management Practices
Bti .... *Bacillus thuringiensis* var. *israelensis*
bw .... Body Weight
CAS RN .... Chemical Abstract Service Registration Number
CDFW .... California Department of Fish and Wildlife
CSM .... Conceptual Site Model
EC_{50} .... Median Effective Concentration
ED_{50} .... Median Effective Dose
EIR .... Environmental Impact Report
FIFRA .... Federal Insecticide, Fungicide and Rodenticide Act
HHRA .... Human Health Risk Assessment
IPA .... Isopropylamine (salt)
IPC .... Integrated Pest Control
IPMP .... Integrated Pest Management Program
K .... Potassium (salt)
K_d .... Soil-Water Partition Coefficient
K_{oa} .... Octanol-Air Partition Coefficient
K_{oc} .... Organic Carbon Absorption Coefficient
K_{ow} .... Octanol-Water Partition Coefficient
LC_{50} .... Median Lethal Concentration
LD_{50} .... Median Lethal Dose
LO(A)EL/LOAEL .... Lowest Observable (Adverse) Effect Level
LOC .... Level of Concern
LOEC .... Lowest Observable Effect Concentration
MEA .... Monoethanolamine (salt)
MW .... Molecular Weight
NA .... Not Applicable
NDA .... No Data Available

NMFS..National Marine Fisheries Service

NO(A)EL/ NOEL..No Observable (Adverse) Effect Level

NOC ....Not Of Concern

NOEC..No Observable Effect Concentration

PUR...Pesticide Use Reporting

RED...Reregistration Eligibility Decision

SLERA ....Screening Level Ecological Risk Assessment

SOD...Sudden Oak Death

TEA ....Triethylamine (salt)

TGAI ....Technical grade of the active ingredient

TIPA..Triisopropanolamine (salt)

Triclopyr BEE ....Triclopyr-2-butoxyethyl ester

USEPA ....U.S. Environmental Protection Agency

USFWS ....U.S. Fish and Wildlife Service

Executive Summary

This Screening Level Ecological Risk Assessment (SLERA) is conducted as an addition to the Ecological Risk Assessment conducted as part of the Environmental Impact Report (EIR) prepared for Midpeninsula Regional Open Space District (District) in 2014. Three new pesticide products that include three active ingredients that were not previously analyzed are proposed for addition to the District's Integrated Pest Management Program (IPMP). Additionally, two salamander species that reside in the District have been designated as special-status species since the 2014 EIR was completed.

Two of the new active ingredients, triclopyr-2-butoxy-ethyl ester (BEE) and triclopyr trimethylamine (TEA) salt, are herbicides that can be used to control a wide variety of weed species. Triclopyr BEE is proposed for use as a spot spray, cut-stump, or basal bark treatment. Triclopyr TEA is proposed for use as a spot spray, cut-stump, or frill/injection treatment. The third new active ingredient is prallethrin that is an insecticide used to control stinging insects and applied using an aerosol spray. The potential for exposure and adverse effects from these newly added active ingredients are considered for all special-status species including the recently designated special-status salamanders.

The salamander species recently designated as special-status species are the California giant salamander and Santa Cruz black salamander. California giant salamanders breed in permanent and semipermanent streams, and the larvae do not metamorphose for up to 18 months. Santa Cruz black salamanders do not have an aquatic larval stage. Eggs are laid in moist burrows, and the juveniles emerge from the egg appearing as fully formed small salamanders. The potential for exposure and adverse effects for these salamanders are considered for all previously assessed active ingredients and adjuvants as well as the newly added active ingredients.

The SLERA relied upon the three-stage process for risk assessments: problem formulation, analysis, and risk characterization. In the problem formulation phase, the District identified the appropriate scenarios to assess and the default data assumptions. The problem formulation stage concluded with conceptual site models (CSMs) that identified the complete exposure pathways carried forward in the analysis based on available information. During the analysis phase of the SLERA, exposure was qualitatively estimated with conservative assumptions. Also in the analysis phase, effect values were developed which incorporated the toxicity properties of the pesticides and adjuvants. The risk characterization phase provided conclusions on the potential for adverse effects to occur to ecological receptors. The risk characterization phase utilized a qualitative assessment.

Several qualitative considerations typically result in a conclusion that the potential for adverse effects would be low. This includes an assessment of the potential for species presence at an application site, incorporation of foraging range and diet, in addition to fate and transport processes of pesticides such as dilution and degradation.

The District's Best Management Practices (BMPs) and the Mitigation Measures from the 2014 EIR are designed to greatly reduce, if not eliminate, pesticide or adjuvant movement to surface water. Therefore, actual impacts to aquatic invertebrates or birds and mammals that feed in aquatic habitats are anticipated to be minimal. Those pesticides that are sufficiently toxic to

terrestrial-phase amphibians are used in such a manner that the potential for exposure is so low, no adverse effects are anticipated. For example, insecticides are either used in or around buildings or as targeted applications of stinging insects, such as wasps or hornets. Herbicides exhibit low toxicity to terrestrial animals. Although there is a greater chance of exposure for special-status terrestrial animals from herbicides, the low toxicity leads to a conclusion that terrestrial special-status species are not at risk.

This SLERA will be used to assist the District in assessing potential to affect particular species and developing site-specific measures to protect these species.

1 Introduction

This Screening Level Ecological Risk Assessment (SLERA) is an addition to the Assessment conducted as part of the previous Environmental Impact Report (EIR) (State Clearinghouse No. 2013092033) for the Integrated Pest Management Program (IPMP) (herein referred to as the 2014 EIR). Since the certification of the 2014 EIR, two species known to occur within the Midpeninsula Regional Open Space District (District) boundaries have been classified as Species of Special Concern by the California Department of Fish and Wildlife (Thomson *et al.,* 2016). These species are: California giant salamander (*Dicamptodon ensatus*) and Santa Cruz black salamander (*Aneides flavipunctatus niger*). Additionally, active ingredients in three new pesticide products are to be included in the IPMP:

Example Product Name	Pesticide Type	Pest(s) Controlled	Pesticide Active Ingredient(s)	Active Ingredient Abbreviation
Garlon 4 Ultra®	Herbicide	Broadleaf and Woody Plants	Triclopyr-2-butoxyethyl ester	Triclopyr BEE
Capstone®	Herbicide		Triclopyr triethylamine (TEA) salt and aminopyralid triisopropanolamine (TIPA) salt	Triclopyr TEA
PT® Wasp-Freeze® II	Insecticide	Wasps, Hornets	Prallethrin	Prallethrin

The active ingredient aminopyralid triisopropanolamine salt was previously analyzed in the 2014 EIR and is not analyzed in this SLERA. Keeping with the approach in the 2014 EIR, only active ingredients were assessed in this SLERA. No inert ingredients were considered.

1.1 Purpose of the Screening Level Ecological Risk Assessment

The SLERA assesses potential future activities to be conducted as part of the District's IPMP. Specifically, the SLERA focuses on potential risk for California giant salamanders and Santa Cruz black salamanders resulting from applications of pesticides previously analyzed in the 2014 EIR. The SLERA also evaluates the potential risk to terrestrial and aquatic species following applications of the three new pesticides added to the District's IPMP.

1.2 Approach

1.2.1 Assessment for California giant salamanders and Santa Cruz black salamanders

This SLERA was conducted by performing a qualitative exposure assessment. The application sites of the active ingredients in thirteen pesticides and three adjuvants that were analyzed in the 2014 EIR were evaluated to assess the potential for overlap with the habitat requirements of California giant salamanders and Santa Cruz black salamanders. One pesticide, PT® Wasp-Freeze®, is no longer used by District staff and is therefore not included in the current evaluation.

Additionally, the application techniques for these same pesticide products were considered to determine the degree of exposure possible when there was a potential for overlap with the habitat of these salamander species. When exposure was deemed possible, toxicity data for salamanders or surrogate species were considered to reach a conclusion regarding whether the degree of exposure along with the severity of toxicity could result in a level of risk suggesting adverse effects following pesticide applications.

1.2.2 Assessment for Triclopyr BEE, Triclopyr TEA, and Prallethrin

A similar qualitative approach was used for the consideration of the potential for adverse effects following applications of triclopyr BEE, triclopyr TEA, and prallethrin. Since there were only three pesticides to consider, the severity of the toxicity for different taxonomic groups was evaluated first to narrow down those species that could be harmed if they were exposed following an application. For those species with high sensitivity to the active ingredients in these pesticides, the application sites and application techniques were considered to determine whether the degree of exposure could be sufficient to produce adverse effect following an application.

2 Problem Formulation

Problem formulation is the first step in the SLERA process. Its purpose is to establish the goals, breadth, and focus of the assessment through a systematic process to identify the major factors to be considered in the assessment. District staff provided details on past pesticide use in the District. The IPMP was described initially in MROSD (2014a) and the environmental impacts assessed in MROSD (2014b). This SLERA assesses the modification to the IPMP for the potential for risk to the California giant salamander and Santa Cruz black salamander following applications of any pesticide included in the IPMP and any potential for risk to all special-status species in the District following applications of triclopyr BEE, triclopyr TEA, and prallethrin. Problem Formulation integrates available information (sources, contaminants, effects, and environmental setting) and serves to provide focus to the SLERA.

2.1 Application Scenarios

Details regarding the application of pesticides that impact the estimation of potential risk include:

- Type of pesticide
- Concentration of pesticide
- Application method (*e.g.*, bait station, spraying)
- Duration and frequency of applications
- Rate of application
- Area of application
- Setting in which activity would occur (*e.g.*, within a building, natural area)
- The use of adjuvants, if any.

The District's IPMP includes implementing cultural, biological, manual/mechanical, and chemical IPM practices in buildings, recreational facilities, fuel management areas, rangelands and agricultural properties, and natural lands within District boundaries. The 2014 EIR includes Best Management Practices (BMPs) intended to minimize movement of pesticides to sensitive areas and protect special-status species. The 2014 EIR also includes Mitigation Measures for the protection of sensitive habitats and special-status species.

A modification to the IPMP is to include basal bark, wick, and frill/injection applications for herbicides, in addition to spot spray applications and cut-stump treatments. These application techniques are described in Section 3.1 of the Addendum Report. Depending on the treatment goals, a wick application could be be made to areas similar to a spot spray applications or uniformly across a larger area, but the potential for off-site movement is reduced. Basal bark and frill/injection applications are comparable to cut-stump applications with regards to area treated and potential for off-site movement. Other application techniques include aerosol spray of insecticides around buildings and along trails, placement of insecticidal disks in water troughs, bait and powdered insecticides used in and around buildings, bait boxes with rodenticides used inside buildings, and spraying herbicides in agricultural and natural settings. Adjuvants can be added to the application spray tank and mixed with the pesticide to improve the pesticide's efficacy by allowing it to more readily penetrate the plant's surface, reduce drift, enhance adhesion, etc. It is not uncommon for adjuvants to be included with a pesticide active ingredient in a pesticide product. In these cases, the adjuvant may be referred to as an inert ingredient. Refer to the IPM Guidance Manual (MROSD, 2014a) for complete details.

Appendix 1

Table Eco-1. List of pesticides and adjuvants included in the IPMP analyzed previously in the 2014 EIR.

Pesticide Category	Active Ingredient	Product Formulations (Manufacturer)	Mode of Action	Purpose
Adjuvants/ Surfactants	Alcohol Ethoxylate	Liberate® (Loveland Products, Inc.)	Enhances uptake of herbicides and pesticides	Increase delivery and efficacy of pesticides to targets
	Alkylphenol Ethoxylate	Pentra-Bark® (Quest)	Enhances uptake of Agri-Fos	Increase delivery of Agri-Fos to trees
	Lecithin	Liberate® (Loveland Products, Inc.)	Enhances uptake of herbicides and pesticides	Increase delivery and efficacy of pesticides to targets
	Canola Oil, Ethyl and Methyl Esters	Competitor® (Wilbur-Ellis)	Decrease surface tension, increase herbicide uptake, enhance wetting and spreading	Increase delivery and efficacy of pesticides to targets
Fungicides	Phosphite K Salts, mono-/di-	Agri-Fos® (AgBio)	Fungal oxidative phosphorylation inhibitor	Prevents sudden oak death
Herbicides	Aminopyralid TIPA	Milestone® (Dow AgroSciences)	Auxin growth hormone mimic	Nonselective post-emergent broad-spectrum weed control
	Clethodim	Envoy Plus™ (Valent)	Fatty acid synthesis inhibitor	Selective post-emergent grass weed control
	Clopyralid MEA	Transline® (Dow AgroSciences)	Auxin growth hormone mimic	Selective broadleaf weed control
	Glyphosate IPA	Roundup Custom™ (Monsanto)	Amino acid synthesis inhibitor	Nonselective post-emergent broad-spectrum weed control
	Glyphosate K	Roundup ProMax® (Monsanto)	Amino acid synthesis inhibitor	Nonselective post-emergent broad-spectrum weed control
	Imazapyr IPA	Polaris® (Nufarm), Stalker® (BASF)	Amino acid synthesis inhibitor	Nonselective pre-and post-emergent broad-spectrum weed control
Insecticides	Diatomaceous Earth	Diatomaceous Earth	Water balance disruptor	Structural pest control (e.g., ants, cockroaches)
	D-trans Allethrin	PT® Wasp-Freeze® (BASF)	Voltage-gated sodium channel interference	Wasp and hornet control
	Fipronil	Maxforce® Bait Stations (Bayer)	GABA-gated chloride channel blocker	Ant control
	Indoxacarb	Advion® Gel Baits (DuPont)	Sodium channel blocker	Structural pest control (e.g., ants, cockroaches)
	Phenothrin	PT® Wasp-Freeze® (BASF)	Voltage-gated sodium channel interference	Wasp and hornet control
	S-Hydroprene	Gentrol Point Source® (Wellmark International)	Juvenile growth hormone mimic	Pest control (e.g., cockroaches, beetles, moths)
	Sodium Tetraborate Decahydrate	Prescription Treatment Baits (BASF), Terro® Ant Killer II (Terro)	Water balance disruptor	Ant control
Rodenticides	Cholecalciferol	Cholecalciferol baits	Calcification of soft tissues	Rodent pest control (e.g., rats, mice)

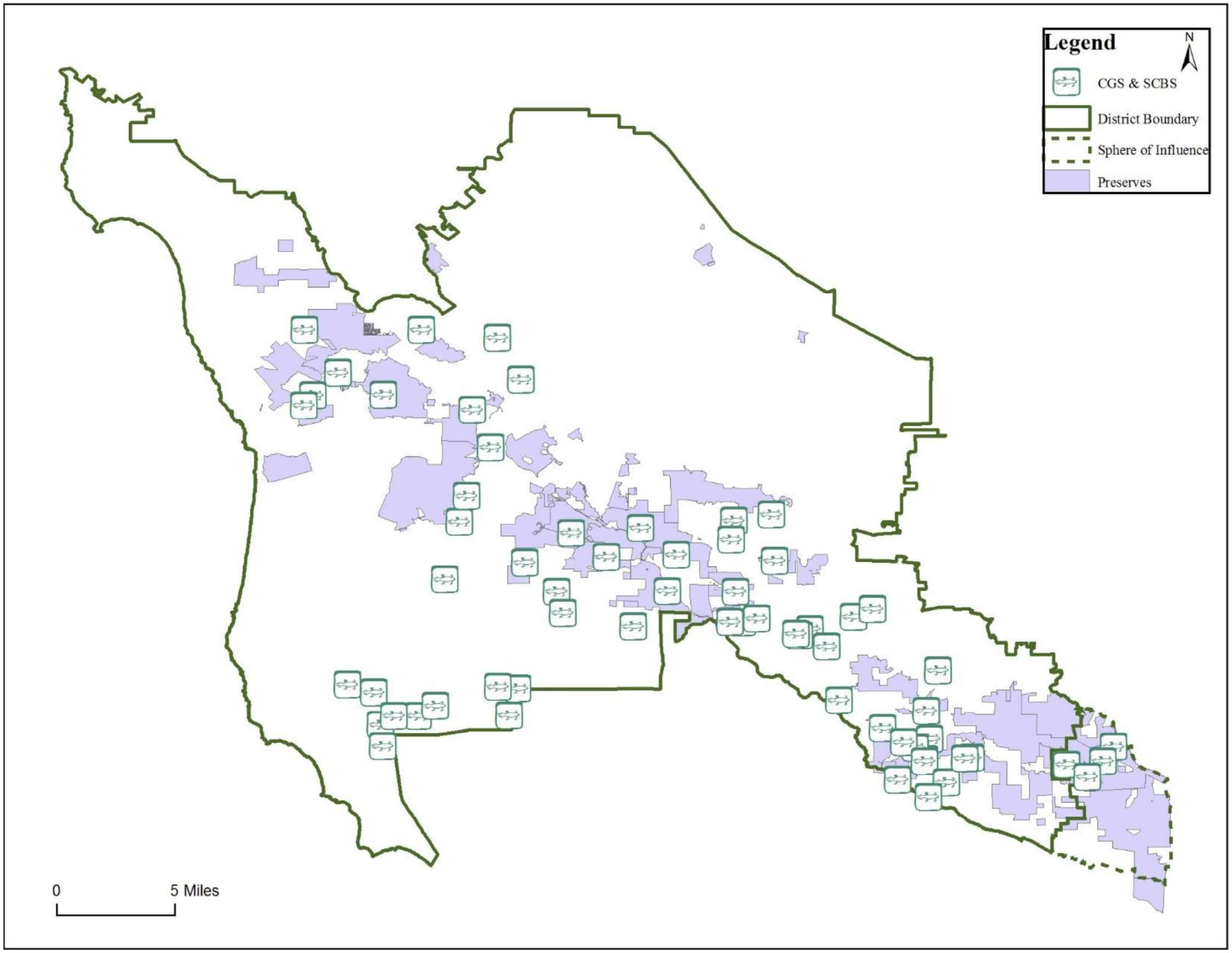
Table Eco-2. Environmental Fate and Transport of Active Ingredients Under Consideration for Use by the District.

Active Ingredient	Air	Water	Soil
Triclopyr butoxyethyl ester	> Relatively nonvolatile (vapor pressure = $3.6x10^{-6}$ mmHg)	> Relatively insoluble (solubility = 7.4 mg/L) > Rapid degradation via hydrolysis (t½ ≈ 0.5 days) > Degradant is stable to hydrolysis	> Moderate sorption to soil; remains in upper 7.5 cm of soil (K_{OC} = 640 to 1650) > Primarily degraded by microbes under aerobic conditions (t½ < 0.2 days) > Degradants are likely more persistent and mobile in soil
Triclopyr triethylamine salt	> Nonvolatile (vapor pressure = $1x10^{-8}$ mmHg)	> Very soluble (solubility = 412,000 mg/L) > Dissipation within 1 minute > Degradant is stable to hydrolysis	> Mobile in soil (K_{OC} = 24 to 144) > Average aerobic t½ = 9.7 days > Degradants are also persistent and mobile in soil
Prallethrin	> Slightly volatile (vapor pressure = $3.2x10^{-5}$ mmHg)	> Slightly soluble (8.03 mg/L) > Very rapid degradation via photolysis (t½ = 0.57 days) > Rapid degradation in basic waters (t½ = 4.9 days) > Slow degradation in neutral to acidic water	> High sorption and low mobility in soil (K_{OC} = 3,082) > Microbial degradation under aerobic conditions (t½ = 3 to 9 days)

2.2 Active Ingredients and Adjuvants of Concern and Environmental Fate Properties

Table Eco-1 includes those active ingredients and adjuvants assessed in the 2014 EIR. The application scenarios analyzed in this SLERA were not substantially similar to any of the previously analyzed scenarios. Two insecticidal active ingredients analyzed in the 2014 EIR have been eliminated from the IPMP: d-trans allethrin and phenothrin, ingredients in PT Wasp-Freeze. PT Wasp-Freeze has been eliminated from the District's IPMP. The list of active ingredients in **Table Eco-1** will be considered for adverse effect to the California giant salamander and Santa Cruz black salamander. Environmental fate properties of the active ingredients assessed are presented in IPM Guidance Manual Appendix A (MROSD, 2014a). The potential for adverse effect for all special-status species will be assessed for the three new active ingredients: triclopyr BEE, triclopyr TEA, and prallethrin. Environmental fate properties of the three new active ingredients assessed here can be found in **Table Eco-2**.

Appendix 1



Source: California Natural Diversity Database.

Figure Eco-1. Locations for California Giant Salamander and Santa Cruz Black Salamander Throughout the District.

2.3 Environmental and Ecological Settings

The setting has not dramatically changed from that assessed in the 2014 EIR. Refer to the 2014 EIR for a full description of the ecological setting for the District. The principal change to the setting is the inclusion of California giant salamander and Santa Cruz black salamander as species of special concern. **Figure Eco-1** displays where these two species have been known to occur within the District (CNDDB, 2017). Their widespread distribution indicates that there is a high likelihood that some pesticide applications could be conducted in or near their habitats.

In the 2014 EIR, the California tiger salamander (*Ambystoma californiense*) was assessed. Some important differences between the California tiger salamander and the two additional salamanders involve habitat and breeding biology. California tiger salamander breeds in seasonal pools and ponds which dry between rainy seasons. Therefore, the California tiger salamander larvae need to metamorphose before the pools dry up. California giant salamanders breed in permanent and semipermanent streams, and the larvae do not metamorphose for up to 18 months. Santa Cruz black salamanders do not have an aquatic larval stage. Eggs are laid in moist burrows, and the juveniles emerge from the egg appearing as fully formed small salamanders. Life history information for these three salamander species is found in **Table Eco-3**.

2.4 Assessment Endpoints and Measures of Ecological Effect

An endpoint is the outcome of an effect on an ecological component, for instance, increased mortality of fish due to a pesticide application. An assessment endpoint is the specific statement of the environmental effect that is going to be protected, such as the prevention of fish mortality due to a pesticide application. Measurement endpoints are measurable attributes used to evaluate the risk hypotheses and are predictive of effects on the assessment endpoints (USEPA, 1998). Since a specific individual of a species may have different mortality susceptibility compared to other individuals of the same species, it is common to use a statistical representation to define what is meant by the assessment endpoint. For instance, it is common to assess mortality by using the lethal dose at which 50 percent of the population in a study failed to survive (LD_{50}).

Assessment endpoints are the ultimate focus in risk characterization and link the measurement endpoints with the risk decision making process. The ecological effects that the SLERA intends to evaluate are determined by the assessment endpoint which is characterized by a specific measurement endpoint.

Table Eco-3. Life history characteristics of the California tiger salamander, California giant salamander, and the Santa Cruz black salamander.

Characteristics	California Tiger Salamander (*Ambystoma californiense*)	Santa Cruz Black Salamander (*Aneides flavipunctatus niger*)	California Giant Salamander (*Dicamptodon ensatus*)
Life Stages	Eggs hatch in ~10-14 d. Larvae require significantly more time to transform into juveniles than other amphibians. Around late spring, salamanders leave the ponds to find burrows. Adults reach sexual maturity in 4-5 yr. They are large and stocky with a broad, rounded snout. They are black in color with white or pale yellow spots.	Little is published on the ecological and life history of this species. Eggs undergo direct development, and fully formed juveniles appear at the surface shortly after the onset of fall rains, often in October or November. Juveniles have brassy dorsal coloration with white or light blue spots. Adults are either solid black or black with a few small white flecks.	The larval stage lasts ~18 mo. Larval dorsal coloration is light brown with a pale eye strip behind each eye. Larvae reach 10 cm within a year of hatching and metamorphose in late summer. Adults are tan to light reddish brown with coppery tan to dark brown irregular marbling. Marbling coloration is often brighter in young metamorphs than in adults.
Diet	Adults mostly eat insects. Larvae eat things such as algae, mosquito larvae, tadpoles and insects.	No diet information has been published. It is presumed that this species is a generalized predator of small arthropods and other invertebrates.	Adults feed on vertebrates such as other salamanders, lizards, mice, shrews, and voles, and invertebrates such as land snails, beetles, and crickets. Larvae are presumed to consume aquatic insects and other invertebrates.
Habitat	Restricted to vernal pools and seasonal ponds, including many constructed stock ponds, in grassland and oak savannah plant communities, predominantly from sea level to 2,000 ft. Prefer natural ephemeral pools or ponds that mimic them. Live underground, using burrows made by burrowing mammals.	Restricted to mesic forests in the fog belt of the outer Coast Range. Occur in moist streamside microhabitats and found in shallow standing water or seeps, under stones along stream edges and boards near creeks. Also occur in talus formations or rock rubble. Spend the majority of time underground.	Occur in mesic coastal forests (oak woodland and coniferous forest) and coastal chaparral habitats. Adults are occasionally found surface active or under cover objects in wet conditions.
Travel/Activity	Enter a dormant state called estivation during the dry months. They come out of their burrow around November. Nocturnal.	Most active on the surface at night, and more so during rain events.	Primarily nocturnal, but may also be active during daytime. Most active during rain events.
Breeding	Emerge from burrows for pond breeding in November, commonly during heavy rainfall. Females lay as many as 1,300 eggs, singly or in small groups. Eggs are usually attached to vegetation.	Females lay eggs underground in July or early August.	Breeding and larval development occur in cold permanent and semipermanent streams during the rainy season and in the spring. Females lay eggs during spring and likely guard nests through hatching.
Distribution	Scattered in the Coastal region from Sonoma Co. in the northern San Francisco Bay Area to Santa Barbara Co. up to 3,500 ft. in elevation, and in the Central Valley and Sierra Nevada foothills from Yolo to Kern Co. up to 2,000 ft. in elevation.	Endemic to CA and have a small range in the woodlands of the Santa Cruz Mountains in western Santa Clara, northern Santa Cruz, and southernmost San Mateo Co. Occur from Sonoma Co. north along the coast into southwestern Oregon and east to Shasta Co.	Endemic to CA, occupying a small range from sea level to 3,000 ft. in elevation along the coast in two isolated areas near San Francisco Bay. South of the Bay, they occur in the Santa Cruz Mountains in San Mateo, Santa Clara, and Santa Cruz Co.

Sources: Kucera, 1997; Thomson *et al*., 2016; USEPA, 2010; USFWS, 2017

2.4.1 Assessment Endpoints

Three principal criteria are used to select ecological characteristics that may be appropriate for assessment endpoints: (1) ecological relevance, (2) susceptibility to known or potential stressors, and (3) relevance to management goals. Of these, ecological relevance and susceptibility are essential for selecting assessment endpoints that are scientifically defensible (USEPA, 1998a). Although stressors can consist of many different environmental factors, the stressors addressed in this SLERA are those effects related to pesticide active ingredient and adjuvant exposure. This SLERA's endpoints focus on organism-level outcomes. These include adverse effects such as mortality, reproductive effects, and pathological changes (*e.g.*, kidney or liver tissue damage) (USEPA, 2003a).

The acute assessment endpoints selected in this SLERA for the IPMP include the prevention of mortality in special-status terrestrial and aquatic invertebrates (including pollinator insects), amphibians, fish, reptiles, birds, mammals, and plants.

The chronic assessment endpoints selected for the SLERA include the protection of survival and reproduction of the same species groups.

Typically, reproduction is a more sensitive endpoint than survival. Thus, this endpoint has been used over survival when it is available to result in a more conservative analysis. Adverse reproductive effects generally do not materialize until chronic exposures have occurred.

2.4.2 Measurement Endpoints

In terms of measurement endpoints, qualitative estimates of exposure have been used to evaluate levels at which exposure may occur whereas measures of effect (*e.g.*, LD_{50}) have been used to evaluate the response of the assessment endpoints if exposed to stressors. Concentration of a pesticide active ingredient or adjuvant in water is a measure of exposure for an aquatic species, and daily intake of a pesticide active ingredient or adjuvant in dietary items is a measure of exposure for terrestrial species. The concentration in water or the amount of daily ingestion of pesticide active ingredient or adjuvant that causes adverse effects are measures of effects. The likelihood of presence at the application site is addressed qualitatively in the risk characterization.

Specific measurement endpoints used to estimate adverse effects include no observable adverse effect levels (NOAELs), lowest observable adverse effects levels (LOAELs), and the median lethal (or effective) dose or concentration (*e.g.*, LD_{50}, ED_{50}, LC_{50}, or EC_{50}). For many amphibians and reptiles, toxicity data from other taxonomic groups were used for effects assessment. For the aquatic-phase for amphibians, fish, such as the rainbow trout, were often used to derive an appropriate TRV. For reptiles and terrestrial-phase amphibians, bird toxicity values act in place of specific toxicity values for reptile or terrestrial amphibian species (USEPA, 2004a).

2.5 Conceptual Site Models

Development of conceptual site models (CSMs) is a fundamental part of the risk assessment process, and their inclusion in the SLERA is intended to allow the reader to understand the exposure pathways which were evaluated for the application scenarios. The CSM is a written and visual representation of predicted relationships among stressors (*e.g.* a pesticide application), exposure pathways (*e.g.* eating vegetation containing pesticide), and assessment endpoints (*e.g.* mortality). It outlines the potential routes of exposure for each assessment endpoint and includes a description of the complete exposure pathways. An exposure pathway demonstrates how a pesticide active ingredient or adjuvant would be expected to travel from a source (application of pesticide active ingredient or adjuvant) to a plant or animal that can be affected by that pesticide active ingredient or adjuvant. An exposure pathway that is not complete means that it is unlikely for that organism to be exposed to the pesticide active ingredient or adjuvant by that exposure route. Application-specific CSMs are presented below (**Figures Eco-2** to **Eco-4**).

The ecological CSM covers the multiple pathways through which ecological receptors could be exposed to pesticide active ingredients and adjuvants that may be applied by the District. The starting point of each CSM is the application technique, which determines the characteristics of release of the pesticide active ingredient or adjuvant into the environment. Additionally, the site at which the application occurs can greatly determine what species could be present and whether exposure was likely.

2.6 Analysis Plan

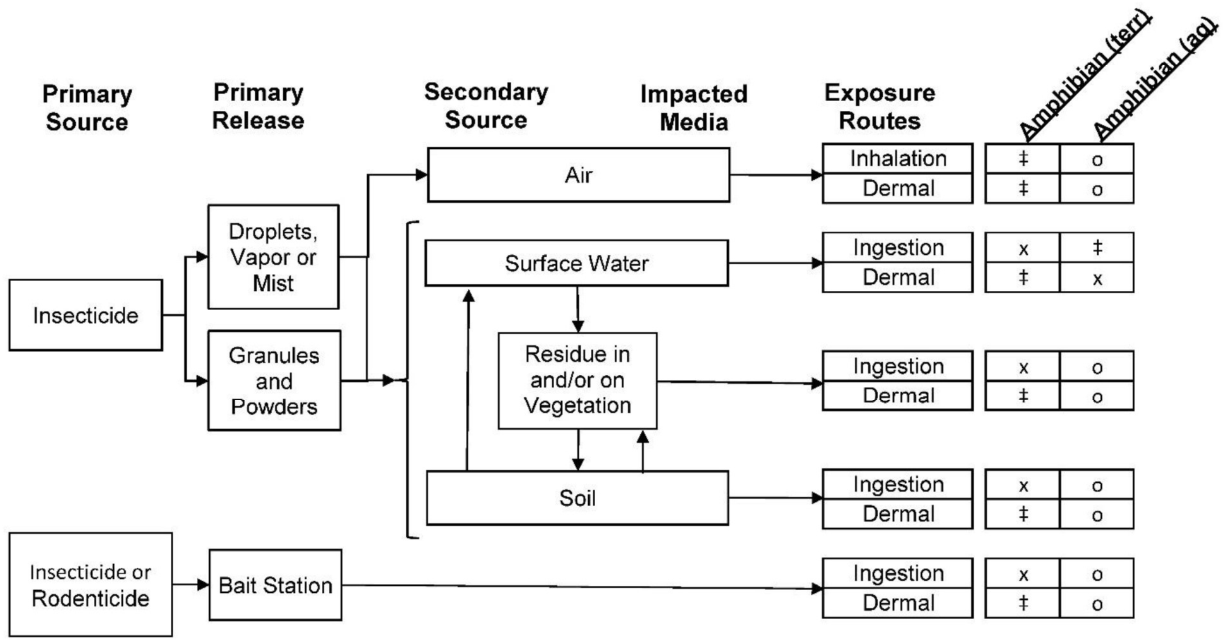
This SLERA uses both reported values in the scientific literature and past pesticide use by the District to estimate the exposures outlined by the CSM. In addition, effects data for the measurement endpoints uses data available from the scientific literature. The analysis is qualitative in that each scenario and setting is considered to determine whether the amount of pesticide active ingredients and adjuvants applied will be sufficient to produce adverse effects.

The analysis plan with the CSMs has been implemented in the next phase of the ecological risk assessment process: analysis. The analysis phase is subdivided into two sections: exposure assessment and effects assessment.

3 Exposure Assessment

The exposure assessment is part of the analysis phase of the risk assessment process which follows the problem formulation phase described in Section 2. The exposure assessment provides a description of the nature and magnitude of the interaction between pesticide active ingredient or adjuvants in surface water, sediment, soil, or diet and the ecological receptors. The exposure to a pesticide active ingredient or adjuvant within an environmental compartment (*i.e.* within soil, water, plant tissue, or a specific organism) is based on estimates of quantities released, discharge patterns and inherent disposition of the substance (*i.e.* fate and distribution), as well as the nature of the specific receiving ecosystems. The results of the exposure assessment are combined with the effects assessment to derive the risk characterization results in the final phase of the risk assessment process.

Conceptual Site Model (CSM) for Midpeninsula Regional Open Space District Pesticide Ecological Risk Assessment



Notes:
x - Complete Exposure Pathway
‡ - Although complete, this pathway is not evaluated due to lack of toxicological or exposure data.
o - Incomplete Exposure Pathway
(1) Includes sediment-dwelling invertebrates.

Figure Eco-2. Conceptual Site Model for California Giant Salamander and Santa Cruz Black Salamander Following Applications in and Around District Buildings

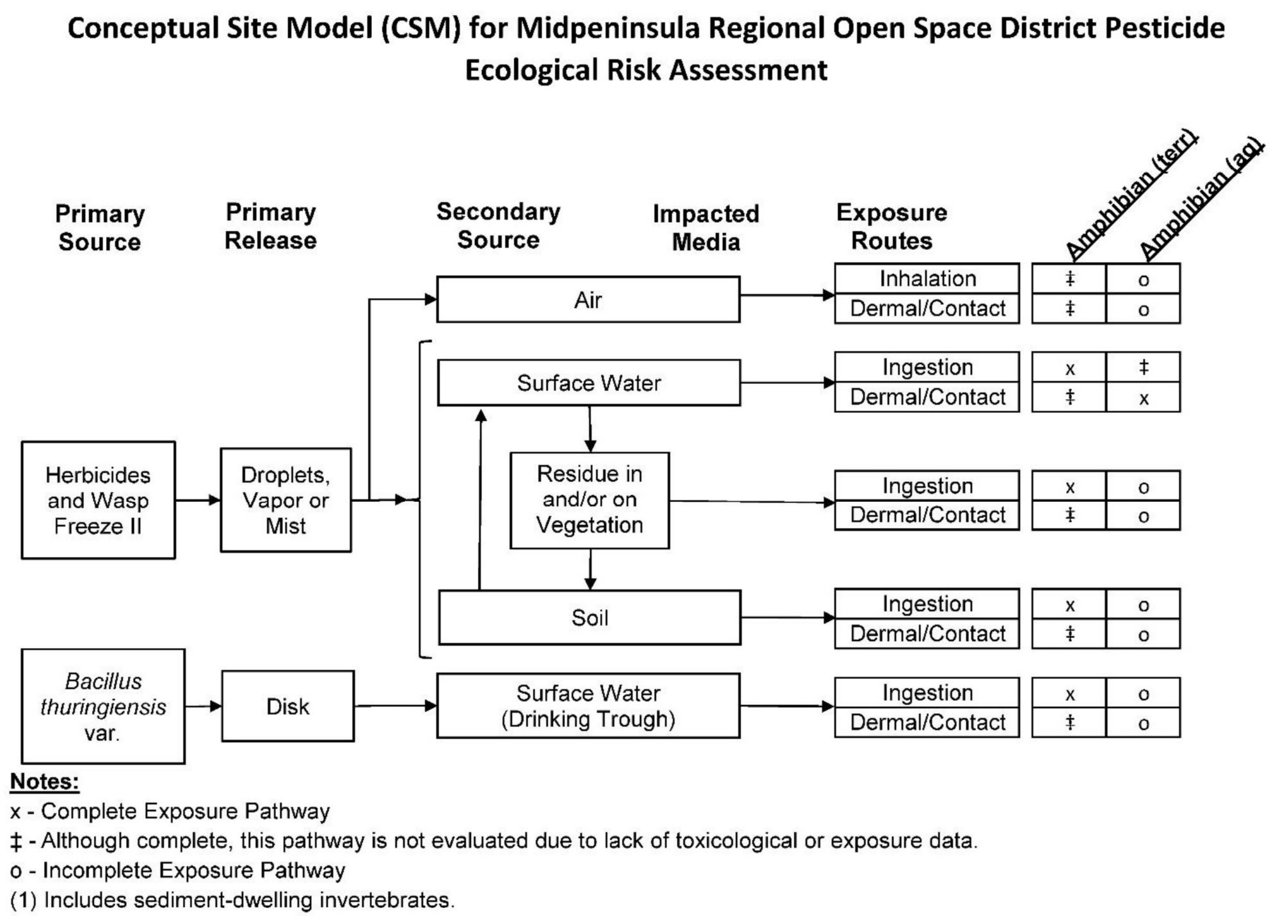
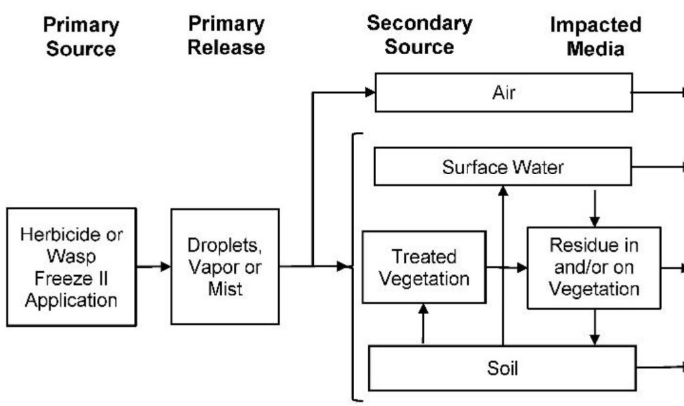


Figure Eco-3. Conceptual Site Model for California Giant Salamander and Santa Cruz Black Salamander Following Applications in Managed, Natural, and Recreational Areas

Conceptual Site Model (CSM) for Midpeninsula Regional Open Space District Pesticide Ecological Risk Assessment



Impacted Media	Exposure Routes	Amphibian (terr)	Reptile	Bird	Mammal	Soil Invert	Terr Insect	Terrestrial Plants	Amphibian (aq)	Fish	Aq. Invert (1)
Air	Inhalation	‡	‡	‡	‡	o	‡	o	o	o	o
	Dermal/Contact	‡	‡	‡	‡	o	x	x	o	o	o
Surface Water	Ingestion	x	x	x	x	o	‡	o	‡	‡	‡
	Dermal/Contact	‡	‡	‡	‡	o	‡	o	x	x	x
Residue in and/or on Vegetation	Ingestion	x	x	x	x	o	x	o	o	o	o
	Dermal/Contact	‡	‡	‡	‡	o	‡	x	o	o	o
Soil	Ingestion	x	x	x	x	x	‡	o	o	o	o
	Dermal/Contact	‡	‡	‡	‡	x	‡	x	o	o	o

Abbreviations
Soil Invert: Soil Invertebrate
Terr. Insect: Terrestrial Insect (incl. pollinators)
Aq. Invert: Aquatic Invertebrate

Notes:
x - Complete Exposure Pathway
‡ - Although complete, this pathway is not evaluated due to lack of toxicological or exposure data.
o - Incomplete Exposure Pathway
(1) Includes sediment-dwelling invertebrates.

Figure Eco-4. Conceptual Site Model for Insecticides Following Applications Outside District Buildings and Insecticides and Herbicides Following Applications in Managed, Natural, and Recreational Areas

The exposure assessments are broken down between acute (short term) and chronic (long term) exposures, described in detail below. Several assumptions are required to estimate the amount of pesticide active ingredient or adjuvants that an organism is exposed to as the pesticide active ingredient or adjuvant gets transported along the various exposure pathways. The assumptions for acute and chronic exposures, for each receptor group in general, in aquatic and terrestrial environments, and under each application scenario are included below.

Typical fate properties which tend to decrease the concentration of a pesticide active ingredient or adjuvant include aerobic degradation, anaerobic degradation, photolysis, hydrolysis, absorption, solubilization, and volatilization. Key transport properties that may not be accounted for are dilution and partial transfer between media such as plants, soil, water, and air.

3.1 Acute Exposure

Pesticide active ingredients and adjuvants typically degrade or dissipate following their release into the environment due to various fate and transport processes. Thus, peak residue levels typically occur immediately following an application and are used to provide an upper–bound and conservative estimate for an acute exposure. In a typical SLERA, an acute exposure is considered to be less than 14 days for fish mammals and birds. For other receptors, an acute exposure lasts for less than 3 days (USEPA, 1999).

Under a scenario in which a single application is sufficient for the control of the pest, the pesticide active ingredient and adjuvant residue shortly after the application is complete is used to estimate the acute exposure. If multiple applications are required, the highest concentration may occur following later applications due to the build-up of pesticide active ingredient and adjuvants from previous application(s) prior to their complete transport or breakdown. Dissipation in vegetation, soil, water, and other environmental media contributing to dietary intake all occur similarly, although at different rates.

3.1.1 Acute Exposure in Terrestrial Species

The peak instantaneous residue for each environmental media have been used for acute exposure estimates. Following a single application, the peak concentrations would occur immediately following the application. Following multiple applications, the peak concentration could occur following one of the later applications. Past use patterns and rates are used to qualitatively estimate the level of pesticide active ingredient and adjuvant residues following an application. For many application scenarios small amounts are used in isolated areas (*e.g.*, spraying yellow jacket ground nests). Under these scenarios, it is possible that there will be high concentrations within that isolated area. Other application scenarios provide for applications over a larger area (*e.g.*, wick, or spot spraying for weeds). When applications are made over a larger area, the potential for exposure increases as more individuals of a species could be present or move into the treated area.

3.1.2 Acute Exposure in Aquatic Species

No treatment of aquatic weeds is included in the District's IPMP so high concentrations of herbicide active ingredients and adjuvants in surface water would only be possible following an accidental spill. Mosquito treatments in watering trough include placements of *Bacillus thuringiensis* var. *israelensis* (*Bti*) disk in the water. Fish and most aquatic invertebrates will have no access to such water troughs, so exposure for aquatic species to *Bti* for mosquito control will not occur.

3.2 Chronic Exposure

Chronic risk is based on the impacts resulting from long-term exposure to a pesticide active ingredient or adjuvant. Chronic exposure is typically over many months. However, for short-lived species such as some aquatic invertebrates, chronic exposure based on exposure across critical life-stages is considered to be on the order of a few weeks.

3.2.1 Chronic Exposure in Terrestrial Species

Chronic exposure for pesticide active ingredient and adjuvant is to continuously diminishing concentrations in environmental media. This is due to the fact that concentrations decrease over time. Some species with small home ranges for foraging areas might be exposed continuously if the treated area is greater than their home range. Other species with larger home ranges might only be exposed periodically as they move into and out of the treated area. If a pesticide active ingredient or adjuvant dissipates rapidly, species might not experience exposure for a sufficient duration to constitute a chronic exposure.

3.2.2 Chronic Exposure in Aquatic Species

Chronic exposures for aquatic species would result from pesticide active ingredient and adjuvant movement to water bodies from treated areas. Movement across soil surface or leaching through soil from a treated site to a surface water body is possible. Mitigation Measures 4.2-1a and 4.2-1b were discussed in the 2014 EIR to minimize movement of pesticide active ingredients and adjuvants to surface water bodies by including a 15-foot buffer distance between surface water and application sites. Best management practices (BMPs) included in the 2014 EIR also protect surface water bodies by minimizing movement to surface water bodies. These include BMPs 19 (Aquatic Areas), 20 (California red-legged frog [*Rana draytonii*]) and 32 (Surface and Groundwater Protection). These Mitigation Measures and BMPs all restrict pesticide applications within 15 feet of surface water bodies. Therefore, surface water concentrations are expected to be low or nonexistent such that chronic exposure following pesticide applications is unlikely.

4 Effects Assessment

The effects assessment consists of an evaluation of available toxicity or other adverse effects information that can be used to relate the exposures to pesticide active ingredients or adjuvants and adverse effects in ecological receptors. Toxicity is a property of a pesticide active ingredient or adjuvant, and its toxicity alone does not indicate its potential to harm a given organism. A key to understanding the effects on an organism is the dosage of the pesticide active ingredient or adjuvant that the organism receives or the concentration to which it is exposed. For example, certain substances are considered toxic (*e.g.*, caffeine), but are harmless in small dosages.

Conversely, an ordinarily harmless substance (*e.g.*, water) can be lethal if over-consumed. This relationship between exposure and effect on an organism is called a dose-response effect and is discussed in Section 5: Risk Characterization. Data that can be used to define the toxicity of a pesticide active ingredient or adjuvant include literature-derived or site-specific single-chemical toxicity data, site-specific ambient-media toxicity tests, and site-specific field surveys (Suter, 2007). For this SLERA, data were restricted to single pesticide active ingredient or adjuvant toxicity data from literature sources because specific toxicity data for the mixtures of pesticide active ingredient with adjuvants were not available. Available toxicity information for the active ingredients and adjuvants included in the District's IPMP are provided in **Table Eco-4**.

For certain pesticide active ingredients or adjuvants, no toxicity results are available for various taxonomic groups. For example, toxicity testing of reptiles is rare, and although becoming more common, many pesticides still lack toxicity test results for amphibians. USEPA (2004a) guidance is to use bird toxicity values in place of specific toxicity values for reptile species and terrestrial-phase amphibians when effects data were not available. USEPA commonly uses freshwater fish such as the rainbow trout as the surrogate species for the aquatic-phase of amphibians (USEPA, 2004a). The USEPA (2017) does not recommend applying any additional uncertainty or safety factors when using avian or fish toxicity endpoints for other taxonomic groups.

The USEPA has developed acute toxicity categories for pesticide active ingredients or adjuvants ranging from the most toxic category of 'very highly toxic' to the least toxic category of 'practically nontoxic' (**Table Eco-5**). These are strictly based on the results of laboratory acute toxicity tests and do not reflect the exposure or dose received by an organism that determines if there is an adverse effect following a pesticide application. This classification only gives a description of the numerical toxicity property of the pesticide active ingredient or adjuvant. It is not until it is combined with an estimate of exposure that adverse effects may occur. The detailed description of the toxicity classification from **Table Eco-5** for the various active ingredients and adjuvants is provided for each application scenario below.

4.1 Adjuvants Considered for Toxicity to California Giant Salamander and Santa Cruz Black Salamander

4.1.1 Alcohol Ethoxylate

Amphibian toxicity data were not available for alcohol ethoxylate (CAS RN 34398-01-1). For aquatic-phase amphibians an LC_{50} of 4.59 mg/L for African clawed frogs (*Xenopus laevis*) (Cardellini and Ometto, 2001) testing alcohol ethoxylate (CAS RN unstated) as a surrogate chemical. Therefore, alcohol ethoxylate would be considered moderately toxic to aquatic-phase amphibians. No bird toxicity data were available for alcohol ethoxylate to use for terrestrial-phase amphibians. Using the mammalian LD_{50} of 1,400 mg/kg (Gingell and Lu, 1991) as the next best toxicity value, alcohol ethoxylate would be considered slightly toxic to terrestrial-phase amphibians.

Appendix 1

Table Eco-4. Acute Ecotoxicity Data for Terrestrial and Aquatic Organisms.

Active Ingredient[1]	Mammalian Oral LD_{50} (mg/kg)[2]	Avian LD_{50} (mg/kg)[3]	Honeybee LD_{50} (µg/bee)	Reptilian LD_{50} (mg/kg)[4]	Fish LC_{50} (mg/L)[5]	Amphibian LC_{50} (mg/L)[6]	Aquatic Invert EC_{50} (mg/L)[7]
ADJUVANTS/SURFACTANTS							
Alcohol Ethoxylate	1,400*	NDA	NDA	NDA	0.59*	4.59*	0.2*
Alkylphenol Ethoxylate	600*ǂ	NDA	NDA	NDA	1.3*	NDA	14*
Canola Oil, Ethyl and Methyl Esters	>5,000*	NDA	NDA	NDA	95*	NDA	>100*
Lecithin	>5,000*	NDA	NDA	NDA	17.6*	NDA	9.3*
FUNGICIDES							
Phosphite K Salts, mono-/di-	>5,000	>1,060	>13.3	NDA	>544.6	NDA	>544.6
HERBICIDES							
Aminopyralid TIPA	>5,000*	>2,250*	$>100_{contact}$* $>117_{oral}$*	NDA	>100*	>95.2* (N. leopard frog)	>98.6*
Clethodim	1,360	>2,000	$>100_{contact}$	NDA	19	NDA	20.2
Clopyralid MEA	>5,000*	>1,465	$>100_{contact}$ $>100_{oral}$	NDA	103.5	NDA	225
Glyphosate IPA	>6,000 (mouse)	>3,851	$>100_{contact}$ $>100_{oral}$	NDA	11	7.6	5.3
Glyphosate K	>4,800*	>2,000*	$>100_{contact}$* $>100_{oral}$*	NDA	45*	2.9ǂ (wood frog)	134*
Imazapyr IPA	>5,000*	>2,150	$>100_{contact}$*	NDA	112	NDA	350
Triclopyr BEE	803	735	$>100_{contact}$	NDA	0.36	3.29 (leopard frog)	12
Triclopyr TEA	1,847	3,175	$>100_{contact}$*	NDA	240	159	775
INSECTICIDES							
Diatomaceous Earth	>5,000	NDA	NDA	NDA	NDA	NDA	NDA
D-trans Allethrin	900_{female}* $2,150_{male}$*	>2,000*	$3.4_{contact}$* 4.6_{oral}*	NDA	0.0094	NDA	0.0089*
Fipronil	97	11.3	$0.009_{contact}$ 0.19_{oral}	30ǂ	0.025	0.85	0.1
Indoxacarb	179	98	$0.18_{contact}$ 18.52_{oral}	NDA	0.65	NDA	0.064
Phenothrin	>5,000	>2,510	$0.067_{contact}$	NDA	0.017	NDA	0.0044
Prallethrin	460	>1,000	$0.028_{contact}$	NDA	0.012	NDA	0.0062
S-Hydroprene	>5,050	NDA	NDA	NDA	>100*	NDA	0.0029*
Sodium Tetraborate Decahydrate	4,550	>2,150*	$>362.58_{contact}$*	NDA	27	420*	133*
RODENTICIDES							
Cholecalciferol	25.24	>600	NDA	NDA	NDA	NDA	NDA

Table Eco-4. Continued.

[1] Surrogate chemicals were used when no ecotoxicity data were available for target chemicals. When no ecotoxicity data were available for both target and surrogate chemicals, values are described as No Data Available (NDA). For each active ingredient, the following surrogate chemicals were used to obtain ecotoxicity values (*):
Alcohol Ethoxylate: Alcohols, C9-11, ethoxylated (mammalian); Alcohols, C14-15, ethoxylated (fish, aquatic invert); Alcohol ethoxylate, unspecified (amphibian)
Alkylphenol Ethoxylate (proprietary blend): Alkylphenol Ethoxylate (mammalian, fish, aquatic invert)
Canola Oil, Ethyl and Methyl Esters (proprietary blend): Competitor Formulation (mammalian, fish, aquatic invert)
Lecithin: Liberate Formulation (mammalian, fish, aquatic invert)
Aminopyralid TIPA: Aminopyralid (mammalian, avian, honeybee, fish, amphibian, aquatic invert)
Clopyralid MEA: Clopyralid (mammalian)
Glyphosate K: Glyphosate (mammalian, avian, honeybee, fish, aquatic invert)
Imazapyr IPA: Imazapyr (mammalian, honeybee)
Triclopyr TEA: Triclopyr (honeybee)
D-trans Allethrin: D-allethrin (mammalian); Allethrin (avian, honeybee, aquatic invert)
S-Hydroprene: Hydroprene (fish, aquatic invert)
Sodium Tetraborate Decahydrate: Boric acid (avian, honeybee, amphibian, aquatic invert)
[2] Values are for rats unless otherwise specified.
[3] Values are for mallard duck or bobwhite quail.
[4] Values are for fringe-toed lizard.
[5] Values are for rainbow trout or bluegill sunfish.
[6] Values are for African clawed frog or Australian tree frog unless otherwise specified.
[7] Values are for *Daphnia magna* or similar species.
* Value is derived from a surrogate chemical. See Footnote 1.
ǂ A No Observable Effect Level (NOEL) or No Observable Effect Concentration (NOEC) was used when no LD_{50} or LC_{50} data, respectively, were available.

Sources: [Alcohol Ethoxylate: Gingell and Lu, 1991; Kline *et al*., 1996; Cardellini and Ometto, 2001; Morrall *et al*., 2003], [Alkylphenol Ethoxylate: Hardin *et al*., 1987; Macek and Krzeminski, 1975; Dorn *et al*., 1993], [Canola Oil, Ethyl and Methyl Esters: Wilbur-Ellis, 2010; WSDA, 2009], [Lecithin:Loveland Products, 2016; WSDA, 2009], [Phosphite K Salts, mono-/di-: Health Canada PMRA, 2012], [Aminopyralid TIPA: USEPA, 2001a, 2001b, 2003b, 2003c, 2004, 2005a], [Clethodim: USEPA, 1986a, 1986b, 1986c, 1990a, 2014a], [Clopyralid MEA: SERA, 2004; USEPA, 1974a, 1974b, 1978b, 1980a, 1980b], [Glyphosate IPA: McComb *et al*., 2008; USEPA, 1972a, 1972b, 1978b, 1980c, 1980d, 1995a], [Glyphosate K: USEPA, 1995b, 1995c, 1997a, 2015; Navarro-Martin *et al*., 2014], [Imazapyr IPA: USEPA, 1983, 1984a, 1984b, 1984c, 2005b], [Triclopyr BEE: USEPA, 1980e, 1985a, 1991, 1993a, 1998b; Wojtaszek *et al*., 2005], [Triclopyr TEA: USEPA, 1973a, 1978c, 1978d, 1992a, 1998b; Perkins *et al*., 2000], [Diatomaceous Earth: USEPA, 1984d], [D-trans allethrin: WHO, 2002; USEPA, 1984e, 1992b, 1993b; Stevenson, 1986], [Fipronil: USEPA, 1990b, 1990c, 1992c, 2007; Zaluski *et al*., 2015; Peveling and Demba, 2003; Overmyer *et al*., 2007], [Indoxacarb: DPR, 2006; USEPA, 1979, 1994a, 1995d, 1997b, 2003d], [Phenothrin: USEPA, 1975, 1978e, 1989, 1994b, 2008], [Prallethrin: USEPA, 1989b, 1989c, 1989d, 1989e, 2014b], [S-Hydroprene: HSDB, 2016; USEPA, 1973c; Oda *et al*., 2005], [Sodium Tetraborate Decahydrate: USEPA, 1982, 1984f, 1987, 2006; Birge and Black, 1977; Bantle *et al*., 1999], [Cholecalciferol: Lam, 1992; USEPA, 2004d]

Table Eco-5. Acute Ecotoxicity Categories for Terrestrial and Aquatic Organisms.

Toxicity Category	Avian: Acute Oral LD_{50} (mg/kg)	Avian: Dietary Concentration (mg/kg-diet)	Aquatic Organisms: Acute LC_{50} (mg/L)	Wild Mammals: Acute Oral LD_{50} (mg/kg)	Non-Target Insects: Acute LD_{50} (µg/bee)
very highly toxic	<10	<50	<0.1	<10	
highly toxic	10-50	50 – 500	0.1 - 1	10 - 50	<2
moderately toxic	51-500	501 – 1000	>1 - 10	51 - 500	2 - 11
slightly toxic	501-2000	1001 – 5000	>10 - 100	501 - 2000	
practically nontoxic	>2000	>5000	>100	>2000	>11

Source: USEPA 2017

4.1.2 Alkylphenol Ethoxylate

Amphibian toxicity data were not available for alkylphenol ethoxylate. For aquatic-phase amphibians an LC_{50} of 1.5 mg/L for bluegill sunfish (*Lepomis macrochirus*) (Macek and

Krzeminski, 1975 *in* ECOTOX, 2018) would indicate alkylphenol ethoxylate is moderately toxic to aquatic-phase amphibians. No bird toxicity data were available for alkylphenol ethoxylate to use for terrestrial-phase amphibians. Using the mammalian NOEL of 600 mg/kg in a formulated product (Hardin *et al*., 1987 *in* ECOTOX, 2018) as the next best toxicity value, alkylphenol ethoxylate would be considered at most slightly toxic to terrestrial-phase amphibians.

4.1.3 Canola Oil, Ethyl and Methyl Esters

Amphibian toxicity data were not available for canola oil. For aquatic-phase amphibians an LC_{50} of 95 mg/L for rainbow trout (WSDA, 2009) testing modified vegetable (seed) oil, polyethylene glycol fatty acid ester, polyoxyethylene sorbitan fatty acid ester as surrogate chemicals would indicate canola oil is slightly toxic to aquatic-phase amphibians. No bird toxicity data were available for canola oil to use for terrestrial-phase amphibians. Using the mammalian LD_{50} of >5,000 mg/kg (Wilbur-Ellis, 2010) testing modified vegetable oil as a surrogate as the next best toxicity value, canola oil would be considered practically nontoxic to terrestrial-phase amphibians.

4.1.4 Lecithin

Amphibian toxicity data were not available for lecithin. For aquatic-phase amphibians an LC_{50} of 17.6 mg/L for rainbow trout (WSDA, 2009) testing a mixture of lecithin, methyl esters of fatty acids, and alcohol ethoxylates as surrogate chemicals would indicate lecithin is slightly toxic to aquatic-phase amphibians. No bird toxicity data were available for lecithin to use for terrestrial-phase amphibians. Using the mammalian LD_{50} of >5,000 mg/kg (Loveland Products, 2016) testing a mixture of lecithin, methyl esters of fatty acids, and alcohol ethoxylates as surrogates as the next best toxicity value, canola oil would be considered practically nontoxic to terrestrial-phase amphibians.

4.2 Pesticide Active Ingredients Considered for Toxicity to California Giant Salamander and Santa Cruz Black Salamander

4.2.1 Phosphite, mono-/di-potassium salts

Amphibian toxicity data were not available for the monopotassium and dipotassium phosphite salts. For aquatic-phase amphibians an LC_{50} of >544.6 mg/L for rainbow trout (PMRA, 2012) would indicate the monopotassium and dipotassium phosphite salts are practically nontoxic to aquatic-phase amphibians. Using the avian LD_{50} of >1,060 mg/kg for mallard ducks (*Anas platyrhynchos*) (PMRA, 2012), the monopotassium and dipotassium phosphite salts would be considered, at most, slightly toxic to terrestrial-phase amphibians.

4.2.2 Aminopyralid Triisopropanolamine (TIPA) Salt

For aquatic-phase amphibians, an LC_{50} of >95.2 mg/L for northern leopard frog (*Lithobates pipiens*) (USEPA, 2003b *in* OPP Ecotox) testing aminopyralid as a surrogate would indicate aminopyralid TIPA is, at most, slightly toxic to aquatic-phase amphibians. Using the avian LD_{50} of >2,250 mg/kg for northern bobwhite (*Colinus virginianus*) (USEPA, 2001a *in* OPP Ecotox), testing aminopyralid as a surrogate would indicate aminopyralid TIPA is practically nontoxic to terrestrial-phase amphibians.

4.2.3 Clethodim

Amphibian toxicity data were not available for clethodim. For aquatic-phase amphibians, an LC_{50} of 18 mg/L for rainbow trout (USEPA, 1986a *in* OPP Ecotox) would indicate clethodim is slightly toxic to aquatic-phase amphibians. Using the avian LD_{50} of >2,000 mg/kg for northern bobwhite (USEPA, 1986b *in* OPP Ecotox) would indicate clethodim is practically nontoxic to terrestrial-phase amphibians.

4.2.4 Clopyralid Monoethanolamine (MEA) Salt

Amphibian toxicity data were not available for clopyralid MEA. For aquatic-phase amphibians, an LC_{50} of 103.5 mg/L for rainbow trout (USEPA, 1978a *in* OPP Ecotox) would indicate clopyralid MEA is practically nontoxic to aquatic-phase amphibians. Using the avian LD_{50} of 1,465 mg/kg for mallard duck (USEPA, 1980a *in* OPP Ecotox) would indicate clopyralid MEA is slightly toxic to terrestrial-phase amphibians.

4.2.5 Glyphosate Isopropylamine (IPA) Salt

For aquatic-phase amphibians, an LC_{50} of 110.8 mg/L for Australian tree frog (*Litoria moorei*) (USEPA, 1995a *in* OPP Ecotox) would indicate glyphosate IPA is practically nontoxic to aquatic-phase amphibians. Using the avian LD_{50} of >3,851 mg/kg for northern bobwhite (USEPA, 1978b *in* OPP Ecotox) would indicate glyphosate IPA is practically nontoxic to terrestrial-phase amphibians.

4.2.6 Glyphosate Potassium (K) Salt

For aquatic-phase amphibians, an NOEC of 2.9 mg/L for wood frog (*Lithobates sylvaticus*) (Navarro-Martin *et al*., 2014 *in* ECOTOX, 2018) would indicate glyphosate K is, at most, moderately toxic to aquatic-phase amphibians. Using the avian LD_{50} of >2,000 mg/kg for northern bobwhite (USEPA, 1997a *in* OPP Ecotox) using glyphosate as a surrogate would indicate glyphosate K is practically nontoxic to terrestrial-phase amphibians.

4.2.7 Imazapyr Isopropylamine (IPA) Salt

Amphibian toxicity data were not available for imazapyr IPA. For aquatic-phase amphibians, an LC_{50} of 112 mg/L for rainbow trout (USEPA, 1984a *in* OPP Ecotox) would indicate imazapyr IPA (as the Arsenal formulation) is practically nontoxic to aquatic-phase amphibians. Using the avian LD_{50} of >2,150 mg/kg for mallard duck (USEPA, 1984b *in* OPP Ecotox) would indicate imazapyr IPA (as the Arsenal formulation) is practically nontoxic to terrestrial-phase amphibians.

4.2.8 Diatomaceous Earth

Almost no toxicity data were available for diatomaceous earth. No aquatic toxicity data were available for any species. Therefore, no estimate is available for aquatic-phase amphibians. However, the physical nature of diatomaceous earth suggests it is likely practically nontoxic to aquatic-phase amphibians. Using the mammalian LD_{50} of >5,000 mg/kg (USEPA, 1984d) would indicate diatomaceous earth is practically nontoxic to terrestrial-phase amphibians.

4.2.9 Fipronil

For aquatic-phase amphibians, an LC_{50} of 0.85 mg/L for African clawed frog (Overmyer *et al*., 2007 *in* ECOTOX, 2018) would indicate fipronil is highly toxic to aquatic-phase amphibians. Using the avian LD_{50} of 11.3 mg/kg for northern bobwhite (USEPA, 1990b *in* OPP Ecotox) would indicate fipronil is highly toxic to terrestrial-phase amphibians.

4.2.10 Indoxacarb

Amphibian toxicity data were not available for indoxacarb. For aquatic-phase amphibians, an LC_{50} of 0.65 mg/L for rainbow trout (USEPA, 1997b *in* OPP Ecotox) would indicate indoxacarb, testing Indoxacarb (DPX-MP062-51A), is highly toxic to aquatic-phase amphibians. Using the avian LD_{50} of 98 mg/kg for northern bobwhite (USEPA, 1997c *in* OPP Ecotox) would indicate indoxacarb is moderately toxic to terrestrial-phase amphibians.

4.2.11 S-Hydroprene

Amphibian toxicity data were not available for S-hydroprene. For aquatic-phase amphibians, an LC_{50} of >100 mg/L for bluegill sunfish (USEPA, 1973b *in* OPP Ecotox) using hydroprene (Zoecon ZR-512 formulation) as a surrogate would indicate S-hydroprene is practically nontoxic to aquatic-phase amphibians. Using the mammalian LD_{50} of >5,050 mg/kg (HSDB, 2016) would suggest S-hydroprene is practically nontoxic to terrestrial-phase amphibians.

4.2.12 Sodium Tetraborate Decahydrate

For aquatic-phase amphibians, an LC_{50} of 420 mg/L for African clawed frog (Bantle *et al*., 1999 *in* ECOTOX, 2018) using boric acid as a surrogate would indicate sodium tetraborate decahydrate is practically nontoxic to aquatic-phase amphibians. Using the avian LD_{50} of >2,510 mg/kg for northern bobwhite (USEPA, 1982 *in* OPP Ecotox) would indicate sodium tetraborate decahydrate is practically nontoxic to terrestrial-phase amphibians.

4.2.13 Cholecalciferol

No relevant aquatic toxicity data are available for any species. Therefore, no estimate is available for aquatic-phase amphibians. Using the avian LD_{50} of >600 mg/kg for mallard duck (USEPA, 2004d) would indicate cholecalciferol is, at most, slightly toxic to terrestrial-phase amphibians.

4.3 New Pesticide Active Ingredients Considered for Toxicity to All Special-Status Species

4.3.1 Triclopyr BEE

Triclopyr BEE is moderately toxic to aquatic-phase amphibians based the LC_{50} of 3.29 mg/L for northern leopard frogs (Wojtaszek *et al*., 2005 *in* ECOTOX, 2018). Triclopyr BEE is moderately toxic to freshwater aquatic invertebrate species based on the LC_{50} of 1.7 mg/L in water flea (*Daphnia magna*) (USEPA, 1980e *in* OPP Ecotox). Triclopyr BEE is highly toxic to freshwater fish based on the LC_{50} of 0.36 mg/L in bluegill sunfish (USEPA, 1993a *in* OPP Ecotox).

No toxicity information was available for terrestrial-phase amphibians or reptiles. The toxicity of triclopyr BEE to terrestrial-phase amphibians and reptiles was considered similar to that in birds (USEPA, 2017). Triclopyr BEE is slightly toxic to birds based on an LD_{50} of 735 mg/kg (USEPA, 1991 *in* OPP Ecotox) in northern bobwhite and slightly toxic to mammals based on an LD_{50} of 803 mg/kg (USEPA, 1998). Triclopyr BEE is practically nontoxic to bees based on a contact LD_{50} of >100 µg/bee (USEPA, 1985a *in* OPP Ecotox).

4.3.2 Triclopyr TEA

Triclopyr TEA is practically nontoxic to aquatic-phase amphibians based the LC_{50} of 159 mg/L for African clawed frogs (Perkins *et al*., 2000 *in* ECOTOX, 2018). Triclopyr TEA is practically nontoxic to freshwater aquatic invertebrate species based on the LC_{50} of 775 mg/L in water flea (USEPA, 1978c *in* OPP Ecotox). Triclopyr TEA is practically nontoxic to freshwater fish based on the LC_{50} of 240 mg/L in rainbow trout (USEPA, 1973a *in* OPP Ecotox).

No toxicity information was available for terrestrial-phase amphibians or reptiles. The toxicity of triclopyr TEA to terrestrial-phase amphibians and reptiles was considered similar to that in birds (USEPA, 2017). Triclopyr TEA is practically nontoxic to birds based on an LD_{50} of 3,176 mg/kg (USEPA, 1978d *in* OPP Ecotox) in mallard duck and slightly toxic to mammals based on an LD_{50} of 1,847 mg/kg (USEPA, 1998b). Triclopyr TEA is practically nontoxic to bees based on a contact LD_{50} of >100 µg/bee, testing triclopyr acid (USEPA, 1985b *in* OPP Ecotox).

4.3.3 Prallethrin

No toxicity information was available for aquatic-phase amphibians. Prallethrin is very highly toxic to freshwater aquatic invertebrate species based on the LC_{50} of 0.0062 mg/L in water flea (USEPA, 1989b *in* OPP Ecotox). Prallethrin is very highly toxic to freshwater fish and aquatic-phase amphibians based on the LC_{50} of 0.012 mg/L in rainbow trout (USEPA, 1989c *in* OPP Ecotox).

No toxicity information was available for terrestrial-phase amphibians or reptiles. The toxicity of prallethrin to terrestrial-phase amphibians and reptiles was considered similar to that in birds (USEPA, 2017). Prallethrin is, at most, slightly toxic to birds based on an LD_{50} of >1000 mg/kg (USEPA, 1989d *in* OPP Ecotox) in mallard duck and moderately toxic to mammals based on an LD_{50} of 460 mg/kg (USEPA, 2014b). Prallethrin is highly toxic to bees based on a contact LD_{50} of 0.028 µg/bee (USEPA, 1989e *in* OPP Ecotox).

5 Risk Characterization

Risk characterization is the final phase in the risk assessment process. The purpose of the risk characterization phase is to integrate the two pieces from the analysis phase: exposure and effects assessments. In risk characterization, exposure and effects data are integrated to allow the risk assessor to draw conclusions concerning the presence, nature, and magnitude of effects that may exist under the application scenarios. For this SLERA, qualitative assessments are relied upon to characterize the risk assessment outcome.

5.1 Potential for a Species to Be Present at the Application Site

One of the first qualitative attributes to consider is the likelihood of the specific species being present at a particular application site. Since species exist in particular habitats and not all habitats can occur at a single application site, it is likely that a fraction of the entire list of special-status species will possibly be present. For instance, if the application site does not contain suitable foraging habitat for a particular species, it is relatively unlikely to come into the area and be exposed to pesticide active ingredients or adjuvants by ingestion. Pollinating species are less likely to be present if there are no plants in bloom present. Some locations are unlikely to have any species present, such as in or around buildings. Marine/estuarine species would be absent if the application site is not near the coastline.

The District's standard practice prior to implementing any pesticide application scenario is to identify whether any special-status species habitat is nearby, and if so, identify appropriate measures to avoid adversely affecting the species. The District obtains technical assistance from California Department of Fish and Wildlife (CDFW), National Marine Fisheries Service (NMFS), and/or United States Fish and Wildlife Service (USFWS). These activities are included in the mitigation measures and BMPs of the 2014 EIR. With implementation of these mitigation measures and BMPs, the potential for adverse effects on species as a result of the District's pesticide applications would be low.

5.2 Foraging Diet

The extent to which a particular species consumes food from the application area will greatly influence their exposure. Different species forage over vastly different areas. Species with large foraging areas are unlikely to consume all their diet from within an application area. Long-term exposures (chronic) are reduced or diluted in such species because a portion of their diets is likely acquired off the application area.

5.3 Dilution and Degradation of Pesticide Active Ingredients and Adjuvants

Through time, concentrations of pesticide active ingredients and adjuvants following applications generally decrease. This applies in particular to soil and water concentrations. In addition to diminished concentrations due to breakdown, dilution (or reduction in concentration when mixed) will occur when the pesticide active ingredient or adjuvant residues combine with environmental media that is not contaminated. For instance, during a rain event that assists in transporting pesticide active ingredient or adjuvant residue from foliage and soil to a waterbody, additional, uncontaminated water will add to the volume of water in the waterbody itself. This also applies to water concentrations as the pesticide active ingredient or adjuvant continues to move from various waterbodies, such as drainage ditches, streams, and rivers. Due to dilution and low probability of application scenarios being adjacent to a marine/estuarine waterbody, the potential for elevated concentrations in marine/estuarine waterbodies would be relatively low, and the potential for adverse effects to marine/estuarine species would be correspondingly low.

5.4 Risk Analysis for Pesticide Active Ingredients and Adjuvants Considered for Toxicity to California Giant Salamander and Santa Cruz Black Salamander

Santa Cruz black salamander do not have a fully aquatic larval stage, so toxicity testing of larval amphibians will not portray the toxic impacts for Santa Cruz black salamander very well. California giant salamander lay eggs and larvae develop in streams. The previous analysis for California tiger salamander which lays eggs in vernal pools or temporary ponds does not accurately reflect the potential for risk to aquatic phase Santa Cruz black salamander and California giant salamander.

The analysis of terrestrial phase California tiger salamanders will reflect reasonably well the potential for risk for California giant salamander since both species spend a lot of time in underground burrows. However, Santa Cruz black salamander spend more time in streams, so the analysis in the 2014 EIR for terrestrial-phase amphibians will not portray the potential for risk for the Santa Cruz black salamander very well.

Mitigation measures and BMPs included in the 2014 EIR are designed to greatly minimize or prevent pesticide active ingredients or adjuvants for reaching surface waters. These practices are anticipated to be protective of aquatic-phase amphibians.

5.4.1 Alcohol Ethoxylate

Alcohol ethoxylate was classified as moderately toxic to aquatic-phase amphibians and slightly toxic to terrestrial-phase amphibians. Alcohol ethoxylate is one of the ingredients in the adjuvant Liberate which could be mixed with herbicides and spot sprayed or applied as a cut-stump, basal bark, or frill/injection treatment or as a wick application. When applied as a cut-stump, basal bark, or frill/injection treatment or as a wick application or spot spray treatment, the potential for exposure to either terrestrial-phase or aquatic-phase amphibians is low. The greatest opportunity for exposure for terrestrial-phase amphibians would be following a spot spray or wick application made to a large stand of weeds. The potential for exposure to aquatic-phase amphibians would be low since BMPs minimize or prevent any movement to surface waters. Due to the low potential for exposure and the low toxicity, the potential for adverse effects is also low.

5.4.2 Alkylphenol Ethoxylate

Alkylphenol ethoxylate was classified as moderately toxic to aquatic-phase amphibians and slightly toxic to terrestrial-phase amphibians. Alkylphenol ethoxylate is a component of the adjuvant Pentra-Bark and is only used to spray or inject tree trunks. Since it would only be sprayed directly onto or injected into trees, the potential for exposure to terrestrial-phase amphibians would be extremely low. The potential for exposure for aquatic-phase amphibians is also low since mitigation measures and BMPs minimize or prevent any movement to surface waters. Due to the low potential for exposure and the low toxicity, the potential for adverse effects is also low.

5.4.3 Canola Oil, Ethyl and Methyl Esters

Canola oil was classified as slightly toxic to aquatic-phase amphibians and practically nontoxic to terrestrial-phase amphibians. Canola is one of the ingredients in the adjuvant Competitor which could be sprayed with herbicides as a spot spray or applied as a cut-stump, basal bark, or frill/injection treatment, or as a wick application. When applied as a cut-stump, basal bark, or frill/injection treatment, or as a wick application or spot spray treatment, the potential for exposure to either terrestrial-phase or aquatic-phase amphibians is low. The greatest opportunity for exposure for terrestrial-phase amphibians would be following a spot spray or wick application made to a large stand of weeds. The potential for exposure to aquatic-phase amphibians would be low since mitigation measures and BMPs minimize or prevent any movement to surface waters. Due to the low potential for exposure and the low toxicity, the potential for adverse effects is also low.

5.4.4 Lecithin

Lecithin was classified as slightly toxic to aquatic-phase amphibians and practically nontoxic to terrestrial-phase amphibians. Lecithin is one of the ingredients in the adjuvant Liberate which could be sprayed with herbicides as a spot spray or applied as a cut-stump, basal bark, or frill/injection treatment, or as a wick application. When applied as a cut-stump, basal bark, or frill/injection treatment, or as a wick application or spot spray treatment, the potential for exposure to either terrestrial-phase or aquatic-phase amphibians is low. The greatest opportunity for exposure for terrestrial-phase amphibians would be following a spot spray or wick application made to a large stand of weeds. The potential for exposure to aquatic-phase amphibians would be low since mitigation measures and BMPs minimize or prevent any movement to surface waters. Due to the low potential for exposure and the low toxicity, the potential for adverse effects is also low.

5.4.5 Phosphite, mono-/di-potassium salts

Monopotassium and dipotassium phosphite salts were classified as practically nontoxic to aquatic-phase amphibians and, at most, slightly toxic to terrestrial-phase amphibians. Products containing phosphite salts are used solely in the District as a fungicide to treat sudden oak death (SOD). The low toxicity for aquatic-phase amphibians and terrestrial-phase amphibians and the limited use pattern lead to a conclusion that use of phosphite salts in the District would pose a low potential for adverse effects for California giant salamander and Santa Cruz black salamander.

5.4.6 Aminopyralid TIPA

Aminopyralid TIPA was classified as, at most, slightly toxic to aquatic-phase amphibians and practically nontoxic to terrestrial-phase amphibians. Products containing aminopyralid TIPA as the sole active ingredient (*e.g*. Milestone) could be used in the District for control of invasive weeds in rangeland, agricultural fields, or in natural lands via spot spray, cut-stump, basal bark, wick, or frill/injection applications. Refer to Section 5.5.2 for information on use sites and application methods associated with Capstone, which contains both aminopyralid TIPA and triclopyr TEA as active ingredients. Despite the possibility of use in a wide variety of settings, the low toxicity of aminopyralid TIPA to both aquatic-phase amphibians and terrestrial-phase amphibians indicates it poses a low risk for California giant salamander and Santa Cruz black salamander when used as a spot spray or wick application for control in invasive weeds or for woody plants used as cut-stump, basal bark, or frill/injection applications in the District.

5.4.7 Clethodim

Clethodim was classified as slightly toxic to aquatic-phase amphibians and practically nontoxic to terrestrial-phase amphibians. Clethodim could be used in the District for control of invasive grass species in natural lands. Its use in natural lands suggests it could be spot sprayed near salamander habitat. However, the low toxicity of clethodim to both aquatic-phase amphibians and terrestrial-phase amphibians indicates it poses a low risk for California giant salamander and Santa Cruz black salamander when used in the District.

5.4.8 Clopyralid MEA

Clopyralid MEA was classified as practically nontoxic to aquatic-phase amphibians and slightly toxic to terrestrial-phase amphibians. Clopyralid MEA could be used in recreational facilities, rangeland, agricultural fields, and natural lands as a spot spray or wick application for weeds such as thistles and clover or for brush and woody plant control as cut-stump or frill/injection applications. Its use in a variety of settings suggest it could be applied near salamander habitat. However, the low toxicity of clopyralid MEA to both aquatic-phase amphibians and terrestrial-phase amphibians indicates it poses a low risk for California giant salamander and Santa Cruz black salamander when used in the District.

5.4.9 Glyphosate IPA

Glyphosate IPA was classified as moderately toxic to aquatic-phase amphibians and practically nontoxic to terrestrial-phase amphibians. Glyphosate IPA is the active ingredient in the terrestrial and aquatic herbicides containing glyphosate. Products containing glyphosate IPA can be used as a spot spray, cut-stump, wick, or frill/injection treatment in recreational facilities (including on dam faces), natural lands, and rangeland and agricultural properties. Therefore, there is the potential for glyphosate IPA to be used near aquatic habitats where aquatic-phase amphibians could occur. The mitigation measures and BMPs in the 2014 EIR require scouting aquatic habitats prior to applying pesticides. Adherence to the mitigation measures and BMPs is anticipated to minimize or prevent exposure of aquatic-phase amphibians. The limited potential for exposure for aquatic phase Santa Cruz black salamander and the low toxicity of glyphosate for terrestrial-phase amphibians indicates the potential is low for adverse effects for California giant salamander and Santa Cruz black salamander following the use of glyphosate IPA for control of a wide spectrum of weed species, including use as a spot spray, cut-stump, wick, or frill/injection application in the District.

5.4.10 Glyphosate K

Glyphosate K was classified as, at most, moderately toxic to aquatic-phase amphibians and practically nontoxic to terrestrial-phase amphibians. Glyphosate K is the active ingredient in the terrestrial-only herbicides containing glyphosate. Products containing glyphosate K can be applied via spot spray, cut-stump, wick, or frill/injection treatment in recreational facilities, fuel management sites, natural lands, and rangeland and agricultural properties. The mitigation measures and BMPs in the 2014 EIR limit the use of glyphosate K near aquatic habitats. Adherence to the mitigation measures and BMPs is anticipated to minimize or prevent exposure of aquatic-phase amphibians. The limited potential for exposure for aquatic phase Santa Cruz black salamander and the low toxicity of glyphosate for terrestrial-phase amphibians indicates the low potential for adverse effects for California giant salamander and Santa Cruz black salamander following the use of glyphosate K for control of a wide spectrum of weed species, including use as a spot spray, cut-stump, wick, or frill/injection treatment in the District.

5.4.11 Imazapyr IPA

Imazapyr IPA was classified as practically nontoxic to aquatic-phase amphibians and practically nontoxic to terrestrial-phase amphibians. Products containing imazapyr IPA can be used in recreational facilities and natural lands for spot spray of a broad spectrum of invasive weeds or cut-stump or frill/injection treatments. Since products containing imazapyr IPA could be used in natural lands, it could be sprayed near salamander habitat. However, its low toxicity leads to a conclusion that imazapyr IPA would pose a low potential for risk for California giant salamander and Santa Cruz black salamander when used in the District.

5.4.12 Diatomaceous Earth

Diatomaceous earth is used within the District only for control of structural pests in and around buildings. Therefore, it is unlikely that aquatic-phase amphibians could be exposed to diatomaceous earth. Diatomaceous earth was classified practically nontoxic to terrestrial-phase amphibians. The limited use of diatomaceous earth in and around buildings along with its low toxicity leads to the conclusion that the use of diatomaceous earth in the District would pose low to no risk for California giant salamander and Santa Cruz black salamander.

5.4.13 Fipronil

Fipronil was classified as highly toxic to aquatic-phase amphibians and terrestrial-phase amphibians. However, within the District, fipronil is used only in and around buildings for control of structural pests. The limited use of fipronil in and around buildings, despite its high toxicity, leads to the conclusion that the use of fipronil in the District would pose low risk for California giant salamander and Santa Cruz black salamander.

5.4.14 Indoxacarb

Indoxacarb was classified as highly toxic to aquatic-phase amphibians and moderately toxic to terrestrial-phase amphibians. However, within the District, indoxacarb is used only in and around buildings for control of structural pests. The limited use of indoxacarb in and around buildings, despite its moderate to high toxicity, leads to the conclusion that the use of indoxacarb in the District would pose low risk for California giant salamander and Santa Cruz black salamander.

5.4.15 S-Hydroprene

S-Hydroprene was classified as practically nontoxic to aquatic-phase amphibians and terrestrial-phase amphibians. S-Hydroprene is used within the District only for control of structural pests in and around buildings. The limited use of S-hydroprene in and around buildings along with its low toxicity leads to the conclusion that the use of S-hydroprene in the District would pose low to no risk for California giant salamander and Santa Cruz black salamander.

5.4.16 Sodium Tetraborate Decahydrate

Sodium tetraborate decahydrate was classified as practically nontoxic to aquatic-phase amphibians and terrestrial-phase amphibians. Sodium tetraborate decahydrate is used within the District only for control of structural pests in and around buildings. The limited use of sodium tetraborate decahydrate in and around buildings along with its low toxicity leads to the conclusion that the use of sodium tetraborate decahydrate in the District would pose low to no risk for California giant salamander and Santa Cruz black salamander.

5.4.17 Cholecalciferol

Cholecalciferol was classified as, at most, slightly toxic to terrestrial-phase amphibians and no classification of toxicity was possible for aquatic-phase amphibians. Cholecalciferol is limited to use for control of rodents inside buildings in the District. Use inside buildings precludes any chance that aquatic-phase amphibians will be exposed. The low toxicity for terrestrial-phase amphibians leads to the conclusion that use of cholecalciferol, on the slight chance an adult salamander might wander into a building, poses a low to no potential for risk to California giant salamander and Santa Cruz black salamander in the District.

5.5 Risk Analysis for New Active Ingredients Considered for Toxicity to All Special-Status Species

5.5.1 Triclopyr BEE

Triclopyr BEE is intended for use for fuel management and invasive weed control in natural lands and at the wildland urban interface, in rangeland and agricultural properties as a spot spray, cut-stump, and basal bark treatment. The potential for use in a wide variety of habitats provides an opportunity for many special-status species to be exposed following applications of triclopyr BEE.

5.5.1.1 Risk to Aquatic Special-Status Species

Triclopyr BEE was classified as moderately toxic to aquatic-phase amphibians, moderately toxic to freshwater aquatic invertebrate species, and highly toxic to freshwater fish. Mitigation measures and BMPs in the 2014 EIR were incorporated to minimize or prevent the movement into surface waters of any pesticides used in the District. Implementation of the mitigation measure and BMPs is anticipated to lead to a low potential for risk to aquatic special-status species following the use of triclopyr BEE for invasive weed control and fuel management within the District.

5.5.1.2 Risk to Terrestrial Special-Status Species

The toxicity of triclopyr BEE to terrestrial-phase amphibians and reptiles was considered similar to that in birds. Triclopyr BEE was classified as slightly toxic to birds and mammals, and practically nontoxic to bees. The wide variety of habitats where triclopyr BEE could be used suggests a moderate to high potential for exposure to special-status species following applications of triclopyr BEE for invasive weed control or fuels management. However, the low toxicity leads to a conclusion of a low potential for risk for terrestrial special-status species in the District.

5.5.2 Triclopyr TEA

Triclopyr TEA in Capstone is intended for use in natural lands and rangeland and agricultural properties as a spot spray for the control of invasive weeds and cut-stump or frill/injection for control of woody vegetation. The potential for use in multiple habitats provides an opportunity for many special-status species to be exposed following applications of triclopyr TEA. Note that Capstone contains both triclopyr TEA and aminopyralid TIPA. Refer to Section 5.4.6 for information on use sites and application methods associated with only aminopyralid TIPA.

5.5.2.1 Risk to Aquatic Special-Status Species

Triclopyr TEA was classified as practically nontoxic to aquatic-phase amphibians, freshwater aquatic invertebrate species, and freshwater fish. Implementation of the mitigation measures and BMPs in the 2014 EIR along with the low toxicity lead to the conclusion of a low potential for risk to aquatic special-status species following the use of triclopyr TEA for invasive weed control within the District.

5.5.2.2 Risk to Terrestrial Special-Status Species

The toxicity of triclopyr TEA to terrestrial-phase amphibians and reptiles was considered similar to that in birds. Triclopyr TEA was classified as practically nontoxic to birds, mammals, and bees. Use of triclopyr TEA in multiple habitats suggests a moderate to high potential for exposure to special-status species following applications of triclopyr TEA for invasive weed or woody plant control. However, the low toxicity leads to a conclusion of a low potential for risk for terrestrial special-status species in the District.

5.5.3 Prallethrin

Prallethrin is intended for use around buildings and in recreational facilities, for control of stinging insects such as wasps or yellow jackets. Treatments in recreational facilities could include treatment of ground nests along hiking trails.

5.5.3.1 Risk to Aquatic Special-Status Species

Toxicity for aquatic-phase amphibians is anticipated to be similar to that determined for freshwater fish. Prallethrin was classified as very highly toxic to freshwater aquatic invertebrate species and freshwater fish. Despite being considered highly toxic to aquatic species, prallethrin is not anticipated to pose a high risk to aquatic special-status species because of its very limited use. The use being limited to around buildings and along trails in recreational areas indicates such low potential for exposure of aquatic special-status species that the potential for risk is low.

5.5.3.2 Risk to Terrestrial Special-Status Species

The toxicity of prallethrin to terrestrial-phase amphibians and reptiles was considered similar to that in birds. Prallethrin was classified as, at most, slightly toxic to birds, moderately toxic to mammals, but highly toxic to bees. The limited nature of use of prallethrin to treatment around buildings and to ground nests of stinging insects along hiking trails greatly limits the potential for exposure for special-status terrestrial vertebrate species. Mitigation Measure 4-2.1c specifically addresses special-status terrestrial invertebrate species. Adherence to Mitigation Measure 4-2.1c and the very limited nature of the use pattern leads to a conclusion that the risk from the use of prallethrin for control of stinging insects in the District is low.

6 Uncertainties

Uncertainty in ecological risk assessment derives partly from biological variability. The response of ecological receptors following exposure to contaminants will vary among individuals within a species as well as across species. Also, literature values from various species are used to predict the response of the species of interest in this SLERA. The differences among species always introduces unavoidable uncertainty to a SLERA. Uncertainty regarding predictions in a risk assessment may be due to inherent randomness, limited knowledge, or lack of knowledge (Suter, 2007).

6.1 Exposure Assessment Uncertainties

In this SLERA, exposure of ecological receptors could not be directly measured. The application equipment, areal extent, and location were all considered in a qualitative assessment of exposure. Past pesticide use information was used as a guide to likely future use, with the understanding that the program is likely to expand (See Section 3 of the Addendum Report).

Pesticide application scenarios were based on descriptions provided by District staff. Past pesticide use patterns provide an excellent indicator of likely future use. The most common conditions under which applications have been made were evaluated, but some uncommon conditions that could lead to greater or lesser exposure than the scenarios represented in the risk assessment were not specifically considered. It is possible that smaller or larger application areas than used in this SLERA could occur in the future.

Most herbicide applications are spot applications where only the target pest plants are treated. Past records indicate the area in which the treatments were made and the amount of herbicide applied. However, the distribution within the treated area was not described, so the uniformity of the application across the landscape is not known, nor can it be predicted for future applications. This creates uncertainty regarding the concentrations of herbicides within small areas of the larger treated area. It is possible that target weed species exhibited a clumped distribution and might do so in the future which would produce an uneven distribution of herbicides across the landscape.

Since this SLERA is attempting to address potential future applications of pesticides, the proximity of application sites is not known. For species with large foraging areas, more than one application site could occur within a species' foraging range. Without knowing the distribution of application sites across a species foraging range, the appropriateness of any exposure estimates cannot be known.

6.2 Effects Assessment Uncertainties

6.2.1 Use of Surrogate Species Effects Data

Toxicity data were rarely available for the special-status species considered in the risk assessment. Use of effects data from species other than the species of concern inherently added uncertainty to the assessment. When toxicity data for more than one species was available, the more sensitive species was selected.

Toxicity data were not always available for all taxonomic groups. This was most common for amphibians and reptiles. Bird or fish toxicity data were used when no data were available for terrestrial-phase amphibians and reptiles or aquatic-phase amphibians, respectively. It was not known when this approach might lead to an over or underestimation of risk.

6.2.2 Sublethal Effects

Sublethal effects were not specifically addressed, but when ecologically relevant sublethal toxicity endpoints were available, they were included in the reference toxicity data.

6.2.3 Dermal or Inhalation Effects

In SLERAs, it is standard practice to only address effects from oral exposure to terrestrial vertebrates. In general, focusing on effects from oral exposures is adequate (Suter, 2007: pp. 258-259). However, for terrestrial-phase amphibians, it is possible that dermal exposure to pesticide active ingredient or adjuvants on surface soils might be readily absorbed and contribute to adverse effects in these species. Effects data for this pathway do not exist, so any effects from contact of terrestrial-phase amphibians to pesticide active ingredient or adjuvants in soils are unknown. Also, inhalation exposure to airborne pesticide active ingredient or adjuvants can occur. Effects data from inhalation exposure are also lacking for wildlife species. The inability to include any potential risk derived from dermal or inhalation exposure will necessarily underestimate total risk, but since these routes are thought to generally be negligible, exclusion of exposure from these routes did not seriously affect the assessment of risk.

7 Conclusions

This SLERA was conducted to determine the potential harm to ecological receptors from implementation of previously assessed pesticide active ingredients and adjuvants to California giant salamander and Santa Cruz black salamander. These two species were not considered special-status species at the time of the 2014 EIR. This SLERA also considered the potential for adverse effects from applications of products containing triclopyr BEE, triclopyr TEA, and prallethrin for all special-status species that could occur within the District. The SLERA consisted of a qualitative assessment of exposure and along with an evaluation of whether the level of exposure might be sufficient to produce adverse effects, based on the toxicity of the pesticide active ingredients and adjuvants. The SLERA relied upon the three-stage process for risk assessments: problem formulation, analysis, and risk characterization. The problem formulation stage concluded with a CSM that identified the complete exposure pathways carried forward in the analysis based on information that was available to evaluate the potential exposure pathways. During the analysis phase of the SLERA, qualitative exposure estimates were considered based on application scenarios. Also in the analysis phase, effect values were identified which incorporated the toxicity properties of the pesticide active ingredient or adjuvants. The risk characterization phase provided conclusions on the potential for adverse effects to occur to ecological receptors. The risk characterization phase utilized a qualitative assessment.

Section 5 lists the results of the risk characterization phase for every species class. As described in Section 5, the qualitative assessment considers the potential for species presence at an application site, incorporation of foraging range and diet, and fate and transport processes such as dilution and degradation.

The District's BMPs are designed to greatly reduce, if not eliminate, movement to surface water. Therefore, actual impacts to aquatic invertebrates or birds and mammals that feed in aquatic habitats are anticipated to be minimal. Herbicides exhibit low toxicity to terrestrial animals. Although there is a greater chance of exposure for special-status terrestrial animals, the low toxicity leads to a conclusion that terrestrial special-status species are not at risk. Some insecticides exhibit high toxicity to ecological receptors, mostly aquatic species. However, their restricted uses to in and around buildings limits exposure such that it can be concluded that adverse effects will not occur. Because of the targeted nature of prallethrin applications to stinging insect nests, only those species would be directly exposed. Most insects, such as flying insects, would receive no exposure following an application to a wasp or hornet nest. Thus, most insects and insectivorous species are anticipated to be exposed to very limited amounts of prallethrin, leading to a conclusion that no special-status species are at risk.

This SLERA along with the 2014 EIR will be used to assist the District in assessing the potential to affect particular species and developing site-specific measures to protect these species. This SLERA did not identify new significant environmental effects or substantial increases in the severity of the significant effects identified in the 2014 EIR. No alterations to any of the scenarios assessed in this SLERA that were not already indicated for other scenarios in the 2014 EIR are recommended for the protection of biological resources.

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