# Risks of Propargite Use to Federally Threatened California Red-legged Frog

(*Rana aurora draytonii*)

**Pesticide Effects Determination**

**Environmental Fate and Effects Division**
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**Washington, D.C. 20460**

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# 1. Executive Summary

The purpose of this assessment is to evaluate potential direct and indirect effects on the California red-legged frog *(Rana aurora draytonii*) (CRLF) arising from the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) regulatory actions regarding use of propargite on agricultural and non-agricultural sites. In addition, this assessment evaluates whether these actions can be expected to result in modification of the species' designated critical habitat. This assessment was completed in accordance with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) *Endangered Species Consultation Handbook* (USFWS/NMFS 1998) and procedures outlined in the Agency's Overview Document (U.S. EPA 2004).

The CRLF was listed as a threatened species by USFWS in 1996. The species is endemic to California and Baja California (Mexico) and inhabits both coastal and interior mountain ranges. A total of 243 streams or drainages are believed to be currently occupied by the species, with the greatest numbers in Monterey, San Luis Obispo, and Santa Barbara counties (USFWS, 1996) in California.

Propargite (an organosulfite chemical) is an acaricide/miticide that functions acutely on contact with larval and adult mites and displays limited ovicidal activity (USEPA 2000). Propargite inhibits oxidative phosphorylation by disrupting ATP formation. (http://edis.ifas.ufl.edu/PI121).

In California, current labeled uses of propargite include alfalfa, almond & walnut, avocado, beans, berries, citrus, clover, corn, cotton, forestry, grapes, hops, jojoba, mint, nectarine, ornamental woody shrubs & vines, other ornamental uses, peanuts, sorghum, strawberry, tree fruit, and tree nut uses. (The preceding use descriptions are related to the uses that appear on labels in Table 3.1.) The following uses are *not* considered as part of the federal action evaluated in this assessment: carrot, ornamental lawns and turf, potato, and sugar beet uses due to geographic restrictions included on pesticide labels that preclude use of propargite on these label uses/sites in California.

Propargite does not degrade rapidly on soils nor in aquatic environments (laboratory half-lives were 38-168 days) and is only slightly to hardly mobile ($K_{oc}$s of 2963 - 57966 mL/g). Initial off-target transport is expected to be through spray drift from aerial, airblast, and ground boom applications and later through erosion and runoff of soil particles to which propargite is adsorbed.

Since CRLFs exist within aquatic and terrestrial habitats, exposure of the CRLF, its prey, and its habitats to propargite are assessed separately for both habitats. Tier-II aquatic exposure models are used to estimate high-end exposures of propargite in aquatic habitats resulting from runoff and spray drift from different uses. Peak model-estimated environmental concentrations (EECs) resulting from different propargite uses range from 3.5 to 48 µg/L. These estimates are supplemented with analysis of available California surface water monitoring data from the U.S. Geological Survey's (USGS) National Water Quality Assessment (NAWQA) program and the California Department of Pesticide

Regulation (CDPR). The maximum concentration of propargite reported by both the NAWQA and CDPR surface water databases for California is 20 µg/L (2.4 times lower than the highest peak EECs of 48 µg/L). These observations are the same for both data sets because the CDPR data set is a compilation of data that includes the NAWQA data and because this maximum value originally came from the NAWQA data set. SCI-GROW simulations predicted a ground water concentration of 0.006 µg/L (U.S. EPA 2000).

To estimate propargite exposures to the terrestrial-phase CRLF, and its potential prey the T-REX model is used for foliar uses. The AgDRIFT model is used to estimate deposition of propargite on terrestrial and aquatic habitats from spray drift. The TerrPlant model is used to estimate propargite exposures to terrestrial-phase CRLF habitat, including plants inhabiting semi-aquatic and dry areas, resulting from uses involving foliar propargite applications. The T-HERPS model is used to allow for further characterization of dietary exposures of terrestrial-phase CRLFs relative to birds.

The effects determination assessment endpoints for the CRLF include direct toxic effects on the survival, reproduction, and growth of the CRLF itself, as well as indirect effects, such as reduction of the prey base or modification of its habitat. Direct effects to the CRLF in the aquatic habitat are based on toxicity information for freshwater fish, which are generally used as a surrogate for aquatic-phase amphibians. In the terrestrial habitat, direct effects are based on toxicity information for birds, which are used as a surrogate for terrestrial-phase amphibians. Given that the CRLF's prey items and designated critical habitat requirements in the aquatic habitat are dependant on the availability of freshwater aquatic invertebrates and aquatic plants, toxicity information for these taxonomic groups is also discussed. In the terrestrial habitat, indirect effects due to depletion of prey are assessed by considering effects to terrestrial insects, small terrestrial mammals, and frogs. Indirect effects due to modification of the terrestrial habitat are characterized by available data for terrestrial monocots and dicots.

Degradates of propargite were identified from available fate studies (Table 2.1) and assessed qualitatively. Based on the dissimilarity of the degradates' chemical structure and/or low maximum degradate yield in any of the fate studies, none of the identified degradates are considered to exceed the risk of the parent compound, propargite, or pose a synergistic risk in conjunction with the parent compound.

Risk quotients (RQs) are derived as quantitative estimates of potential high-end risk. Acute and chronic RQs are compared to the Agency's levels of concern (LOCs) to identify instances where propargite use within the action area has the potential to adversely affect the CRLF and its designated critical habitat via direct toxicity or indirectly based on direct effects to its food supply (*i.e.*, freshwater invertebrates, algae, fish, frogs, terrestrial invertebrates, and mammals) or habitat (*i.e.*, aquatic plants and terrestrial upland and riparian vegetation). When RQs for a particular type of effect are below LOCs, the pesticide is determined to have "no effect" on the subject species. Where RQs exceed LOCs, a potential to cause adverse effects is identified, leading to a conclusion of "may affect." If a determination is made that use of propargite within the action area "may affect" the CRLF and its designated critical habitat, additional information is considered to refine the potential for exposure and effects, and the best available information is used to distinguish those actions that "may affect, but are not likely to adversely affect" (NLAA) from those actions that are "likely to adversely affect" (LAA) the CRLF or modify its critical habitat.

Based on the best available information, the Agency makes a Likely to Adversely Affect determination for the CRLF from the use of propargite. Additionally, the Agency has determined that there is the potential for modification of CRLF designated critical habitat from the use of the chemical. These determinations are based on: 1) direct effects to the CRLF and 2) adverse effects expected to the prey base of the aquatic and terrestrial-phase CRLF for all the modeled uses. A summary of the risk conclusions and effects determinations for the CRLF and its critical habitat is presented in **Tables 1.1 and 1.2**. Use-specific determinations for direct and indirect effects to the CRLF are provided in **Tables 1.3 and 1.4**. Further information on the results of the effects determination is included as part of the Risk Description in Section 5.2.

**Table 1.1 Effects Determination Summary for Direct and Indirect Effects of Propargite on the CRLF**

| Assessment Endpoint | Effects Determination[1] | Basis for Determination |
|---|---|---|
| ***Aquatic-Phase CRLF (Eggs, Larvae, and Adults)*** | | |
| Direct Effects:<br>Survival, growth, and reproduction of CRLF individuals via direct effects on aquatic-phases | LAA | The LOC is exceeded for all uses except tree nut and tree fruit based on the modeled estimated environmental concentrations (EECs) and for all uses based on the monitored maximum concentrations. In addition, there are several other lines of evidence discussed in the risk description sec. 5.2.1.1 |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via effects to food supply (*i.e.*, freshwater invertebrates, non-vascular plants, fish, and frogs) | Freshwater invertebrates: NLAA | The effect on the CRLF is discountable as only a small percentage of the aquatic invertebrate prey will be acutely affected based on the results of the probit analysis. |
| | Non-vascular aquatic plants: NE | There are no LOC exceedances for risk to non-vascular aquatic plants for any of the modeled uses. |
| | Fish and frogs: LAA | The LOC is exceeded for all uses except jojoba based on the modeled EECs and for all uses based on the maximum concentration from available monitoring data |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat, cover, and/or primary productivity (*i.e.*, aquatic plant community) | Non-vascular aquatic plants: NE | There are no LOC exceedances for any of the modeled uses. |
| | Vascular aquatic plants: NE | There are no LOC exceedances for risk to vascular aquatic plants for any of the modeled uses. |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via effects to riparian vegetation, required to maintain acceptable water quality and habitat in ponds and streams comprising the species' current range. | NE | There are no LOC exeedances for risk to terrestrial plants. |

| Table 1.1 Effects Determination Summary for Direct and Indirect Effects of Propargite on the CRLF | | |
|---|---|---|
| **Assessment Endpoint** | **Effects Determination[1]** | **Basis for Determination** |
| ***Terrestrial-Phase CRLF (Juveniles and adults)*** | | |
| Direct Effects:<br>Survival, growth, and reproduction of CRLF individuals via direct effects on terrestrial-phase adults and juveniles (based on most sensitive toxicity data for birds) | LAA | Based on the RQ calculations from both the T-REX and T-HERPS models, there are LOC exceedances for risk to the terrestrial-phase CRLF for all the modeled uses except jojoba, sorghum, and other ornamentals. Additionally since there are a multitude of use patterns of propargite that could potentially overlap the habitat of the CRLF, the terrestrial-phase CRLF may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via effects on prey (*i.e.*, terrestrial invertebrates, small terrestrial vertebrates, including mammals and terrestrial-phase amphibians) | Terrestrial invertebrates: LAA | Based on the RQ calculations, there are LOC exceedances for risk to terrestrial invertebrate insect prey of the terrestrial-phase CRLF for all the modeled uses. Additionally since there are a multitude of use patterns of propargite that may potentially overlap the habitat of the CRLF, the terrestrial invertebrate prey may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| | Mammals: LAA | Based on the RQ calculations, there are LOC exceedances for risk to mammalian prey of the terrestrial-phase CRLF for all the modeled uses. Additionally since there are a multitude of use patterns of propargite that may potentially overlap the habitat of the CRLF, the mammalian prey may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| | Frogs: LAA | Based on the RQ calculations from both the T-REX and T-HERPS models, there are LOC exceedances for risk to frog prey of the terrestrial-phase CRLF for all the modeled uses. Additionally since there are a multitude of use patterns of propargite that may potentially overlap the habitat of the CRLF, frog prey of the terrestrial-phase CRLF may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat (*i.e.*, riparian vegetation) | NE | There are no LOC exeedances for risk to terrestrial plants. |

[1] NE = no effect; NLAA = may affect, but not likely to adversely affect; LAA = likely to adversely affect.

**Table 2 .2 Effects Determination Summary for the Critical Habitat Impact Analysis**

| Assessment Endpoint | Effects Determination[1] | Basis for Determination |
|---|---|---|
| ***Aquatic-Phase CRLF PCEs (Aquatic Breeding Habitat and Aquatic Non-Breeding Habitat)*** | | |
| Alteration of channel/pond morphology or geometry and/or increase in sediment deposition within the stream channel or pond: aquatic habitat (including riparian vegetation) provides for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLFs. | NHM | There are no LOC exeedances for risk to terrestrial plants. |
| Alteration in water chemistry/quality including temperature, turbidity, and oxygen content necessary for normal growth and viability of juvenile and adult CRLFs and their food source.[1] | NHM | There are no LOC exceedances for risk to non-vascular or vascular aquatic plants for any of the modeled uses. |
| Alteration of other chemical characteristics necessary for normal growth and viability of CRLFs and their food source. | HM | There are LOC exceedances for all the modeled uses for all the prey of the aquatic-phase of the CRLF. |
| Reduction and/or modification of aquatic-based food sources for pre-metamorphs (*e.g.*, algae). | NHM | There are no LOC exceedances for risk to aquatic non-vascular plants (algae). |
| ***Terrestrial-Phase CRLF PCEs (Upland Habitat and Dispersal Habitat)*** | | |
| Elimination and/or disturbance of upland habitat; ability of habitat to support food source of CRLFs: Upland areas within 200 ft of the edge of the riparian vegetation or dripline surrounding aquatic and riparian habitat that are comprised of grasslands, woodlands, and/or wetland/riparian plant species that provide the CRLF shelter, forage, and predator avoidance. | NHM | There are no LOC exeedances for risk to terrestrial plants. |
| Elimination and/or disturbance of dispersal habitat: Upland or riparian dispersal habitat within designated units and between occupied locations within 0.7 mi of each other that allow for movement between sites including both natural and altered sites which do not contain barriers to dispersal. | NHM | |
| Reduction and/or modification of food sources for terrestrial-phase juveniles and adults. | HM | There are LOC exceedances for all the modeled uses for all terrestrial-phase CRLF food items including mammals, frogs, and terrestrial insects. |
| Alteration of chemical characteristics necessary for normal growth and viability of juvenile and adult CRLFs and their food sources. | HM | There are LOC exceedances for all the modeled uses for all terrestrial-phase CRLF food items including mammals, frogs, and terrestrial insects. |
| [1] NHM = No habitat modification HM = habitat modification | | |

Tables 1.3 and 1.4 below illustrates the effects determinations for the direct and indirect effects to the CRLF for each use. Table 1.3 demonstrates that propargite was: 1) "likely to adversely effect" the aquatic phase of the CRLF on a direct acute toxic effect basis for all the modeled uses except tree nut and fruit nut, 2) a "no effect" to the aquatic phase of the CRLF on a direct chronic basis for all the modeled uses, 3) a "likely to adversely effect" the terrestrial phase of the CRLF on a direct acute effect basis for all the modeled

[1] Physico-chemical water quality parameters such as salinity, pH, and hardness are not evaluated because these processes are not biologically mediated and, therefore, are not relevant to the endpoints included in this assessment.

uses except  other ornamental, sorghum, and jojoba., and 4) a likely to adversely effect the terrestrial phase of the CRLF on a direct chronic effect basis for all the modeled uses.

| Table 1.3  Propargite Use-specific Direct Effects Determinations[1] for the CRLF | | | | |
|---|---|---|---|---|
| Use(s) | Aquatic Habitat | | Terrestrial Habitat | |
| | Acute | Chronic | Acute | Chronic |
| **1.** Alfalfa | LAA | NE | LAA | LAA |
| **2.** Almond & Walnut | LAA | NE | LAA | LAA |
| **3.** Avocado | LAA | NE | LAA | LAA |
| **4.** Beans | LAA | NE | LAA | LAA |
| **5.** Berries | LAA | NE | LAA | LAA |
| **6.** Citrus | LAA | NE | LAA | LAA |
| **7.** Clover | LAA | NE | LAA | LAA |
| **8.** Corn | LAA | NE | LAA | LAA |
| **9.** Cotton | LAA | NE | LAA | LAA |
| **10.** Forestry | LAA | NE | LAA | LAA |
| **11.** Grapes | LAA | NE | LAA | LAA |
| **12.** Hops | LAA | NE | LAA | LAA |
| **13.** Jojoba | LAA | NE | NE | LAA |
| **14.** Mint | LAA | NE | LAA | LAA |
| **15.** Nectarine | LAA | NE | LAA | LAA |
| **16.** Ornamental Woody Shrubs & Vines | LAA | NE | LAA | LAA |
| **17.** Other Ornamental | LAA | NE | NE | LAA |
| **18.** Peanuts | LAA | NE | LAA | LAA |
| **19.** Sorghum | LAA | NE | NE | LAA |
| **20.** Strawberry | LAA | NE | LAA | LAA |
| **21.** Tree fruit except nectarine | NE | NE | LAA | LAA |
| **22.** Tree nut except almond and walnut | NE | NE | LAA | LAA |
| [1] NE = No effect; NLAA = May affect, but not likely to adversely affect; LAA = Likely to adversely affect. | | | | |

| Table 1.4 Propargite Use-specific Indirect Effects Determinations[1] Based on Effects to Prey | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Use(s)** | **Non-vascular Plants** | **Aquatic Invertebrates** | | **Terrestrial Invertebrates (Acute)** | **Aquatic-phase frogs and fish** | | **Terrestrial-phase frogs** | | **Small Mammals** | |
| | | **Acute** | **Chronic** | | **Acute** | **Chronic** | **Acute** | **Chronic** | **Acute** | **Chronic** |
| **1.** Alfalfa | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **2.** Almond & Walnut | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **3.** Avocado | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **4.** Beans | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **5.** Berries | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **6.** Citrus | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **7.** Clover | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **8.** Corn | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **9.** Cotton | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **10.** Forestry | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **11.** Grapes | NE | NLAA | NE | LAA | NE | NE | LAA | LAA | LAA | LAA |
| **12.** Hops | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **13.** Jojoba | NE | NLAA | NE | LAA | LAA | NE | NE | LAA | NE | LAA |
| **14.** Mint | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **15.** Nectarine | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **16.** Ornamental Woody Shrubs & Vines | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **17.** Other Ornamental | NE | NLAA | NE | LAA | LAA | NE | NE | LAA | NE | LAA |
| **18.** Peanuts | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **19.** Sorghum | NE | NLAA | NE | LAA | LAA | NE | NE | LAA | NE | LAA |
| **20.** Strawberry | NE | NLAA | NE | LAA | LAA | NE | LAA | LAA | LAA | LAA |
| **21.** Tree fruit except nectarine | NE | NLAA | NE | LAA | NE | NE | LAA | LAA | LAA | LAA |

| Table 1.4 Propargite Use-specific Indirect Effects Determinations[1] Based on Effects to Prey | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Use(s)** | **Non-vascular Plants** | **Aquatic Invertebrates** | | **Terrestrial Invertebrates (Acute)** | **Aquatic-phase frogs and fish** | | **Terrestrial-phase frogs** | | **Small Mammals** | | |
| | | **Acute** | **Chronic** | | **Acute** | **Chronic** | **Acute** | **Chronic** | **Acute** | **Chronic** | |
| **22.** Tree nut except almond and walnut | NE | NLAA | NE | LAA | NE | NE | NE | LAA | LAA | LAA | |

[1] NE = No effect; NLAA = May affect, not likely to adversely affect; LAA = Likely to adversely affect.

Based on the conclusions of this assessment, a formal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act should be initiated.

When evaluating the significance of this risk assessment's direct/indirect and adverse habitat modification effects determinations, it is important to note that pesticide exposures and predicted risks to the species and its resources (*i.e.*, food and habitat) are not expected to be uniform across the action area. In fact, given the assumptions of drift and downstream transport (*i.e.*, attenuation with distance), pesticide exposure and associated risks to the species and its resources are expected to decrease with increasing distance away from the treated field or site of application. Evaluation of the implication of this non-uniform distribution of risk to the species would require information and assessment techniques that are not currently available. Examples of such information and methodology required for this type of analysis would include the following:

- Enhanced information on the density and distribution of CRLF life stages within specific recovery units and/or designated critical habitat within the action area. This information would allow for quantitative extrapolation of the present risk assessment's predictions of individual effects to the proportion of the population extant within geographical areas where those effects are predicted. Furthermore, such population information would allow for a more comprehensive evaluation of the significance of potential resource impairment to individuals of the species.
- Quantitative information on prey base requirements for individual aquatic- and terrestrial-phase frogs. While existing information provides a preliminary picture of the types of food sources utilized by the frog, it does not establish minimal requirements to sustain healthy individuals at varying life stages. Such information could be used to establish biologically relevant thresholds of effects on the prey base, and ultimately establish geographical limits to those effects. This information could be used together with the density data discussed above to characterize the likelihood of adverse effects to individuals.
- Information on population responses of prey base organisms to the pesticide. Currently, methodologies are limited to predicting exposures and likely levels of direct mortality and growth or reproductive impairment immediately following exposure to the pesticide. The degree to which repeated exposure events and the inherent demographic characteristics of the prey population play into the extent to which prey resources may recover is not predictable. An enhanced understanding of long-term prey responses to pesticide exposure would allow for a more refined determination of the magnitude and duration of resource impairment, and together with the information described above, a more complete prediction of effects to individual frogs and potential modification to critical habitat.

## 2. Problem Formulation

Problem formulation provides a strategic framework for the risk assessment. By identifying the important components of the problem, it focuses the assessment on the most relevant life history stages, habitat components, chemical properties, exposure routes, and endpoints. The structure of this risk assessment is based on guidance contained in U.S. EPA's *Guidance for Ecological Risk Assessment* (U.S. EPA 1998), the Services' *Endangered Species Consultation Handbook* (USFWS/NMFS 1998) and is consistent with procedures and methodology outlined in the Overview Document (U.S. EPA 2004) and reviewed by the U.S. Fish and Wildlife Service and National Marine Fisheries Service (USFWS/NMFS 2004).

### 2.1 Purpose

The purpose of this endangered species assessment is to evaluate potential direct and indirect effects on individuals of the federally threatened California red-legged frog *(Rana aurora draytonii*) (CRLF) arising from FIFRA regulatory actions regarding use of propargite on agricultural, nursery, and forest uses. In addition, this assessment evaluates whether use on these crops is expected to result in modification of the species' designated critical habitat. This ecological risk assessment has been prepared consistent with a settlement agreement in the case *Center for Biological Diversity (CBD) vs. EPA et al*. (Case No. 02-1580-JSW(JL)) settlement entered in Federal District Court for the Northern District of California on October 20, 2006.

In this assessment, direct and indirect effects to the CRLF and potential modification to its designated critical habitat are evaluated in accordance with the methods described in the Agency's Overview Document (U.S. EPA 2004). Screening level methods include use of standard models such as PRZM-EXAMS, T-REX, TerrPlant, AgDRIFT, and AGDISP, all of which are described at length in the Overview Document. The California PUR data and T-HERPS model are used as methods for refining of the assessment findings by the standard models. Use of such information is consistent with the methodology described in the Overview Document (U.S. EPA 2004), which specifies that "the assessment process may, on a case-by-case basis, incorporate additional methods, models, and lines of evidence that EPA finds technically appropriate for risk management objectives" (Section V, page 31 of U.S. EPA 2004).

In accordance with the Overview Document, provisions of the ESA, and the Services' *Endangered Species Consultation Handbook,* the assessment of effects associated with registrations of propargite is based on an action area. The action area is the area directly or indirectly affected by the federal action, as indicated by the exceedance of the Agency's Levels of Concern (LOCs). It is acknowledged that the action area for a national-level FIFRA regulatory decision associated with a use of propargite may potentially involve numerous areas throughout the United States and its Territories. However, for the purposes of this assessment, attention will be focused on relevant sections of the action area including those geographic areas associated with locations of the CRLF and its designated critical habitat within the state of California. As part of the "effects determination," one of the following three conclusions will be reached regarding the potential use of propargite in accordance with current labels:

- "No effect";
- "May affect, but not likely to adversely affect"; or
- "May affect and likely to adversely affect".

Designated critical habitat identifies specific areas that have the physical and biological features, (known as primary constituent elements or PCEs) essential to the conservation of the listed species. The PCEs for CRLFs are aquatic and upland areas where suitable breeding and non-breeding aquatic habitat is located, interspersed with upland foraging and dispersal habitat.

If the results of initial screening-level assessment methods show no direct or indirect effects (no LOC exceedances) upon individual CRLFs or upon the PCEs of the species' designated critical habitat, a "no effect" determination is made for use of propargite as it relates to this species and its designated critical habitat. If, however, potential direct or indirect effects to individual CRLFs are anticipated or effects may impact the PCEs of the CRLF's designated critical habitat, a preliminary "may affect" determination is made for the FIFRA regulatory action regarding propargite.

If a determination is made that use of propargite within the action area(s) associated with the CRLF "may affect" this species or its designated critical habitat, additional information is considered to refine the potential for exposure and for effects to the CRLF and other taxonomic groups upon which these species depend (*e.g.*, aquatic and terrestrial vertebrates and invertebrates, aquatic plants, riparian vegetation, *etc*.). Additional information, including spatial analysis (to determine the geographical proximity of CRLF habitat and propargite use sites) and further evaluation of the potential impact of propargite on the PCEs is also used to determine whether modification of designated critical habitat may occur. Based on the refined information, the Agency uses the best available information to distinguish those actions that "may affect, but are not likely to adversely affect" from those actions that "may affect and are likely to adversely affect" the CRLF or the PCEs of its designated critical habitat. This information is presented as part of the Risk Characterization in Section 5 of this document.

The Agency believes that the analysis of direct and indirect effects to listed species provides the basis for an analysis of potential effects on the designated critical habitat. Because propargite is expected to directly impact living organisms within the action area (defined in Section 2.7), critical habitat analysis for propargite is limited in a practical sense to those PCEs of critical habitat that are biological or that can be reasonably linked to biologically mediated processes (*i.e.*, the biological resource requirements for the listed species associated with the critical habitat or important physical aspects of the habitat that may be reasonably influenced through biological processes). Activities that may modify critical habitat are those that alter the PCEs and appreciably diminish the value of the habitat. Evaluation of actions related to use of propargite that may alter the PCEs of the CRLF's critical habitat form the basis of the critical habitat impact analysis. Actions that may affect the CRLF's designated critical habitat have been identified by the Services and are discussed further in Section 2.6.

## 2.2 Scope

Propargite is currently registered as an acaracide/miticide for agricultural, nursery, and forest uses.

The end result of the EPA pesticide registration process (*i.e.*, the FIFRA regulatory action) is an approved product label. The label is a legal document that stipulates how and where a given pesticide may be used. Product labels (also known as end-use labels) describe the formulation type (*e.g.,* liquid or granular), acceptable methods of application, approved use sites, and any restrictions on how applications may be conducted. Thus, the use or potential use of propargite in accordance with the approved product labels for California is "the action" relevant to this ecological risk assessment.

Although current registrations of propargite allow for use nationwide, this ecological risk assessment and effects determination addresses currently registered uses of propargite in portions of the action area that are reasonably assumed to be biologically relevant to the CRLF and its designated critical habitat. Further discussion of the action area for the CRLF and its critical habitat is provided in Section 2.7.

The Health Effects Division (HED) has concluded that parent propargite is the only residue included in the tolerance expression for propargite (U.S. EPA 2000). Based on the dissimilarity of the degradates' chemical structure and/or low maximum degradate yield in the fate studies, none of the identified degradates are considered to exceed the risk of the parent compound alone or pose a synergistic risk in conjunction with the parent compound. Therefore, EFED assessed ecological risk based on modeling predictions on the parent compound alone.

The Agency does not routinely include an evaluation of mixtures of active ingredients in its risk assessments, either those mixtures of multiple active ingredients in product formulations or those in the applicator's tank. In the case of the product formulations of active ingredients (that is, a registered product containing more than one active ingredient), each active ingredient is subject to an individual risk assessment for regulatory decision regarding the active ingredient on a particular use site. If effects data are available for a formulated product containing more than one active ingredient, they may be used qualitatively or quantitatively in accordance with the Agency's Overview Document and the Services' Evaluation Memorandum (U.S. EPA 2004; USFWS/NMFS 2004). However, propargite does not have any registered products that contain multiple active ingredients. Therefore, an assessment based on the toxicity of the single active ingredient (propargite) is appropriate.

## 2.3 Previous Assessments

Propargite was assessed for the Propargite Reregistration Eligibility Decision (RED) (U.S. EPA 2000). No new registrant-sponsored fate or effects studies were submitted or included in this assessment that were not included in the previous RED. A search of ecological toxicity data (ECOTOX Data) did not provide any assessment endpoints that were more sensitive (lower) than those endpoints previously identified in the RED. The RED concluded:

> EFED's assessment suggests that the most significant ecological risk posed by the use of propargite is the potential for adverse effects on reproduction in birds and mammals. … The assessment indicates that reproduction risk to birds may occur where propargite is applied a single time at 0.5 lb active ingredient per acre (ai/A) or greater... Concerns for reproduction risk to mammals are triggered at application rates of 1.6 lb ai/A or greater. These concerns are heightened when multiple applications of propargite, which are allowed by most labels, are factored into the assessment…
>
> The EFED assessment suggests that risk to aquatic organisms and plants are generally lower than the risk for birds and mammals. However, the standard method for assessing aquatic risk results in concern for potential chronic effects to freshwater fish and invertebrates… EFED's criteria for restricted use and endangered species are exceeded for most classes of terrestrial and aquatic organisms (USEPA 2000, page 1).

In July 2002, EPA submitted a request for formal consultation to the National Marine Fisheries Service relative to the potential effects of propargite uses on pacific anadromous salmon and steelhead species. That assessment concluded that propargite use was likely to adversely affect 7 Environmentally Significant Units (ESUs) of salmon and steelhead, was Not Likely to Adversely Affect 12 ESUs and would have No Effect on 7 ESUs. The Agency is currently in consultation with the National Marine Fisheries Service relative to that assessment.

## 2.4 Stressor Source and Distribution

### 2.4.1 Environmental Fate Properties

#### 2.4.1.1 Chemical Profile

Table 2.1 lists the chemical nomenclature and properties of propargite.

**Table 2.1 Chemical nomenclature and properties of propargite.**

| Property | Value |
|---|---|
| Common Name | Propargite |
| Chemical Name | 2-[4-(1,1-dimethylethyl)phenoxy]cyclohexyl 2-propynyl sulfite |
| CAS Number | 2312-35-8 |
| Pesticide Class | Organo-sulfite |
| Molecular Formula | $C_{19}H_{26}SO_4$ |
| Molecular Weight | 350.5 g/mole |

| Property | Value |
| --- | --- |
| Physical State | light to dark brown viscous liquid |
| Vapor Pressure | $4.49 \times 10^{-8}$ torr |
| Water Solubility | 0.63 mg/L @ 25 $^{0}$C |
| Henry's Law Constant | $3.28 \times 10^{-8}$ atm $m^3$/mol |
| Log $K_{ow}$ | 5.8 |

### 2.4.1.2 Environmental Fate Assessment Summary

Propargite is moderately persistent (metabolism half-lives = 38-168 days) and slightly to hardly mobile ($K_d$s range from 60 to 218 mL/g, while $K_{oc}$s range from 2963 to 57,966 mL/g). It degrades rapidly under alkaline hydrolytic conditions (half-life = 2.2 days) and is moderately persistent to persistent under neutral (half-lives = 75 days) and acid (pH 5 half-life = 120 days) hydrolytic conditions. Soil and aquatic photolysis and aerobic and anaerobic metabolism occur at moderate rates (half-lives = 39-168 days). Degradates are listed in Section 2.2. Terrestrial field half-lives range from 67 days (Florida citrus) to 99 days (California bare ground). Because of its high affinity for soil and sediment, propargite has the potential to move off the site of application during rainfall/irrigation by erosion/runoff on soil particles and by spray drift. Propargite has a low potential to volatilize (vapor pressure = $4.49 \times 10^{-8}$ torr). Given the moderate to slow degradation rates for metabolism and photolysis, and the high $K_{oc}$ values, propargite will probably be adsorbed to sediments and organic material if transported to surface waters.

Propargite's potential to bioaccumulate is a concern because it has a high log octanol/water partition coefficient ($K_{ow}$) of 5.8. However, propargite was readily metabolized into polar compounds and rapidly excreted in a registrant submitted study of bluegill sunfish. This study indicated the maximum bioconcentration factor (from water to fish viscera) was 1550x, which rapidly decreased by 82% during the 14-day depuration phase (MRIDs 40494801 and 40916601).

Degradates of propargite include:

- BGES – bis-[2,-(4-(1,1-dimethyl-ethyl)-phenoxy)cyclohexyl]sulfite;
- OMT-B – 2,2-dimethyl -2-(4'-(2-hydroxy- cyclohexoxy)phenyl)ethanol;
- PTBP – p-tertiarybutylphenol;
- TBPC – propargite glycol ether – 2-[4-(1,1-dimethylethyl)phenoxy]-cyclohexane-1-ol, also identified as 2-(*p*-tertiarybutyl phenoxycyclohexanol);
- TBPC-acid – 2-[4-(2-hydroxycyclohexoxy)phenyl]-2,2-dimethyl acetic acid; and

A "sulfate derivative of TBPC

**Table 2.2** lists the environmental fate properties of propargite, along with the major and minor degradates detected (and maximum degradate yields) in the submitted environmental fate and transport studies. Chemical structure diagrams for propargite and four of its degradates identified in fate studies are shown in Appendix Figure B1.

| Table 2.2 Summary of Propargite Environmental Fate Properties | | | | |
|---|---|---|---|---|
| **Study** | **Values (Units)** | **Major Degradates (≥10% of Parent Applied)** ***Minor Degradates*** **(<10% of Parent Applied)** | **MRID #** | **Study Status** |
| Hydrolysis | $T_{1/2}$ = 120 days @ pH 5<br>$T_{1/2}$ = 75 days @ pH 7<br>$T_{1/2}$ = 2.2 days @ pH 9 | *TBPC* (7.8% Max.)<br>TBPC (37% Max.)<br>TBPC (88% Max.) | 40358401 | acceptable |
| Direct Aqueous Photolysis | $T_{1/2}$ = 134 - 140 days @ pH 5 | *TBPC* (7.3% Max.)<br>PTBP (13% Max.) | 40358402 | acceptable |
| Soil Photolysis | $T_{1/2}$ = 63 days (sterilized sandy clay loam) [6]<br>$T_{1/2}$ = 91 days (unsterilized sandy loam soil) [6]<br>$T_{1/2}$ = 113 days (dark control) | TBPC (20.8% Max.) | 40358402<br>42319301<br>42319307 | acceptable<br>supplemental[1]<br>supplemental[1] |
| Aerobic Soil Metabolism | $T_{1/2}$ = 168 days @ pH 6.6 (sandy loam) | *A "sulfate derivative of TBPC"* (7.62% Max.)<br>*TBPC* (1.98% Max.) | 41003601<br>42786301<br>43851402 | supplemental[3]<br>supplemental[3]<br>acceptable |
| Photodegradation – air | Waived[2] | | | |
| Anaerobic Soil Metabolism | $T_{1/2}$ = 64.4 days @ pH 6.9 (sandy clay loam) | TBPC (20.3% Max. soil/3.4% Max. water)<br>*PTBP (0.7% Max. water)* | 41003602 | acceptable |
| Anaerobic Aquatic Metabolism | $T_{1/2}$ = 47 days | TBPC (61.5% Max.)<br>*PTBP (1.57% Max.)*<br>*OMT-B (4.7% Max.)*<br>*BGES (1.72% Max.)* | 43139401 | acceptable |
| Aerobic Aquatic Metabolism | $T_{1/2}$ = 38 days | TBPC (27.7% Max.)<br>*PTBP (≤1.54% Max.)*<br>*OMT-B (≤1.54% Max.)*<br>*TBPC-acid (≤1.54% Max.)* | 42688801 | acceptable |
| $K_{d\text{-}ads}$ / $K_{d\text{-}des}$<br><br>$K_{oc\text{-}ads}$ / $K_{oc\text{-}des}$ | Propargite $K_d$ = 60 – 218 mL/g<br>TBPC $K_d$ = 0.65 – 8.39 mL/g<br><br>Propargite $K_{oc}$ = 2963 – 57,966 mL/g<br>TBPC $K_{oc}$ = 187 – 551 mL/g | NA | 40431602<br>41449202<br>41449203<br>41449204<br>41449205<br>41449206<br>41449207<br>42908401<br>42908402 | supplemental[4]<br>supplemental[4]<br>supplemental[4]<br>supplemental[4]<br>supplemental[4]<br>supplemental[4]<br>supplemental[4]<br>acceptable<br>acceptable |
| Volatility – lab | Waived[2] | | | |
| Volatility – field | Waived[2] | | | |
| Terrestrial Field Dissipation | $T_{1/2}$ = 67, 78,87, 94, and 99 days (41307301)<br>$T_{1/2}$ = 67 and 87 days (41731501)<br>$T_{1/2}$ = 94 days (41325901)<br>$T_{1/2}$ = 78 and 99 days (40969501) | TBPC | 40969501<br>41307301<br>41325901<br>41432501<br>41731501<br>41966001<br>41966002 | supplemental<br>acceptable<br>supplemental<br>supplemental<br>acceptable<br>supplemental<br>supplemental |
| Aquatic Field Dissipation | | | Not submitted [5] | |

| Table 2.2 Summary of Propargite Environmental Fate Properties | | | | |
|---|---|---|---|---|
| **Study** | **Values (Units)** | **Major Degradates (≥10% of Parent Applied)** ***Minor Degradates*** **(<10% of Parent Applied)** | **MRID #** | **Study Status** |
| Bioaccumulation (in fish) | BCFs 260x (fillet), 1550x (viscera), and 775x (whole fish); Depuration 82% in 14 days; log $K_{ow}$ = 5.8 | | 40494001 40916601 | acceptable |

[1] MRIDs 42319301 and 42319307 were supplemental to MRID 40358402.
[2] EFED concurs with the waiver request due to the low vapor pressure of propargite.
[3] MRIDs 41003601 and 42786301 were classified as supplemental due to soil type and unexplained high rate of soil binding in studies respectively.
[4] Soils were autoclaved prior to initiation of test. It is believed that autoclaving soils changes their physical and chemical properties and possibly affects their adsorption behavior.
[5] Aquatic dissipation data are needed for aquatic uses to make a complete environmental fate assessment in an aquatic environment. However because there currently are no direct application to water uses for propargite, an aquatic dissipation study is not needed. The only direct applicastion to water use (cranberry) was canceled due to tolerance concerns (SMART meeting 20 October 1998).
[6] Half-lives corrected for dark control.

### 2.4.2 Environmental Transport Mechanisms

Potential transport mechanisms include pesticide surface water runoff, spray drift, and secondary drift of volatilized or soil-bound residues leading to deposition onto nearby or more distant ecosystems. Due to the physical properties of propargite (Table 2.1), volatilization is not expected to be a significant mechanism of environmental transport. Surface water runoff and spray drift are expected to be the major routes of exposure for propargite.

### 2.4.3 Mechanism of Action

Propargite (OMITE, COMITE, and ORNAMITE), is an organosulfite chemical which functions acutely on contact with larval and adult mites and displays limited ovicidal activity (USEPA 2000). Propargite inhibits oxidative phosphorylation by disrupting ATP formation. (http://edis.ifas.ufl.edu/PI121).

### 2.4.4 Use Characterization

Analysis of labeled use information is the critical first step in evaluating the federal action. The current label for propargite represents the FIFRA regulatory action; therefore, labeled use and application rates specified on the label form the basis of this assessment. The assessment of use information is critical to the development of the action area and selection of appropriate modeling scenarios and inputs.

**Table 2.3** presents the uses and corresponding application rates and methods of application considered in this assessment. Because a large number of uses appear on propargite labels, it was deemed impractical to model each individual label use separately. Therefore, labels that had similar application rates and were to be modeled using the same PRZM/EXAMS scenario, were grouped into 22 scenario groups. Column 1 of Table 2.3 relates the specific label uses to those uses scenario group. Each scenario group was modeled to estimate EECs and risk as a surrogate for all of the uses included in that scenario group. In order to ensure that the EECs and risk estimated for that scenario group will be equal to or higher than the EECs and risk that would be estimated for the individual uses, the highest application rates and number of applications per year, and shortest application interval (Table 3.1) are used for the scenario group modeling.

**Table 2.3 Propargite Uses Assessed for the CRLF**

| Scenario Group (Label Uses) | Ground or Air Appl. | Max. Single Appl. Rate (lb ai/A) | Max. Seasonal Appl. Rate (lb ai/A) | Max. Number of Application per Year |
|---|---|---|---|---|
| **1.** Alfalfa (Alfalfa) | G<br>A | 2.46<br>2.46 | NS<br>NS | NS (2)<br>NS (2) |
| **2.** Almond & Walnut (Almond and Walnut) | G<br>A | 4<br>4 | 6.75<br>6.75 | 2<br>2 |
| **3.** Avocado (Avocado) | G | 4.8 | NS | 2 |
| **4.** Beans (Beans – Dried and Succulent) | G<br>A | 2.46<br>2.46 | 4.5<br>4.5 | 2<br>2 |
| **5.** Berries (Boysenberry, Currant, and Raspberry) | G | 1.92 | NS | 2 |
| **6.** Citrus (Citrus, Grapefruit, Lemon, Lime, Orange, and Tangerines) | G<br>A | 3.36<br>2.46 | 4.10<br>5.76 | 2<br>2 |
| **7.** Clover (Clover) | G<br>A | 1.64<br>1.64 | NS<br>NS | NS (2)<br>NS (2) |
| **8.** Corn (Corn – Field, Pop, and Sweet) | G<br>A | 2.63<br>2.63 | 2.63<br>2.63 | 1<br>1 |
| **9.** Cotton (Cotton) | G<br>A | 2.46<br>2.46 | NS<br>NS | 2<br>2 |
| **10.** Forestry (Christmas Tree Plantations, Forest Trees, and Nursery Stock) | G<br>A | 2.4<br>2.4 | NS<br>NS | 3<br>3 |
| **11.** Grapes (Grapes) | G | 2.88 | NS | 2 |
| **12.** Hops (Hops) | G | 1.5 | NS | 2 |
| **13.** Jojoba (Jojoba) | G<br>A | 1.64<br>1.64 | NS<br>NS | 1<br>1 |
| **14.** Mint (Mint) | G<br>A | 2.25<br>2.25 | 4.10<br>4.10 | 2<br>2 |
| **15.** Nectarine (Nectarine) | G<br>A | 2.88<br>2.88 | NS<br>NS | 2<br>2 |
| **16.** Ornamental Woody Shrubs & Vines (Ornamental Woody Shrubs and Vines) | G<br>A | 1.6<br>1.6 | NS<br>NS | 3<br>3 |
| **17.** Other Ornamental (Ornamental and/or Shade Trees, Ornamental Herbaceous Plants, and Ornamental Nonflowering Plants) | G | 0.48 | NS | 3 |
| **18.** Peanuts (Peanuts) | G<br>A | 1.64<br>1.64 | NS<br>NS | 2<br>2 |
| **19.** Sorghum (Sorghum – Silage and Unspecified) | A | 1.64 | NS | 1 |
| **20.** Strawberry (Strawberry) | G | 1.92 | NS | 2 |

| Table 2.3 Propargite Uses Assessed for the CRLF | | | | |
|---|---|---|---|---|
| **Scenario Group (Label Uses)** | **Ground or Air Appl.** | **Max. Single Appl. Rate (lb ai/A)** | **Max. Seasonal Appl. Rate (lb ai/A)** | **Max. Number of Application per Year** |
| **21.** Tree fruit – except nectarine (Apple, Apricot, Cherry, Fig,, Peach, Pear, Persimmon, Plum, Prune, Quince, Small Fruits, and Stone Fruits) | G | 1.92 | NS | 2 |
| **22.** Tree nut – except almond and walnut (Date, Filbert/Hazelnut, Macadamia Nut/Bush nut, Pecan, and Pistachio) | G | 1.92 | NS | 2 |

NS – Not specified.

It is important to note that some of the scenario group names may be misleading. For example, 'almond & walnut' (scenario group #2) are not part of 'tree nuts' (scenario group #22) because almonds and walnuts have a much higher application rate (4 lbs ai/A) than the other tree nut uses (1.92 lbs ai/A). Similarly, 'nectarine' (scenario group #15) are not part of 'tree fruit' (scenario group #21) because nectarines have a much higher application rate (2.88 lbs ai/A) than the other tree fruit uses (1.92 lbs ai/A). Lastly, 'ornamental woody shrubs & vines' (scenario group #16) are not part of 'other ornamental' (scenario group #21) because ornamental woody shrubs and vines have a much higher application rate (1.6 lbs ai/A) than the other ornamental uses (0.48 lbs ai/A).

Several changes will be occurring on future labels:

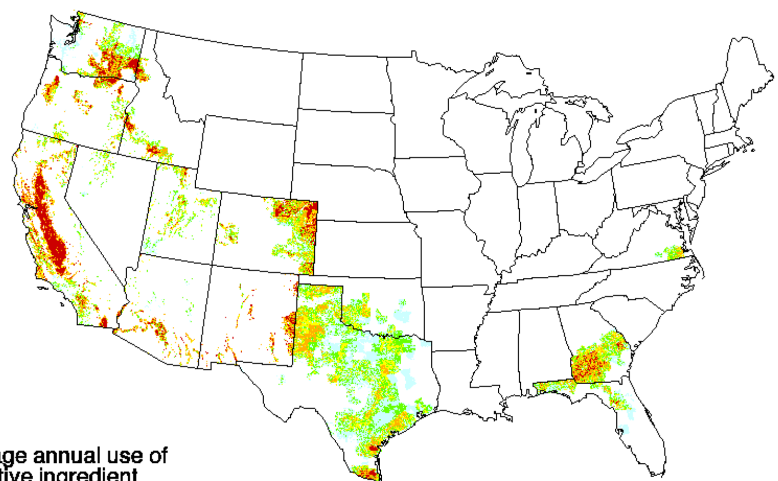
- The maximum use rate for airblast spray operations will be reduced from 4.5 lbs a.i./A to 4.05 lbs a.i./A on all propargite labels.
- Omite 30WS (400-427) – The foliar post-harvest uses for stone fruit as proposed, included apricots, cherries, peaches, and plums/prunes. Only cherries were approved for foliar post-harvest use application and this is the only stone fruit that will appear on the new label. The other stone fruits are not approved for this use.
- OMITE-6E EPA Reg. No. 400-89 and OMITE CR (For use in California) EPA Reg. No. 400-425 – The label as proposed listed avocados (nonbearing). However, this use is not approved and will not appear on the new label.
- The spray drift language will be clarified.

However, the following risk analysis only considers the information included on current labels and not these anticipated future changes to labels.

**Figure 2.1** was downloaded from a USGS NAWQA website (http://water.usgs.gov/nawqa/pnsp/usage/maps/) and shows the estimated poundage of propargite uses across the United States. The model used to estimate the average annual agricultural use displayed in this map is not based on crop-specific maps indicating where each crop occurs. Rather, the map is generated from county level tabulations of the amount of propargite used in a county and the spatial variation in the density of agricultural lands within the county. Therefore, some fraction of the county's propargite applied is allocated to all agricultural lands in the county even on the agricultural lands that have crops to which propargite would not be applied (Thelin and Gianessi 2000).

**PROPARGITE – acaracide/miticide**

2002 estimated annual agricultural use




| Crops | Total pounds applied | Percent national use |
|---|---|---|
| corn | 506970 | 36.97 |
| almonds | 237745 | 17.34 |
| grapes | 141014 | 10.28 |
| walnuts | 98993 | 7.22 |
| cotton | 72072 | 5.26 |
| dry beans | 55668 | 4.06 |
| peanuts | 50976 | 3.72 |
| mint for oil | 49167 | 3.59 |
| potatoes | 40910 | 2.98 |
| sorghum | 38190 | 2.78 |

**Figure 2.1 Average Annual Propargite (Active Ingredient) Use**

The Agency's Biological and Economic Analysis Division (BEAD) provides an analysis of both national- and county-level usage information (Kaul and Jones, 2006) using state-level usage data obtained from USDA-NASS[2], Doane (www.doane.com; the full dataset is not provided due to its proprietary nature) and the California's Department of Pesticide Regulation Pesticide Use Reporting (CDPR PUR) database[3]. Because the federal action considered in this assessment falls exclusively within California, the CDPR PUR is considered a more comprehensive source of usage data in California than USDA-NASS

[2] United States Depart of Agriculture (USDA), National Agricultural Statistics Service (NASS) Chemical Use Reports provide summary pesticide usage statistics for select agricultural use sites by chemical, crop and state. See http://www.usda.gov/nass/pubs/estindx1.htm#agchem.
[3] The California Department of Pesticide Regulation's Pesticide Use Reporting database provides a census of pesticide applications in the state. See http://www.cdpr.ca.gov/docs/pur/purmain.htm.

or EPA proprietary databases, and therefore, is the source of the usage data reported for propargite in this assessment. The accuracy and completeness of all of these data sources are dependent on the voluntary cooperation of individuals who may or may not have incentives to provide accurate and complete information. Though the accuracy and completeness of the CDPR PUR usage data with regard to any individual application of pesticide is largely unknown, most of the records in the data set are assumed to be accurate. Therefore in general, it is assumed to be a relatively accurate depiction of pesticide application in California.

A summary of propargite usage from 2002 through 2005 for all California use sites is provided below in **Table 2.4.** Scenario groups that exceed 100,000 lbs. ai/yr. include ground applications to almonds and walnuts, ground and air applications to corn, and ground applications to grapes. Scenario groups that do not exceed 1000 lbs. ai/yr. include ground applications to alfalfa, avocado, berries, citrus, forestry, hops, jojoba, ornamental woody shrubs & vines, peanuts, strawberry, and tree nuts and air applications to citrus, clover, forestry, jojoba, nectarine, ornamental woody shrubs & vines, peanuts, and sorghum. Many of the maximum application rates recorded in the 2002 to 2005 CDPR PUR data (which are based on a single record in the data set) greatly exceed the maximum application rates permitted on propargite labels and likely indicate data entry errors in the pounds applied or the acres treated data fields, misuse or a recent reduction in label application rates. Typically, the average application rate (based on many records from the data set) is far below the maximum label-permitted application rate (see Table 2.3).

**Table 2.4 Summary of California Department of Pesticide Registration (CDPR) Pesticide Use Reporting (PUR) Data from 2002 to 2005 for Currently Registered Propargite Uses**

| Scenario Group | Ground or Air Appl. | Last Application Date | Lbs. ai/Yr. All Uses | Application Rate All Uses in Scenario Group (Lbs. ai/Yr.) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Average | $95^{th}$ %ile | $99^{th}$ %ile | Maximum |
| **1.** Alfalfa | G | 8/21/2006 | 601 | 1.60 | **2.48**[1] | **2.48** | **2.48** |
| | A | 9/1/2006 | 1,712 | 1.73 | **2.48** | **2.49** | **2.49** |
| **2.** Almond & Walnut | G | 9/29/2006 | 326,225 | 1.93 | 3.06 | 3.73 | **78.29** |
| | A | 9/29/2006 | 20,859 | 2.13 | 3.08 | **4.58** | **8.80** |
| **3.** Avocado | G | 10/17/1997 | Not in 2002-2005 California PUR Data | | | | |
| | A | 1/1/1995 | Aerial applications not permitted under current labels | | | | |
| **4.** Beans | G | 9/15/2006 | 5,156 | 1.82 | **2.48** | **3.17** | **16.56** |
| | A | 9/24/2006 | 17,618 | 1.78 | **2.48** | **2.48** | **16.72** |
| **5.** Berries | G | Not in 1990-2006 California PUR Data | | | | | |
| **6.** Citrus | G | 11/4/2006 | 613 | 2.30 | **3.36** | **3.47** | **3.59** |
| | A | 8/1/1999 | Not in 2002-2005 California PUR Data | | | | |
| **7.** Clover | G | 7/15/2006 | 2,228 | 1.63 | **1.66** | **1.67** | **1.69** |
| | A | 7/11/2006 | 66 | **1.65** | **1.66** | **1.66** | **1.66** |
| **8.** Corn | G | 10/2/2006 | 195,685 | 2.01 | 2.48 | 2.60 | **72.24** |
| | A | 10/3/2006 | 206,826 | 2.05 | 2.48 | 2.50 | **23.45** |
| **9.** Cotton | G | 9/8/2006 | 13,018 | 1.54 | 1.93 | **2.52** | **16.55** |
| | A | 9/19/2006 | 69,129 | 1.61 | 1.66 | **2.48** | **6.62** |

**Table 2.4 Summary of California Department of Pesticide Registration (CDPR) Pesticide Use Reporting (PUR) Data from 2002 to 2005 for Currently Registered Propargite Uses**

| Scenario Group | Ground or Air Appl. | Last Application Date | Lbs. ai/Yr. All Uses | Application Rate All Uses in Scenario Group (Lbs. ai/Yr.) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Average | $95^{th}$ %ile | $99^{th}$ %ile | Maximum |
| **10.** Forestry | G | 8/11/2001 | Not in 2002-2005 California PUR Data | | | | |
| | A | Not in 1990-2006 California PUR Data | | | | | |
| **11.** Grapes | G | 8/26/2006 | 110,124 | 1.81 | 2.56 | **3.04** | **25.65** |
| | A | 7/29/2006 | Aerial applications not permitted under current labels | | | | |
| **12.** Hops | G | Not in 1990-2006 California PUR Data | | | | | |
| **13.** Jojoba | G<br>A | Not in 1990-2006 California PUR Data | | | | | |
| **14.** Mint | G | 8/11/2006 | 1,407 | 1.59 | 1.98 | **2.83** | **12.34** |
| | A | 8/21/2006 | 2,237 | 1.60 | 2.10 | **2.28** | **2.31** |
| **15.** Nectarine | G | 9/5/2006 | 13,711 | 2.04 | 2.56 | **2.92** | **25.60** |
| | A | 7/26/2003 | 75 | 2.43 | 2.58 | 2.82 | 2.88 |
| **16.** Ornamental Woody Shrubs & Vines | G<br>A | Not in 1990-2006 California PUR Data. However, the PUR data categories for scenario groups 16 and 17 may not be equivalent to the label categories. | | | | | |
| **17.** Other Ornamental | G | 9/5/2006 | 1,062 | **1.71** | **2.85** | **4.87** | **14.88** |
| | A | 7/26/2003 | Aerial applications not permitted under current labels | | | | |
| **18.** Peanuts | G | 8/3/2006 | 0.12 | 0.24 | 0.24 | 0.24 | 0.24 |
| | A | 8/14/1997 | Not in 2002-2005 California PUR Data | | | | |
| **19.** Sorghum | G | 6/20/1997 | Ground applications not permitted under current labels | | | | |
| | A | 5/19/2005 | 52 | **2.46** | **2.46** | **2.46** | **2.46** |
| **20.** Strawberry | G | 9/25/2005 | 8 | 0.87 | 1.79 | 1.89 | 1.92 |
| | A | 8/23/1995 | Aerial applications not permitted under current labels | | | | |
| **21.** Tree fruit – except nectarine | G | 9/21/2006 | 19,471 | 1.68 | **2.24** | **3.05** | **19.52** |
| | A | 7/26/2006 | Aerial applications not permitted under current labels | | | | |
| **22.** Tree nut – except almond and walnut | G<br>A | 6/6/2000<br>7/28/1990 | Not in 2002-2005 California PUR Data | | | | |

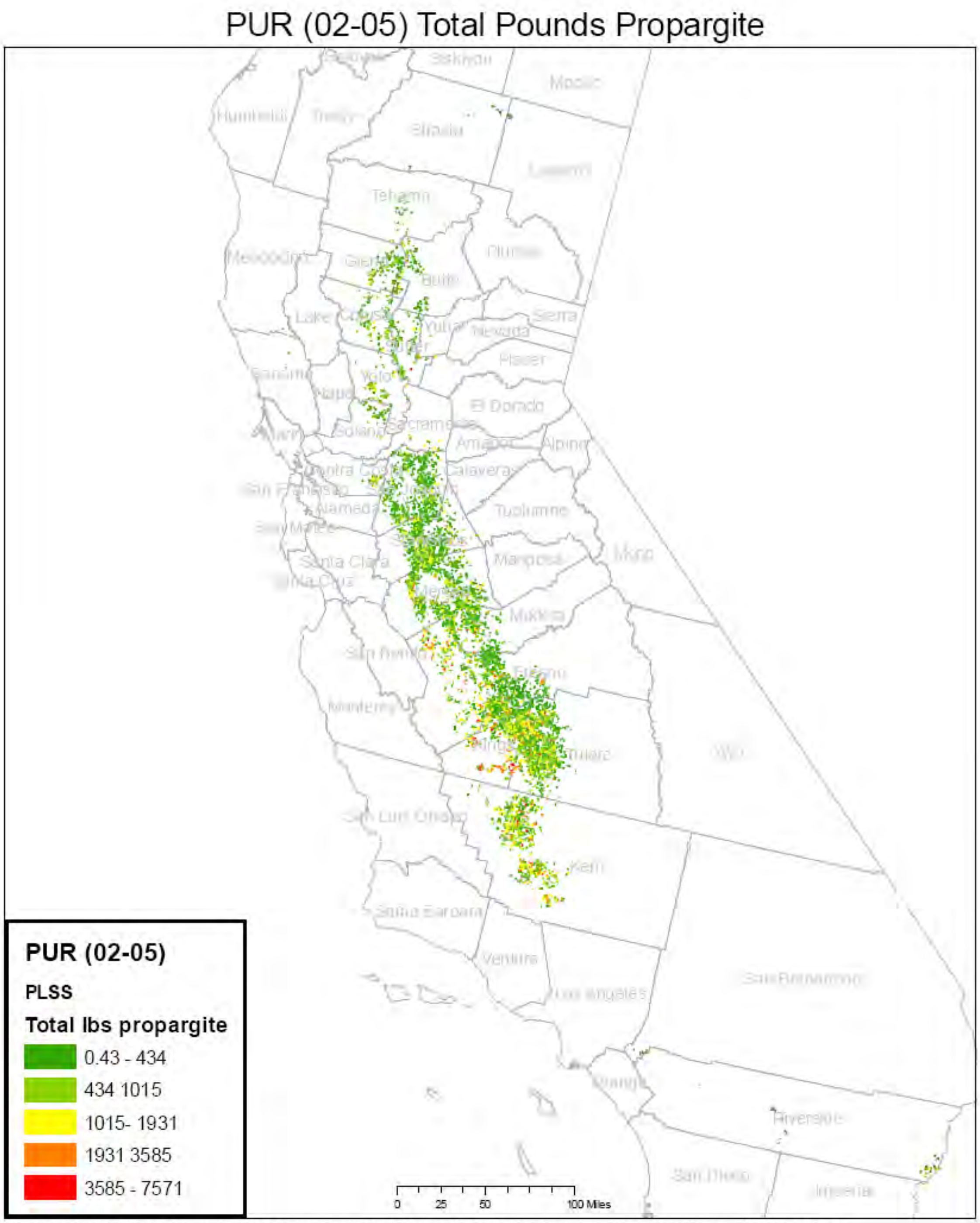
[1] Values in bold indicate application rates based on 2002 – 2005 CDPR PUR data that exceeds the current (2008) maximum label application rate.

Typically, the average application rate in the 2002 – 2005 time period is far below the current (2008) maximum label-permitted application rate (Table 2.4; compare to Table 2.3). For example, the average application rate for alfalfa and almond & walnut are approximately 70% and 53% of their respective maximum application rates for those uses. Conversely for clover, the average application rate approximately equals the maximum label application rate. Additionally some uses (sorghum and other ornamentals), the 2002 – 2005 average application rate exceeds the current maximum label application rate. Potentially, this may reflect an issue regarding whether corn application rates (label maximum of 2.63 lbs. ai/A) can be applied to sorghum (average 2002 – 2005 application rate of 2.46 lbs. ai/A and maximum label application rate specifically for sorghum of 1.64 lbs. ai/A). Similarly, there may be issues with which CDPR PUR uses are included under the other ornamentals category used in this assessment. The average 2002 – 2005 application rate for other ornamentals (1.71 lbs. ai/A) is much closer to the maximum label application rate for Ornamental Woody Shrubs & Vines (1.6 lbs. ai/A) than the maximum label application rate for other ornamentals (0.48 lbs. ai/A).

The $95^{th}$ and $99^{th}$ percentile and maximum application rates as determined from the CDPR PUR 2002 – 2005 data are presented as measures of the highest application rates actually applied. For most uses, the $95^{th}$ and $99^{th}$ percentile application rates tend to reflect the maximum current label application rates except for sorghum and other ornamentals as discussed previously. Many of the maximum application rates recorded in the 2002 to 2005 CDPR PUR data (which is based on a single record in the data set) greatly exceed the maximum application rates permitted on propargite labels and likely indicate data entry errors in the pounds applied or the acres treated data fields, misuse or a recent reduction in label application rates.  Such applications are not part of the federal action under review and therefore, are not included in this analysis.

Several uses (avocado, berries, aerial applications to citrus, forestry, hops, jojoba, ornamental woody shrubs & vines, aerial applications to peanuts, and tree nut) do not occur in the CDPR PUR data within the 2002 – 2005 time frame. Further investigation into previous years of CDPR PUR data as well as the recently available 2006 data indicates that several uses (berries, aerial applications to forestry, hops, jojoba, and ornamental woody shrubs & vines) do not occur in this data set during the entire available data (1990 – 2006) time frame. However, these uses are evaluated in this assessment because these uses are permitted by the labels and, therefore, may occur in the future. Temporal variation (1990 – 2006) in a 60-day moving averages of the ground and aerial applications of each of the use groups is provided in Appendix Figure B2.

The following map (Figure 2.2) uses the CDPR PUR data (2002 – 2005) to indicate the spatial distribution and relative application intensity in California.  In general, the most intensive usage of propargite appears to be in the California Central Valley.




Compiled from California County boundaries (ESRI, 2002), California Pesticide Use Reporting data (2002-2005) and MTRS surveys.
Maps created by the US Environmental Protection Agency, Office of Pesticide Programs, Environmental Fate and Effects Division.
Projection: Albert Equal Area Conic USGS, North American Datum of 1983 (NAD 1983). Created April, 2008.

**Figure 2.2 Map of propargite use intensity (total pounds of active ingredient applied per MRTS section between 2002 and 2005) relative to CRLF core and critical habitat.**

## 2.5 Assessed Species

The CRLF was federally listed as a threatened species by USFWS effective June 24, 1996 (USFWS 1996). It is one of two subspecies of the red-legged frog and is the largest native frog in the western United States (USFWS 2002). A brief summary of information regarding CRLF distribution, reproduction, diet, and habitat requirements is provided in Sections 2.5.1 through 2.5.4, respectively. Further information on the status, distribution, and life history of and specific threats to the CRLF is provided in Attachment 1.

Final critical habitat for the CRLF was designated by USFWS on April 13, 2006 (USFWS 2006; 71 FR 19244-19346). Further information on designated critical habitat for the CRLF is provided in Section 2.6.

### 2.5.1 Distribution

The CRLF is endemic to California and Baja California (Mexico) and historically inhabited 46 counties in California including the Central Valley and both coastal and interior mountain ranges (USFWS 1996). Its range has been reduced by about 70%, and the species currently resides in 22 counties in California (USFWS 1996). The species has an elevational range of near sea level to 1,500 meters (5,200 feet) (Jennings and Hayes 1994); however, nearly all of the known CRLF populations have been documented below 1,050 meters (3,500 feet) (USFWS 2002).

Populations currently exist along the northern California coast, northern Transverse Ranges (USFWS 2002), foothills of the Sierra Nevada (5-6 populations), and in southern California south of Santa Barbara (two populations) (Fellers 2005a). Relatively larger numbers of CRLFs are located between Marin and Santa Barbara Counties (Jennings and Hayes 1994). A total of 243 streams or drainages are believed to be currently occupied by the species, with the greatest numbers in Monterey, San Luis Obispo, and Santa Barbara counties (USFWS 1996). Occupied drainages or watersheds include all bodies of water that support CRLFs (*i.e.*, streams, creeks, tributaries, associated natural and artificial ponds, and adjacent drainages), and habitats through which CRLFs can move (*i.e.*, riparian vegetation, uplands) (USFWS 2002).

The distribution of CRLFs within California is addressed in this assessment using four categories of location including recovery units, core areas, designated critical habitat, and known occurrences of the CRLF reported in the California Natural Diversity Database (CNDDB) that are not included within core areas and/or designated critical habitat (see **Figure 2.2**). Recovery units, core areas, and other known occurrences of the CRLF from the CNDDB are described in further detail in this section, and designated critical habitat is addressed in Section 2.6. Recovery units are large areas defined at the watershed level that have similar conservation needs and management strategies. The recovery unit is primarily an administrative designation, and land area within the recovery unit boundary is not exclusively CRLF habitat. Core areas are smaller areas within the recovery units that comprise portions of the species' historic and current range and have been determined by USFWS to be important in the preservation of the species. Designated critical habitat is generally contained within the core areas, although a number of critical habitat units are outside the boundaries of core areas, but within the boundaries of the recovery units. Additional information on CRLF occurrences from the CNDDB is used to cover the current range of the species not included in core areas and/or designated critical habitat, but within the recovery units.

*Recovery Units*

Eight recovery units have been established by USFWS for the CRLF. These areas are considered essential to the recovery of the species, and the status of the CRLF "may be considered within the smaller scale of the recovery units, as opposed to the statewide range" (USFWS 2002). Recovery units reflect areas with similar conservation needs and population statuses, and therefore, similar recovery goals. The eight units described for the CRLF are delineated by watershed boundaries defined by US Geological Survey hydrologic units and are limited to the elevational maximum for the species of 1,500 m above sea level. The eight recovery units for the CRLF are listed in **Table 2.5** and shown in **Figure 2.2**.

*Core Areas*

USFWS has designated 35 core areas across the eight recovery units to focus their recovery efforts for the CRLF (see **Figure 2.2**). **Table 2.5** summarizes the geographical relationship among recovery units, core areas, and designated critical habitat. The core areas, which are distributed throughout portions of the historic and current range of the species, represent areas that allow for long-term viability of existing populations and reestablishment of populations within historic range. These areas were selected because they: 1) contain existing viable populations; or 2) they contribute to the connectivity of other habitat areas (USFWS 2002). Core area protection and enhancement are vital for maintenance and expansion of the CRLF's distribution and population throughout its range.

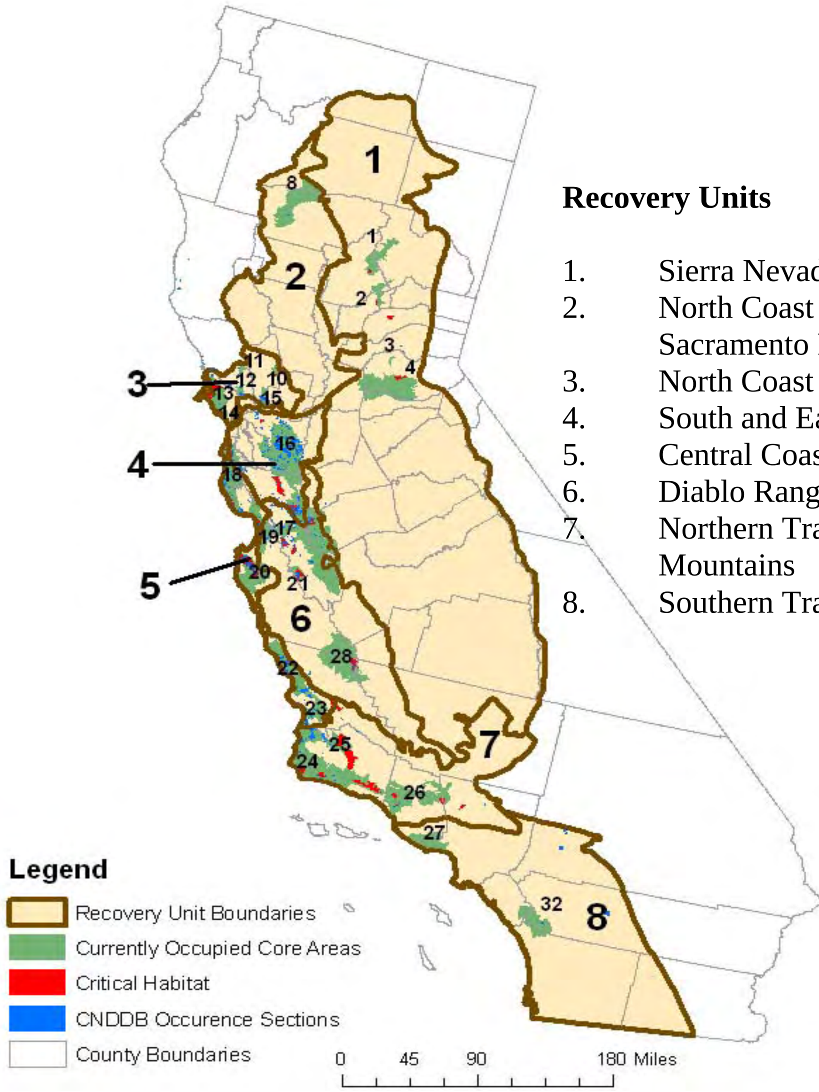
For purposes of this assessment, designated critical habitat, currently occupied (post-1985) core areas, and additional known occurrences of the CRLF from the CNDDB are considered. Historically occupied sections of the core areas are not evaluated as part of this assessment because the USFWS Recovery Plan (USFWS 2002) indicates that CRLFs are extirpated from these areas. A summary of currently and historically occupied core areas is provided in **Table 2.5** (currently occupied core areas are bolded). While core areas are considered essential for recovery of the CRLF, core areas are not federally-designated critical habitat, although designated critical habitat is generally contained within these core recovery areas. It should be noted, however, that several critical habitat units are located outside of the core areas, but within the recovery units. The focus of this assessment is currently occupied core areas, designated critical habitat, and other known CNDDB CRLF occurrences within the recovery units. Federally-designated critical habitat for the CRLF is further explained in Section 2.6.

| Table 2.5 California Red-legged Frog Recovery Units with Overlapping Core Areas and Designated Critical Habitat | | | | |
|---|---|---|---|---|
| **Recovery Unit [1] (Figure 2.3)** | **Core Areas [2,7] (Figure 2.3)** | **Critical Habitat Units [3]** | **Currently Occupied (post-1985) [4]** | **Historically Occupied [4]** |
| Sierra Nevada Foothills and Central Valley (1) (eastern boundary is the 1,500m elevation line) | **Cottonwood Creek (partial) (8)** | -- | ✓ | |
| | **Feather River (1)** | BUT-1A-B | ✓ | |
| | **Yuba River-S. Fork Feather River (2)** | YUB-1 | ✓ | |
| | -- | NEV-1[6] | | |
| | **Traverse Creek/Middle Fork American River/Rubicon (3)** | -- | ✓ | |
| | **Consumnes River (4)** | ELD-1 | ✓ | |
| | S. Fork Calaveras River (5) | -- | | ✓ |
| | Tuolumne River (6) | -- | | ✓ |
| | Piney Creek (7) | -- | | ✓ |
| | **East San Francisco Bay (partial)(16)** | -- | ✓ | |
| North Coast Range Foothills and Western Sacramento River Valley (2) | **Cottonwood Creek (8)** | -- | ✓ | |
| | Putah Creek-Cache Creek (9) | -- | | ✓ |
| | **Jameson Canyon – Lower Napa Valley (partial) (15)** | -- | ✓ | |
| | **Belvedere Lagoon (partial) (14)** | -- | ✓ | |
| | **Pt. Reyes Peninsula (partial) (13)** | -- | ✓ | |
| North Coast and North San Francisco Bay (3) | Putah Creek-Cache Creek (partial) (9) | -- | | ✓ |
| | **Lake Berryessa Tributaries (10)** | NAP-1 | ✓ | |
| | **Upper Sonoma Creek (11)** | -- | ✓ | |
| | **Petaluma Creek-Sonoma Creek (12)** | -- | ✓ | |
| | **Pt. Reyes Peninsula (13)** | MRN-1, MRN-2 | ✓ | |
| | **Belvedere Lagoon (14)** | -- | ✓ | |
| | **Jameson Canyon-Lower Napa River (15)** | SOL-1 | ✓ | |
| South and East San Francisco Bay (4) | -- | CCS-1A[6] | | |
| | **East San Francisco Bay (partial) (16)** | ALA-1A, ALA-1B, STC-1B | ✓ | |
| | -- | STC-1A[6] | | |
| | **South San Francisco Bay (partial) (18)** | SNM-1A | ✓ | |
| Central Coast (5) | **South San Francisco Bay (partial) (18)** | SNM-1A, SNM-2C, SCZ-1 | ✓ | |
| | **Watsonville Slough- Elkhorn Slough (partial) (19)** | SCZ-2 [5] | ✓ | |
| | **Carmel River-Santa Lucia (20)** | MNT-2 | ✓ | |
| | **Estero Bay (22)** | -- | ✓ | |

**Table 2.5 California Red-legged Frog Recovery Units with Overlapping Core Areas and Designated Critical Habitat**

| Recovery Unit [1] (Figure 2.3) | Core Areas [2,7] (Figure 2.3) | Critical Habitat Units [3] | Currently Occupied (post-1985) [4] | Historically Occupied [4] |
|---|---|---|---|---|
| | -- | SLO-8[6] | | |
| | **Arroyo Grande Creek (23)** | -- | ✓ | |
| | **Santa Maria River-Santa Ynez River (24)** | -- | ✓ | |
| Diablo Range and Salinas Valley (6) | **East San Francisco Bay (partial) (16)** | MER-1A-B, STC-1B | ✓ | |
| | -- | SNB-1[6], SNB-2[6] | | |
| | **Santa Clara Valley (17)** | -- | ✓ | |
| | **Watsonville Slough- Elkhorn Slough (partial)(19)** | MNT-1 | ✓ | |
| | **Carmel River-Santa Lucia (partial)(20)** | -- | ✓ | |
| | **Gablan Range (21)** | SNB-3 | ✓ | |
| | **Estrella River (28)** | SLO-1A-B | ✓ | |
| Northern Transverse Ranges and Tehachapi Mountains (7) | -- | SLO-8[6] | | |
| | **Santa Maria River-Santa Ynez River (24)** | STB-4, STB-5, STB-7 | ✓ | |
| | **Sisquoc River (25)** | STB-1, STB-3 | ✓ | |
| | **Ventura River-Santa Clara River (26)** | VEN-1, VEN-2, VEN-3 | ✓ | |
| | -- | LOS-1[6] | | |
| Southern Transverse and Peninsular Ranges (8) | **Santa Monica Bay-Ventura Coastal Streams (27)** | -- | ✓ | |
| | San Gabriel Mountain (29) | -- | | ✓ |
| | Forks of the Mojave (30) | -- | | ✓ |
| | Santa Ana Mountain (31) | -- | | ✓ |
| | **Santa Rosa Plateau (32)** | -- | ✓ | |
| | San Luis Rey (33) | -- | | ✓ |
| | Sweetwater (34) | -- | | ✓ |
| | Laguna Mountain (35) | -- | | ✓ |

[1] Recovery units designated by the USFWS (USFWS 2000, pg 49).
[2] Core areas designated by the USFWS (USFWS 2000, pg 51).
[3] Critical habitat units designated by the USFWS on April 13, 2006 (USFWS 2006, 71 FR 19244-19346).
[4] Currently occupied (post-1985) and historically occupied core areas as designated by the USFWS (USFWS 2002, pg 54).
[5] Critical habitat unit where identified threats specifically included pesticides or agricultural runoff (USFWS 2002).
[6] Critical habitat units that are outside of core areas, but within recovery units.
[7] Currently occupied core areas that are included in this effects determination are bolded.




**Recovery Units**

1. Sierra Nevada Foothills and Central Valley
2. North Coast Range Foothills and Western Sacramento River Valley
3. North Coast and North San Francisco Bay
4. South and East San Francisco Bay
5. Central Coast
6. Diablo Range and Salinas Valley
7. Northern Transverse Ranges and Tehachapi Mountains
8. Southern Transverse and Peninsular Ranges

**Figure 2.3 Recovery Unit, Core Area, Critical Habitat, and Occurrence Designations for CRLF**

## Core Areas

1. Feather River
2. Yuba River- S. Fork Feather River
3. Traverse Creek/ Middle Fork/ American R. Rubicon
4. Cosumnes River
5. South Fork Calaveras River*
6. Tuolumne River*
7. Piney Creek*
8. Cottonwood Creek
9. Putah Creek – Cache Creek*
10. Lake Berryessa Tributaries
11. Upper Sonoma Creek
12. Petaluma Creek – Sonoma Creek
13. Pt. Reyes Peninsula
14. Belvedere Lagoon
15. Jameson Canyon – Lower Napa River
16. East San Francisco Bay
17. Santa Clara Valley
18. South San Francisco Bay
19. Watsonville Slough-Elkhorn Slough
20. Carmel River – Santa Lucia
21. Gablan Range
22. Estero Bay
23. Arroyo Grange River
24. Santa Maria River – Santa Ynez River
25. Sisquoc River
26. Ventura River – Santa Clara River
27. Santa Monica Bay – Venura Coastal Streams
28. Estrella River
29. San Gabriel Mountain*
30. Forks of the Mojave*
31. Santa Ana Mountain*
32. Santa Rosa Plateau
33. San Luis Ray*
34. Sweetwater*
35. Laguna Mountain*

* Core areas that were historically occupied by the California red-legged frog are not included in the map

*Other Known Occurrences from the CNDBB*

The CNDDB provides location and natural history information on species found in California. The CNDDB serves as a repository for historical and current species location sightings. Information regarding known occurrences of CRLFs outside of the currently occupied core areas and designated critical habitat is considered in defining the current range of the CRLF. See: http://www.dfg.ca.gov/bdb/html/cnddb_info.html for additional information on the CNDDB.

### 2.5.2 Reproduction

CRLFs breed primarily in ponds; however, they may also breed in quiescent streams, marshes, and lagoons (Fellers 2005a). According to the Recovery Plan (USFWS 2002), CRLFs breed from November through late April. Peaks in spawning activity vary geographically; Fellers (2005b) reports peak spawning as early as January in parts of coastal central California. Eggs are fertilized as they are being laid. Egg masses are typically attached to emergent vegetation, such as bulrushes (*Scirpus* spp.) and cattails (*Typha* spp.) or roots and twigs, and float on or near the surface of the water (Hayes and Miyamoto 1984). Egg masses contain approximately 2000 to 6000 eggs ranging in size between 2 and 2.8 mm (Jennings and Hayes 1994). Embryos hatch 10 to 14 days after fertilization (Fellers 2005a) depending on water temperature. Egg predation is reported to be infrequent and most mortality is associated with the larval stage (particularly through predation by fish); however, predation on eggs by newts has also been reported (Rathburn 1998). Tadpoles require 11 to 28 weeks to metamorphose into juveniles (terrestrial-phase), typically between May and September (Jennings and Hayes 1994, USFWS 2002); tadpoles have been observed to over-winter (delay metamorphosis until the following year) (Fellers 2005b, USFWS 2002). Males reach sexual maturity at 2 years, and females reach sexual maturity at 3 years of age; adults have been reported to live 8 to 10 years (USFWS 2002). Figure 2.3 depicts CRLF annual reproductive timing.

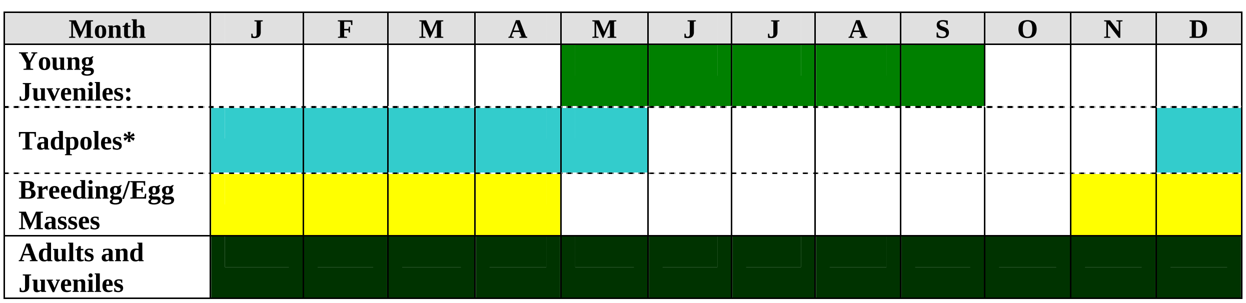



**Figure 2.4 CRLF Reproductive Events by Month *except those that over-winter.**

### 2.5.3 Diet

Although the diet of CRLF aquatic-phase larvae (tadpoles) has not been studied specifically, it is assumed that their diet is similar to that of other frog species, with the aquatic-phase feeding exclusively in water and consuming diatoms, algae, and detritus (USFWS 2002). Tadpoles filter and entrap suspended algae (Seale and Beckvar, 1980) via mouthparts designed for effective grazing of periphyton (Wassersug, 1984, Kupferberg *et al.*; 1994; Kupferberg, 1997; Altig and McDiarmid, 1999).

Juvenile and adult CRLFs forage in aquatic and terrestrial habitats, and their diet differs greatly from that of larvae. The main food source for juvenile aquatic- and terrestrial-phase CRLFs is thought to be aquatic and terrestrial invertebrates found along the shoreline and on the water surface. Hayes and Tennant (1985) report, based on a study examining the gut content of 35 juvenile and adult CRLFs, that the species feeds on as many as 42 different invertebrate taxa, including Arachnida, Amphipoda, Isopoda, Insecta, and Mollusca. The most commonly observed prey species were larval alderflies (*Sialis* cf. *californica*), pillbugs (*Armadilliadrium vulgare*), and water striders (*Gerris* sp). The preferred prey species, however, was the sowbug (Hayes and Tennant, 1985). This study suggests that CRLFs forage primarily above water, although the authors note other data reporting that adults also feed under water, are cannibalistic, and consume fish. For larger CRLFs, over 50% of the prey mass may consists of vertebrates such as mice, frogs, and fish, although aquatic and terrestrial invertebrates were the most numerous food items (Hayes and Tennant 1985). For adults, feeding activity takes place primarily at night; for juveniles feeding occurs during the day and at night (Hayes and Tennant 1985).

### 2.5.4 Habitat

CRLFs require aquatic habitat for breeding, but also use other habitat types including riparian and upland areas throughout their life cycle. CRLF use of their environment varies; they may complete their entire life cycle in a particular habitat or they may utilize multiple habitat types. Overall, populations are most likely to exist where multiple breeding areas are embedded within varying habitats used for dispersal (USFWS 2002). Generally, CRLFs utilize habitat with perennial or near-perennial water (Jennings et al. 1997). Dense vegetation close to water, shading, and water of moderate depth are habitat features that appear especially important for CRLF (Hayes and Jennings 1988). Breeding sites include streams, deep pools, backwaters within streams and creeks, ponds, marshes, sag ponds (land depressions between fault zones that have filled with water), dune ponds, and lagoons. Breeding adults have been found near deep (0.7 m) still or slow moving water surrounded by dense vegetation (USFWS 2002); however, the largest number of tadpoles have been found in shallower pools (0.26 – 0.5 m) (Reis, 1999). Data indicate that CRLFs do not frequently inhabit vernal pools, as conditions in these habitats generally are not suitable (Hayes and Jennings 1988).

CRLFs also frequently breed in artificial impoundments such as stock ponds, although additional research is needed to identify habitat requirements within artificial ponds (USFWS 2002). Adult CRLFs use dense, shrubby, or emergent vegetation closely associated with deep-water pools bordered with cattails and dense stands of overhanging vegetation (http://www.fws.gov/endangered/features/rl_frog/rlfrog.html#where).

In general, dispersal and habitat use depends on climatic conditions, habitat suitability, and life stage. Adults rely on riparian vegetation for resting, feeding, and dispersal. The foraging quality of the riparian habitat depends on moisture, composition of the plant community, and presence of pools and backwater aquatic areas for breeding. CRLFs can be found living within streams at distances up to 3 km (2 miles) from their breeding site and have been found up to 30 m (100 feet) from water in dense riparian vegetation for up to 77 days (USFWS 2002).

During dry periods, the CRLF is rarely found far from water, although it will sometimes disperse from its breeding habitat to forage and seek other suitable habitat under downed trees or logs, industrial debris, and agricultural features (UWFWS 2002). According to Jennings and Hayes (1994), CRLFs also use small mammal burrows and moist leaf litter as habitat. In addition, CRLFs may also use large cracks in the bottom of dried ponds as refugia; these cracks may provide moisture for individuals avoiding predation and solar exposure (Alvarez 2000).

### 2.6 Designated Critical Habitat

In a final rule published on April 13, 2006, 34 separate units of critical habitat were designated for the CRLF by USFWS (USFWS 2006; FR 51 19244-19346). A summary of the 34 critical habitat units relative to USFWS-designated recovery units and core areas (previously discussed in Section 2.5.1) is provided in Table 2.5.

'Critical habitat' is defined in the ESA as the geographic area occupied by the species at the time of the listing where the physical and biological features necessary for the conservation of the species exist, and there is a need for special management to protect the listed species. It may also include areas outside the occupied area at the time of listing if such areas are 'essential to the conservation of the species.' All designated critical habitat for the CRLF was occupied at the time of listing. Critical habitat receives protection under Section 7 of the ESA through prohibition against destruction or adverse modification with regard to actions carried out, funded, or authorized by a federal Agency. Section 7 requires consultation on federal actions that are likely to result in the destruction or adverse modification of critical habitat.

To be included in a critical habitat designation, the habitat must be 'essential to the conservation of the species.' Critical habitat designations identify, to the extent known using the best scientific and commercial data available, habitat areas that provide essential life cycle needs of the species or areas that contain certain primary constituent elements (PCEs) (as defined in 50 CFR 414.12(b)). PCEs include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, rearing (or development) of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species. The designated critical habitat areas for the CRLF are considered to have the following PCEs that justify critical habitat designation:

- Breeding aquatic habitat;
- Non-breeding aquatic habitat;
- Upland habitat; and

- Dispersal habitat.

Further description of these habitat types is provided in Attachment 1.

Occupied habitat may be included in the critical habitat only if essential features within the habitat may require special management or protection. Therefore, USFWS does not include areas where existing management is sufficient to conserve the species. Critical habitat is designated outside the geographic area presently occupied by the species only when a designation limited to its present range would be inadequate to ensure the conservation of the species. For the CRLF, all designated critical habitat units contain all four of the PCEs, and were occupied by the CRLF at the time of FR listing notice in April 2006. The FR notice designating critical habitat for the CRLF includes a special rule exempting routine ranching activities associated with livestock ranching from incidental take prohibitions. The purpose of this exemption is to promote the conservation of rangelands, which could be beneficial to the CRLF, and to reduce the rate of conversion to other land uses that are incompatible with CRLF conservation. Please see Attachment 1 for a full explanation on this special rule.

USFWS has established adverse modification standards for designated critical habitat (USFWS 2006). Activities that may destroy or adversely modify critical habitat are those that alter the PCEs and jeopardize the continued existence of the species. Evaluation of actions related to use of propargite that may alter the PCEs of the CRLF's critical habitat form the basis of the critical habitat impact analysis. According to USFWS (2006), activities that may affect critical habitat and therefore result in adverse effects to the CRLF include, but are not limited to the following:

(1) Significant alteration of water chemistry or temperature to levels beyond the tolerances of the CRLF that result in direct or cumulative adverse effects to individuals and their life-cycles.
(2) Significant increase in sediment deposition within the stream channel or pond or disturbance of upland foraging and dispersal habitat that could result in elimination or reduction of habitat necessary for the growth and reproduction of the CRLF by increasing the sediment deposition to levels that would adversely affect their ability to complete their life cycles.
(3) Significant alteration of channel/pond morphology or geometry that may lead to changes to the hydrologic functioning of the stream or pond and alter the timing, duration, water flows, and levels that would degrade or eliminate the CRLF and/or its habitat. Such an effect could also lead to increased sedimentation and degradation in water quality to levels that are beyond the CRLF's tolerances.
(4) Elimination of upland foraging and/or aestivating habitat or dispersal habitat.
(5) Introduction, spread, or augmentation of non-native aquatic species in stream segments or ponds used by the CRLF.
(6) Alteration or elimination of the CRLF's food sources or prey base (also evaluated as indirect effects to the CRLF).

As previously noted in Section 2.1, the Agency believes that the analysis of direct and indirect effects to listed species provides the basis for an analysis of potential effects on the designated critical habitat. Because propargite is expected to directly impact living organisms within the action area, critical habitat analysis for propargite is limited in a practical sense to those PCEs of critical habitat that are biological or that can be reasonably linked to biologically mediated processes.

## 2.7 Action Area

For listed species assessment purposes, the action area is considered to be the area affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR 402.02). It is recognized that the overall action area for the national registration of propargite is likely to encompass considerable portions of the United States based on the large array of agricultural uses. However, the scope of this assessment limits consideration of the overall action area to those portions that may be applicable to the protection of the CRLF and its designated critical habitat within the state of California. The Agency's approach to defining the action area under the provisions of the Overview Document (USEPA 2004) considers the results of the risk assessment process to establish boundaries for that action area with the understanding that exposures below the Agency's defined Levels of Concern (LOCs) constitute a no-effect threshold. For the purposes of this assessment, attention will be focused on the footprint of the action (*i.e.*, the area where pesticide application occurs), plus all areas where offsite transport (*i.e.*, spray drift, downstream dilution, etc.) may result in potential exposure within the state of California that exceeds the Agency's LOCs.

Deriving the geographical extent of this portion of the action area is based on consideration of the types of effects that propargite may be expected to have on the environment, the exposure levels to propargite that are associated with those effects, and the best available information concerning the use of propargite and its fate and transport within the state of California. Specific measures of ecological effect for the CRLF that define the action area include any direct and indirect toxic effect to the CRLF and any potential modification of its critical habitat, including reduction in survival, growth, and fecundity as well as the full suite of sub-lethal effects available in the effects literature. Therefore, the action area extends to a point where environmental exposures are below any measured lethal or sub-lethal effect threshold for any biological entity at the whole organism, organ, tissue, and cellular level of organization. In situations where it is not possible to determine the threshold for an observed effect, the action area is not spatially limited and is assumed to be the entire state of California.

The definition of action area requires a stepwise approach that begins with an understanding of the federal action. The federal action is defined by the currently labeled uses for propargite. An analysis of labeled uses and review of available product labels was completed. Several of the currently labeled uses are special local needs (SLN) uses or are restricted to specific states and are excluded from this assessment. In addition, a distinction has been made between food use crops and those that are non-food/non-agricultural uses. For those uses relevant to the CRLF, the analysis indicates that, for propargite, the following agricultural uses are considered as part of the federal action evaluated in this assessment: alfalfa, almond, apple, apricot, avocado, beans - dried-type, beans - succulent (lima), boysenberry, cherry, citrus, clover, corn (field, pop, and sweet), cotton (unspecified), currant, date, fig, filbert (hazelnut), grapefruit, grapes, hops, jojoba, lemon, lime, macadamia nut (bush nut), mint, nectarine, orange, peach, peanuts (unspecified), pear, pecan, persimmon, pistachio, plum, prune, quince, raspberry (black - red), small fruits, sorghum (silage and unspecified), stone fruits, strawberry, tangerines, and walnut (english/black).

In addition, the following non-food and non-agricultural uses are considered: Christmas tree plantations, forest trees (softwoods - conifers), nursery stock, ornamental and/or shade trees, ornamental herbaceous plants, ornamental non-flowering plants, and ornamental woody shrubs and vines.

Following a determination of the assessed uses, an evaluation of the potential "footprint" of propargite use patterns (*i.e.*, the area where pesticide application occurs) is determined. This "footprint" represents the initial area of concern, based on an analysis of available land cover data for the state of California. The initial area of concern is defined as all land cover types and the stream reaches within the land cover areas that represent the labeled uses described above. **Table 2.6** relates the scenario groups modeled in Section 3 to the label uses, CDPR PUR uses, and the land use classes assumed to represent the label uses for mapping purposes. A map representing all the land cover types that make up the initial area of concern for propargite is presented in **Figure 2.4**.

**Table 2.6. Key to assumed relationships between the various data sets used in this risk analysis.**

| Scenario Group | Label Use/Sites Included in Group | CDPR Pesticide Use Reporting Data Set Site Name | Land Cover Class |
|---|---|---|---|
| **1.** Alfalfa | Alfalfa | Alfalfa (Forage - Fodder) (Alfalfa Hay) | Pasture/Hay |
| **2.** Almond & Walnut | Almond<br>Walnut (English/Black) | Almond<br>Walnut (English Walnut, Persian Walnut) | Orchards/Vineyards |
| **3.** Avocado | Avocado | Avocado (All or Unspec) | Orchards/Vineyards |
| **4.** Beans | Beans - Dried-Type<br>Beans - Succulent (Lima) | Beans (All or Unspec)<br>Beans, Dried-Type<br>Beans, Lima (All or Unspec)<br>Beans, Succulent (Other than Lima) | Cultivated Crops |
| **5.** Berries | Boysenberry<br>Currant<br>Raspberry (Black - Red) | Boysenberry (Boysens)<br>Currant (Ribes Species)<br>Raspberry (All or Unspecified) | Cultivated Crops |
| **6.** Citrus | Citrus<br>Grapefruit<br>Lemon<br>Lime<br>Orange<br>Tangerines | Citrus Fruits (All or Unspec)<br>Grapefruit<br>Lemon<br>Lime (Mexican Lime, Etc.)<br>Orange (All or Unspec)<br>Tangerine (Mandarin, Satsuma, Murcott, Etc.) | Orchards/Vineyards |
| **7.** Clover | Clover | Clover (All or Unspec) (Forage - Fodder) | Pasture/Hay |

| Scenario Group | Label Use/Sites Included in Group | CDPR Pesticide Use Reporting Data Set Site Name | Land Cover Class |
|---|---|---|---|
| **8.** Corn | Corn - Field<br>Corn - Pop<br>Corn - Sweet | Corn (All or Unspec)<br>Corn (Forage - Fodder)<br>Corn, Field, Dent (Grain Crop)<br>Corn, Human Consumption<br>Corn, Sweet (Fresh Mkt. and Grain Crop) | Cultivated Crops |
| **9.** Cotton | Cotton (Unspecified) | Cotton, General | Cultivated Crops |
| **10.** Forestry | Christmas Tree Plantations<br>Forest Trees (Softwoods - Conifers)<br>Nursery Stock | Christmas Tree Plantations<br>5 Other Categories | Cultivated Crops<br>Forest<br>Cultivated Crops |
| **11.** Grapes | Grapes | Grapes<br>Grapes (All or Unspec)<br>Grapes, Wine | Orchards/Vineyards |
| **12.** Hops | Hops | Hops | Cultivated Crops |
| **13.** Jojoba | Jojoba | Jojoba (Oil Crop) | Orchards/Vineyards |
| **14.** Mint | Mint | Mint (All or Unspec) | Cultivated Crops |
| **15.** Nectarine | Nectarine | Nectarine | Orchards/Vineyards |
| **16.** Ornamental Woody Shrubs and Vines | Ornamental Woody Shrubs and Vines | Ornamental Vines (Herb. & Woody) (All or Unspecified) | Cultivated Crops |
| **17.** Other Ornamentals | Ornamental and/or Shade Trees<br>Ornamental Herbaceous Plants<br>Ornamental Nonflowering Plants | N-Outdr Container/Fld Grwn Plants<br>N-Outdr Grwn Cut Flwrs or Greens<br>N-Outdr Grwn Trnsplnt/Prpgtv Mtrl | Cultivated Crops |
| **18.** Peanuts | Peanuts (Unspecified) | Peanuts, Human Consumption | Cultivated Crops |
| **19.** Sorghum | Sorghum<br>Sorghum (Silage)<br>Sorghum (Unspecified) | Sorghum (Forage - Fodder) (Sorgo, Etc.)<br>Sorghum/Milo General<br>3 Other Categories | Pasture/Hay<br>Cultivated Crops |
| **20.** Strawberry | Strawberry | Strawberry (All or Unspec) | Cultivated Crops |
| **21.** Tree fruit – except nectarine | Apple<br>Apricot<br>Cherry<br>Fig<br>Peach<br>Pear<br>Persimmon<br>Plum<br>Prune<br>Quince<br>Small Fruits<br>Stone Fruits | Apple<br>Apricot<br>Cherry<br>Fig<br>Orchards (Fruit/Nut Etc.)<br>Peach<br>Pear<br>Persimmon<br>Plum (Includes Wild Plums for Human Consumption)<br>Prune<br>Quince<br>Several Categories<br>Stone Fruits (All or Unspec.) | Orchards/Vineyards |

| Scenario Group | Label Use/Sites Included in Group | CDPR Pesticide Use Reporting Data Set Site Name | Land Cover Class |
|---|---|---|---|
| **22.** Tree nut – except almond and walnut | Date<br>Filbert (Hazelnut)<br>Macadamia Nut (Bushnut)<br>Pecan<br>Pistachio | Nut Crops, Nut Trees (All or Unspec)<br>Date<br>Filbert or Hazelnut<br>Macadamia Nut (Bushnut)<br>Pecan<br>Pistachio (Pistache Nut) | Orchards/Vineyards |

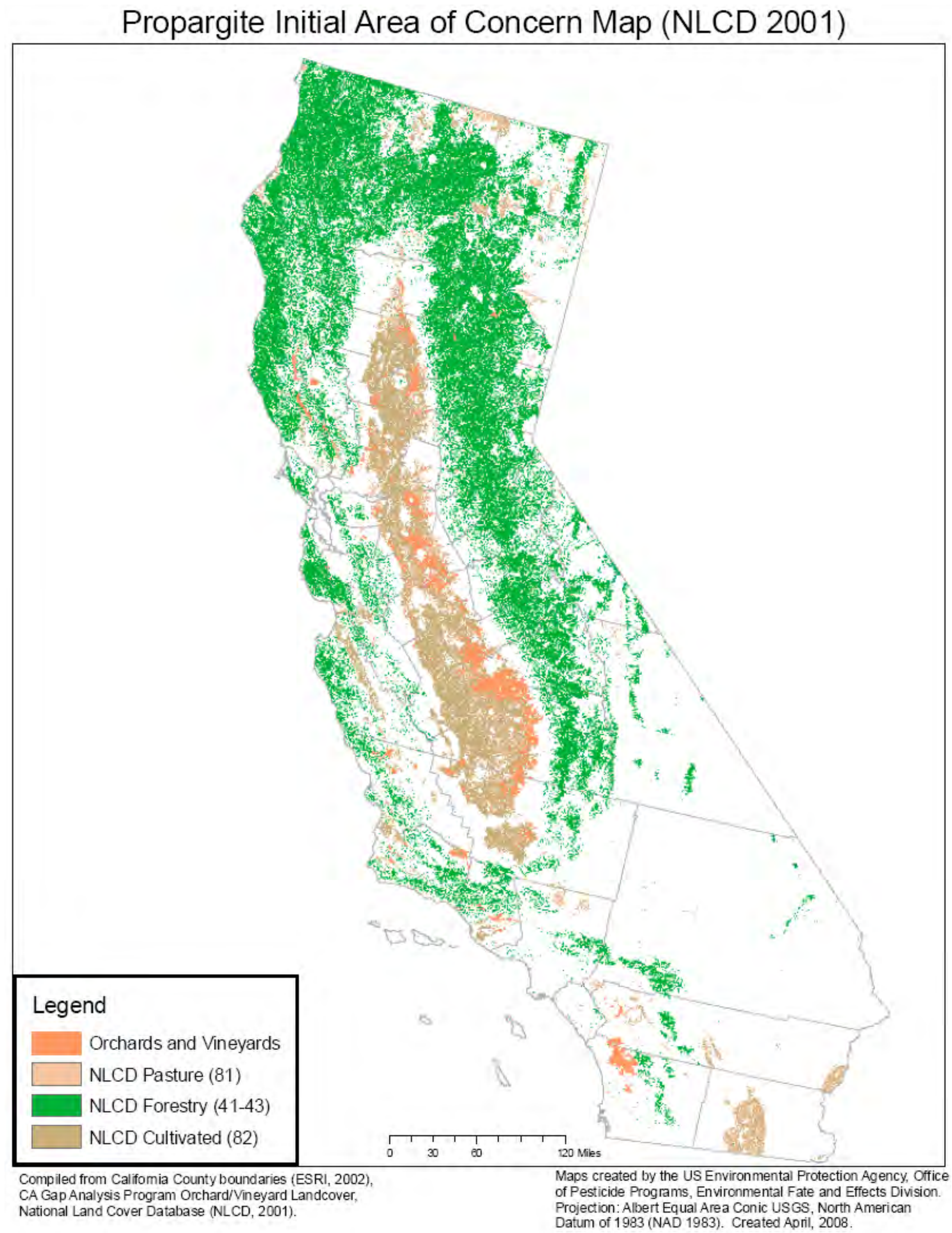



**Figure 2.5 Initial area of concern, or "footprint" of potential use, for Propargite**

Once the initial area of concern is defined, the next step is to define the potential boundaries of the action area by determining the extent of offsite transport via spray drift and runoff where exposure of one or more taxonomic groups to the pesticide exceeds the listed species LOCs.

As previously discussed, the action area is defined by the most sensitive measure of direct and indirect ecological toxic effects including reduction in survival, growth, reproduction, and the entire suite of sub-lethal effects from valid, peer-reviewed studies. Due to the lack of a defined no effect concentration because of a positive result in a carcinogenicity test (Section 4.2.2.2), the spatial extent of the action area (*i.e*., the boundary where exposures and potential effects are less than the Agency's LOC) for propargite cannot be determined (The MRID and title of the carcinogenicity study are 42837201 and Special Two Year Oncogenicity). Therefore, it is assumed that the action area encompasses the entire state of California, regardless of the spatial extent (*i.e*., initial area of concern or footprint) of the pesticide uses.

## 2.8 Assessment Endpoints and Measures of Ecological Effect

Assessment endpoints are defined as "explicit expressions of the actual environmental value that is to be protected."[4] Selection of the assessment endpoints is based on valued entities (*e.g.,* CRLF, organisms important in the life cycle of the CRLF, and the PCEs of its designated critical habitat), the ecosystems potentially at risk (*e.g.,* waterbodies, riparian vegetation, and upland and dispersal habitats), the migration pathways of propargite (*e.g.,* runoff, spray drift, etc.), and the routes by which ecological receptors are exposed to propargite *(e.g.*, direct contact, *etc.).*

### 2.8.1. Assessment Endpoints for the CRLF

Assessment endpoints for the CRLF include direct toxic effects on the survival, reproduction, and growth of the CRLF, as well as indirect effects, such as reduction of the prey base or modification of its habitat. In addition, potential modification of critical habitat is assessed by evaluating potential effects to PCEs, which are components of the habitat areas that provide essential life cycle needs of the CRLF. Each assessment endpoint requires one or more "measures of ecological effect," defined as changes in the attributes of an assessment endpoint or changes in a surrogate entity or attribute in response to exposure to a pesticide. Specific measures of ecological effect are generally evaluated based on acute and chronic toxicity information from registrant-submitted guideline tests that are performed on a limited number of organisms. Additional ecological effects data from the open literature are also considered. It should be noted that assessment endpoints are limited to direct and indirect effects associated with survival, growth, and fecundity, and do not include the full suite of sub-lethal effects used to define the action area. According the Overview Document (USEPA 2004), the Agency relies on acute and chronic effects endpoints that are either direct measures of impairment of survival, growth, or fecundity or endpoints for which there is a scientifically robust, peer reviewed relationship that can quantify the impact of the measured effect endpoint on the assessment endpoints of survival, growth, and fecundity.

A complete discussion of all the toxicity data available for this risk assessment, including resulting measures of ecological effect selected for each taxonomic group of concern, is

[4] From U.S. EPA (1992). *Framework for Ecological Risk Assessment.* EPA/630/R-92/001.

included in Section 4 of this document. A summary of the assessment endpoints and measures of ecological effect selected to characterize potential assessed direct and indirect CRLF risks associated with exposure to propargite is provided in **Table 2.7**.

| **Table 2.7 Assessment Endpoints and Measures of Ecological Effects** | |
|---|---|
| **Assessment Endpoint** | **Measures of Ecological Effects**[5] |
| *Aquatic-Phase CRLF (Eggs, larvae, juveniles, and adults)*[a] | |
| *Direct Effects* | |
| 1. Survival, growth, and reproduction of CRLF | 1a. Most sensitive freshwater fish acute $LC_{50}$ (guideline study; species: rainbow trout)<br>1b. Most sensitive freshwater fish chronic NOAEC (guideline study; species: fathead minnow) |
| *Indirect Effects and Critical Habitat Effects* | |
| 2. Survival, growth, and reproduction of CRLF individuals via indirect effects on aquatic prey food supply (*i.e.*, fish, freshwater invertebrates, non-vascular plants) | 2a. Most sensitive freshwater fish acute $LC_{50}$ (guideline study; species: rainbow trout)<br>2b. Most sensitive freshwater fish chronic NOAEC (guideline study; species: fathead minnow)<br>2c. Most sensitive freshwater aquatic invertebrate acute $LC_{50}$ (guideline study; species: water flea)<br>2d. Most sensitive freshwater invertebrate chronic NOAEC (guideline study and water flea)<br>2e. Most sensitive freshwater non-vascular plant $EC_{50}$ (guideline study; species: *Selenastrum capricornutum* ) |
| 3. Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat, cover, food supply, and/or primary productivity (*i.e.*, aquatic plant community) | 3a. Most sensitive freshwater vascular plant acute $EC_{50}$ (guideline study; species: duckweed)<br>3b. Most sensitive freshwater non-vascular plant acute $EC_{50}$ (guideline study; *Selenastrum capricornutum*) |
| 4. Survival, growth, and reproduction of CRLF individuals via effects to riparian vegetation | 4a. Most Sensitive of $EC_{25}$ values for monocots (guideline seedling emergence and vegetative vigor studies)<br>4b. Most Sensitive of $EC_{25}$ values for dicots (guideline seedling emergence and vegetative vigor studies) |
| *Terrestrial-Phase CRLF (Juveniles and adults)* | |
| *Direct Effects* | |
| 5. Survival, growth, and reproduction of CRLF individuals via direct effects on terrestrial-phase adults and juveniles | 5a. Most sensitive bird[b] $LD_{50}$ (guideline study; species: Mallard duck )<br>5b. Most sensitive bird[b] chronic NOAEC (guideline study; species: Mallard duck) |

[5] All registrant-submitted and open literature toxicity data reviewed for this assessment are identified in Appendix A.

| Table 2.7 Assessment Endpoints and Measures of Ecological Effects | |
|---|---|
| **Assessment Endpoint** | **Measures of Ecological Effects**[5] |
| *Indirect Effects and Critical Habitat Effects* | |
| 6. Survival, growth, and reproduction of CRLF individuals via effects on terrestrial prey (*i.e.*,terrestrial invertebrates, small mammals , and frogs) | 6a. Most sensitive terrestrial invertebrate and vertebrate acute respective $EC_{50}$, $LC_{50}$ [c] , $LD_{50}$ values (guideline studies; respective species honey bee, mallard duck, and laboratory rat)<br>6b. Most sensitive terrestrial invertebrate and vertebrate chronic NOAEC (guideline study; respective species honey bee, mallard duck, and laboratory rat) |
| 7. Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat (*i.e.*, riparian and upland vegetation) | 7a. Most Sensitive of $EC_{25}$ for monocots (guideline seedling emergence and vegetative vigor studies)<br>7b. Most Sensitive of $EC_{25}$ for dicots (guideline seedling emergence and vegetative vigor studies) |

[a] Adult frogs are no longer in the "aquatic-phase" of the amphibian life cycle; however, submerged adult frogs are considered "aquatic" for the purposes of this assessment because exposure pathways in the water are considerably different that exposure pathways on land.
[b] Birds are used as surrogates for terrestrial-phase amphibians.

### 2.8.2 Assessment Endpoints for Designated Critical Habitat

As previously discussed, designated critical habitat is assessed to evaluate actions related to the use of propargite that may alter the PCEs of the CRLF's critical habitat. PCEs for the CRLF were previously described in Section 2.6. Actions that may modify critical habitat are those that alter the PCEs and jeopardize the continued existence of the CRLF. Therefore, these actions are identified as assessment endpoints. It should be noted that evaluation of PCEs as assessment endpoints is limited to those of a biological nature (*i.e.*, the biological resource requirements for the listed species associated with the critical habitat) and those for which propargite effects data are available.

Adverse modification to the critical habitat of the CRLF includes, but is not limited to, the following, as specified by USFWS (2006):

1. Alteration of water chemistry/quality including temperature, turbidity, and oxygen content necessary for normal growth and viability of juvenile and adult CRLFs.
2. Alteration of chemical characteristics necessary for normal growth and viability of juvenile and adult CRLFs.
3. Significant increase in sediment deposition within the stream channel or pond or disturbance of upland foraging and dispersal habitat.
4. Significant alteration of channel/pond morphology or geometry.
5. Elimination of upland foraging and/or aestivating habitat, as well as dispersal habitat.
6. Introduction, spread, or augmentation of non-native aquatic species in stream segments or ponds used by the CRLF.
7. Alteration or elimination of the CRLF's food sources or prey base.

Measures of such possible effects by labeled use of propargite on critical habitat of the CRLF are described in **Table 2.8**. Some components of these PCEs are associated with physical abiotic features (*e.g.*, presence and/or depth of a water body, or distance between two sites), which are not expected to be measurably altered by use of pesticides. Assessment endpoints used for the analysis of designated critical habitat are based on the adverse modification standard established by USFWS (2006).

**Table 2.8 Summary of Assessment Endpoints and Measures of Ecological Effect for Primary Constituent Elements of Designated Critical Habitat[a]**

| Assessment Endpoint | Measures of Ecological Effect |
|---|---|
| ***Aquatic-Phase CRLF PCEs (Aquatic Breeding Habitat and Aquatic Non-Breeding Habitat)*** | |
| Alteration of channel/pond morphology or geometry and/or increase in sediment deposition within the stream channel or pond: aquatic habitat (including riparian vegetation) provides for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLFs. | a. Most sensitive aquatic plant $EC_{50}$ (guideline study; species: *Selenastrum capricornutum*<br>b. Most sensitive of $EC_{25}$ values for terrestrial monocots (guideline seedling emergence and vegetative vigor studies)<br>c. Most sensitive of $EC_{25}$ values for terrestrial dicots (guideline seedling emergence and vegetative vigor studies) |
| Alteration in water chemistry/quality including temperature, turbidity, and oxygen content necessary for normal growth and viability of juvenile and adult CRLFs and their food source. | a. Most sensitive $EC_{50}$ values for aquatic plants (*Selenastrum capricornutum* ; guideline study)<br>b. Most sensitive of $EC_{25}$ values for terrestrial monocots (guideline seedling emergence and vegetative vigor studies)<br>c. Most sensitive of $EC_{25}$ values for terrestrial dicots (guideline seedling emergence and vegetative vigor) |
| Alteration of other chemical characteristics necessary for normal growth and viability of CRLFs and their food source. | a. Most sensitive $LC_{50}$ values for fish (guideline study; species: rainbow trout)<br>b. Most sensitive chronic NOAEC values for fish (guideline study; species fat head minnow) |
| Reduction and/or modification of aquatic-based food sources for pre-metamorphs (*e.g.*, algae) | a. Most sensitive aquatic plant $EC_{50}$ (guideline study; species: *Selenastrum capricornutum*) |
| ***Terrestrial-Phase CRLF PCEs (Upland Habitat and Dispersal Habitat)*** | |
| Elimination and/or disturbance of upland habitat; ability of habitat to support food source of CRLFs: Upland areas within 200 ft of the edge of the riparian vegetation or dripline surrounding aquatic and riparian habitat that are comprised of grasslands, woodlands, and/or wetland/riparian plant species that provides the CRLF shelter, forage, and predator avoidance | a. Most sensitive of $EC_{25}$ values for monocots (guideline seedling emergence and vegetative vigor study)<br>b. Most sensitive of $EC_{25}$ values for dicots (guideline seedling emergence and vegetative vigor study)<br>c. Most sensitive food source acute $EC_{50}/LC_{50}$ and NOAEC values for terrestrial vertebrates (guideline study; species: laboratory rat) and invertebrates (guideline study; species: honey bee), terrestrial-phase amphibians (guideline study, species: bird) and freshwater fish (guideline study). |
| Elimination and/or disturbance of dispersal habitat: Upland or riparian dispersal habitat within designated units and between occupied locations within 0.7 mi of each other that allow for movement between sites including both natural and altered sites which do not contain barriers to dispersal | |
| Reduction and/or modification of food sources for terrestrial-phase juveniles and adults | |
| Alteration of chemical characteristics necessary for normal growth and viability of juvenile and adult CRLFs and their food source. | |

[a] Physico-chemical water quality parameters such as salinity, pH, and hardness are not evaluated because these processes are not biologically mediated and, therefore, are not relevant to the endpoints included in this assessment.

## 2.9 Conceptual Model

### 2.9.1 Risk Hypotheses

Risk hypotheses are specific assumptions about potential adverse effects (*i.e.*, changes in assessment endpoints) and may be based on theory and logic, empirical data, mathematical models, or probability models (U.S. EPA 1998). For this assessment, the risk is stressor-linked, where the stressor is the release of propargite to the environment. The following risk hypotheses are presumed for this endangered species assessment:

The labeled use of propargite within the action area may:

- directly affect the CRLF by causing mortality or by adversely affecting growth or fecundity;
- indirectly affect the CRLF by reducing or changing the composition of food supply;
- indirectly affect the CRLF or modify designated critical habitat by reducing or changing the composition of the aquatic plant community in the ponds and streams comprising the species' current range and designated critical habitat, thus affecting primary productivity and/or cover;
- indirectly affect the CRLF or modify designated critical habitat by reducing or changing the composition of the terrestrial plant community (*i.e.*, riparian habitat) required to maintain acceptable water quality and habitat in the ponds and streams comprising the species' current range and designated critical habitat;
- modify the designated critical habitat of the CRLF by reducing or changing breeding and non-breeding aquatic habitat (via modification of water quality parameters, habitat morphology, and/or sedimentation);
- modify the designated critical habitat of the CRLF by reducing the food supply required for normal growth and viability of juvenile and adult CRLFs;
- modify the designated critical habitat of the CRLF by reducing or changing upland habitat within 200 ft of the edge of the riparian vegetation necessary for shelter, foraging, and predator avoidance;
- modify the designated critical habitat of the CRLF by reducing or changing dispersal habitat within designated units and between occupied locations within 0.7 mi of each other that allow for movement between sites including both natural and altered sites which do not contain barriers to dispersal;
- modify the designated critical habitat of the CRLF by altering chemical characteristics necessary for normal growth and viability of juvenile and adult CRLFs.

### 2.9.2 Diagram

The conceptual model is a graphic representation of the structure of the risk assessment. It specifies the propargite release mechanisms, biological receptor types, and effects endpoints of potential concern. The conceptual models for aquatic and terrestrial-phases of the CRLF are shown in **Figures 2.6 and 2.7**, respectively, and the conceptual models for the aquatic and terrestrial PCE components of critical habitat are shown in **Figures 2.8 and 2.9**, respectively. Exposure routes shown in dashed lines are not quantitatively considered because the contribution of those potential exposure routes to potential risks to the CRLF and modification to designated critical habitat is expected to be negligible.

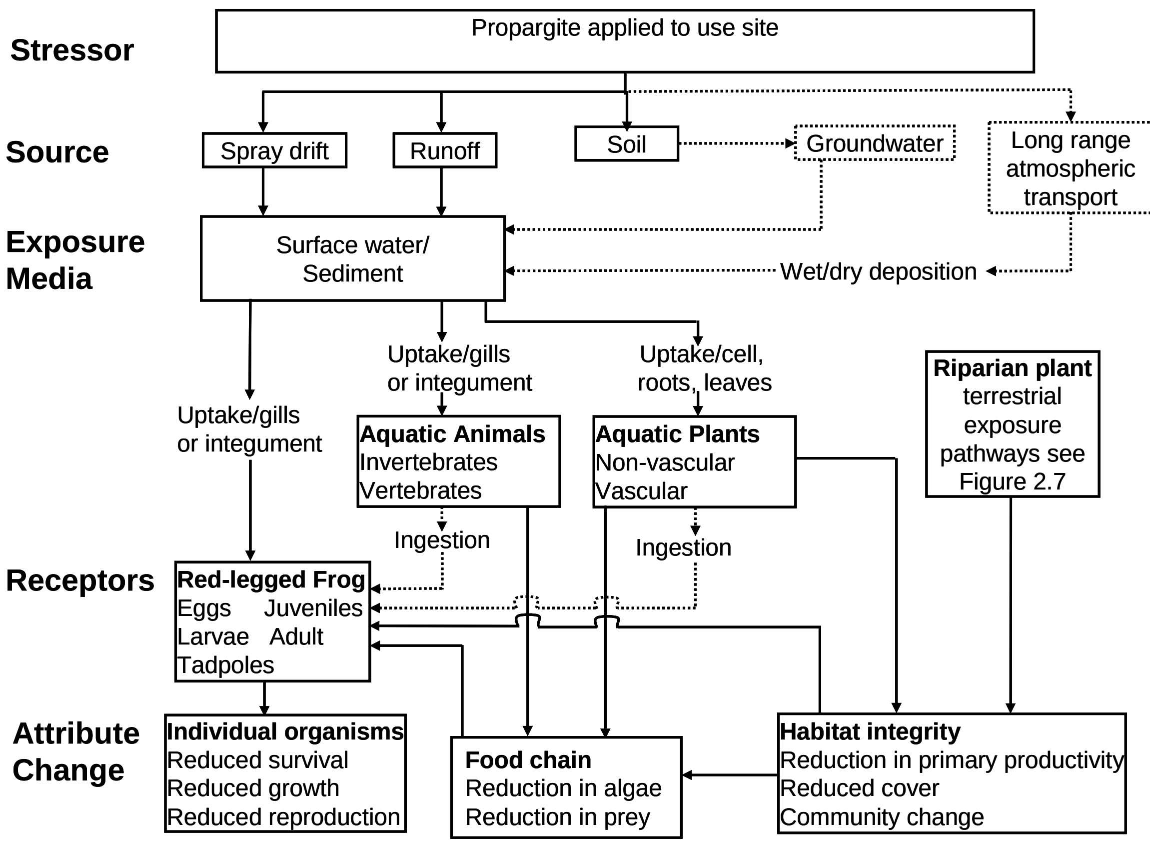



**Figure 2.6 Conceptual Model for Aquatic-Phase of the CRLF**

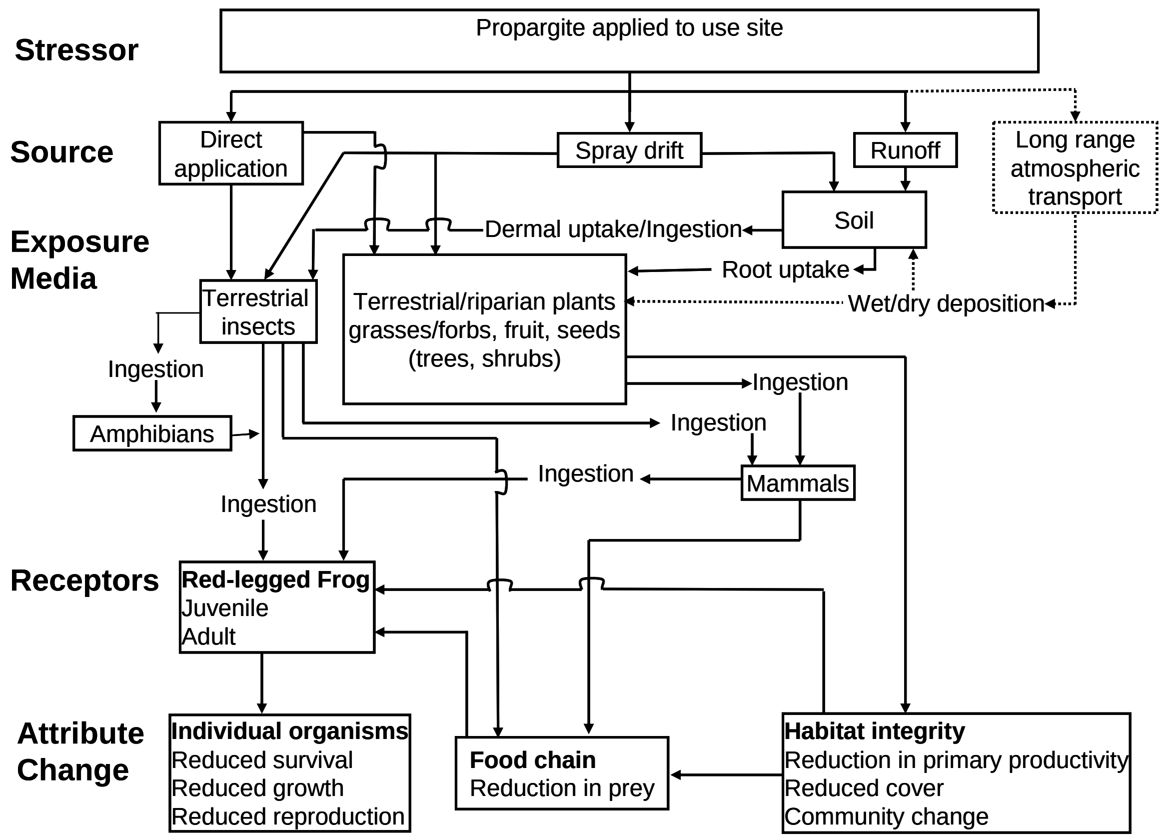



**Figure 2.7 Conceptual Model for Terrestrial-Phase of the CRLF**

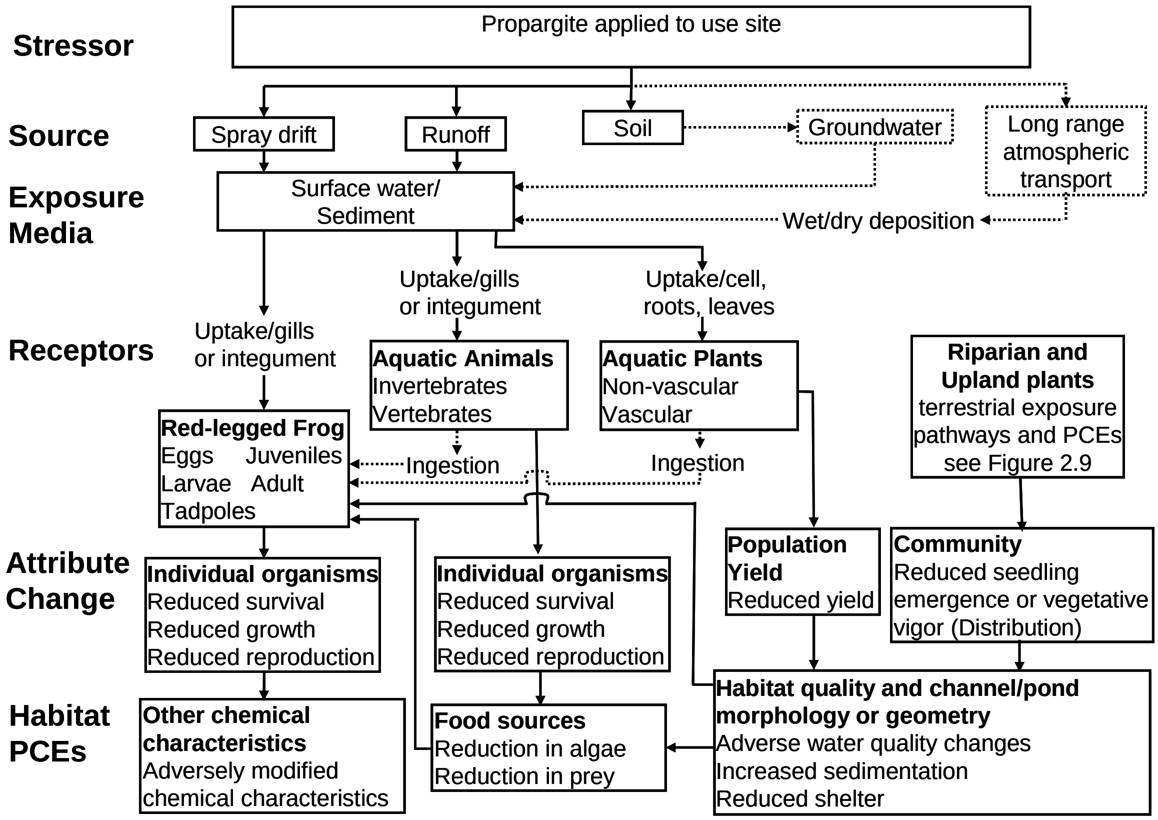



**Figure 2.8 Conceptual Model for Pesticide Effects on Aquatic Component of CRLF Critical Habitat**

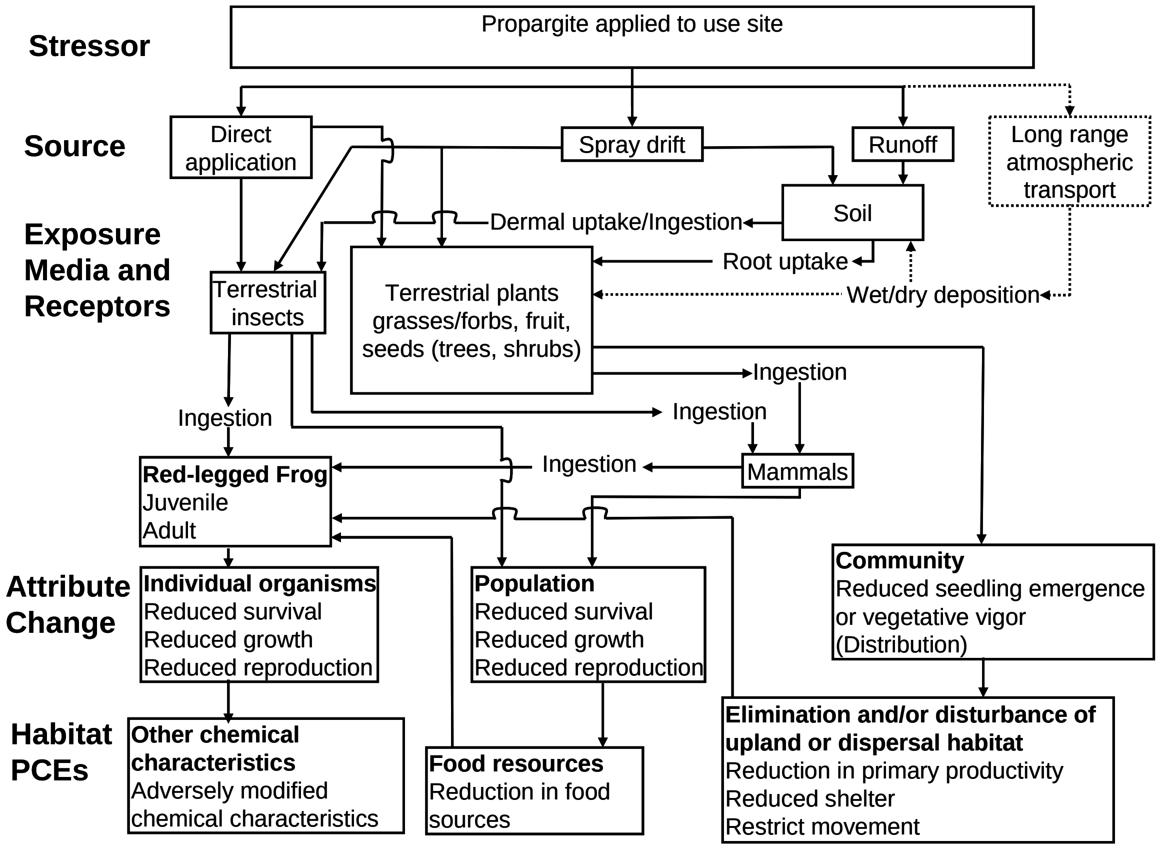



**Figure 2.9 Conceptual Model for Pesticide Effects on Terrestrial Component of CRLF Critical Habitat**

## 2.10 Analysis Plan

In order to address the risk hypothesis, the potential for direct and indirect effects to the CRLF, its prey, and its habitat is estimated. In the following sections, the use, environmental fate, and ecological effects of propargite are characterized and integrated to assess the risks. This is accomplished using a risk quotient (ratio of exposure concentration to effects concentration) approach. Although risk is often defined as the likelihood and magnitude of adverse ecological effects, the risk quotient-based approach does not provide a quantitative estimate of likelihood and/or magnitude of an adverse effect. However, as outlined in the Overview Document (U.S. EPA 2004), the likelihood of effects to individual organisms from particular uses of propargite is estimated using the probit dose-response slope and either the level of concern (discussed below) or actual calculated risk quotient value.

### 2.10.1 Measures to Evaluate the Risk Hypothesis and Conceptual Model

#### 2.10.1.1 Measures of Exposure

The environmental fate properties of propargite along with available monitoring data indicate that runoff and spray drift are the principle potential transport mechanisms of propargite to the aquatic and terrestrial habitats of the CRLF. In this assessment, transport of propargite through runoff and spray drift is considered in deriving quantitative estimates of propargite exposure to CRLF, its prey and its habitats. No air monitoring or atmospheric deposition data was found. The physical properties related to propargite's ability to volatilize indicate that volatilization and long-range atmospheric transport are unlikely to be significant exposure routes for propargite.

Measures of exposure are based on aquatic and terrestrial models that predict estimated environmental concentrations (EECs) of propargite using maximum labeled application rates and methods of application. The models used to predict aquatic EECs are the Pesticide Root Zone Model coupled with the Exposure Analysis Model System (PRZM/EXAMS). The model used to predict terrestrial EECs on food items is T-REX. These models are parameterized using relevant reviewed registrant-submitted environmental fate data.

PRZM (v3.12.2, May 2005) and EXAMS (v2.98.4.6, April 2005) are screening simulation models coupled with the input shell pe5.pl (Aug 2007) to generate daily exposures and 1-in-10 year EECs of propargite that may occur in surface water bodies adjacent to application sites receiving propargite through runoff and spray drift. PRZM simulates pesticide application, movement and transformation on an agricultural field and the resultant pesticide loadings to a receiving water body via runoff, erosion, and spray drift. EXAMS simulates the fate of the pesticide and resulting concentrations in the water body. The standard scenario used for ecological pesticide assessments assumes application to a 10-hectare agricultural field that drains into an adjacent 1-hectare water body, 2-meters deep (20,000 $m^3$ volume) with no outlet. PRZM/EXAMS was used to estimate screening-level exposure of aquatic organisms to propargite. The measure of exposure for aquatic species is the 1-in-10 year return peak or rolling mean concentration. The 1-in-10 year peak is used for estimating acute exposures of direct effects to the CRLF, as well as indirect effects to the CRLF through effects to potential prey items, including: algae, aquatic invertebrates, fish and frogs. The 1-in-10-year 60-day mean is used for assessing chronic exposure to the CRLF and fish and frogs serving as prey items; the 1-in-10-year 21-day mean is used for assessing chronic exposure for aquatic invertebrates, which are also potential prey items.

Exposure estimates for the terrestrial-phase CRLF and terrestrial invertebrates and mammals (serving as potential prey) assumed to be in the target area or in an area exposed to spray drift are derived using the T-REX model (version 1.3.1, 12/07/2006). This model incorporates the Kenega nomograph, as modified by Fletcher *et al.* (1994), which is based on a large set of actual field residue data. The upper limit values from the nomograph represented the 95th percentile of residue values from actual field measurements (Hoerger and Kenega, 1972). For modeling purposes, direct exposures of the CRLF to propargite through contaminated food are estimated using the EECs for the small bird (20 g) which consumes small insects. Dietary-based and dose-based exposures of potential prey (small mammals) are assessed using the small mammal (15 g) which consumes short grass. The small bird (20g) consuming small insects and the small mammal (15g) consuming short grass are used because these categories represent the largest RQs of the size and dietary categories in T-REX that are appropriate surrogates for the CRLF and one of its prey items. Estimated exposures of terrestrial insects to propargite are bound by using the dietary based EECs for small insects and large insects.

Birds are currently used as surrogates for terrestrial-phase CRLF. However, amphibians are poikilotherms (body temperature varies with environmental temperature) while birds are homeotherms (temperature is regulated, constant, and largely independent of environmental temperatures). Therefore, amphibians tend to have much lower metabolic rates and lower caloric intake requirements than birds or mammals. As a consequence, birds are likely to consume more food than amphibians on a daily dietary intake basis, assuming similar caloric content of the food items. Therefore, the use of avian food intake allometric equation as a surrogate to amphibians is likely to result in an over-estimation of exposure and risk for reptiles and terrestrial-phase amphibians. Therefore, the T-HERPS model has been develop as a means to refine the results of the T-REX model (v. 1.0), which allows for an estimation of food intake for poikilotherms using the same basic procedure as T-REX to estimate avian food intake. The T-HERPS model is only used if the avian RQs (based on the 20 g bird) calculated by T-REX (v.1.3.1) exceed the endangered species LOC for acute or chronic exposures. If the avian RQs do not exceed the endangered species avian LOC of 0.10, then RQs that incorporate the food intake allometric equation for herptiles would presumably not exceed LOCs because of the lower food intake of herptiles relative to birds. In situations where the avian RQ is less than the LOC, the effects determination for dietary exposures to terrestrial-phase amphibians is “no effect” and no further evaluation is required.

A spray drift model, AgDRIFT, is used to assess exposures of terrestrial-phase CRLF and its prey to propargite deposited on terrestrial habitats by spray drift. In addition to the buffered area from the spray drift analysis, the downstream extent of propargite that exceeds the LOC for the effects determination is also considered.

#### 2.10.1.2 Measures of Effect

Data identified in Section 2.8 are used as measures of effect for direct and indirect effects to the CRLF. Data were obtained from registrant submitted studies or from literature studies identified by ECOTOX. The ECOTOXicology database (ECOTOX) was searched in order to provide more ecological effects data and in an attempt to bridge existing data gaps. ECOTOX is a source for locating single chemical toxicity data for aquatic life, terrestrial plants, and wildlife. ECOTOX was created and is maintained by the USEPA, Office of Research and Development, and the National Health and Environmental Effects Research Laboratory's Mid-Continent Ecology Division.

The assessment of risk for direct effects to the terrestrial-phase CRLF makes the assumption that toxicity of propargite to birds is similar to or less than the toxicity to the terrestrial-phase CRLF. The same assumption is made for fish and aquatic-phase CRLF. Algae, aquatic invertebrates, fish, and amphibians represent potential prey of the CRLF in the aquatic habitat. Terrestrial invertebrates, small mammals, and terrestrial-phase amphibians represent potential prey of the CRLF in the terrestrial habitat. Aquatic, semi-aquatic, and terrestrial plants represent habitat of CRLF.

The acute measures of effect used for animals in this screening level assessment are the $LD_{50}$, $LC_{50}$ and $EC_{50}$. LD stands for "Lethal Dose", and $LD_{50}$ is the amount of a material, given all at once, that is estimated to cause the death of 50% of the test organisms. LC stands for “Lethal Concentration” and $LC_{50}$ is the concentration of a chemical that is estimated to kill 50% of the test organisms. EC stands for “Effective Concentration” and the $EC_{50}$ is the concentration of a chemical that is estimated to produce a specific effect in 50% of the test organisms. Endpoints for chronic measures of exposure for listed and non-listed animals are the NOAEL/NOAEC and NOEC. NOAEL stands for “No Observed-Adverse-Effect-Level” and refers to the highest tested dose of a substance that has been reported to have no harmful (adverse) effects on test organisms. The NOAEC (*i.e.*, “No-Observed-Adverse-Effect-Concentration”) is the highest test concentration at which none of the observed effects were statistically different from the control. The NOEC is the No-Observed-Effects-Concentration. For non-listed plants, only acute exposures are assessed (*i.e.*, $EC_{25}$ for terrestrial plants and $EC_{50}$ for aquatic plants).

It is important to note that the measures of effect for direct and indirect effects to the CRLF and its designated critical habitat are associated with impacts to survival, growth, and fecundity, and do not include the full suite of sublethal effects used to define the action area. According the Overview Document (USEPA 2004), the Agency relies on effects endpoints that are either direct measures of impairment of survival, growth, or fecundity or endpoints for which there is a scientifically robust, peer reviewed relationship that can quantify the impact of the measured effect endpoint on the assessment endpoints of survival, growth, and fecundity.

#### 2.10.1.3 Integration of Exposure and Effects

Risk characterization is the integration of exposure and ecological effects characterization to determine the potential ecological risk from agricultural and non-agricultural uses of propargite, and the likelihood of direct and indirect effects to CRLF in aquatic and terrestrial habitats. The exposure and toxicity effects data are integrated in order to evaluate the risks of adverse ecological effects on non-target species. For the assessment of propargite risks, the risk quotient (RQ) method is used to compare exposure and measured toxicity values. EECs are divided by acute and chronic toxicity values. The resulting RQs are then compared to the Agency’s levels of concern (LOCs) (USEPA, 2004) (see Appendix C).

For this endangered species assessment, listed species LOCs are used for comparing RQ values for acute and chronic exposures of propargite directly to the CRLF. If estimated exposures directly to the CRLF of propargite resulting from a particular use are sufficient to exceed the listed species LOC, then the effects determination for that use is “may affect”. When considering indirect effects to the CRLF due to effects to animal prey (aquatic and terrestrial invertebrates, fish, frogs, and mice), the listed species LOCs are also used. If estimated exposures to CRLF prey of propargite resulting from a particular use are sufficient to exceed the listed species LOC, then the effects determination for that use is a “may affect.” If the RQ being considered also exceeds the non-listed species acute risk LOC, then the effects determination is a LAA. If the acute RQ is between the listed species LOC and the non-listed acute risk species LOC, then further lines of evidence (*i.e.*, probability of individual effects, species sensitivity distributions) are considered in distinguishing between a determination of NLAA and a LAA. When considering indirect effects to the CRLF due to effects to algae as dietary items or plants as habitat, the non-listed species LOC for plants is used because the CRLF does not have an obligate relationship with any particular aquatic and/or terrestrial plant. If the RQ being considered for a particular use exceeds the non-listed species LOC for plants, the effects determination is “may affect”. Further information on LOCs is provided in Appendix C.

### 2.10.2 Data Gaps

There are no fate data gaps identified at this time. The only data gap pertaining to ecological toxicity data is the lack of terrestrial and aquatic phase amphibian toxicity data. The use of amphibian toxicity data would address the uncertainty of using surrogate toxicity data to assess the risk of propargite to the amphibians including the CRLF and its amphibian prey.

## 3. Exposure Assessment

Review of the environmental fate data, as well as physico-chemical properties, of propargite suggest the dominant terrestrial routes of exposure would be from propargite residues on food items within the treatment areas and areas bordering treatment areas where spray drift occurs in sufficient quantities. Because propargite tends to adsorb to soil particles, aquatic exposures would be from runoff containing eroded soil particles, deposition as sediment, and redisolution of sediment bound propargite, as well as spray drift that directly falls on surface waters.

Propargite is formulated as both a wettable powder and emulsifiable concentrate. Application equipment includes ground application, aerial application, and various sprayers. Risks from ground boom and aerial applications are considered in this assessment because they are expected to result in the highest off-target levels of propargite due to generally higher spray drift levels. Ground boom and aerial modes of application tend to use lower volumes of pesticide applied in finer sprays than applications coincident with sprayers and spreaders and thus have a higher potential for off-target movement via spray drift.

### 3.1 Label Application Rates and Intervals

Propargite labels may be categorized into two types: labels for manufacturing uses (including technical grade propargite and its formulated products) and end-use products. While technical products, which contain propargite of high purity, are not used directly in the environment, they are used to make formulated products, which can be applied in specific areas to control spiders and mites. The formulated product labels legally limit propargite's potential use to only those sites that are specified on the labels.

Currently registered agricultural and non-agricultural uses of propargite within California include alfalfa, almond, apple, apricot, avocado, beans (dried-type and succulent), boysenberry, cherry, citrus, clover, corn (field, pop, and sweet), cotton, currant, date, fig, filbert (hazelnut), grapefruit, grapes, hops, jojoba, lemon, lime, macadamia nut (bush nut), mint, nectarine, orange, peach, peanuts, pear, pecan, persimmon, pistachio, plum, prune, quince, raspberry (black/red), small fruits, sorghum (silage and unspecified), stone fruits, strawberry, tangerines, walnut (english/black), Christmas tree plantations, forest trees (softwoods/conifers), nursery stock, ornamental and/or shade trees, ornamental herbaceous plants, ornamental non-flowering plants, and ornamental woody shrubs and vines. The uses being assessed and labels on which those uses appear are summarized in **Table 3.1**. The values indicated in bold are the application values that lead to the highest EECs (most conservative values in terms of protecting the CRLF) and, therefore, are used in the analyses presented in this risk assessment.

**Table 3.1 Summary of Propargite Uses by Label with Application Information[1] (values in bold are used in this assessment[2])**

| | | | Aerial Applications (6% Spray Drift) | | | | Ground Applications (0.8% Spray Drift) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario Group** | **Crop/Site** | **Label Registration Number** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** |
| **1.** Alfalfa | Alfalfa | CA83002400 | **2.456** | **NS** | **NS** | **NS** | **2.456** | **NS** | **NS** | **NS** |
| **2.** Almond & Walnut | Almond | 000400-00082 | NA | | | | 3.2 | 2 | 21 | NS |
| | | 000400-00089 | 3 | 2 | 21 | NS | 3 | 2 | 21 | NS |
| | | 000400-00427 | NA | | | | 3.2 | 2 | 21 | NS |
| | | CA94003100 | 2.456 | 2 | NS | NS | 2.456 | 2 | NS | NS |
| | Walnut (English/Black) | 000400-00082 | **4** | **2** | **21** | **NS** | **4** | **2** | **21** | **NS** |
| | | 000400-00089 | 4.5 | 2 | 21 | 6.75 | 4.5 | 2 | 21 | 6.75 |
| | | 000400-00427 | 4 | 2 | 21 | 6.4 | 4 | 2 | 21 | 6.4 |
| | | CA94003100 | 2.456 | 2 | NS | NS | 2.456 | 2 | NS | NS |
| **3.** Avocado | Avocado | 000400-00427 | NA | | | | **4.8** | **2** | **21** | **NS** |
| | | CA81008800 | | | | | 4.8 | 2 | NS | NS |
| **4.** Beans | Beans – Dried-Type | 000400-00104 | 2.456 | 2 | 21 | 3.684 | 2.456 | 2 | 21 | 3.684 |
| | | 000400-00154 | 2.4375 | 2 | 21 | 4.5 | 2.4375 | 2 | 21 | 4.5 |
| | | CA94003100 | **2.456** | **2** | **21** | **NS** | **2.456** | **2** | **21** | **NS** |
| | Beans – Succulent (Lima) | 000400-00104 | 2.456 | 2 | 21 | 3.684 | 2.456 | 2 | 21 | 3.684 |
| **5.** Berries | Boysenberry | 000400-00082 | NA | | | | **1.92** | **2** | **21** | **NS** |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | Currant | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Raspberry (Black – Red) | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| **6.** Citrus | Citrus | 000400-00154 | 1.5 | 2 | 28 | 4.095 | 1.5 | 2 | 28 | 4.095 |
| | | 000400-00427 | NA | | | | 1.92 | 2 | 28 | NS |
| | Grapefruit | 000400-00082 | NA | | | | 3.36 | 2 | NS | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00104 | **2.456** | **2** | **28** | **4.094** | 2.456 | 2 | 28 | 4.094 |
| | | 000400-00154 | 1.5 | 2 | 28 | 4.095 | 1.5 | 2 | 28 | 4.095 |

| | | | **Aerial Applications (6% Spray Drift)** | | | | **Ground Applications (0.8% Spray Drift)** | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario Group** | **Crop/Site** | **Label Registration Number** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** |
| | | 000400-00425 | NA | | | | **3.36** | **2** | **28** | **5.76** |
| | | 000400-00427 | | | | | 3.36 | 2 | 28 | 5.76 |
| | | CA86007000 | | | | | 3.2 | NS | 21 | NS |
| | Lemon | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00154 | 1.5 | 2 | 28 | 4.095 | 1.5 | 2 | 28 | 4.095 |
| | | 000400-00425 | NA | | | | 3.36 | 2 | 28 | 5.76 |
| | Lime | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00154 | 1.5 | 2 | 28 | 4.095 | 1.5 | 2 | 28 | 4.095 |
| | Orange | 000400-00082 | NA | | | | 3.36 | 2 | NS | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00104 | 2.456 | 2 | 28 | 4.094 | 2.456 | 2 | 28 | 4.094 |
| | | 000400-00154 | 1.5 | 2 | 28 | 4.095 | 1.5 | 2 | 28 | 4.095 |
| | | 000400-00425 | NA | | | | 3.36 | 2 | 28 | 5.76 |
| | | 000400-00427 | | | | | 3.36 | 2 | 28 | 5.76 |
| | | CA86007000 | | | | | 3.2 | NS | 21 | NS |
| | Tangerines | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00154 | 1.5 | 2 | 28 | 4.095 | 1.5 | 2 | 28 | 4.095 |
| **7.** Clover | Clover | CA04001300 | **1.6375** | **NS** | **NS** | **NS** | **1.6375** | **NS** | **NS** | **NS** |
| **8.** Corn | Corn – Field | 000400-00089 | 1.5 | 1 | | 1.5 | 1.5 | 1 | | 1.5 |
| | | 000400-00104 | 2.456 | 1 | | NS | 2.456 | 1 | | NS |
| | | 000400-00154 | 1.5 | 1 | | 1.5 | 1.5 | 1 | | 1.5 |
| | Corn – Pop | 000400-00104 | 2.456 | 1 | | NS | 2.456 | 1 | | NS |
| | | 000400-00154 | **2.625** | **1** | | **2.625** | **2.625** | **1** | | **2.625** |
| | Corn – Sweet | 000400-00104 | 2.456 | 1 | | NS | 2.456 | 1 | | NS |
| **9.** Cotton | Cotton (Unspecified) | 000400-00104 | 1.6375 | 2 | 21 | NS | 1.6375 | 2 | 21 | NS |
| | | CA82008300 | 1.6375 | 2 | 21 | NS | 1.6375 | 2 | 21 | NS |
| | | CA94003100 | **2.456** | **2** | **21** | **NS** | **2.456** | **2** | **21** | **NS** |
| **10.** Forestry | Christmas Tree Plantations | 000400-00082 | **2.4** | **3** | **NS** | **NS** | **2.4** | **3** | **NS** | **NS** |

| | | | Aerial Applications (6% Spray Drift) | | | | Ground Applications (0.8% Spray Drift) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario Group** | **Crop/Site** | **Label Registration Number** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** |
| | | 000400-00427 | 2.4 | 3 | NS | NS | 2.4 | 3 | NS | NS |
| | Forest Trees (Softwoods – Conifers) | 000400-00082 | 2.4 | 3 | NS | NS | 2.4 | 3 | NS | NS |
| | | 000400-00427 | 2.4 | 3 | NS | NS | 2.4 | 3 | NS | NS |
| | Nursery Stock | 000400-00082 | 2.4 | 3 | NS | NS | 2.4 | 3 | NS | NS |
| | | 000400-00427 | 2.4 | 3 | NS | NS | 2.4 | 3 | NS | NS |
| **11.** Grapes | Grapes | 000400-00082 | NA | | | | **2.88** | **2** | **21** | **NS** |
| | | 000400-00427 | | | | | 2.88 | 2 | 21 | NS |
| **12.** Hops | Hops | 000400-00089 | NA | | | | **1.5** | **2** | **21** | **NS** |
| **13.** Jojoba | Jojoba | 000400-00104 | **1.6375** | **1** | | **NS** | **1.6375** | **1** | | **NS** |
| **14.** Mint | Mint | 000400-00089 | 2.0625 | 2 | 14 | 4.095 | 2.0625 | 2 | 14 | 4.095 |
| | | 000400-00104 | 2.047 | 2 | 14 | 4.094 | 2.047 | 2 | 14 | 4.094 |
| | | 000400-00154 | **2.25** | **2** | **14** | **NS** | **2.25** | **2** | **14** | **NS** |
| **15.** Nectarine | Nectarine | 000400-00082 | **2.88** | **2** | **21** | **NS** | **2.88** | **2** | **21** | **NS** |
| | | 000400-00089 | NA | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | 2.88 | 2 | 21 | NS | 2.88 | 2 | 21 | NS |
| **16.** Ornamental Woody Shrubs & Vines | Ornamental Woody Shrubs And Vines | 000400-00082 | NA | | | | 1.6 | 3 | 14 | NS |
| | | 000400-00083 | 1.5625 | 3 | 14 | NS | 1.5625 | 3 | 14 | NS |
| | | 000400-00427 | **1.6** | **3** | **14** | **NS** | **1.6** | **3** | **14** | **NS** |
| | | CA94000800 | 1.5 | NS | NS | NS | | | | |
| **17.** Other Ornamental | Ornamental and/or Shade Trees | 000400-00082 | NA | | | | 0.32 | 3 | 14 | NS |
| | | 000400-00427 | | | | | 0.32 | 3 | 14 | NS |
| | Ornamental Herbaceous Plants | 000400-00082 | NA | | | | **0.48** | **3** | **14** | **NS** |
| | | 000400-00427 | | | | | 0.48 | 3 | 14 | NS |
| | Ornamental Nonflowering Plants | 000400-00082 | NA | | | | 0.32 | 3 | 14 | NS |
| | | 000400-00427 | | | | | 0.32 | 3 | 14 | NS |
| **18.** Peanuts | Peanuts (Unspecified) | 000400-00082 | NA | | | | 1.6 | 2 | 14 | NS |
| | | 000400-00104 | **1.6375** | **2** | **14** | **NS** | **1.6375** | **2** | **14** | **NS** |
| | | 000400-00154 | 1.6875 | 1 | | NS | 1.6875 | 1 | | NS |
| | | 000400-00427 | | | | | 1.6 | 2 | 14 | NS |
| **19.** Sorghum | Sorghum | CA78016700 | **1.6375** | **1** | | **NS** | | | | |
| | Sorghum (Silage) | 000400-00104 | 1.6375 | 1 | | NS | | | | |

| | | | Aerial Applications (6% Spray Drift) | | | | Ground Applications (0.8% Spray Drift) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario Group** | **Crop/Site** | **Label Registration Number** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** |
| | Sorghum (Unspecified) | 000400-00104 | 1.6375 | 1 | | NS | | | | |
| **20.** Strawberry | Strawberry | 000400-00082 | NA | | | | **1.92** | **2** | **21** | **NS** |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| **21.** Tree fruit – except nectarine | Apple | 000400-00082 | NA | | | | **1.92** | **2** | **21** | **NS** |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Apricot | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Cherry | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Fig | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Peach | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Pear | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Persimmon | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 28 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Plum | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Prune | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Quince | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |

| | | | Aerial Applications (6% Spray Drift) | | | | Ground Applications (0.8% Spray Drift) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Scenario Group** | **Crop/Site** | **Label Registration Number** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** | **Appl. Rate (lbs. ai/A)** | **Number of Apps.** | **Appl. Interval** | **Max. Annual (lbs. ai/Yr)** |
| | Small Fruits | 000400-00427 | NA | | | | 1.92 | 2 | 21 | NS |
| | Stone Fruits | 000400-00427 | NA | | | | 1.92 | 2 | 21 | NS |
| **22. Tree nut – except almond and walnut** | Date | 000400-00082 | NA | | | | **1.92** | **2** | **21** | **NS** |
| | | 000400-00089 | | | | | 1.5 | 2 | 21 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Filbert (Hazelnut) | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 28 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Macadamia Nut (Bush nut) | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 28 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Pecan | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 28 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |
| | Pistachio | 000400-00082 | NA | | | | 1.92 | 2 | 21 | NS |
| | | 000400-00089 | | | | | 1.5 | 2 | 28 | NS |
| | | 000400-00427 | | | | | 1.92 | 2 | 21 | NS |

[1] Uses assessed are based on memorandum from SRRD dated 12/31/2007.
[2] The values indicated in bold are the application values that lead to the highest EECs (most conservative values in terms of protecting the CRLF) and, therefore, are used in the analyses presented in this risk assessment.
NS – Not specified on label (values assumed for modeling purposes when not specified on label appear in Appendix Table B2).

Labels require 50 and 75 ft. buffer distances for ground and aerial applications, respectively, between the site of propargite application and surface waterbodies. Using the default settings in AgDRIFT model (Teske et al 2001) and required buffer distances results in estimated spray drift fractions of 0.8% and 6.1% for ground and aerial applications, respectively. More detailed information on the values assumed when not specified on labels and the specific PRZM/EXAMS scenarios used appear in Appendix Table B2.

Many of the labels in Table 3.1 do not specify all of the information necessary for modeling exposure with PRZM/EXAMS. In cases where information was not provided on the labels ('NS' in Table 3.1), values had to be assumed. On most of the labels, the maximum annual pounds of active ingredient or amount of formulated product that could be applied in a year were not specified. For modeling purposes the maximum annual pounds of active ingredient was assumed to be the maximum application rate multiplied by the maximum number of applications per year. For labels without the maximum number of applications per year or minimum re-treatment interval (the minimum number days that must pass between treatments of the same area with the same chemical), values were estimated from the other propargite labels for the same use that did provide this information or, in cases in which no other labels from that use were available, best professional judgment was used. These assumptions may result in over- or under-estimation of exposures if these assumptions deviate from actual use patterns. All labels did specify the maximum application pounds of active ingredient or amount of formulated product that could be applied in a single application. The values assumed when not specified on labels and the specific PRZM/EXAMS scenarios used appear in Appendix Table B2.

## 3.2 Aquatic Exposure Assessment

### 3.2.1 Modeling Approach

Aquatic exposures are quantitatively estimated for all of assessed uses using scenarios that represent high exposure sites for propargite use. Each of these sites represents a 10 hectare field that drains into a 1-hectare pond that is two meters deep and has no outlet. Exposure estimates generated using the standard pond are intended to represent a wide variety of vulnerable water bodies that occur in the upland area of watersheds including prairie pot holes, playa lakes, wetlands, vernal pools, man-made and natural ponds, and intermittent and first-order streams. As a group, there are factors that make these water bodies more or less vulnerable than the standard surrogate pond. Static water bodies that have larger ratios of drainage area to water body volume would be expected to have higher peak EECs than the standard pond. These water bodies will be either shallower or have large drainage areas (or both). Shallow water bodies tend to have limited additional storage capacity, and thus, tend to overflow and carry pesticide in the discharge whereas the standard pond has no discharge. As watershed size increases beyond 10 hectares, at some point, it becomes unlikely that the entire watershed is planted to a single crop, which is all treated with the pesticide. Headwater streams can also have peak concentrations higher than the standard pond, but they tend to persist for only short periods of time and are then carried downstream.

Crop-specific management practices for all of the assessed uses of propargite were used for modeling, including application rates, number of applications per year, application intervals, buffer widths and resulting spray drift values modeled from AgDRIFT, and the first application date for each crop. The date of first application was developed based on a summary of individual applications from the CDPR PUR data  As an example, a 15-day moving average of ground (left graph) and aerial (right graph) propargite applications (total lbs ai/day) to alfalfa was fit across 17 years (1990-2006) of CDPR PUR data to pick first and last application dates. For ground applications (left graph), July 4$^{th}$ and July 24$^{th}$ (dashed vertical lines) were chosen as the first and last application dates, respectively, based on a maximum application date of July 14$^{th}$ (solid vertical line) and an assumed maximum number of 2 applications with an assumed minimum application interval of 21 days (Figure 3.1). Similar graphs for all of the scenario groups are presented in Appendix Figure B3.

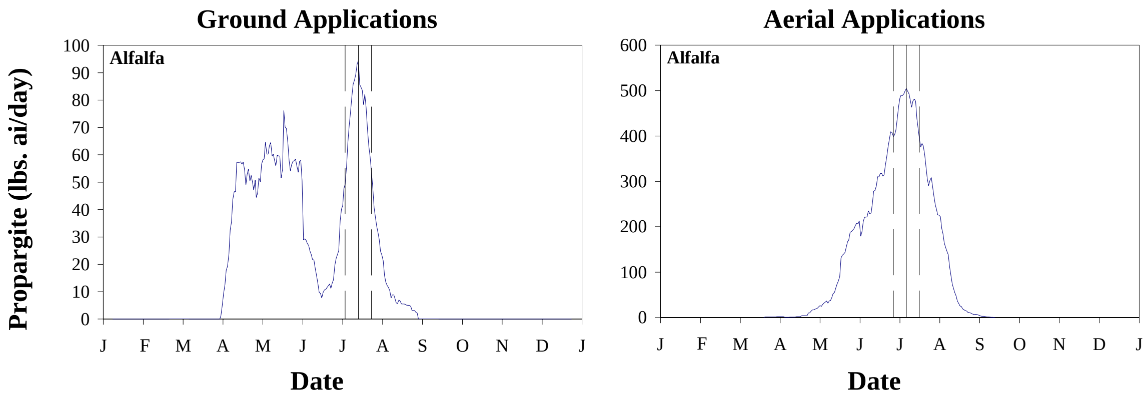



**Figure 3.1  Summary of Average Propargite Applications per day in California to Alfalfa between 1990 and 2006 (CDPR PUR data) indicates the "most typical" time of application (solid vertical line) and first and last application dates (dashed vertical lines) for both ground and aerial applications.**

Propargite has many agricultural uses. One source of information on typical agricultural practices is called the "crop profile", which can be found at: http://www.ipmcenters.org/cropprofiles/CP_form.cfm. It is the intent that profiles provide the complete production story for a commodity and a look at current research activities directed at finding replacement strategies for the pesticides of concern. Crop Profiles include typical use information (not simply what pesticide labels state) and have a common format for ease of use.

### 3.2.2 Model Inputs

The environmental fate data for propargite used for generating model parameters are listed in **Table 2.2**.  The input parameters for PRZM and EXAMS are in **Table 3.2**.  The names of the specific scenarios modeled, application rates, number of application, and application intervals assumed are recorded in Appendix Table B2.

| **Table 3.2 Summary of PRZM/EZAMS Environmental Fate Data Used for Aquatic Exposure Inputs[1] for Propargite Endangered Species Assessment for the CRLF** | | | |
|---|---|---|---|
| **Chemical Specific Property** | **Value** | **Notes** | **Reference** |
| Molecular Weight | 350.5 g/mole | None | RED (U.S. EPA 2000) |
| Henry's Law Constant | $3.28 \times 10^{-8}$ atm.m$^3$/mole | None | MRID 41003603 |
| Vapor Pressure | $4.49 \times 10^{-8}$ mm Hg @ 25$^0$C | None | MRID 41003603 |
| Solubility | 6.3 mg/L | 0.63 mg/L x 10 | MRID 42319303 |
| Organic Carbon Partitioning Coefficient ($K_{oc}$) | 25,918 mL/g | $K_{oc}$ from a California soil (Appendix Table B1) | MRID 42908402 |
| Soil Partition Coefficient (Kd) | 107 mL/g | None | MRID 42908402 |
| Acid hydrolysis half-life | 120 days @ pH 5 | None | MRID 40358401 |
| Neutral hydrolysis half-life | 75 days @ pH 7 | None | MRID 40358401 |
| Alkaline hydrolysis half-life | 3 days @ pH 9 | None | MRID 40358401 |
| Aqueous photolysis half-life | 140 days @ pH 5 | Same as dark control (stable) | MRID 40358402 |
| Aerobic soil Metabolism half-life | 504 days | 168 days x 3 | MRID 43851402 |
| Aerobic Aquatic metabolism half-life | 114 days | 38 days x 3 | MRID 42688801 |
| Anaerobic aquatic Metabolism half-life | 141 days | 47 days x 3 | MRID 431139401 |
| Application Efficiency | Air – 95%; Ground – 99% | None | Guidance[1] |
| Spray Drift Fraction | Air –6.1%; Ground – 0.8% | Buffers: 75' (Air); 50' (Ground) | AgDRIFT |

[1] Inputs determined in accordance with EFED "*Guidance for Chemistry and Management Practice Input Parameters for Use in Modeling the Environmental Fate and Transport of Pesticides*" dated February 28, 2002

### 3.2.3 Results

The aquatic 1-in-10-year EECs predicted for the 22 scenario groups by ground or aerial application practices are listed in **Table 3.3.** The peak EECs range from 2.12 µg/L (ground application to jojoba) to 48.24 µg/L (ground application to avocado). Likewise, the 21-day average EECs range from 1.88 µg/L (ground application to jojoba) to 29.09 µg/L (ground application to avocado). However, the range of the 60-day average EECs was determined by different crops, which vary from 1.48 µg/L (ground application to citrus) to 20.13 µg/L (ground application to strawberry).

| **Table 3.3 Aquatic EECs (µg/L) for Propargite Uses in California** | | | | | | |
|---|---|---|---|---|---|---|
| **Scenario Group (Crops Represented)** | **Ground or Air Appl.** | **Application Rate** | **1st – last Appl. Date** | **Peak EEC** | **21-day average EEC** | **60-day average EEC** |
| **1.** Alfalfa (Alfalfa) | G | 2.456 | 7/4 – 7/24 | 1.75 | 0.69 | 0.54 |
| | A | 2.456 | 6/27 – 7/17 | 8.68 | 2.00 | 1.55 |
| **2.** Almond & Walnut (Almond and Walnut) | G | 4 | 7/3 – 7/23 | 7.83 | 2.03 | 1.44 |
| | A | 4 | 6/27 – 7/17 | 14.56 | 3.59 | 2.92 |

| Table 3.3 Aquatic EECs (μg/L) for Propargite Uses in California | | | | | | |
|---|---|---|---|---|---|---|
| Scenario Group (Crops Represented) | Ground or Air Appl. | Application Rate | 1st – last Appl. Date | Peak EEC | 21-day average EEC | 60-day average EEC |
| **3.** Avocado (Avocado) | G | 4.8 | 8/5 – 8/25 | 18.60 | 3.71 | 2.34 |
| **4.** Beans (Beans - Dried and Succulent) | G | 2.456 | 8/2 – 8/22 | 9.23 | 2.25 | 1.66 |
| | A | 2.456 | 8/5 – 8/25 | 9.62 | 2.74 | 2.20 |
| **5.** Berries (Boysenberry, Currant, and Raspberry) | G | 1.92 | NPUR (6/1) | 11.48 | 2.84 | 1.84 |
| **6.** Citrus (Citrus, Grapefruit, Lemon, Lime, Orange, and Tangerines) | G | 3.36 | 4/23 – 5/20 | 1.51 | 0.31 | 0.26 |
| | A | 2.456 | 10/20 – 11/16 | 8.07 | 1.35 | 1.04 |
| **7.** Clover (Clover) | G | 1.6375 | 6/18 – 7/8 | 1.11 | 0.44 | 0.35 |
| | A | 1.6375 | 6/19 – 7/9 | 5.81 | 1.28 | 1.03 |
| **8.** Corn (Corn – Field, Pop, and Sweet) | G | 2.625 | 7/3 | 8.79 | 2.45 | 1.73 |
| | A | 2.625 | 7/14 | 9.48 | 2.56 | 1.86 |
| **9.** Cotton (Cotton) | G | 2.456 | 6/28 – 7/18 | 3.89 | 1.30 | 1.01 |
| | A | 2.456 | 7/23 – 8/12 | 9.11 | 2.27 | 1.91 |
| **10.** Forestry (Christmas Tree Plantations, Forest Trees, and Nursery Stock) | G | 2.4 | 6/7 – 7/2 | 25.07 | 5.98 | 4.62 |
| | A | 2.4 | 6/7 – 7/2 | 24.99 | 6.60 | 5.22 |
| **11.** Grapes (Grapes) | G | 2.88 | 7/3 – 7/23 | 21.00 | 5.14 | 3.36 |
| **12.** Hops (Hops) | G | 1.5 | NPUR (6/1) | 7.67 | 2.32 | 1.95 |
| **13.** Jojoba (Jojoba) | G | 1.6375 | NPUR (6/1) | 0.95 | 0.33 | 0.30 |
| | A | 1.6375 | NPUR (6/1) | 5.56 | 1.05 | 0.66 |
| **14.** Mint (Mint) | G | 2.25 | 6/12 – 6/25 | 5.47 | 1.79 | 1.30 |
| | A | 2.25 | 7/6 – 7/19 | 8.52 | 2.99 | 1.98 |
| **15.** Nectarine (Nectarine) | G | 2.88 | 7/3 – 7/23 | 2.16 | 0.53 | 0.39 |
| | A | 2.88 | 5/22 – 6/11 | 9.94 | 2.00 | 1.58 |
| **16.** Ornamental Woody Shrubs & Vines (Ornamental Woody Shrubs and Vines) | G | 1.6 | 5/29 – 6/25 | 32.11 | 7.23 | 5.01 |
| | A | 1.6 | 7/1 – 7/28 | 31.75 | 7.58 | 5.26 |
| **17.** Other Ornamental (Ornamental and/or Shade Trees, Ornamental Herbaceous Plants, and Ornamental Nonflowering Plants) | G | 0.48 | 5/29 – 6/25 | 9.63 | 2.17 | 1.50 |
| **18.** Peanuts (Peanuts) | G | 1.6375 | 7/25 – 8/7 | 6.05 | 1.48 | 1.09 |
| | A | 1.6375 | 8/10 – 8/23 | 6.43 | 2.22 | 1.48 |
| **19.** Sorghum (Sorghum, Sorghum – Silage, Sorghum – Unspecified) | A | 1.6375 | 7/23 | 5.74 | 1.22 | 0.82 |
| **20.** Strawberry (Strawberry) | G | 1.92 | 11/20 – 12/10 | 7.12 | 2.37 | 1.99 |

| Table 3.3 Aquatic EECs (µg/L) for Propargite Uses in California | | | | | | |
|---|---|---|---|---|---|---|
| **Scenario Group (Crops Represented)** | **Ground or Air Appl.** | **Application Rate** | **1st – last Appl. Date** | **Peak EEC** | **21-day average EEC** | **60-day average EEC** |
| **21.** Tree fruit – except nectarine (Apple, Apricot, Cherry, Fig,, Peach, Pear, Persimmon, Plum, Prune, Quince, Small Fruits, and Stone Fruits | G | 1.92 | 7/3 – 7/23 | 1.44 | 0.35 | 0.26 |
| **22.** Tree nut – except almond and walnut (Date, Filbert/Hazelnut, Macadamia Nut/Bush nut, Pecan, and Pistachio | G | 1.92 | 5/20 – 6/9 | 3.34 | 0.88 | 0.63 |

NPUR – Not in CDPR PUR data set. The date in parentheses is the date used in the assessment (determined by professional judgment).

### 3.2.4 Existing Monitoring Data

A critical step in the process of characterizing EECs is comparing the modeled estimates with available monitoring data. An evaluation of the surface water monitoring data was conducted to assess the occurrence of propargite in California surface and ground waters. Surface and ground water data were obtained from the USGS NAWQA data warehouse (http://water.usgs.gov/nawqa/data). Surface water data were obtained from the California Department of Pesticide Regulation (CDPR) (http://www.cdpr.ca.gov/docs/sw/surfdata.htm). The CDPR surface water data set is a compilation of data from multiple sources and likely includes much of the USGS California data. Additionally, air monitoring data was obtained from the California Environmental Protection Agency.

#### 3.2.4.1 USGS NAWQA Surface Water Data

The USGS surface water data set contains propargite data from filtered surface water samples (1893 samples from 74 sites in California collected between 4/15/1992 and 9/19/2006). USGS monitoring data detected propargite at concentrations of up to 20 µg/L in California in filtered surface water samples. Because these samples were filtered, the implication is that the propargite measured in these samples is dissolved in these samples rather than bound to suspended soil and sediment particles and, therefore, is likely more biologically available than if it were bound to soil or sediment particles.

Reported detection limits ranged from 0.013 to 1 µg/L. This variation in detection limits complicates the interpretation of the USGS monitoring data. For example, if two samples have the same propargite concentration of 0.5 µg/L, but are measured using different detection limits of 0.013 and 1 µg/L, the first analysis results in a measured concentration of 0.5 µg/L, while the second is recorded as < 1 µg/L.

In order to accurately characterize the distribution of measured propargite concentrations in the USGS data set, it is important to characterize this distribution relative to the distribution of sample detection limits. Of the 1893 samples, 235 (~12.5%) from 22 sites had sample concentrations measured above their respective sample detection limits. Only 17 of the 235 above-detection-limit results from 5 sites exceed the maximum detection limit (1 µg/L).

The distribution of maximum site concentrations in the USGS surface water data set is depicted in **Figure 3.2a** with maximum site concentrations measured above their respective detection limits indicated in black and the count of sites that had no samples measured above their respective detection limits (<D.L.) indicated in gray.

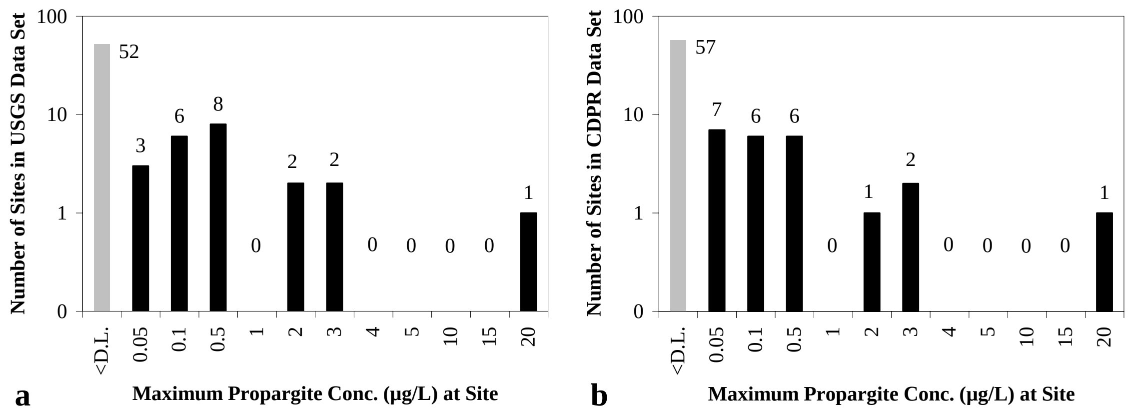



**Figure 3.2 Distribution of maximum site detections of propargite (black bars) in filtered surface water samples for the USGS NAWQA (a) and CDPR (b) data sets.**

### 3.2.4.2 USGS NAWQA Groundwater Data

The USGS NAWQA data set contained ground water data for propargite from 671 samples from 374 sites in California (collected between 8/11/1993 and 9/14/2006). Reported detection limits varied by sample and ranged from 0.013 to 0.023 µg/L. None of the ground water samples had propargite concentrations measured above their respective sample's reported detection limits. The registrant-submitted mobility data indicates that propargite has very limited leaching potential. The lack of detectable concentrations of propargite in California ground water seems to confirm that propargite is, in general, immobile in soil.

### 3.2.4.3 California Department of Pesticide Regulation (CDPR) Data

The CDPR data set contained monitoring data for propargite from 1600 samples from 80 sites in California (collected between 3/4/1991 and 9/25/2003). Because much of the USGS data has been compiled into the CDPR data set, much of the discussion of the USGS surface water data (Section 3.2.4.1) also applies to the CDPR data set. Reported detection limits varied by sample and ranged from 0.013 to 1 µg/L. The maximum concentration measured above the reported detection limit is 20 µg/L. Of the 162 CDPR surface water samples with propargite concentrations measured above their respective sample's reported detection limits, only 15 had measurable concentrations above the maximum detection limit in the entire data set of 1 µg/L. The minimum above-the-detection-limit sample concentration measured was 0.014 µg/L. Of the 1600 samples in the CDPR data set, 879 samples (~55% of samples) have reported detection limits that exceed the minimum above-the-detection-limit sample concentration of 0.014 µg/L. The distribution of maximum site concentrations in the CDPR surface water data set is depicted in **Figure 3.2b** with maximum site concentrations measured above their respective detection limits indicated in black and the count of sites that had no samples measured above their respective detection limits (<D.L.) indicated in gray.

#### 3.2.4.4 Atmospheric Monitoring Data

Because of propargite's chemical/physical properties related to volatility, propargite would only be expected to occur at very low concentrations in air samples except in cases where samples are collected near the site of application at a time soon after application (*i.e.*, spray drift). A search of summaries of a large number of pesticide deposition studies revealed no deposition monitoring data for propargite (Majewski and Capel 1995). However, a more recent (2001) California Environmental Protection Agency (CEPA) report provides relevant atmospheric monitoring data.

CEPA (2001) summarizes California propargite air monitoring studies – an ambient air quality monitoring study (monitoring air quality at public places some distance from the site of application) and an application site monitoring study (monitoring air quality near a site of application). Ambient monitoring was conducted to coincide with the use of propargite on cotton and grapes in Fresno and Kings Counties, CA, from June 24 to August 4, 1999. The highest 24-hr. air concentration observed was 1300 $ng/m^3$. Application monitoring was conducted in Fresno County around the use of propargite as a miticide on 12 acres of grapes from July 13 to 17, 1999. The highest concentration, 3500 $ng/m^3$, was observed during the 1st sampling period (application). Again, however, because of propargite's chemical/physical properties related to volatility, propargite would only be expected to occur at very low concentrations in air samples except in cases where samples are collected near the site of application at a time soon after application.

## 3.3 Terrestrial Animal Exposure Assessment

T-REX (Version 1.3.1) is used to calculate dietary and dose-based EECs of propargite for the CRLF and its potential prey (*e.g.*, small mammals and terrestrial insects) inhabiting terrestrial areas. EECs used to represent direct exposure to the CRLF are also used to represent exposure values for frogs serving as potential prey of CRLF adults. T-REX simulates a 1-year time period. For this assessment, spray applications of propargite are considered, as discussed below.

Terrestrial EECs for foliar formulations of propargite were derived for the uses summarized in **Table 3.4**. Given that no data on interception and subsequent dissipation from foliar surfaces is available for propargite, a default foliar dissipation half-life of 35 days is used based on the work of Willis and McDowell (1987). Use specific input values, including number of applications, application rate and application interval are provided in **Table 3.4**. An example output from T-REX is available in **Appendix E**.

**Table 3.4 Input Parameters for Foliar Applications Used to Derive Terrestrial EECs for Propargite with T-REX**

| Scenario Group | Ground or Air Appl. | Appl. Rate (lbs. ai/A) | Number of Appl. | Appl. Interval |
|---|---|---|---|---|
| **1.** Alfalfa | G | 2.456 | NS (2) | NS (21) |
| | A | 2.456 | NS (2) | NS (21) |
| **2.** Almond & Walnut | G | 4 | 2 | 21 |
| | A | 4 | 2 | 21 |
| **3.** Avocado | G | 4.8 | 2 | 21 |
| **4.** Beans | G | 2.456 | 2 | 21 |
| | A | 2.456 | 2 | 21 |
| **5.** Berries | G | 1.92 | 2 | 21 |
| **6.** Citrus | G | 3.36 | 2 | 28 |
| | A | 2.456 | 2 | 28 |
| **7.** Clover | G | 1.6375 | NS (2) | NS (21) |
| | A | 1.6375 | NS (2) | NS (21) |
| **8.** Corn | G | 2.625 | 1 | -- |
| | A | 2.625 | 1 | -- |
| **9.** Cotton | G | 2.456 | 2 | 21 |
| | A | 2.456 | 2 | 21 |
| **10.** Forestry | G | 2.4 | 3 | NS (21) |
| | A | 2.4 | 3 | NS (21) |
| **11.** Grapes | G | 2.88 | 2 | 21 |
| **12.** Hops | G | 1.5 | 2 | 21 |
| **13.** Jojoba | G | 1.6375 | 1 | -- |
| | A | 1.6375 | 1 | -- |
| **14.** Mint | G | 2.25 | 2 | 14 |
| | A | 2.25 | 2 | 14 |
| **15.** Nectarine | G | 2.88 | 2 | 21 |
| | A | 2.88 | 2 | 21 |
| **16.** Ornamental Woody Shrubs & Vines | G | 1.6 | 3 | 14 |
| | A | 1.6 | 3 | 14 |
| **17.** Other Ornamental | G | 0.48 | 3 | 14 |
| **18.** Peanuts | G | 1.6375 | 2 | 14 |
| | A | 1.6375 | 2 | 14 |
| **19.** Sorghum | A | 1.6375 | 1 | -- |
| **20.** Strawberry | G | 1.92 | 2 | 21 |
| **21.** Tree fruit – except nectarine | G | 1.92 | 2 | 21 |
| **22.** Tree nut – except almond and walnut | G | 1.92 | 2 | 21 |

NS – Not specified. The value in parenthesis is the value assumed for exposure modeling purposes.

| **Table 3.4 Input Parameters for Foliar Applications Used to Derive Terrestrial EECs for Propargite with T-REX** | | | | |
|---|---|---|---|---|
| **Scenario Group** | **Ground or Air Appl.** | **Appl. Rate (lbs. ai/A)** | **Number of Appl.** | **Appl. Interval** |
| **1.** Alfalfa | G | 2.456 | NS (2) | NS (21) |
| | A | 2.456 | NS (2) | NS (21) |
| **2.** Almond & Walnut | G | 4 | 2 | 21 |
| | A | 4 | 2 | 21 |
| **3.** Avocado | G | 4.8 | 2 | 21 |
| **4.** Beans | G | 2.456 | 2 | 21 |
| | A | 2.456 | 2 | 21 |
| **5.** Berries | G | 1.92 | 2 | 21 |
| **6.** Citrus | G | 3.36 | 2 | 28 |
| | A | 2.456 | 2 | 28 |
| **7.** Clover | G | 1.6375 | NS (2) | NS (21) |
| | A | 1.6375 | NS (2) | NS (21) |
| **8.** Corn | G | 2.625 | 1 | -- |
| | A | 2.625 | 1 | -- |
| **9.** Cotton | G | 2.456 | 2 | 21 |
| | A | 2.456 | 2 | 21 |
| **10.** Forestry | G | 2.4 | 3 | NS (21) |
| | A | 2.4 | 3 | NS (21) |
| **11.** Grapes | G | 2.88 | 2 | 21 |
| **12.** Hops | G | 1.5 | 2 | 21 |
| **13.** Jojoba | G | 1.6375 | 1 | -- |
| | A | 1.6375 | 1 | -- |
| **14.** Mint | G | 2.25 | 2 | 14 |
| | A | 2.25 | 2 | 14 |
| **15.** Nectarine | G | 2.88 | 2 | 21 |
| | A | 2.88 | 2 | 21 |
| **16.** Ornamental Woody Shrubs & Vines | G | 1.6 | 3 | 14 |
| | A | 1.6 | 3 | 14 |
| **17.** Other Ornamental | G | 0.48 | 3 | 14 |
| **18.** Peanuts | G | 1.6375 | 2 | 14 |
| | A | 1.6375 | 2 | 14 |
| **19.** Sorghum | A | 1.6375 | 1 | -- |
| **20.** Strawberry | G | 1.92 | 2 | 21 |
| **21.** Tree fruit – except nectarine | G | 1.92 | 2 | 21 |
| **22.** Tree nut – except almond and walnut | G | 1.92 | 2 | 21 |

NS – Not specified. The value in parenthesis is the value assumed for exposure modeling purposes.

T-REX is also used to calculate EECs for terrestrial insects exposed to propargite. Dietary-based EECs calculated by T-REX for small and large insects (units of a.i./g) are used to bound an estimate of exposure to bees. Available acute contact toxicity data for bees exposed to propargite (in units of µg a.i./bee), are converted to µg a.i./g (of bee) by multiplying by 1 bee/0.128 g. The EECs are later compared to the adjusted acute contact toxicity data for bees in order to derive RQs.

For modeling purposes, exposures of the CRLF to propargite through contaminated food are estimated using the EECs for the small bird (20 g) which consumes small insects. Dietary-based and dose-based exposures of potential prey are assessed using the small mammal (15 g) which consumes short grass. Upper-bound Kenega nomogram values reported by T-REX for these two organism types are used for derivation of EECs for the CRLF and its potential prey (**Table 3.5**). Dietary-based EECs for small and large insects reported by T-REX as well as the resulting adjusted EECs are available in **Table 3.6**. An example output from T-REX v. 1.3.1 is available in **Appendix E**.

**Table 3.5 Upper-bound Kenega Nomogram EECs for Dietary- and Dose-based Exposures of the CRLF and its Prey to Propargite**

| Use | EECs for CRLF | | EECs for Prey (small mammals) | |
|---|---|---|---|---|
| | Dietary-based EEC (ppm) | Dose-based EEC (mg/kg-bw) | Dietary-based EEC (ppm) | Dose-based EEC (mg/kg-bw) * |
| Alfalfa | 551.20 | NA* | 979.92 | 934.28 |
| Almond & Walnut | 896.27 | NA | 1593.36 | 1519.15 |
| Avocado | 1075.52 | NA | 1912.04 | 1822.98 |
| Beans | 550.31 | NA | 978.33 | 932.76 |
| Berries | 430.21 | NA | 764.81 | 729.19 |
| Citrus (air appl. only) | 521.99 | NA | 927.98 | 1210.42 |
| Citrus (ground appl. only) | 714.12 | NA | 1269.56 | 884.76 |
| Clover | 367.47 | NA | 653.28 | 622.85 |
| Corn | 354.38 | NA | 630.00 | 600.66 |
| Cotton | 550.31 | NA | 978.33 | 932.76 |
| Forestry | 678.79 | NA | 1206.74 | 1150.53 |
| Grapes | 645.31 | NA | 1147.22 | 1093.79 |
| Hops | 336.10 | NA | 597.51 | 569.68 |
| Jojoba | 221.40 | NA | 393.60 | 375.27 |
| Mint | 533.95 | NA | 949.24 | 905.03 |
| Nectarine | 645.31 | NA | 1147.22 | 1093.79 |
| Ornamental Woody Shrubs & Vines | 503.76 | NA | 895.57 | 853.86 |
| Other Ornamental | 151.13 | NA | 268.67 | 256.16 |
| Peanuts | 389.19 | NA | 691.89 | 659.67 |
| Sorghum | 221.40 | NA | 393.60 | 375.27 |
| Strawberry | 430.21 | NA | 764.81 | 729.19 |
| Tree fruit – except nectarine | 430.21 | NA | 764.81 | 729.19 |
| Tree nut – except almond and walnut | 430.21 | NA | 764.81 | 729.19 |

* Note: The risk quotients based on the dose-based EECs will not be calculated. This is because the avian acute oral toxicity data demonstrated no mortalities in the test birds. Thus, propargite is practically nontoxic to birds on an acute oral basis, and consequently progargite is presumed to be practically nontoxic to the CRLF on an acute oral basis.

| Table 3.6 EECs (ppm) for Indirect Effects to the Terrestrial-Phase CRLF via Effects to Terrestrial Invertebrate Prey Items | | |
|---|---|---|
| **Use** | **Small Insects EEC** | **Large Insects** |
| Alfalfa | 551.2 | 61.24 |
| Almond & Walnut | 896.27 | 99.59 |
| Avocado | 1075.52 | 119.5 |
| Beans | 550.31 | 61.15 |
| Berries | 430.21 | 47.8 |
| Citrus (air appl. only) | 521.99 | 58 |
| Citrus (ground appl. only) | 714.12 | 79.35 |
| Clover | 367.47 | 40.83 |
| Corn | 354.38 | 39.38 |
| Cotton | 550.31 | 61.15 |
| Forestry | 678.79 | 75.42 |
| Grapes | 645.31 | 71.7 |
| Hops | 336.1 | 37.34 |
| Jojoba | 221.4 | 24.6 |
| Mint | 533.95 | 59.33 |
| Nectarine | 645.31 | 71.7 |
| Ornamental Woody Shrubs & Vines | 503.76 | 55.97 |
| Other Ornamental | 151.13 | 16.79 |
| Peanuts | 389.19 | 43.24 |
| Sorghum | 221.4 | 24.6 |
| Strawberry | 430.21 | 47.8 |
| Tree fruit – except nectarine | 430.21 | 47.8 |
| Tree nut – except almond and walnut | 430.21 | 47.8 |

### 3.4 Terrestrial Plant Exposure Assessment

TerrPlant (Version 1.1.2) is used to calculate EECs for non-target plant species inhabiting dry and semi-aquatic areas. Typically the EECs are calculated based on the registrant submitted terrestrial plant toxicity data. However, since the terrestrial plant toxicity data (MRIDs 43848801 and 43848802) demonstrates that propargite shows no adverse toxic effects to terrestrial plants at the highest concentration tested which was 2.45 lb ai/A, no terrestrial plant EECs will be calculated based on these data. Since the registrant submitted data did not test terrestrial plant toxicity up to the highest maximum use rate of 4.8 lbs. ai/acre (avocado use) among the modeled uses, terrestrial plant EECs will be calculated using TerrPlant based on the highest maximum use rate in order to assess plant risk based on a worst case scenario.

| Table 3.7 Terrestrial Plant Toxicity EECs for propagite. Units in lbs ai/acre. | |
|---|---|
| **Description** | **EEC lbs ai/acre** |
| Runoff to dry areas | 0.048 |
| Runoff to semi-aquatic areas | 0.48 |
| Spray drift | 0.24 |
| Total for dry areas | 0.288 |

| | |
|---|---|
| Total for semi-aquatic areas | 0.72 |

## 4. Effects Assessment

This assessment evaluates the potential for propargite to directly or indirectly affect the CRLF or modify its designated critical habitat. As previously discussed in Section 2.7, assessment endpoints for the CRLF effects determination include direct toxic effects on the survival, reproduction, and growth of CRLF, as well as indirect effects, such as reduction of the prey base or modification of its habitat. In addition, potential modification of critical habitat is assessed by evaluating effects to the PCEs, which are components of the critical habitat areas that provide essential life cycle needs of the CRLF. Direct effects to the aquatic-phase of the CRLF are based on toxicity information for freshwater fish, while terrestrial-phase effects are based on avian toxicity data, given that birds are generally used as a surrogate for terrestrial-phase amphibians. Because the frog's prey items and habitat requirements are dependent on the availability of freshwater fish and invertebrates, small mammals, terrestrial invertebrates, and aquatic and terrestrial plants, toxicity information for these taxa are also discussed. Acute (short-term) and chronic (long-term) toxicity information is characterized based on registrant-submitted studies and a comprehensive review of the open literature on propargite.

As described in the Agency's Overview Document (U.S. EPA 2004), the most sensitive endpoint for each taxon is used for risk estimation. For this assessment, evaluated taxa include freshwater fish (surrogate for aquatic-phase amphibians), freshwater invertebrates, aquatic plants, birds (surrogate for terrestrial-phase amphibians), mammals, and terrestrial invertebrates.

Toxicity endpoints are established based on data generated from guideline studies submitted by the registrant, and from open literature studies that meet the criteria for inclusion into the ECOTOX database maintained by EPA/Office of Research and Development (ORD) (U.S. EPA 2004). Open literature data presented in this assessment were obtained from ECOTOX on 3/19/2008. In order to be included in the ECOTOX database, papers must meet the following minimum criteria:

(1) the toxic effects are related to single chemical exposure;
(2) the toxic effects are on an aquatic or terrestrial plant or animal species;
(3) there is a biological effect on live, whole organisms;
(4) a concurrent environmental chemical concentration/dose or application rate is reported; and
(5) there is an explicit duration of exposure.

Data that pass the ECOTOX screen are evaluated along with the registrant-submitted data, and may be incorporated qualitatively or quantitatively into this endangered species assessment. In general, effects data in the open literature that are more conservative than the registrant-submitted data are considered. The degree to which open literature data are quantitatively or qualitatively characterized for the effects determination is dependent on whether the information is relevant to the assessment endpoints (*i.e.*, maintenance of CRLF survival, reproduction, and growth) identified in Section 2.8. For example, endpoints such as behavior modifications are likely to be qualitatively evaluated unless quantitative relationships between modifications and reduction in species survival, reproduction, and/or growth are available. Although the effects determination relies on endpoints that are relevant to the assessment endpoints of survival, growth, or reproduction, it is important to note that the full suite of sublethal endpoints potentially available in the effects literature (regardless of their significance to the assessment endpoints) are considered to define the action area for propargite.

Citations of all open literature not considered as part of this assessment because they were either rejected by the ECOTOX screen or accepted by ECOTOX but not used (*e.g.*, the endpoint is less sensitive) are included in **Appendix G. Appendix G** also includes a rationale for rejection of those studies that did not pass the ECOTOX screen and those that were not evaluated as part of this endangered species risk assessment.

A detailed spreadsheet of the available ECOTOX open literature data, including the full suite of lethal and sub-lethal endpoints is presented in **Appendix F** and also includes a summary of the human health effects data for propargite.

In addition to registrant-submitted and open literature toxicity information, other sources of information, including use of the acute probit dose response relationship to establish the probability of an individual effect and reviews of the Ecological Incident Information System (EIIS), are used to further refine the characterization of potential ecological effects associated with exposure to propargite. A summary of the available aquatic and terrestrial ecotoxicity information, use of the probit dose response relationship, and the incident information for propargite are provided in Sections 4.1 through 4.4, respectively.

A detailed summary of the available ecotoxicity information for all propargite and formulated products is presented in **Appendix A**. Since there are no toxic degradates of concern, there are no degradate toxicity data available to discuss. Additionally, there are no toxicity data available for propargite in mixtures with other pesticides.

## 4.1 Toxicity of Propargite to Aquatic Organisms

**Table 4.1** summarizes the most sensitive aquatic toxicity endpoints for the CRLF, based on an evaluation of both the submitted studies and the open literature, as previously discussed. A brief summary of submitted and open literature data considered relevant to this ecological risk assessment for the CRLF is presented below. Additional information is provided in **Appendix A.**

| Table 4.1 Freshwater Aquatic Toxicity Profile for Propargite | | | | |
|---|---|---|---|---|
| **Assessment Endpoint** | **Species** | **Toxicity Value Used in Risk Assessment** | **Citation MRID #** | **Comment** |
| Acute Direct Toxicity to Aquatic-Phase CRLF | Rainbow trout<br><br>*Onchorynchus mykiss* | 96-h $LC_{50}$ 118 µg/L ai<br><br>(highly toxic; default slope = 4.5; 95% Confidence Interval = 2-9) | 0066498 | Acceptable |
| | Bluegill sunfish<br><br>*(Lepomis macrochirus)* | $LC_{50}$ 30 µg/L ai formulated product, Omite 57E (According to the OPP Usage and Label Use Team report for propagite dated 11-6-07, this product is currently registered for use on ornamental woody shrubs and vines under the registration no.400-00083.) | 00112368 | Supplemental<br><br>The study is deemed supplemental because the formulated product was tested instead of the active ingredient. This formulated product is only registered for use on the ornamental woody shrubs & Vines modeled uses. |
| Chronic Direct Toxicity to Aquatic-Phase CRLF | Fathead minnow<br><br>*Cyprinus carpio* | NOAEC 16 µg/L ai<br><br>LOAEC 28 µg/L ai (growth survival, day to mean hatch) | 00126739 | Acceptable |
| Indirect Toxicity to Aquatic-Phase CRLF via Acute Toxicity to Freshwater Invertebrates (*i.e.*, prey items) | Water flea<br><br>*Daphnia magna* | 48-h $EC_{50}$ 74 µg/L ai<br><br>(very highly toxic; reported probit slope=9.2; 95% Confidence Interval = 66.1-84.7) | 43759002 | Acceptable |
| Indirect Toxicity to Aquatic-Phase CRLF via Chronic Toxicity to Freshwater Invertebrates (*i.e.*, prey items) | *Daphnia magna* | NOAEC 9 µg/L ai<br><br>LOAEC 14 µg/L ai (reproduction output) | 0126738 | Acceptable |

| | | | | |
|---|---|---|---|---|
| Indirect Toxicity to Aquatic-Phase CRLF via Acute Toxicity to Non-vascular Aquatic Plants | Freshwater Green Alga<br><br>*Selenastrum capricornutum*<br><br>Non-vascular aquatic plants | $EC_{50}$ 66.2 µg/L | 43885806 | Acceptable |
| Indirect Toxicity to Aquatic-Phase CRLF via Acute Toxicity to Vascular Aquatic Plants | *Lemna gibba*<br><br>Vascular plants | $EC_{50}$ 75000 µg/L ai | 43885805 | Acceptable |

Toxicity to aquatic fish and invertebrates is categorized using the system shown in **Table 4.2** (U.S. EPA 2004). Toxicity categories for aquatic plants have not been defined.

| **Table 4.2 Categories of Acute Toxicity for Aquatic Organisms** | |
|---|---|
| **$LC_{50}$ (ppm)** | **Toxicity Category** |
| < 0.1 | Very highly toxic |
| > 0.1 - 1 | Highly toxic |
| > 1 - 10 | Moderately toxic |
| > 10 - 100 | Slightly toxic |
| > 100 | Practically nontoxic |

### 4.1.1 Toxicity to Freshwater Fish

Given that no propargite toxicity data are available for aquatic-phase amphibians, freshwater fish data were used as a surrogate to estimate direct acute and chronic risks to the CRLF. Freshwater fish toxicity data were also used to assess potential indirect effects of propargite to the CRLF. Effects to freshwater fish resulting from exposure to propargite could indirectly affect the CRLF via reduction in available food. As discussed in Section 2.5.3, over 50% of the prey mass of the CRLF may consist of vertebrates such as mice, frogs, and fish (Hayes and Tennant, 1985).

A summary of acute and chronic freshwater fish data, including data from the open literature, is provided below in Sections 4.1.1.1 through 4.1.1.3.

#### 4.1.1.1 Freshwater Fish: Acute Exposure (Mortality) Studies

Three species of freshwater fish have been used to investigate the acute toxicity of propargite. These include bluegill sunfish (*Lepomis macrochirus*), rainbow trout (*Onchorynchus mykiss*), and the carp (*Cyprinus carpio*).

There are two studies testing the technical grade active ingredient. These include a 96-h trout study which resulted in a $LC_{50}$ of 118 µg ai /L (technical, MRID 0066498, acceptable) and a 96-h bluegill study which resulted in a $LC_{50}$ of 167 µg/L for a 88% purity of propargite (MRID 00966498, acceptable).

There are also several studies testing the formulated product of progargite including two trout studies, a bluegill study, and a carp study. The trout studies include a 96-h study testing a 76.2% ai, test material formulation called Comite which resulted in a $LC_{50}$ of 143 µg/L (MRID 43759001, acceptable), and a 96-h $LC_{50}$ study testing a 30% ai, test material formulation called Omite which resulted in a $LC_{50}$ of 445 µg/L (MRID 00043552, supplemental). The bluegill study is a 96-h $LC_{50}$ study which resulted in a $LC_{50}$ of 31 µg/L for a 57% emulsifiable product (MIRD 00112368, supplemental). The carp study is a 96-h $LC_{50}$ study testing a 35% ai emulsifiable concentrate of propargite called Omite which yielded a $LC_{50}$ of 330 µg/L (MRID 00090718, supplemental).

The endpoint used to access the acute risk to the aquatic-phase CRLF is the rainbow trout $LC_{50}$ of 118 µg ai /L. This is the most sensitive fish acute toxicity endpoint among the technical grade active ingredient fish acute toxicity data for propargite. The most sensitive fish acute toxicity endpoint among all the propargite fish acute toxicity data was the formulated product, Omite 57E, LC50 of 31 ppb. However, this formulation is registered for only one of the modeled uses which is ornamental woody shrubs & vines (See Table 3.1 under registration no. 000400-00083). Thus, risk quotients based on this Omite 57E, LC50 will only be calculated for ornamental woody shrubs & vines.

#### 4.1.1.2 Freshwater Fish: Chronic Exposure (Growth/Reproduction) Studies

One early life stage study in freshwater fish is available for propargite. An 88.9% ai propargite test product (Omite technical) produced impairment to growth (reductions in both length and weight), hatchling survival, and time to mean hatch at a concentration of 28 µg/L (LOAEC) with no effects observed (NOAEC) at a concentration of 16 µg/L (MRID 0126739 acceptable). The NOAEC produced in this study will be used to calculate the chronic risk of propargite to the aquatic-phase CRLF.

#### 4.1.1.3 Freshwater Fish: Sublethal Effects and Additional Open Literature Information

No additional effects data for aquatic organisms were identified from the open literature. In addition, none of the available registrant submitted acute fish toxicity studies reported any sublethal effects.

#### 4.1.1.4 Aquatic-phase Amphibian: Acute and Chronic Studies

No studies with propargite are available.

### 4.1.2 Toxicity to Freshwater Invertebrates

Freshwater aquatic invertebrate toxicity data are used to assess potential indirect effects of propargite to the CRLF. Effects to freshwater invertebrates resulting from exposure to propargite may indirectly affect the CRLF via reduction in available food items. As discussed in Section 2.5.3, the main food source for juvenile aquatic- and terrestrial-phase CRLFs is thought to be aquatic invertebrates found along the shoreline and on the water surface, including aquatic sowbugs, larval alderflies and water striders.

A summary of acute and chronic freshwater invertebrate data, is provided below in Sections 4.1.2.1 through 4.1.2.3.

#### 4.1.2.1 Freshwater Invertebrates: Acute Exposure Studies

Two freshwater invertebrate studies are available for propargite using the freshwater cladoceran *Daphnia magna*. The pesticide as 100% propargite produced a 48-h $EC_{50}$ of 91 µg/L ai (MRID 00068752, acceptable) and a 76.2% propargite form yielded a 48-h $EC_{50}$ of 74 µg/L ai (MRID 43759002 acceptable). The water flea $EC_{50}$ of 74 µg/L ai will be used to access the acute risk of propargite to the aquatic invertebrate prey of the CRLF.

#### 4.1.2.2 Freshwater Invertebrates: Chronic Exposure Studies

A single life cycle study is available for propargite with freshwater invertebrates. An 88% propargite product, omite technical, produced reductions in reproductive output at 14 µg/L (LOAEC) and no observable effects at 9 µg/L (NOAEC) (MRID 00126738, acceptable). The NOAEC produced in this study will be used to access the chronic risk of propargite to the aquatic invertebrate prey of the CRLF.

#### 4.1.2.3 Freshwater Invertebrates: Open Literature Data

No data are available.

### 4.1.3 Toxicity to Aquatic Plants

Aquatic plant toxicity studies are used as one of the measures of effect to evaluate whether propargite may affect primary production and the availability of aquatic plants as food for CRLF tadpoles. Primary productivity is essential for indirectly supporting the growth and abundance of the CRLF.

Laboratory data were used to determine whether propargite may cause direct effects to aquatic plants. A summary of the laboratory data for aquatic plants is provided in Section 4.1.3.1.

#### 4.1.3.1 Aquatic Plants: Laboratory Data

Effects data are available for one species of aquatic vascular plant and four species of unicellular plants. All studies are classified as acceptable. The following **Table 4.3** is the summary of these data. The most sensitive freshwater non-vascular aquatic plant acute toxicity endpoint was a *Selenastrum capricornutum* $EC_{50}$ of 66.2 µg/L.

| Table 4.3 Summary of aquatic vascular and non-vascular plant toxicity data | | | | |
|---|---|---|---|---|
| **Plant Species** | **% ai** | **$EC_{50}$ (µg/L)** | **NOAEL (µg/L)** | **MRID** |
| *Lemna gibba* | 76.2 | 75000 | 2800 | 43885805 |
| *Kirchneria subcapitata* | 88.2 | 105 | 4.3 | 43414542 |
| *Navicula pelliculosa* | 76.2 | 106 | 99 | 43885807 |
| *Anabaena flos-aquae* | 76.2 | >101,000 | 101,000 | 43885803 |
| *Selenastrum capricornutum* | 76.2 | 66.2 | 5 | 43885804 |

### 4.1.4 Freshwater Field/Mesocosm Studies

No data are available.

## 4.2 Toxicity of Propargite to Terrestrial Organisms

**Table 4.4** summarizes the most sensitive terrestrial toxicity endpoints for the CRLF, based on an evaluation of both the submitted studies and the open literature. A brief summary of submitted and open literature data considered relevant to this ecological risk assessment for the CRLF is presented below.

| Table 4.4 Terrestrial Toxicity Profile for Propargite | | | | |
|---|---|---|---|---|
| **Endpoint** | **Species** | **Toxicity Value Used in Risk Assessment** | **Citation MRID# or Author & Date** | **Comment** |
| Acute Direct Toxicity to Terrestrial-Phase CRLF ($LD_{50}$) | Mallard duck (*Anas platyrhynchus*) | $LD_{50}$ >4640 mg/kg (practically nontoxic) | 43414529 | This endpoint is the most sensitive avian acute oral endpoint available. The study which produced the endpoint is deemed acceptable based on the Agency's review of the study. Since the endpoint demonstrated that progargite is practically non-toxic to birds on an acute oral basis and there were no mortalities exhibited in the study, no avian acute oral risk quotient calculations will be conducted. |
| Acute Direct Toxicity to Terrestrial-Phase CRLF ($LC_{50}$) | Northern bobwhite quail *(Colinus virginianus)* | $LC_{50}$ = 3401 ppm (slightly toxic) | 00113471 | Acceptable |
| Chronic Direct Toxicity to Terrestrial-Phase CRLF | Mallard duck *(Anas platyrhynchus)* | NOAEC=43.2 ppm based on adult body wt change, eggs laid/female, live embryos, and hatchling survival | 410417-01 | Acceptable |
| Indirect Toxicity to Terrestrial-Phase CRLF (via acute toxicity to mammalian prey items) | Laboratory rat *(Rattus norvegicus)* | $LD_{50}$=2639 mg/kg (practically nontoxic) | 41750901 | Acceptable |

| Table 4.4 Terrestrial Toxicity Profile for Propargite | | | | |
|---|---|---|---|---|
| **Endpoint** | **Species** | **Toxicity Value Used in Risk Assessment** | **Citation MRID# or Author & Date** | **Comment** |
| Indirect Toxicity to Terrestrial-Phase CRLF (via chronic toxicity to mammalian prey items) | Laboratory rat *(Rattus norvegicus)* | NOAEL= 80 ppm for males based on increased mortality | 41750901 | Acceptable |
| Indirect Toxicity to Terrestrial-Phase CRLF (via acute toxicity to terrestrial invertebrate prey items) | Honey bee | $LD_{50}$ = 15 µg ai/bee (practically non-toxic) | 43185001 | Acceptable |
| Indirect Toxicity to Terrestrial- and Aquatic-Phase CRLF (via toxicity to terrestrial plants) | Seedling Emergence Monocots | > 2.45 lb ai/A | 43848801 | Acceptable |
| | Seedling Emergence Dicots | > 2.45 lb ai/A | 43848801 | |
| | Vegetative Vigor Monocots | > 2.45 lb ai/A | 43848802 | Acceptable |
| | Vegetative Vigor Dicots | > 2.45 lb ai/A | 43848802 | |

Acute toxicity to terrestrial animals is categorized using the classification system shown in **Table 4.5** (U.S. EPA 2004). Toxicity categories for terrestrial plants have not been defined.

| Table 4.5 Categories of Acute Toxicity for Terrestrial Organisms including Birds and Mammals | | |
|---|---|---|
| Categories of Acute Toxicity for Birds and Mammals | | |
| **Toxicity Category** | **Oral $LD_{50}$** | **Dietary $LC_{50}$** |
| Very highly toxic | < 10 mg/kg | < 50 ppm |
| Highly toxic | 10 – 50 mg/kg | 50 - 500 ppm |
| Moderately toxic | 51 – 500 mg/kg | 501 - 1000 ppm |
| Slightly toxic | 501 - 2000 mg/kg | 1001 - 5000 ppm |
| Practically non-toxic | > 2000 mg/kg | > 5000 ppm |
| Categories of Acute Toxicity for Non-Target Insects | | |
| Toxicity Category | Concentration | |
| Highly toxic | < 2 µg/bee | |
| Moderately | 2-11 µg/bee | |
| Practically nontoxic | >11 µg/bee | |

### 4.2.1 Toxicity to Birds

As specified in the Overview Document, the Agency uses birds as a surrogate for terrestrial-phase amphibians when amphibian toxicity data are not available (U.S. EPA 2004). No terrestrial-phase amphibian data are available for propargite; therefore, acute and chronic avian toxicity data are used to assess the potential direct effects of propargite to terrestrial-phase CRLFs.

#### 4.2.1.1 Birds: Acute Exposure (Mortality) Studies

Propargite has been investigated for acute lethal toxicity in gavage study with mallard ducks (*Anas platyrhynchus*). The $LD_{50}$ for this species is >4640, with no signs of toxicity (MRID 43414529). Because there are no adverse lethal effects, no dose-response slope data are available.

Propargite has also been administered to birds through the diet on a subacute exposure schedule. Four species of birds have been tested: mallard duck, Northern bobwhite quail (*Colinus virginianus*), Japanese quail (*Coturnix japonica*), and ring-necked pheasant (*Phasianus colchicus*). The results of these studies demonstrate that propargite is practically nontoxic to birds on a subacute exposure basis. The most sensitive endpoint produced among these studies was a Northern bobwhite quail $LC_{50}$ of 3401 mg/kg-diet (MRID 000113471). This endpoint will be used to calculate the acute dietary risk of propargite to the terrestrial-phase CRLF. The following **Table 4.6** presents the results of these studies.

**Table 4.6 Avian Subacute Dietary Toxicity Data for Propargite**

| Species | Toxicity Value $LC_{50}$ mg/kg-diet | MRID# ECOTOX Ref | Comment |
|---|---|---|---|
| mallard duck (*Anas platyrhynchus*) | >4640 | 00052454 | Acceptable |
| Northern bobwhite quail (*Colinus virginianus*) | 3401 (88% formulation) | 00113471 | Acceptable (no dose response slope reported; CI 2494-4639) information) |
| | >5620 (57% formulation) | 00076407 | Acceptable |

#### 4.2.1.2 Birds: Chronic Exposure (Growth, Reproduction) Studies

There were two registrant submitted acceptable avian chronic toxicity studies. The species tested in the studies include the Mallard duck *(Anas platyrhynchus)* and Bobwhite quail.

Chronic effects to birds included reductions in mean numbers of eggs laid/female(mallard and bobwhite), viable embryos (mallard ), live 3 wk embryos (mallard), hatch success (mallard), hatchling survival and weight (mallard and bobwhite), adult body weight change (mallard) were affected at 288 ppm. In mallard slight reductions were also observed at 84.7 ppm adult body wt change (bobwhite and mallard), eggs laid/female, live embryos, and hatchling survival, thus the NOAEC = 43.2 ppm for these parameters (**Table 4.7**).

The NOAEC of 43.2 ppm will be used to calculate the chronic risk of propargite to birds because it is the most sensitive endpoint among the avian chronic toxicity data.

Table 4.7 Avian Chronic Toxicity Data for Propargite

| **Species** | **% ai** | **NOAEC/ LOAEC (ppm)** | **Endpoints Affected** | **MRID No. Author/Year** | **Study Classification** |
|---|---|---|---|---|---|
| Northern bobwhite quail *(Colinus virginianus)* | 85 | LOAEC=288 NOAEC=84.7 | see paragraph below | 410417-02 J. B. Beavers *et al*(1988) | Core |
| Mallard duck *(Anas platyrhynchus)* | 85 | >84.7=LOAEC 43.2=NOAEC | see paragraph below | 410417-01 J. B. Beavers *et al(1988)* | Core |

#### 4.2.1.3 Terrestrial-phase Amphibian Acute and Chronic

No terrestrial-phase acute or chronic toxicity data are available.

#### 4.2.1.4 Birds: Sublethal Effects and Additional Open Literature Information

No sublethal effects data were identified from the open literature. In addition, none of the available registrant submitted acute toxicity bird studies reported any sublethal effects

### 4.2.2 Toxicity to Mammals

Mammalian toxicity data are used to assess potential indirect effects of propargite to the terrestrial-phase CRLF. Effects to small mammals resulting from exposure to propargite could also indirectly affect the CRLF via reduction in available food. As discussed in Section 2.5.3, over 50% of the prey mass of the CRLF may consist of vertebrates such as mice, frogs, and fish (Hayes and Tennant, 1985).

Propargite was evaluated for acute lethal effects in laboratory strains of the Norwegian rat and produced $LD_{50}$ values of 2639 mg/kg for males, 2947 mg/kg for females, and 2800 mg/kg for males and females combined (MIRD 42857001).

#### 4.2.2.1 Mammals: Acute Exposure (Mortality) Studies

There is one registrant submitted acceptable rat acute oral toxicity study. Based on a laboratory rat $LD_{50}$ value of 2639 mg/kg, propargite is practically non-toxic to small mammals on an acute oral basis (42857001). No dose-response slope information is provided in this study summary.

#### 4.2.2.2 Mammals: Chronic Exposure (Growth, Reproduction) Studies

The following information concerning reproduction, developmental, and sublethal effects in mammals is excerpted from HED’s Revised Human Health Risk Assessment for Propargite, Case # 0243. DP Barcode: D276544 and the REVISED HED Toxicology

Chapter for the Risk Assessment for the Reregistration Eligibility Decision Document (RED), Case # 0243. DP Barcode: D266213).

There are two registrant submitted multigenerational reproduction toxicity studies (MRIDs 41750901 and 41352401). Based on the results of these studies, the most sensitive chronic exposure endpoint between the two studies was a NOAEL value as low as 80 ppm. The affected endpoint was increased mortality among male rats. Other less sensitive affected endpoints include decreased body weight in females at a NOAEL of 400 ppm.

Propargite is classified as a carcinogen by HED. However, propargite was not found to be mutagenic in either eukaryotic and prokaryotic cell systems. On January 23, 1992, the Cancer Peer Review Committee (CPRC) determined that based on the evidence presented, propargite was classified a Group B2, "likely" human carcinogen. It was concluded that administration of propargite was associated with the appearance of extremely rare jejunal tumors in male and female Sprague-Dawley rats. There was an increase in the incidence of undifferentiated sarcoma of the jejunum in males and females receiving 800 ppm propargite compared to concurrent and historical controls. This was the only concentration level tested in the experiment. Thus, there was no NOAEC produced. The MRID and study title are 42837201 and Special Two Year Oncogenicity; rat OPPTS 870.4200 [§83-2]. The data generated in this study have been considered for generating the action area for the CRLF assessment. (The summary was excerpted from HED's Revised Human Health Risk Assessment for Propargite, Case # 0243. DP Barcode: D276544 and the REVISED HED Toxicology Chapter for the Risk Assessment for the Reregistration Eligibility Decision Document (RED),Case # 0243. DP Barcode: D266213).

#### 4.2.2.3 Mammals: Sublethal Effects and Additional Open Literature Information

No sublethal effects data were identified from the open literature. In addition, none of the available registrant submitted acute toxicity mammalian studies reported any sublethal effects.

### 4.2.3 Toxicity to Terrestrial Invertebrates

Terrestrial invertebrate toxicity data are used to assess potential indirect effects of propargite to the terrestrial-phase CRLF. Effects to terrestrial invertebrates resulting from exposure to propargite could indirectly affect the CRLF via reduction in available food.

#### 4.2.3.1 Terrestrial Invertebrates: Acute Exposure (Mortality) Studies

There are four registrant submitted bee acute toxicity studies testing propargite (MRIDs 43185001, 00036935, 00060628, and 00009033) and one registrant submitted propargite acute toxicity study testing the predator insect, *Stethorus punctum* (MRID 00074486).

Based on the results of these toxicity studies, propargite is practically non-toxic to honey bees and has low toxicity to insect predators. The most sensitive insect acute toxicity endpoint is a bee $LD_{50}$ of 15 µg/bee. This endpoint will be used to assess the risk of propargite to terrestrial invertebrate prey of the CRLF.

#### 4.2.3.2 Terrestrial Invertebrates: Open Literature Studies

There are 2 terrestrial invertebrate acute toxicity studies available in the open literature (ECOTOX Reference no 63713 and 70351). The results of these studies generally show that propagite had low toxicity to non-target insects. None of the endpoints produced in these studies demonstrate a more sensitive endpoint than what was produced by the registrant submitted studies. **Table 4.8** presents the results of these studies.

**Table 4.8 Insect Acute Toxicity Data for Propargite**

| Common Name (Species) | Meas | Endpt. | Endpoint Value | % Active Ingredient | Ref # | Title |
|---|---|---|---|---|---|---|
| Eulophid wasp (*Colpoclypeus florus*) | MORT. | NOAEL | 450 ppm | 100 | 63713 | Effect of Pesticides on Colpoclypeus florus (Hymenoptera: Eulophidae) and Trichogramma platneri (Hymenoptera: Trichogrammatidae), Parasitoids of Leafrollers in Washington |
| Parasitic wasp (Trichogramma platneri) | MORT. | NOAEL | 45 ppm | 100 | 63713 | Effect of Pesticides on Colpoclypeus florus (Hymenoptera: Eulophidae) and Trichogramma platneri (Hymenoptera: Trichogrammatidae), Parasitoids of Leafrollers in Washington |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{10}$ | 44.92 µg/org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{50}$ | 111.8 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{90}$ | 278.3 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{10}$ | 24.54 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{50}$ | 107.8 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |
| Honey bee (*Apis mellifera*) | | $LD_{90}$ | 466.8 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on |

| | | | | | | |
|---|---|---|---|---|---|---|
| | MORT. | | | | | Honeybee Brood |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{10}$ | 30.11 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{50}$ | 67.47 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |
| Honey bee (*Apis mellifera*) | MORT. | $LD_{90}$ | 151.2 µg /org | 100 | 70351 | Comparative Morphogenic and Toxicity Studies on the Effect of Pesticides on Honeybee Brood |

Note 1: NR-ZERO is defined as 0% mortality or 100% survival of test organisms.

### 4.2.4 Toxicity to Terrestrial Plants

Terrestrial plant toxicity data are used to evaluate the potential for propargite to affect riparian zone and upland vegetation within the action area for the CRLF. Impacts to riparian and upland (*i.e.*, grassland, woodland) vegetation may result in indirect effects to both aquatic- and terrestrial-phase CRLFs, as well as modification to designated critical habitat PCEs via increased sedimentation, alteration in water quality, and reduction of upland and riparian habitat that provides shelter, foraging, predator avoidance, and dispersal for juvenile and adult CRLFs.

Plant toxicity data from both registrant-submitted studies and studies in the scientific literature were reviewed for this assessment. Registrant-submitted studies are conducted under conditions and with species defined in EPA toxicity test guidelines. Sub-lethal endpoints such as plant growth, dry weight, and biomass are evaluated for both monocots and dicots, and effects are evaluated at both seedling emergence and vegetative life stages. Guideline studies generally evaluate toxicity to ten crop species. A drawback to these tests is that they are conducted on herbaceous crop species only, and extrapolation of effects to other species, such as the woody shrubs and trees and wild herbaceous species, contributes uncertainty to risk conclusions.

Commercial crop species have been selectively bred, and may be more or less resistant to particular stressors than wild herbs and forbs. The direction of this uncertainty for specific plants and stressors, including propargite, is largely unknown. Homogenous test plant seed lots also lack the genetic variation that occurs in natural populations, so the range of effects seen from tests is likely to be smaller than would be expected from wild populations.

The results of the Tier I seedling emergence and vegetative vigor toxicity tests on non-target plants are summarized below in **Table 4.9.** The results of these studies demonstrate that propargite does not demonstrate significant adverse toxicity to terrestrial plants on a vegetative vigor and seedling emergence basis at an exposure level of up to 2.45 lb ai/A. This application rate does not match the highest application rates. The uses with higher application rates include the almond, avocado, citrus, and grape uses (maximum rates from 2.88 lb ai/A to 4.8 lb ai/A).

| Table 4.9 Non-target Terrestrial Plant Seedling Emergence/Vegetative Vigor Toxicity (Tier I) | | | | | |
|---|---|---|---|---|---|
| **Species** | **% ai** | **$EC_{25}$ (lb ai/A)** | **Endpoint Affected** | **MRID No. Author/Year** | **Study Classification** |
| Monocots- sorghum, corn, oat, wheat, onion<br>Dicots- carrot, cucumber, radish, soybean, sunflower, tomato | 88 | >2.45 lb ai/A | no observed growth effects | 43848801<br>43848802<br>(Aufderheide and Kranzfelder) | Acceptable |

There is also one terrestrial plant toxicity study that is available in the open literature and cited in the ECOTOX database. The ECOTOX database classified the study as acceptable for consideration by the Agency for risk assessment purposes. The ECOTOX identification number of the study is 64451. The study was a 2-year experiment which examined the effects of several insecticides including propargite on the photosynthetic rate and stomatal conductance of field corn (*Zea mays* L.). The results of this study are not applicable to the analysis for this propargite CRLF assessment. This is because the endpoints on photosynthetic rate and stomatal conductance produced by this study do not provide any definitive information regarding the adverse effects propargite to terrestrial plants.

### 4.3 Use of Probit Slope Response Relationship to Provide Information on the Endangered Species Levels of Concern

The Agency uses the probit dose response relationship as a tool for providing additional information on the potential for acute direct effects to individual listed species and aquatic animals that may indirectly affect the listed species of concern (U.S. EPA 2004). As part of the risk characterization, an interpretation of acute RQ for listed species is discussed. This interpretation is presented in terms of the chance of an individual event (*i.e.*, mortality or immobilization) should exposure at the EEC actually occur for a species with sensitivity to propargite on par with the acute toxicity endpoint selected for RQ calculation. To accomplish this interpretation, the Agency uses the slope of the dose response relationship available from the toxicity study used to establish the acute toxicity measures of effect for each taxonomic group that is relevant to this assessment. The individual effects probability associated with the acute RQ is based on the mean estimate of the slope and an assumption of a probit dose response relationship. In addition to a single effects probability estimate based on the mean, upper, and lower estimates of the effects probability are also provided to account for variance in the slope, if available.

Individual effect probabilities are calculated based on an Excel spreadsheet tool IECV1.1 (Individual Effect Chance Model Version 1.1) developed by the U.S. EPA, OPP, Environmental Fate and Effects Division (June 22, 2004). The model allows for such calculations by entering the mean slope estimate (and the 95% confidence bounds of that estimate) as the slope parameter for the spreadsheet. In addition, the acute RQ is entered as the desired threshold. Slope information was reported for only the aquatic invertebrate study, MRID 43759002, to be used to calculate risk to aquatic invertebrate prey.  The reported probit slope was 9.2.  Since no slope information was provided by any of the other studies with most sensitive toxicity endpoints, the default slope of 4.5 was used as the slope input for the model.

## 4.4 Incident Database Review

A review of the EIIS database for ecological incidents involving propargite was completed on April 14, 2008.  The results of this review for terrestrial, plant, and aquatic incidents are discussed below in Sections 4.4.1 through 4.4.3, respectively.  A complete list of the incidents involving propargite including associated uncertainties is included as **Appendix H**.

### 4.4.1 Terrestrial Incidents

There is only one reported terrestrial animal incident associated with the use of propagite. The identification number for this incident is I010626-001.  This incident was a report of fenamiphos and propagite being applied by drip irrigation to a vineyard in Mendocino County, CA, resulting in the death of at least 15 starlings, one mockingbird, and one finch. Subsequently 13 more birds were found dead.  Puddles of water below the pesticide emitters in the vineyard were reportedly the source that led to the demise of the birds.  The conclusion of the incident report deemed that it was unlikely that propagite contributed to the death of the birds and that it was probable that fenamiphos was the likely cause.  This conclusion was reached because of the low acute avian toxicity of propargite relative to fenamiphos' high acute avian toxicity.  The report also stated that the County Agricultural Department will suggest that all growers use fenamiphos only at night if they believe there may be a high bird population at or near the application site.

### 4.4.2 Plant Incidents

There are two terrestrial plant incidents reported to the Agency.  The identification numbers of these incidents are I012366-001and I007740-001.  Incident number I012366-001 was a report from Dow Chemical, Inc. that the owners of a yellow sweet corn crop and potato applied the two pesticides, progargite and spinosad, to their crop.  The pesticide applications were intended to control airworms, mites, and aphids.  The amounts applied were not included in the report.  The owners claimed that the applied products were ineffective and caused damage to the yellow sweet corn and potatoes.  The total acreage damaged included 9000 acres of corn and 65 acres of potatoes.  The incident report concluded that the likelihood that the incident occurred as a result of the pesticide exposure was possible. The report's reason for coming to the conclusion was that there was not enough information provided to draw any conclusions other than that damage may have occurred.

The incident number, I007740-001, was a report from Dow Chemical, Inc.  The report was that a cotton crop in Arvin, CA, demonstrated injury after the pesticide application at planting which allegedly burned the cotton and bronzed the top half.  The crop reportedly looked as if a defoliant had been applied.  The pesticides applied to the crop included chlopyrifos, propargite, and amitraz. The incident report deemed that it was possible that chemicals caused the damage. No further information was provided that would have enabled the report to give a more definitive conclusion regarding the reason for the incident.

### 4.4.3 Aquatic Incidents

Currently, there are no reported incidents involving aquatic organisms and the use of propargite.

# 5. Risk Characterization

Risk characterization is the integration of the exposure and effects characterizations. Risk characterization is used to determine the potential for direct and/or indirect effects to the CRLF or for modification to its designated critical habitat from the use of propargite in California. The risk characterization provides an estimation (Section 5.1) and a description (Section 5.2) of the likelihood of adverse effects; articulates risk assessment assumptions, limitations, and uncertainties; and synthesizes an overall conclusion regarding the likelihood of adverse effects to the CRLF or its designated critical habitat (*i.e.*, "no effect," "likely to adversely affect," or "may affect, but not likely to adversely affect").

## 5.1 Risk Estimation

Risk is estimated by calculating the ratio of exposure to toxicity. This ratio is the risk quotient (RQ), which is then compared to pre-established acute and chronic levels of concern (LOCs) for each category evaluated (**Appendix C**). For acute exposures to the CRLF and its animal prey in aquatic habitats, as well as terrestrial invertebrates, the LOC is 0.05. For acute exposures to the terrestrial phase CRLF and mammals, the LOC is 0.1. The LOC for chronic exposures to CRLF and its prey, as well as acute exposures to plants is 1.0.

Risk to the aquatic-phase CRLF is estimated by calculating the ratio of exposure to toxicity using 1-in-10 year EECs based on the label-recommended propargite usage scenarios summarized in Appendix **Table B2** and the appropriate aquatic toxicity endpoint from **Table 4.1**. Risks to the terrestrial-phase CRLF and its prey (*e.g.*, terrestrial insects, small mammals, and terrestrial-phase frogs) are estimated based on exposures resulting from applications of propargite (**Tables 3.5 through 3.6**) and the appropriate toxicity endpoint from **Table 4.3**. Exposures are also derived for terrestrial plants, as discussed in Section 3.3 and summarized in **Table 3.7**, based on the highest application rates of propargite use within the action area.

### 5.1.1 Exposures in the Aquatic Habitat

#### 5.1.1.1 Direct Effects to Aquatic-Phase CRLF

Direct effects to the aquatic-phase CRLF are based on peak EECs in the standard pond and the lowest acute toxicity value for freshwater fish. In order to assess direct chronic risks to the CRLF, 60-day EECs and the lowest chronic toxicity value for freshwater fish are used. **Table 5.1** demonstrates the RQ calculations for both acute and chronic risk to the CRLF. As illustrated in the **Table 5.1**, the RQ calculations demonstrate 19 of the modeled scenarios exceed the LOC for risk to listed species and 7 of the modeled scenarios exceed the LOC for risk to the CRLF for acute restricted use (the acute LOC exceedances are applicable to all the uses except the tree fruit, and tree nut uses). There are no chronic LOC exceedances for any of the modeled uses. In addition there is an acute LOC exceedance for the ornamental woody shrubs & vines use for the formulated product, Omite 57EC, which has the most sensitive fish acute toxicity endpoint of 31 ppb. **Table 5.1** provides further details regarding this LOC exceedance. Based on the results of these RQ calculations, EFED's preliminary effects determination is that progargite "may effect" the aquatic-phase of the CRLF strictly on a direct acute toxic effect basis for the modeled uses that exceed the Agency LOC.

| Table 5.1 Summary of Direct Effect RQs for the Aquatic-phase CRLF | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Freshwater Fish | | |
| **Scenario Group** | **Ground or Air Appl.** | **Peak EEC (µg/L)** | **60-day EEC (µg/L)** | **Acute $LC_{50}$ = 118 µg/l** | **Chance of individual Effect ****** | **Chronic NOAEC = 16 µg/l** |
| **1.** Alfalfa | G | 1.75 | 0.54 | 0.01 | 1 in 4.18E+08 based on LOC | 0.03 |
| | A | 8.68 | 1.55 | 0.07* | 1 in 9.88E+6 based on RQ | 0.10 |
| **2.** Almond & Walnut | G | 7.83 | 1.44 | 0.07* | 1 in 9.88E+6 based on RQ | 0.09 |
| | A | 14.56 | 2.92 | 0.12 ** | 1 in 5.85E+4 based on RQ | 0.18 |
| **3.** Avocado | G | 18.60 | 2.34 | 0.16** | 1 in 5.85E+4 based on RQ | 0.15 |
| **4.** Beans | G | 9.23 | 1.66 | 0.08* | 1 in 2.51E+06 based on RQ | 0.10 |
| | A | 9.62 | 2.20 | 0.08* | 1 in 2.51E +06 based on RQ | 0.14 |
| **5.** Berries | G | 11.48 | 1.84 | 0.10** | 1 in 2.94E+05 based on RQ | 0.11 |
| **6.** Citrus | G | 1.51 | 0.26 | 0.01 | 1 in 4.18E+08 based on LOC | 0.02 |
| | A | 8.07 | 1.04 | 0.07* | 1 in 9.88E+6 based on RQ | 0.07 |
| **7.** Clover | G | 1.11 | 0.35 | 0.01 | 1 in 4.18E+08 based on LOC | 0.02 |
| | A | 5.81 | 1.03 | 0.05* | 1 in 4.18E+08 based on RQ | 0.06 |
| **8.** Corn | G | 8.79 | 1.73 | 0.07* | (1 in 9.88E+6 based on RQ) | 0.11 |
| | A | 9.48 | 1.86 | 0.08* | 1 in 2.51E +06 based on RQ | 0.12 |
| **9.** Cotton | G | 3.89 | 1.01 | 0.03 | 1 in 4.18E+08 based on LOC | 0.06 |
| | A | 9.11 | 1.91 | 0.08* | 1 in 2.51E +06 based on RQ | 0.12 |
| **10.** Forestry | G | 25.07 | 4.62 | 0.21** | 1 in 8.47E+02 based on RQ | 0.29 |
| | A | 24.99 | 5.22 | 0.21** | 1 in 8.47E+02 based on RQ | 0.33 |
| **11.** Grapes | G | 2.76 | 0.48 | 0.02 | 1 in 4.18E+08 based on LOC | 0.03 |
| **12.** Hops | G | 7.67 | 1.95 | 0.07* | 1 in 9.88E+6 based on RQ | 0.12 |
| **13.** Jojoba | G | 0.95 | 0.30 | 0.01 | 1 in 4.18E+08 based on LOC | 0.02 |
| | A | 5.56 | 0.66 | 0.05* | 1 in 4.18E+08 based on RQ | 0.04 |
| **14.** Mint | G | 5.47 | 1.30 | 0.05* | 1 in 4.18E+08 based on RQ | 0.08 |
| | A | 8.52 | 1.98 | 0.07* | 1 in 9.88E+6 based on RQ | 0.12 |
| **15.** Nectarine | G | 2.16 | 0.39 | 0.02 | 1 in 4.18E+08 based on LOC | 0.02 |

| Table 5.1 Summary of Direct Effect RQs for the Aquatic-phase CRLF | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Freshwater Fish | | |
| **Scenario Group** | **Ground or Air Appl.** | **Peak EEC (µg/L)** | **60-day EEC (µg/L)** | **Acute $LC_{50}$ = 118 µg/l** | **Chance of individual Effect ****** | **Chronic NOAEC = 16 µg/l** |
| | A | 9.94 | 1.58 | 0.08* | 1 in 2.51E +06 based on RQ | 0.10 |
| **16.** Ornamental Woody Shrubs & Vines [A] | G | 32.11 | 5.01 | 0.27** | 1 in 1.90E+02 based on RQ | 0.31 |
| | A | 31.75 | 5.26 | 0.27** | 1 in 1.90E+02 based on RQ | 0.33 |
| **17.** Other Ornamental | G | 9.63 | 1.50 | 0.08* | 1 in 2.51E +06 based on RQ | 0.09 |
| **18.** Peanuts | G | 6.05 | 1.09 | 0.05* | 1 in 4.18E+08 | 0.07 |
| | A | 6.43 | 1.48 | 0.05* | 1 in 4.18E+08 based on RQ | 0.09 |
| **19.** Sorghum | A | 5.74 | 0.82 | 0.05* | 1 in 4.18E+08 based on RQ | 0.05 |
| **20.** Strawberry | G | 7.12 | 1.99 | 0.06* | 1 in 5.22E+07 based on RQ | 0.12 |
| 21. Tree fruit – except nectarine | G | 1.44 | 0.26 | 0.01 | 1 in 4.18E+08 based on LOC | 0.02 |
| 22. Tree nut – except almond and walnut | G | 3.34 | 0.63 | 0.03 | 1 in 4.18E+08 based on LOC | 0.04 |

* Exceeds the *acute* endangered species LOC (level of concern) or the *chronic* risk LOC.
** Exceeds the acute restricted use LOC.
*** Exceeds the acute risk LOC.
******** Chance of individual effect based on the probit analysis. If a modeled use exceeds the Agency LOC, the probit analysis is based on the RQ. If a modeled use does not exceed the Agency LOC, the probit analysis is based on the Agency LOC. The probit analyses are based on the rainbow trout LC50 of 118 ppb (CI 96-146) and a default slope of 4.5.
Note [A] The most sensitive fish acute toxicity endpoint was the formulated product, Omite 57E, LC50 of 31 ppb. However, this formulation is registered for only one of the modeled uses which is ornamental woody shrubs & vines. The RQ for the ornamental woody shrub and vine uses based on the Omite 57E formulation is 1.4 for ground application and 1.02 for aerial application. Both of these RQs exceed the LOC for acute risk to the CRLF.

#### 5.1.1.2 Indirect Effects to Aquatic-Phase CRLF via Reduction in Prey (non-vascular aquatic plants, aquatic invertebrates, fish, and frogs)

<u>Non-vascular Aquatic Plants</u>

Indirect effects of propargite to the aquatic-phase CRLF (tadpoles) via reduction in non-vascular aquatic plants in its diet are based on peak EECs from the standard pond and the lowest toxicity value for aquatic non-vascular plants. Based on the RQ calculations, there are no LOC exceedances for any of the modeled uses for risk to non-vascular and vascular aquatic plants (**Table 5.2**). Based on results of the RQs, EFED's effects determination is a "no effect" for propargite regarding effects to the aquatic non-vascular and vascular plants in the CRLF habitat.

| Table 5.2 Summary of Acute RQs Used to Estimate Indirect Effects to the CRLF via Effects to Non-Vascular Aquatic Plants (diet of CRLF in tadpole life stage and habitat of aquatic-phase CRLF) | | | | |
|---|---|---|---|---|
| Scenario Group | Ground or Air Appl. | Peak EEC (µg/L) | Non-vascular Acute Risk $EC_{50}$ = 66.2 µg/l | Vascular Acute Risk $EC_{50}$ = 75000 µg/l |
| **1.** Alfalfa | G | 1.75 | < 1 | < 1 |
| | A | 8.68 | < 1 | < 1 |
| **2.** Almond & Walnut | G | 7.83 | < 1 | < 1 |
| | A | 14.56 | < 1 | < 1 |
| **3.** Avocado | G | 18.60 | < 1 | < 1 |
| **4.** Beans | G | 9.23 | < 1 | < 1 |
| | A | 9.62 | < 1 | < 1 |
| **5.** Berries | G | 11.48 | < 1 | < 1 |
| **6.** Citrus | G | 1.51 | < 1 | < 1 |
| | A | 8.07 | < 1 | < 1 |
| **7.** Clover | G | 1.11 | < 1 | < 1 |
| | A | 5.81 | < 1 | < 1 |
| **8.** Corn | G | 8.79 | < 1 | < 1 |
| | A | 9.48 | < 1 | < 1 |
| **9.** Cotton | G | 3.89 | < 1 | < 1 |
| | A | 9.11 | < 1 | < 1 |
| **10.** Forestry | G | 25.07 | < 1 | < 1 |
| | A | 24.99 | < 1 | < 1 |
| **11.** Grapes | G | 2.76 | < 1 | < 1 |
| **12.** Hops | G | 7.67 | < 1 | < 1 |
| **13.** Jojoba | G | 0.95 | < 1 | < 1 |
| | A | 5.56 | < 1 | < 1 |
| **14.** Mint | G | 5.47 | < 1 | < 1 |
| | A | 8.52 | < 1 | < 1 |
| **15.** Nectarine | G | 2.16 | < 1 | < 1 |
| | A | 9.94 | < 1 | < 1 |
| **16.** Ornamental Woody Shrubs & Vines | G | 32.11 | < 1 | < 1 |
| | A | 31.75 | < 1 | < 1 |
| **17.** Other Ornamental | G | 9.63 | < 1 | < 1 |
| **18.** Peanuts | G | 6.05 | < 1 | < 1 |
| | A | 6.43 | < 1 | < 1 |
| **19.** Sorghum | A | 5.74 | < 1 | < 1 |
| **20.** Strawberry | G | 7.12 | < 1 | < 1 |
| 21. Tree fruit – except nectarine | G | 1.44 | < 1 | < 1 |
| 22. Tree nut – except almond and walnut | G | 3.34 | < 1 | < 1 |
| Exceeds the *acute risk* LOC (level of concern) – | | | | |

<u>Aquatic Invertebrates</u>

Indirect acute effects to the aquatic-phase CRLF via effects to prey (invertebrates) in aquatic habitats are based on peak EECs in the standard pond and the lowest acute toxicity value for freshwater invertebrates.  For chronic risks, 21-day EECs and the lowest chronic toxicity value for invertebrates are used to derive RQs.  A summary of the acute and chronic RQ values for exposure to aquatic invertebrates (as prey items of aquatic-phase CRLFs) is provided in **Table 5.3**.  As illustrated in the **Table 5.3**, the RQ calculations demonstrate that 20 of the modeled uses exceed the Agency LOC for restricted use, 8 of the modeled uses exceed the Agency LOC for listed species, and none of the modeled uses exceed the Agency LOC for chronic risks to aquatic invertebrate prey of the CRLF.  Based on the RQ calculations, EFED's preliminary effects determination is that propargite "may affect" the CRLF via effects to the aquatic invertebrate prey of the CRLF based strictly on an acute toxic effect basis for the modeled uses that exceed the Agency LOC.

| Table 5.3 Summary of Acute and Chronic RQs Used to Estimate Indirect Effects to the CRLF via Direct Effects on Aquatic Invertebrates as Dietary Food Items (prey of CRLF juveniles and adults in aquatic habitats) | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Freshwater Invertebrates | | |
| **Scenario Group** | **Ground or Air Appl.** | **Peak EEC (µg/L)** | **21-day EEC (µg/L)** | **$EC_{50}$ = 74 µg/l Acute** | **Chance of Individual Effect***** | **Chronic NOAEC = 9 µg/l** |
| **1.** Alfalfa | G | 1.75 | 0.69 | 0.02 | 1 in 1.12E+32 based on LOC | 0.08 |
| | A | 8.68 | 2.00 | 0.12** | 1 in 4.40E+16 based on the RQ | 0.22 |
| **2.** Almond & Walnut | G | 7.83 | 2.03 | 0.11** | 1 in 8.77E+17 based on the RQ | 0.23 |
| | A | 14.56 | 3.59 | 0.20** | 1 in 1.09E+10 based on the RQ | 0.40 |
| **3.** Avocado | G | 18.60 | 3.71 | 0.25** | 1 in 5.00E+07 based on the RQ | 0.41 |
| **4.** Beans | G | 9.23 | 2.25 | 0.12** | 1 in 4.40E+16 based on the RQ | 0.25 |
| | A | 9.62 | 2.74 | 0.13** | 1 in 3.11E+15 based on the RQ | 0.30 |
| **5.** Berries | G | 11.48 | 2.84 | 0.16** | 1 in 5.11E+12 based on the RQ | 0.32 |
| **6.** Citrus | G | 1.51 | 0.31 | 0.02 | 1 in 1.12E+32 based on LOC | 0.03 |
| | A | 8.07 | 1.35 | 0.11** | 1 in 8.77E+17based on the RQ | 0.15 |
| **7.** Clover | G | 1.11 | 0.44 | 0.02 | 1 in 1.12E+32 based on LOC | 0.05 |
| | A | 5.81 | 1.28 | 0.08* | 1 in 1.36E+23 based on the RQ | 0.14 |
| **8.** Corn | G | 8.79 | 2.45 | 0.12** | 1 in 4.40E+16 based on the RQ | 0.27 |
| | A | 9.48 | 2.56 | 0.13** | 1 in 3.11E+15 based on the RQ | 0.28 |
| **9.** Cotton | G | 3.89 | 1.30 | 0.05* | 1 in 1.12E+32 based on the RQ | 0.14 |
| | A | 9.11 | 2.27 | 0.12** | 1 in 4.40E+16 based on the RQ | 0.25 |
| **10.** Forestry | G | 25.07 | 5.98 | 0.34** | 1 in 1.04E+05 based on the RQ | 0.66 |
| | A | 24.99 | 6.60 | 0.34** | 1 in 1.04E+05 based on the RQ | 0.73 |
| **11.** Grapes | G | 2.76 | 0.66 | 0.04 | 1 in 1.12E+32 based on LOC | 0.07 |
| **12.** Hops | G | 7.67 | 2.32 | 0.10** | 1 in 2.66E+19 | 0.26 |

| Table 5.3 Summary of Acute and Chronic RQs Used to Estimate Indirect Effects to the CRLF via Direct Effects on Aquatic Invertebrates as Dietary Food Items (prey of CRLF juveniles and adults in aquatic habitats) | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Freshwater Invertebrates | | |
| **Scenario Group** | **Ground or Air Appl.** | **Peak EEC (µg/L)** | **21-day EEC (µg/L)** | **$EC_{50}$ = 74 µg/l Acute** | **Chance of Individual Effect*** ** | **Chronic NOAEC = 9 µg/l** |
| | | | | | based on the RQ | |
| **13.** Jojoba | G | 0.95 | 0.33 | 0.01 | 1 in 1.12E+32 based on LOC | 0.04 |
| | A | 5.56 | 1.05 | 0.08* | 1 in 1.36E+23 based on the RQ | 0.12 |
| **14.** Mint | G | 5.47 | 1.79 | 0.07* | 1 in 3.28E+25 based on the RQ | 0.20 |
| | A | 8.52 | 2.99 | 0.12** | 1 in 4.40E+16 based on the RQ | 0.33 |
| **15.** Nectarine | G | 2.16 | 0.53 | 0.03 | 1 in 1.12E+32 based on LOC | 0.06 |
| | A | 9.94 | 2.00 | 0.13** | 1 in 3.11E+15 based on the RQ | 0.22 |
| **16.** Ornamental Woody Shrubs & Vines | G | 32.11 | 7.23 | 0.43** | 1 in 2.41E+03 based on the RQ | 0.80 |
| | A | 31.75 | 7.58 | 0.43** | 1 in 2.41E+03 based on the RQ | 0.84 |
| **17.** Other Ornamental | G | 9.63 | 2.17 | 0.13** | 1 in 3.11E+15 based on the RQ | 0.24 |
| **18.** Peanuts | G | 6.05 | 1.48 | 0.08* | 1 in 1.36E+23 based on the RQ | 0.16 |
| | A | 6.43 | 2.22 | 0.09* | 1 in 1.36E+21 based on the RQ | 0.25 |
| **19.** Sorghum | A | 5.74 | 1.22 | 0.08* | 1 in 1.36E+23 based on the RQ | 0.14 |
| **20.** Strawberry | G | 7.12 | 2.37 | 0.10** | 1 in 2.66E+19 based on the RQ | 0.26 |
| 21. Tree fruit – except nectarine | G | 1.44 | 0.35 | 0.02 | 1 in 1.12E+32 based on LOC | 0.04 |
| 22. Tree nut – except almond and walnut | G | 3.34 | 0.88 | 0.05* | 1 in 1.12E+32 based on RQ | 0.10 |

* Exceeds the *acute* endangered species LOC (level of concern) or the *chronic* risk LOC.
** Exceeds the acute restricted use LOC.
*** Exceeds the acute risk LOC.
**** The reported probit slope was 9.2 and the CI were 66.1-84.7.

## Fish and Frogs

Fish and frogs also represent potential prey items of adult aquatic-phase CRLFs. RQs associated with acute and chronic direct toxicity to the CRLF (**Table 5.1**) are used to assess potential indirect effects to the CRLF based on a reduction in freshwater fish and frogs as food items.

**Table 5.1** above demonstrates the RQ calculations for both acute and chronic risk to the CFLF. As illustrated in the **Table 5.1**, the RQ calculations demonstrate 19 of the modeled scenarios exceed the LOC for risk to listed species and 7 of the modeled scenarios exceed the LOC for risk to the CRLF for acute restricted use (the acute LOC exceedances are applicable to all the uses except the tree fruit, and tree nut uses). There are no chronic LOC exceedances for any of the modeled uses. In addition there is an acute LOC exceedance for the ornamental woody shrubs & vines use for the formulated product, Omite 57EC, which has the most sensitive fish acute toxicity endpoint of 31 ppb. **Table 5.1** provides further details regarding this LOC exceedance. Based on the results of these RQ calculations EFED's preliminary effects determination is that progargite "may affect" the fish and amphibian prey of aquatic-phase CRLF strictly on an acute toxic effect basis for the modeled uses that exceed the Agency LOC.

#### 5.1.1.3 Indirect Effects to CRLF via Reduction in Habitat and/or Primary Productivity (Freshwater Aquatic Plants)

Indirect effects to the CRLF via direct toxicity to aquatic plants are estimated using the most sensitive non-vascular and vascular plant toxicity endpoints. Because there are no obligate relationships between the CRLF and any aquatic plant species, the most sensitive $EC_{50}$ values, rather than NOAEC values, were used to derive RQs. Based on the RQ calculations, there are no LOC exceedances for risk to aquatic vascular or nonvascular aquatic plants. Based on results of the RQs (**Table 5.2**), EFED's effects determination is "no effect" to the CRLF via effects to the aquatic vascular and non-vascular plants.

#### 5.1.1.4 Surface Water Monitoring Data

Based on the USGS NAWQA data set, two monitoring samples have risk quotients that exceed at least one LOC for risk to aquatic organisms. The monitoring sample with the highest concentration (20 µg/L) produces risk quotients that exceed aquatic animal LOCs for acute restricted use (LOC = 0.1), acute endangered species (LOC = 0.05), and chronic (LOC = 1) for both freshwater fish and invertebrates. The monitoring sample with the second highest concentration (2.4 µg/L) produces risk quotients that exceed a single aquatic animal LOC for acute endangered species for freshwater invertebrates. Because the CDPR surface water data set for propargite appears to contain mostly USGS NAWQA samples, the summary presented above for the NAWQA data set also applies to the CDPR surface water data.

### 5.1.2 Exposures in the Terrestrial Habitat

#### 5.1.2.1 Direct Effects to Terrestrial-phase CRLF

As previously discussed in Section 3.3, potential direct effects to terrestrial-phase CRLFs are based on foliar applications of propargite.

Potential direct acute effects to the terrestrial-phase CRLF are derived by considering dose- and dietary-based EECs modeled in T-REX for a small bird (20 g) consuming small invertebrates (**Table 3.5**) and acute oral and subacute dietary toxicity endpoints for avian species.  However because the avian acute oral toxicity studies demonstrated that no mortalities occurred at the highest concentration tested (>4640 mg/kg) and that propargite is practically non-toxic to birds on an acute oral basis, no acute oral RQs are calculated.  Only acute dietary RQs are calculated based on the most sensitive avian acute dietary toxicity endpoint ($LC_{50}$ = 3401 ppm; **Table 4.3**).

Potential direct chronic effects of propargite to the terrestrial-phase CRLF are derived by considering dietary-based exposures modeled in T-REX for a bird consuming small invertebrates.  Chronic effects are estimated using the lowest available toxicity data for birds. EECs are divided by toxicity values to estimate chronic dietary-based RQs.

Based on the results of the T-REX RQ calculations, all the modeled uses exceed the Agency LOC for risk to the terrestrial-phase CRLF.  The RQs showed that 16 of the modeled scenarios exceed the LOC for acute risk to listed species, 4 of the modeled scenarios exceed the LOC for acute restricted use for risk to the terrestrial-phase CRLF, and all the modeled scenarios exceed the LOC for chronic risk to the terrestrial-phase CRLF (**Tables 5.4a & 5.4b**). Based on results of the RQs (**Table 5.2**), EFED's preliminary effects determination is a "may affect" to the terrestrial phase of the CRLF for all of the modeled uses except jojoba, other ornamentals, and sorghum.

| **Table 5.4a Summary of Acute RQs Calculated by T-REX Used to Estimate Direct Effects to the Terrestrial-phase CRLF,** | | | |
|---|---|---|---|
| **Acute RQs** | | | |
| **Use** | **Broadleaf Plants/Small Insects** | | |
| | **EEC** | **RQ** | **Chance of Individual Effect** |
| Alfalfa | 551.20 | 0.16* | 1 in 5.88E+03 based on the RQ |
| Almond & Walnut | 896.27 | 0.26** | 1 in 2.36E+02 based on the RQ |
| Avocado | 1075.52 | 0.32** | 1 in 7.70E+01 based on the RQ |
| Beans | 550.31 | 0.16* | 1 in 5.85+03 based on the RQ |
| Berries | 430.21 | 0.13* | 1 in 2.99+04 based on the RQ |
| Citrus (air appl. only) | 521.99 | 0.15* | 1 in 9.56E+03 based on the RQ |
| Citrus (ground appl. Only) | 714.12 | 0.21** | 1 in 8.74E+02 based on the RQ |
| Clover | 367.47 | 0.11* | 1 in 1.25E+05 based on the RQ |
| Corn | 354.38 | 0.10* | 1 in 2.94E+05 based on the RQ |
| Cotton | 550.31 | 0.16* | 1 in 5.85E+03 based on the RQ |
| Forestry | 678.79 | 0.20** | 1 in 1.12E+03 based on the RQ |
| Grapes | 645.31 | 0.19* | 1 in 1.71E+03 based on the RQ |
| Hops | 336.10 | 0.10* | 1 in 2.94E+05 based on the RQ |
| Jojoba | 221.40 | 0.07 | 1 in 2.94E+05 based on the LOC |
| Mint | 533.95 | 0.16* | 1 in 5.85+03 based on the RQ |
| Nectarine | 645.31 | 0.19* | 1 in 1.71E+03 based on the RQ |
| Ornamental Woody Shrubs & Vines | 503.76 | 0.15* | 1 in 9.56E+03 based on the RQ |
| Other Ornamental | 151.13 | 0.04 | 1 in 2.94E+05 based on the LOC |
| Peanuts | 389.19 | 0.11* | 1 in 1.25E+05 based on the RQ |
| Sorghum | 221.40 | 0.07 | 1 in 2.94E+05 based on the LOC |
| Strawberry | 430.21 | 0.13* | 1 in 2.99+04 based on the RQ |
| Tree fruit – except nectarine | 430.21 | 0.13* | 1 in 2.99+04 based on the RQ |
| Tree nut – except almond and walnut | 430.21 | 0.13* | 1 in 2.99+04 based on the RQ |
| *** Exceeds Level of Concern for Acute Risk to Herpetofauna Dietary items 0.5<br>** Exceeds Level of Concern for to Herpetofauna Dietary items for Acute Restricted Use 0.2<br>* Exceeds Level of Concern Acute Listed Species of Herpetofauna Dietary items 0.1 | | | |

| Table 5.4b Summary of Chronic RQs Calculated by T-REX Used to Estimate Direct Effects to the Terrestrial-phase CRLF (non-granular application) | | |
|---|---|---|
| | **Broadleaf Plants/Small Insects** | |
| **Use** | **EEC** | **RQ** |
| Alfalfa | 551.20 | 12.76* |
| Almond & Walnut | 896.27 | 20.75* |
| Avocado | 1075.50 | 24.70* |
| Beans | 550.31 | 12.74* |
| Berries | 430.21 | 9.96* |
| Citrus (air appl. only) | 521.99 | 12.08* |
| Citrus (ground appl. Only) | 238.04 | 5.51* |
| Clover | 367.47 | 8.51* |
| Corn | 354.38 | 8.20* |
| Cotton | 550.31 | 12.74* |
| Forestry | 678.79 | 15.71* |
| Grapes | 645.31 | 14.94* |
| Hops | 336.10 | 7.78* |
| Jojoba | 221.40 | 5.13* |
| Mint | 533.95 | 12.36* |
| Nectarine | 645.31 | 14.92* |
| Ornamental Woody Shrubs & Vines | 167.92 | 3.89* |
| Other Ornamental | 151.13 | 3.50* |
| Peanuts | 389.19 | 9.00* |
| Sorghum | 221.40 | 5.13* |
| Strawberry | 430.21 | 9.96* |
| Tree fruit – except nectarine | 430.21 | 9.96* |
| Tree nut – except almond and walnut | 430.21 | 9.96* |
| * Exceeds Level of Concern for Chronic Risk to Herpetofauna Dietary items 1 | | |

#### 5.1.2.2 Indirect Effects to Terrestrial-Phase CRLF via Reduction in Prey (terrestrial invertebrates, mammals, and frogs)

*Terrestrial Invertebrates*

In order to assess the risks of propargite to terrestrial invertebrates, which are considered prey of CRLF in terrestrial habitats, the honey bee is used as a surrogate for terrestrial invertebrates. The toxicity value for terrestrial invertebrates is calculated by multiplying the lowest available acute contact $LD_{50}$ of 15 µg a.i./bee by 1 bee/0.128g, which is based on the weight of an adult honey bee. EECs (µg a.i./g of bee) calculated by T-REX for small and large insects are divided by the calculated toxicity value for terrestrial invertebrates, which is 117.19 µg a.i./g of bee. Based on the results of the RQ calculations, the risk to small insects and large insects exceeds LOCs for all the modeled scenarios. Based on the results of the RQs, propargite "may affect" small and large insect prey of the terrestrial-phase of the CRLF (**Table 5.5**).

| Table 5.5 Summary of RQs Used to Estimate Indirect Effects to the Terrestrial-phase CRLF via Direct Effects on Terrestrial Invertebrates as Dietary Food Items | | | | |
|---|---|---|---|---|
| Use | Small Insects | | Large Insects | |
| | EECs | RQs | EECs | RQs |
| Alfalfa | 551.2 | 4.70* | 61.24 | 0.52* |
| Almond & Walnut | 896.27 | 7.65* | 99.59 | 0.85* |
| Avocado | 1075.52 | 9.18* | 119.5 | 1.02* |
| Beans | 550.31 | 4.70* | 61.15 | 0.52* |
| Berries | 430.21 | 3.67* | 47.8 | 0.41* |
| Citrus (air appl. only) | 521.99 | 4.45* | 58 | 0.50* |
| Citrus (ground appl. Only) | 714.12 | 6.09* | 79.35 | 0.68* |
| Clover | 367.47 | 3.14* | 40.83 | 0.35* |
| Corn | 354.38 | 3.02* | 39.38 | 0.34* |
| Cotton | 550.31 | 4.70* | 61.15 | 0.52* |
| Forestry | 678.79 | 5.79* | 75.42 | 0.64* |
| Grapes | 645.31 | 5.51* | 71.7 | 0.62* |
| Hops | 336.1 | 2.87* | 37.34 | 0.32* |
| Jojoba | 221.4 | 1.89* | 24.6 | 0.21* |
| Mint | 533.95 | 4.56* | 59.33 | 0.51* |
| Nectarine | 645.31 | 5.51* | 71.7 | 0.62* |
| Ornamental Woody Shrubs & Vines | 503.76 | 4.30* | 55.97 | 0.48* |
| Other Ornamental | 151.13 | 1.29* | 16.79 | 0.14* |
| Peanuts | 389.19 | 3.32* | 43.24 | 0.37* |
| Sorghum | 221.4 | 1.89* | 24.6 | 0.30* |
| Strawberry | 430.21 | 3.67* | 47.8 | 0.41* |
| Tree fruit – except nectarine | 430.21 | 3.67* | 47.8 | 0.41* |
| Tree nut – except almond and walnut | 430.21 | 3.67* | 47.8 | 0.41* |
| * The LOC is exceeded (RQ $\geq$ 0.05). | | | | |

*Mammals*

Risks associated with ingestion of small mammals by large terrestrial-phase CRLFs are derived for dietary-based and dose-based exposures modeled in T-REX for a small mammal (15g) consuming short grass. Acute and chronic effects are estimated using the most sensitive mammalian toxicity data. EECs are divided by the toxicity value to estimate acute and chronic dose-based RQs as well as chronic dietary-based RQs. The risk calculations demonstrate that 16 of the modeled uses exceed the acute risk LOC for Listed mammal species and 4 of the modeled uses exceed the LOC for acute restricted use. There are also LOC exceedance for chronic risk for all the modeled scenarios (**Tables 5.6a, 5.6b, and 5.6c**). Based on the results of the RQ calculations all the modeled uses of propargite "may affect" the terrestrial phase CRLF via effect to the mammalian prey of the terrestrial-phase CRLF based on both an acute and chronic toxicity basis.

| Table 5.6a Summary of Acute RQs* Used to Estimate Indirect Effects to the Terrestrial-phase CRLF via Direct Effects on Small Mammals (15 gm) as Dietary Food Items (non-granular application) | | |
|---|---|---|
| | EECs and RQs | |
| | Short Grass | |
| Use | EEC | RQ |
| Alfalfa | 934.28 | 0.16* |
| Almond & Walnut | 1519.15 | 0.26** |
| Avocado | 1822.98 | 0.31** |
| Beans | 932.76 | 0.16* |
| Berries | 729.19 | 0.13* |
| Citrus (ground application) | 1210.42 | 0.21** |
| Citrus (air application) | 884.76 | 0.15* |
| Clover | 622.85 | 0.11* |
| Corn | 600.66 | 0.10* |
| Cotton | 932.76 | 0.16* |
| Forestry | 1150.53 | 0.20** |
| Grapes | 1093.79 | 0.19* |
| Hops | 569.68 | 0.10* |
| Jojoba | 375.27 | 0.06 |
| Mint | 905.03 | 0.16* |
| Nectarine | 1093.79 | 0.19* |
| Ornamental Woody Shrubs & Vines | 853.86 | 0.15* |
| Other Ornamental | 256.16 | 0.04 |
| Peanuts | 659.67 | 0.11* |
| Sorghum | 375.27 | 0.06 |
| Strawberry | 729.19 | 0.13* |
| Tree fruit – except nectarine | 729.19 | 0.13* |
| Tree nut – except almond and walnut | 729.19 | 0.13* |
| *** Exceeds Level of Concern for Acute Risk to Herpetofauna Dietary items 0.5<br>** Exceeds Level of Concern for to Herpetofauna Dietary items for Acute Restricted Use 0.2<br>* Exceeds Level of Concern Acute Listed Species of Herpetofauna Dietary items 0.1 | | |

| Table 5.6b Summary of Dietary Based Chronic RQs* Used to Estimate Indirect Effects to the Terrestrial-phase CRLF via Direct Effects on Small Mammals as Dietary Food Items (non-granular application) | | |
|---|---|---|
| **Use** | **Short Grass** | |
| | **EEC** | **RQ** |
| Alfalfa | 979.92 | 12.25* |
| Almond & Walnut | 1593.36 | 19.92* |
| Avocado | 1912.04 | 23.90* |
| Beans | 978.33 | 12.23* |
| Berries | 764.81 | 9.56* |
| Citrus (air appl. Only) | 927.98 | 11.60* |
| Citrus (ground appl. Only) | 1269.56 | 15.87* |
| Clover | 653.28 | 8.17* |
| Corn | 630.00 | 7.88* |
| Cotton | 978.33 | 12.23* |
| Forestry | 1206.74 | 15.08* |
| Grapes | 1147.22 | 14.34* |
| Hops | 597.51 | 7.47* |
| Jojoba | 393.60 | 4.92* |
| Mint | 949.24 | 11.87* |
| Nectarine | 1147.22 | 14.34* |
| Ornamental Woody Shrubs & Vines | 895.57 | 11.19* |
| Other Ornamental | 268.67 | 3.36* |
| Peanuts | 691.89 | 8.65* |
| Sorghum | 393.60 | 4.92* |
| Strawberry | 764.81 | 9.56* |
| Tree fruit – except nectarine | 764.81 | 9.56* |
| Tree nut – except almond and walnut | 764.81 | 9.56* |
| * Exceeds Level of Concern for Chronic Risk to Herpetofauna Dietary items 1 | | |

| Table 5.6c Summary of Dose Based Chronic RQs* Used to Estimate Indirect Effects to the Terrestrial-phase CRLF via Direct Effects on Small Mammals as Dietary Food Items (non-granular application) | | | |
|---|---|---|---|
| | **Size Class** | **EECs and RQs** | |
| | | **Short Grass** | |
| **Use** | | **EEC** | **RQ** |
| Alfalfa | 15 | 934.28 | 5.31* |
| Almond & Walnut | 15 | 1519.15 | 172.80* |
| Avocado | 15 | 1822.98 | 207.36* |
| Beans | 15 | 932.76 | 106.10* |
| Berries | 15 | 729.19 | 82.94* |
| Citrus (ground application) | 15 | 1210.42 | 137.68* |
| Citrus (air application) | 15 | 1210.42 | 137.68* |
| Clover | 15 | 622.85 | 70.85* |
| Corn | 15 | 600.66 | 68.32* |
| Cotton | 15 | 932.76 | 106.10* |
| Forestry | 15 | 1150.53 | 130.87* |
| Grapes | 15 | 1093.79 | 124.42* |

| Table 5.6c Summary of Dose Based Chronic RQs* Used to Estimate Indirect Effects to the Terrestrial-phase CRLF via Direct Effects on Small Mammals as Dietary Food Items (non-granular application) | | | |
|---|---|---|---|
| Use | Size Class | EECs and RQs | |
| | | Short Grass | |
| | | EEC | RQ |
| Hops | 15 | 569.68 | 64.80* |
| Jojoba | 15 | 375.27 | 42.69* |
| Mint | 15 | 905.03 | 102.95* |
| Nectarine | 15 | 1093.79 | 124.42* |
| Ornamental Woody Shrubs & Vines | 15 | 853.86 | 97.12* |
| Other Ornamental | 15 | 256.16 | 29.14* |
| Peanuts | 15 | 659.67 | 75.04* |
| Sorghum | 15 | 375.27 | 42.69* |
| Strawberry | 15 | 729.19 | 82.94* |
| Tree fruit – except nectarine | 15 | 729.19 | 82.94* |
| Tree nut – except almond and walnut | 15 | 729.19 | 82.94* |

*Frogs*

An additional prey item of the adult terrestrial-phase CRLF is other species of frogs. In order to assess risks to these organisms, dietary-based and dose-based exposures were modeled in T-REX for a small bird (20g) consuming small invertebrates. However, no acute oral RQs are calculated because the avian acute oral toxicity studies demonstrated that no mortalities occurred at the highest concentration tested ($LD_{50}$>4640 mg/kg) and that propargite is practically non-toxic to birds on an acute oral basis. Only acute avian dietary RQs are calculated based on the most sensitive avian acute dietary toxicity endpoint ($LC_{50}$ = 3401 ppm; **Table 4.3**).

Based on the results of the T-REX RQ calculations, all the modeled uses exceed the Agency LOC for risk to frog prey of the terrestrial-phase CRLF. The RQs showed that 16 of the modeled scenarios exceed the LOC for acute risk to listed species, 4 of the modeled scenarios exceed the LOC for acute restricted use for risk to the frog prey of the terrestrial-phase CRLF, and all the modeled scenarios exceed the LOC for chronic risk to the frog prey of the terrestrial-phase CRLF (**Tables 5.4a & 5.4b**). Based on results of the RQs (**Table 5.2**), EFED's preliminary effects determination is a "may affect" the terrestrial phase CRLF via effects to the frog prey of the terrestrial phase of the CFRL for all of the modeled uses.

#### 5.1.2.3 Indirect Effects to CRLF via Reduction in Terrestrial Plant Community (Riparian and Upland Habitat)

Potential indirect effects to the CRLF resulting from direct effects on riparian and upland vegetation are assessed using RQs calculated from terrestrial plant seedling emergence and vegetative vigor $EC_{25}$ data as a screen. Typically the terrestrial plant RQs are calculated based on the registrant submitted terrestrial plant toxicity data using the TERRPLANT model. However, since the terrestrial plant toxicity data (MRIDs 43848801 and 43848802) demonstrates that propargite shows no adverse toxic effects to terrestrial plants at the highest concentration tested which was 2.45 lb ai/A. However, since the registrant submitted data did not test terrestrial plant toxicity up to the highest maximum use rate of 4.8 lbs. ai/acre (avocado use) among the modeled uses, terrestrial plant RQs will be calculated using TerrPlant based on the highest maximum use rate and assuming that the NOAEC and $EC_{25}$ values are 2.45 lbs ai/acre (highest concentration tested in registrant submitted terrestrial plant studies) (Table 5.7).. These RQs were calculated to assess the risk to terrestrial plants under a worst case scenario. Based on this RQ calculation, there are no LOC exceedances for this worst case scenario.

Thus based on this analysis, uses of propargite result in “no effect” to the terrestrial phase CRLF based on the effects to the terrestrial plant communities.

**Table 5. 7 RQ values for plants in dry and semi-aquatic areas exposed to propargite through runoff and/or spray drift.***

| Plant Type | Listed Status | RQ for Dry | RQ for Semi-Aquatic | RQ for Spray Drift |
|---|---|---|---|---|
| Monocot | non-listed | 0.12 | 0.29 | <0.1 |
| Monocot | Listed | 0.12 | 0.29 | <0.1 |
| Dicot | non-listed | 0.12 | 0.29 | <0.1 |
| Dicot | listed | 0.12 | 0.29 | <0.1 |

*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.

### 5.1.3 Primary Constituent Elements of Designated Critical Habitat

#### 5.1.3.1 Aquatic-Phase (Aquatic Breeding Habitat and Aquatic Non-Breeding Habitat)

Three of the four assessment endpoints for the aquatic-phase primary constituent elements (PCEs) of designated critical habitat for the CRLF are related to potential effects to aquatic and/or terrestrial plants:

- Alteration of channel/pond morphology or geometry and/or increase in sediment deposition within the stream channel or pond: aquatic habitat (including riparian vegetation) provides for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLFs.

- Alteration in water chemistry/quality including temperature, turbidity, and oxygen content necessary for normal growth and viability of juvenile and adult CRLFs and their food source.
- Reduction and/or modification of aquatic-based food sources for pre-metamorphs (*e.g.*, algae).

The determination for these aquatic-phase PCEs is “no effect” based on the risk estimation for aquatic vascular and non-vascular plants provided in Sections 5.1.1.2,

The remaining aquatic-phase PCE is “alteration of other chemical characteristics necessary for normal growth and viability of CRLFs and their food source.” To assess the impact of propargite on this PCE, acute and chronic freshwater fish and invertebrate toxicity endpoints, as well endpoints for aquatic non-vascular plants, are used as measures of effects. RQs for these endpoints were calculated in Sections 5.1.1.1 and 5.1.1.2.

Based on the RQ calculations for fish and amphibian prey of the adult aquatic-phase CRLF, 19 of the modeled scenarios exceed the LOC for risk to listed species and 7 of the modeled scenarios exceed the LOC for risk to the CRLF for acute restricted use (the acute LOC exceedances are applicable to all the uses except the tree fruit, and tree nut uses). There are no chronic LOC exceedances for any of the modeled uses. In addition there is an acute LOC exceedance for the ornamental woody shrubs & vines use for the formulated product, Omite 57EC, which has the most sensitive fish acute toxicity endpoint of 31 ppb. **Table 5.1** provides further details regarding this LOC exceedance. Based on the results of these RQ calculations EFED’s preliminary effects determination is that progargite “may affect” the PCEs via effects to the fish and amphibian prey of the aquatic-phase CRLF strictly on an acute toxic effect basis for the modeled uses that exceed the Agency LOC.

Based on the results of the RQ calculations, 20 of the modeled uses exceed the Agency LOC for restricted use, 8 of the modeled uses exceed the Agency LOC for listed species, and none of the modeled uses exceed the Agency LOC for chronic risks to aquatic invertebrate prey of the CRLF. Based on the RQ calculations, EFED’s preliminary effects determination is that propargite “may affect” the PCEs via effects to the aquatic invertebrate prey of the CRLF based strictly on an acute toxic effect basis for the modeled uses that exceed the Agency LOC.

Based on the RQ calculations there are no LOC exceedances for acute risk to nonvascular aquatic plants (**Table 5.2**). There are also no LOC exceedances for risk to aquatic vascular plants. Based on results of the RQs, EFED’s preliminary effects determination is a “no effect” for risk to the PCEs via effects to the non-vascular plant diet of the CRLF.

#### 5.1.3.2 Terrestrial-Phase (Upland Habitat and Dispersal Habitat)

Two of the four assessment endpoints for the terrestrial-phase PCEs of designated critical habitat for the CRLF are related to potential effects to terrestrial plants:

- Elimination and/or disturbance of upland habitat; ability of habitat to support food source of CRLFs: Upland areas within 200 ft of the edge of the riparian vegetation or dripline surrounding aquatic and riparian habitat that are comprised of grasslands, woodlands, and/or wetland/riparian plant species that provides the CRLF shelter, forage, and predator avoidance
- Elimination and/or disturbance of dispersal habitat: Upland or riparian dispersal habitat within designated units and between occupied locations within 0.7 mi of each other that allow for movement between sites including both natural and altered sites which do not contain barriers to dispersal

The determination for terrestrial-phase PCEs of designated habitat related to potential effects on terrestrial plants is "no effect", based on the risk estimation provided in Section 5.1.2.3.

The third terrestrial-phase PCE is "reduction and/or modification of food sources for terrestrial-phase juveniles and adults." To assess the impact of propargite on this PCE, acute and chronic toxicity endpoints for birds, mammals, and terrestrial invertebrates are used as measures of effects. RQs for these endpoints were calculated in Section 5.1.2.2.

Based on the results of the RQ calculations, the LOC is exceeded for risk to small and large insects for all the modeled scenarios. Based on the results of the RQs, propargite "may affect" the PCEs via effects to small and large insect prey of the terrestrial-phase of the CRLF.

The risk calculations demonstrate that 20 of the modeled scenarios exceed the LOC for acute risk to mammalian prey of the CRLF and the chronic risk RQs for all the modeled scenarios exceed the LOC for chronic risk to mammalian prey of the CRLF (**Tables 5.7a, 5.7b, and 5.7c**). Based on the results of these studies all the modeled uses of propargite "may affect" the PCEs via effects to the mammalian prey of the CRLF based on both an acute and chronic toxicity basis.

Based on the results of the T-REX RQ calculations, 16 of the modeled scenarios exceed the LOC for acute risk to listed species, 4 modeled scenarios exceed the LOC for acute restricted use for risk to amphibian prey of the terrestrial-phase of the CRLF, and all the modeled scenarios exceed the LOC for chronic risk to amphibian prey of the terrestrial-phase of the CRLF. Based on the results of these RQ calculations, EFED's preliminarily effect determination is that progargite "may affect" the PCEs via effects to amphibian prey of the terrestrial-phase CRLF on an acute and chronic toxicity basis.

The fourth terrestrial-phase PC is based on alteration of chemical characteristics necessary for normal growth and viability of juvenile and adult CRLFs and their food source. Direct acute and chronic RQs for terrestrial-phase CRLFs are presented in Section 5.2.1.2.

Based on the results of the T-REX RQ calculations, 16 of the modeled scenarios exceed the LOC for acute risk to listed species, 4 modeled scenarios exceed the LOC for acute restricted use for risk to the terrestrial-phase CRLF, and all the modeled scenarios exceed the LOC for chronic risk to the terrestrial-phase CRLF.

Based on the results of these RQ calculations, EFED's preliminary effect determination is that progargite "may affect" the PCE via effects to the terrestrial-phase CLRF on an acute and chronic toxicity basis.

### 5.1.4 Spray Drift Buffer Analysis

In order to determine terrestrial and aquatic habitats of concern due to propargite exposures through spray drift, it is necessary to estimate the distance that spray applications can drift from the treated area and still be present at concentrations that exceed levels of concern. An analysis of spray drift distances was completed using AgDrift.

For propargite use relative to the terrestrial-phase CRLF, a screening-level risk assessment using the AgDrift model for the Tier I ground mode with the standard default settings and an application rate of 4.8 lbs./A (ground application to avocados; highest application rate). The most sensitive terrestrial endpoint is the terrestrial invertebrate $LD_{50}$ of 15 µg ai/g of insect. The calculated distance identifies those locations where terrestrial landscapes may be impacted by spray drift deposition alone (no runoff considered) at concentrations above the acute endangered species LOC for terrestrial invertebrates of (0.05). The LOC was compared to the highest RQ (9.18 based on single application only; Table 5.5) for ground applications to avocado at 4.8 lbs ai/acre. This analysis yields a terrestrial spray drift distance of 187 feet. This distance represents the maximum extent where effects are possible using the most sensitive data and the acute endangered species LOC for terrestrial insects.

Similar to the analysis described above, the buffer distance needed to get below the most sensitive aquatic LOC was determined. This calculated distance identifies those locations where water bodies can be impacted by spray drift deposition alone (no runoff considered) resulting in concentrations above the LOC. The most sensitive aquatic endpoint is for aquatic invertebrates with an $EC_{50}$ value of 0.43 µg a.i./L. The analysis yields a much lower buffer distance than the terrestrial buffer with a distance of 6.56 feet (based on the most sensitive data, maximum application rate, and the acute endangered species LOC for aquatic invertebrates). Because propargite labels require a 50' and 75' buffer between the application site and surface waters for ground and aerial applications, respectively, the aquatic buffer distance calculated would fall within the label required buffer.

Therefore, only the spray drift buffer analysis for the terrestrial-phase CRLF will increase the maximum extent of the LAA call beyond the use site. This additional area can be thought of as a 'buffer' that extends 187' beyond the use site in all directions.

### 5.1.5 Downstream Dilution Analysis

The downstream dilution approach is used to determine the downstream extent of exposure in flowing streams and rivers where direct/indirect effects and/or habitat modification may occur (*i.e.*, the downstream extent of exposure in streams and rivers where the EEC could potentially be above levels that would exceed the most sensitive LOC). To complete this assessment, the greatest ratio of aquatic RQ to LOC was estimated. Using an assumption of uniform runoff across the landscape, it is assumed that streams flowing through treated areas (*i.e.*, the initial area of concern) are represented by the modeled EECs; as those waters move downstream, it is assumed that the influx of non-impacted water will dilute the concentrations of propargite present.

The most sensitive aquatic endpoint is an $EC_{50}$ value of 0.43 µg/L for aquatic invertebrates. Using this endpoint in conjunction with the acute endangered species LOC for aquatic invertebrates (0.05) yields an RQ/LOC ratio of 8.6 (0.43/.05). The downstream dilution approach (described in more detail in **Appendix D**) yields a target percent crop area (PCA) of 0.82%. Based on the downstream dilution approach, a total of 121 kilometers of stream downstream from the initial area of concern (footprint of use) could be expected to have aquatic macroinvertebrate RQs in excess of the acute endangered LOC.

## 5.2 Risk Description

The risk description synthesizes an overall conclusion regarding the likelihood of adverse impacts leading to an effects determination (*i.e.*, “no effect,” “may affect, but not likely to adversely affect,” or “likely to adversely affect”) for the CRLF and its designated critical habitat.

If the RQs presented in the Risk Estimation (Section 5.1) show no direct or indirect effects for the CRLF, and no modification to PCEs of the CRLF’s designated critical habitat, a “no effect” determination is made, based on propargite’s use within the action area. However, if direct or indirect effect LOCs are exceeded or effects may modify the PCEs of the CRLF’s critical habitat, the Agency concludes a preliminary “may affect” determination for the FIFRA regulatory action regarding propargite. A summary of the results of the risk estimation (*i.e.*, “no effect” or “may affect” finding) is provided in **Table 5.7** for direct and indirect effects to the CRLF and in **Table 5.8** for the PCEs of designated critical habitat for the CRLF.

| Table 5.7 Preliminary Effects Determination Summary for Propargite - Direct and Indirect Effects to CRLF | | |
|---|---|---|
| **Assessment Endpoint** | **Preliminary Effects Determination** | **Basis For Preliminary Determination** |
| ***Aquatic-phase (eggs, larvae, tadpoles, juveniles, and adults)*** | | |
| Survival, growth, and reproduction of CRLF individuals via direct effects on aquatic-phases | May Effect | There are LOC exceedances to the aquatic-phase CRLF for all the uses excepted tree fruit and tree nut. |
| Survival, growth, and reproduction of CRLF individuals via effects to food supply (*i.e.*, freshwater invertebrates, non-vascular plants) | May Effect | There are LOC exceedances for the prey (except nonvascular aquatic plants) of the aquatic-phase CRLF for all the modeled uses. |
| Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat, cover, and/or primary productivity (*i.e.*, aquatic plant community) | No Effect | There are no LOC exceedances for risk to non-vascular aquatic plants for any of the modeled uses. |
| Survival, growth, and reproduction of CRLF individuals via effects to riparian vegetation, required to maintain acceptable water quality and habitat in ponds and streams comprising the species' current range. | No Effect | There are no LOC exceedances for risk to terrestrial plants. or vascular aquatic plants. |
| ***Terrestrial-phase (Juveniles and adults)*** | | |
| Survival, growth, and reproduction of CRLF individuals via direct effects on terrestrial-phase adults and juveniles | May Effect | There are LOC exceedances for risk to the terrestrial-phase of the CRLF for all the modeled use. |
| Survival, growth, and reproduction of CRLF individuals via effects on prey (*i.e.*, terrestrial invertebrates, small terrestrial mammals and terrestrial-phase amphibians) | May Effect | There are LOC exeedances for all the terrestrial-phase CRLF prey for all of the modeled uses. |
| Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat (*i.e.*, riparian vegetation) | No Effect | There are no LOC exceedances for terrestrial or aquatic vascular plants. |

| Table 5.8 Preliminary Effects Determination Summary for Propargite – PCEs of Designated Critical Habitat for the CRLF | | |
|---|---|---|
| **Assessment Endpoint** | **Preliminary Effects Determination** | **Basis For Preliminary Determination** |
| ***Aquatic-phase PCEs (Aquatic Breeding Habitat and Aquatic Non-Breeding Habitat)*** | | |
| Alteration of channel/pond morphology or geometry and/or increase in sediment deposition within the stream channel or pond: aquatic habitat (including riparian vegetation) provides for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLFs. | No Effect | Since there are no LOC exceedances for risk to terrestrial plants, EFED does not expect propargite to pose a significant risk to terrestrial plants including riparian vegetation. Additionally there are no LOC exceedances for vascular plants. |
| Alteration in water chemistry/quality including temperature, turbidity, and oxygen content necessary for normal growth and viability of juvenile and adult CRLFs and their food source. | No Effect | There are no LOC exceedances for risk to non-vascular aquatic plants for any of the modeled uses. Thus, water chemistry/quality including temperature, turbidity, and oxygen content are not expected to be adversely impacted. |
| Alteration of other chemical characteristics necessary for normal growth and viability of CRLFs and their food source. | HM | There are LOC exceedances for all the prey (including fish and aquatic invertebrate) of the aquatic-phase CRLF for all the modeled uses. |
| Reduction and/or modification of aquatic-based food sources for pre-metamorphs (*e.g.*, algae) | HM | There are LOC exceedances for all the food prey items of the aquatic-phase CRLF. |
| ***Terrestrial-phase PCEs (Upland Habitat and Dispersal Habitat)*** | | |
| Elimination and/or disturbance of upland habitat; ability of habitat to support food source of CRLFs: Upland areas within 200 ft of the edge of the riparian vegetation or dripline surrounding aquatic and riparian habitat that are comprised of grasslands, woodlands, and/or wetland/riparian plant species that provides the CRLF shelter, forage, and predator avoidance | No Effect | There are no LOC exceedances for risk to terrestrial plants. |
| Elimination and/or disturbance of dispersal habitat: Upland or riparian dispersal habitat within designated units and between occupied locations within 0.7 mi of each other that allow for movement between sites including both natural and altered sites which do not contain barriers to dispersal | No Effect | There are no LOC exceedances for risk to terrestrial plants. |
| Reduction and/or modification of food sources for terrestrial-phase juveniles and adults | HM | There are LOC exceedances for all the food prey items of the terrestrial-phase CRLF. |
| Alteration of chemical characteristics necessary for normal growth and viability of juvenile and adult CRLFs and their food source. | HM | There are LOC exceedances for all the uses for the terrestrial and aquatic-phase CRLF and for the food sources of these phases of the CRLF. |

Following a "may affect" determination, additional information is considered to refine the potential for exposure at the predicted levels based on the life history characteristics (*i.e.*, habitat range, feeding preferences, etc.) of the CRLF. Based on the best available information, the Agency uses the refined evaluation to distinguish those actions that "may affect, but are not likely to adversely affect" from those actions that are "likely to adversely affect" the CRLF and its designated critical habitat.

The criteria used to make determinations that the effects of an action are "not likely to adversely affect" the CRLF and its designated critical habitat include the following:

- Significance of Effect: Insignificant effects are those that cannot be meaningfully measured, detected, or evaluated in the context of a level of effect where "take" occurs for even a single individual. "Take" in this context means to harass or harm, defined as the following:
    - Harm includes significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering.
    - Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.
- Likelihood of the Effect Occurring: Discountable effects are those that are extremely unlikely to occur.
- Adverse Nature of Effect: Effects that are wholly beneficial without any adverse effects are not considered adverse.

A description of the risk and effects determination for each of the established assessment endpoints for the CRLF and its designated critical habitat is provided in **Sections 5.2.1 through 5.2.3**.

### 5.2.1 Direct Effects

#### 5.2.1.1 Aquatic-Phase CRLF

The aquatic-phase considers life stages of the frog that are obligatory aquatic organisms, including eggs and larvae. It also considers submerged terrestrial-phase juveniles and adults, which spend a portion of their time in water bodies that may receive runoff and spray drift containing propargite.

Based on multiple lines of evidence, EFED effects determination for the aquatic-phase of the CRLF is a "Likely to Adversely Effect" (LAA) for all the crops except the tree fruit and tree nut uses. The lines of evidence are as follows. Firstly, the aquatic-phase CRLF risk quotients for all the crops except the tree fruit and tree nut uses exceed at least one of the Agency's LOCs including acute risk to listed species, risk for acute restricted use, and risk for chronic effects (**Table 5.1**). Secondly, the available toxicity data demonstrates that propargite is highly toxic to fish, the surrogate assessment organism of the CRLF. Thirdly, chemical characteristics of propargite as previously discussed in the Environmental Fate Assessment Summary section 2.4.1.2 indicate that because of the high affinity for soil and sediment, propargite has the potential to move off the site of application during rainfall/irrigation by erosion/runoff on soil particles and by drift. Thus, propargite is highly likely to move from the site of application and enter aquatic habitat of the CRLF. Additionally, according to the USGS NAWQA monitoring data, the highest monitored surface water concentration of propargite was 20 ppb (Section 3.2.4.3). This concentration is within the range of peak EECs calculated by the modeled scenarios (**Table 3.3**). This concentration will also exceed the LOC for all crops for the aquatic-phase CRLF for acute restricted use.

The last line of evidence supporting EFED's effect determination is that there are a multitude of different uses of propargite in the state of California. Thus, EFED presumes that propargite usage in California is likely to be either within very close proximity or overlap the CRLF habitat. This presumption is also supported by Appendix D which provides a GIS analysis of the overlaps of the propargite crops and the CRLF habitats.

Table 5.1 provides the probability of individual effect for each of the uses.

#### 5.2.1.2 Terrestrial-Phase CRLF

Because of the LOC exceedances in the T-REX model, the T-HERPS model was conducted as a refinement. The T-HERPS model predicts the acute exposure of the terrestrial phase CRLF from prey with residues of propargite. These dietary items include terrestrial invertebrates, small mammals, and amphibians. Based on the RQ calculation results of the T-HERPS model, all of the modeled scenarios except for the jojoba, other ornamentals and sorghum scenarios exceed the LOC for acute risk to the terrestrial-phase of CRLF. Based on the results of these refined RQ calculations, EFED's preliminary effect determination is that progargite "may effect" the terrestrial-phase CLRF on an acute and chronic toxicity basis.

| Table 5.9 Upper Bound Kenega, Subacute Terrestrial Herpetofauna Dietary Based Risk Quotients Calculated by T-HERPS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Use** | **Broad leaf plants/Small Insects** | | **Fruits/Pods/Seeds/ Large Insects** | | **Small Herbivore Mammals** | | **Small Insectivore Mammals** | | **Small Amphibians** | |
| | **EEC** | **RQ** | **EEC** | **RQ** | **EEC** | **RQ** | **EEC** | **RQ** | **EEC** | **RQ** |
| Alfalfa | 551.20 | 0.16 * | 61.24 | 0.02 | 645.71 | 0.19** | 40.36 | 0.01 | 19.13 | 0.01 |
| Almond & Walnut | 896.27 | 0.26** | 99.59 | 0.03 | 1049.94 | 0.31** | 65.62 | 0.02 | 31.11 | 0.01 |
| Avocado | 1075.52 | 0.32 ** | 119.50 | 0.04 | 1259.92 | 0.37** | 78.75 | 0.02 | 37.33 | 0.01 |
| Beans | 551.20 | 0.16 * | 61.24 | 0.02 | 645.71 | 0.19* | 40.36 | 0.01 | 19.13 | 0.01 |
| Berries | 430.21 | 0.13 * | 47.80 | 0.01 | 503.97 | 0.15* | 31.50 | 0.01 | 14.93 | 0.00 |
| Citrus (air appl. only) | 522.84 | 0.15 * | 58.09 | 0.02 | 612.48 | 0.18* | 38.28 | 0.01 | 18.15 | 0.01 |
| Citrus (ground appl. Only) | 714.12 | 0.21 ** | 79.35 | 0.02 | 836.56 | 0.25** | 52.29 | 0.02 | 24.79 | 0.01 |
| Clover | 367.47 | 0.11* | 40.83 | 0.01 | 430.47 | 0.13* | 26.90 | 0.01 | 12.76 | 0.00 |
| Corn | 355.05 | 0.10* | 39.45 | 0.01 | 415.92 | 0.12* | 26.00 | 0.01 | 12.32 | 0.00 |
| Cotton | 551.20 | 0.16* | 61.24 | 0.02 | 645.71 | 0.19* | 40.36 | 0.01 | 19.13 | 0.01 |
| Forestry | 678.79 | 0.20** | 75.42 | 0.02 | 795.17 | 0.23** | 49.70 | 0.01 | 23.56 | 0.01 |
| Grapes | 645.31 | 0.19* | 71.70 | 0.02 | 755.95 | 0.22** | 47.25 | 0.01 | 22.40 | 0.01 |
| Hops | 336.10 | 0.10* | 37.34 | 0.01 | 393.73 | 0.12* | 24.61 | 0.01 | 11.67 | 0.00 |
| Jojoba | 221.40 | 0.07 | 24.60 | 0.01 | 259.36 | 0.08 | 16.21 | 0.00 | 7.69 | 0.00 |
| Mint | 533.95 | 0.16** | 59.33 | 0.02 | 625.50 | 0.18* | 39.09 | 0.01 | 18.53 | 0.01 |
| Nectarine | 645.31 | 0.19** | 71.70 | 0.02 | 755.95 | 0.22** | 47.25 | 0.01 | 22.40 | 0.01 |
| Ornamental Woody Shrubs & Vines | 503.76 | 0.15* | 55.97 | 0.02 | 590.13 | 0.17* | 36.88 | 0.01 | 17.49 | 0.01 |
| Other Ornamental | 151.13 | 0.04 | 16.79 | 0.00 | 177.04 | 0.05 | 11.06 | 0.00 | 5.25 | 0.00 |
| Peanuts | 389.19 | 0.11* | 43.24 | 0.01 | 455.92 | 0.13* | 28.49 | 0.01 | 13.51 | 0.00 |
| Sorghum | 221.40 | 0.07 | 24.60 | 0.01 | 259.36 | 0.08 | 16.21 | 0.00 | 7.69 | 0.00 |
| Strawberry | 430.21 | 0.13* | 47.80 | 0.01 | 503.97 | 0.15* | 31.50 | 0.01 | 14.93 | 0.00 |
| Tree fruit | 430.21 | 0.13* | 47.80 | 0.01 | 503.97 | 0.15* | 31.50 | 0.01 | 14.93 | 0.00 |
| Tree nut | 430.21 | 0.13* | 47.80 | 0.01 | 503.97 | 0.15* | 31.50 | 0.01 | 14.93 | 0.00 |

*** Exceeds Level of Concern for Acute Risk to Herpetofauna Dietary items 0.5
** Exceeds Level of Concern for to Herpetofauna Dietary items for Acute Restricted Use 0.2
* Exceeds Level of Concern Acute Listed Species of Herpetofauna Dietary items 0.1

EFED concludes a LAA for the Terrestrial-Phase of the CRLF. EFED's conclusion is based the following premises. Firstly, all of the RQs calculated by both TREX and THERPS for all the modeled uses except jojoba, other ornamental, and sorghum exceeded the levels of concern for acute and chronic risk to the terrestrial-phase of the CRLF. Secondly, because of the multitude of different uses of progargite across the state of California, EFED presumes that it is likely that progargite usage in California is likely to be either in close proximity or overlap the habitat of the CRLF. This presumption is also supported the maps in Appendix D which provide GIS analyses of the overlaps of the propargite crops and the CRLF habitats. Thus, EFED presumes that the terrestrial-phase CRLF is likely to be exposed to progargite at the estimated concentrations demonstrated to exceed the Agency's LOC.

Because of the bird acute dietary LOC exceedances, mortality effects to the CRLF are anticipated based on all modeled uses of propargite. Table 5.4a provides the probability of an individual effect for each of the modeled uses.

### 5.2.2 Indirect Effects (via Reductions in Prey Base)

#### 5.2.2.1 Algae (non-vascular plants)

As discussed in Section 2.5.3, the diet of CRLF tadpoles is composed primarily of unicellular aquatic plants (*i.e.*, algae and diatoms) and detritus. EFED concludes that the effects determination for aquatic non-vascular plants is a "no effect" because there are no LOC exceedances for any of the modeled uses.

#### 5.2.2.2 Aquatic Invertebrates

Based upon the following explanation, EFED concludes that risk to aquatic invertebrate prey of the CRLF will be a "NLAA". This conclusion is based on the premise that although there are LOC exceedances for aquatic invertebrate prey of the CRLF for all the uses, the probit analysis results for aquatic invertebrate prey of the CRLF indicates that only a relatively small percentage of the prey population may be acutely affected (Table 5.3). In addition, the prey base of aquatic phase CRLF consists of other animal taxa besides aquatic invertebrates. Since the frogs are mobile and opportunistic feeders, their fitness is unlikely to be impacted. Thus based on the results of the probit analysis and the feeding patterns of the CRLF, EFED presumes that the effect to the CRLF on the basis of aquatic invertebrate prey will be discountable.

#### 5.2.2.3 Fish and Aquatic-phase Frogs

As discussed in section 5.2.1.1 the aquatic-phase CRLF is "likely to be adversely affected" directly by propargite. Thus, because of this effects determination EFED concludes for the very same reasons discussed in section 5.2.1.1 that the aquatic phase of the CRLF is likely to be adversely effected by propargite via adverse effects to fish and aquatic-phase frog prey of the CRLF..

#### 5.2.2.4 Terrestrial Invertebrates

When the terrestrial-phase CRLF reaches juvenile and adult stages, its diet is mainly composed of terrestrial invertebrates. EFED concludes a LAA for the terrestrial-phase CRLF via adverse effects to insect prey of the terrestrial-phase of the CRLF. This determination is based on the results of the RQ calculations which showed that the level of concern is exceeded for risk to small and large insects for all the modeled scenarios.

#### 5.2.2.5 Mammals

Life history data for terrestrial-phase CRLFs indicate that large adult frogs consume terrestrial vertebrates, including mice.

EFED has determined that the terrestrial-phase CRLF will are “likely to be adversely affected” by propargite via adverse effects to mammalian prey of the terrestrial-phase CRLF. This determination is made based upon the premise that all the modeled uses exceed the acute and chronic risk LOC for mammals. Additionally EFED presumes that because of the multitude of uses of propargite in the state of California, it is likely that progargite usage is either in close proximity or overlaps the habitat of the CRLF. Thus, EFED presumes that mammalian prey of the terrestrial-phase CRLF is likely to be exposed to progargite at the estimated concentrations demonstrated to exceed the Agency’s LOC.

#### 5.2.2.6 Terrestrial-phase Amphibians

Terrestrial-phase adult CRLFs also consume frogs. RQ values representing direct exposures of propargite to terrestrial-phase CRLFs are used to represent exposures of propargite to frogs in terrestrial habitats.

As discussed in section 5.2.1.2 the terrestrial-phase CRLF is “likely to be adversely affected” by propargite. Thus, because of this effects determination EFED concludes for the very same reasons discussed in section 5.2.1.2 that frog prey of the terrestrial-phase CRLF is also “likely to be adversely affected” by propargite.

### 5.2.3 Indirect Effects (via Habitat Effects)

#### 5.2.3.1 Aquatic Plants (Vascular and Non-vascular)

Aquatic plants serve several important functions in aquatic ecosystems. Non-vascular aquatic plants are primary producers and provide the autochthonous energy base for aquatic ecosystems. Vascular plants provide structure, rather than energy, to the system, as attachment sites for many aquatic invertebrates, and refugia for juvenile organisms, such as fish and frogs. Emergent plants help reduce sediment loading and provide stability to near shore areas and lower stream banks. In addition, vascular aquatic plants are important as attachment sites for egg masses of CRLFs.

Potential indirect effects to the CRLF based on impacts to habitat and/or primary production were assessed using RQs from freshwater aquatic vascular and non-vascular plant data.

There are no LOC exceedances for risk to either non-vascular or vascular aquatic plants for any of the modeled uses.

EFED concludes that the effects determination for CRLF habitat is a "no effect" via effects to vascular and non-vascular plants because there are no LOC exceedances for any of the modeled uses.

#### 5.2.3.2 Terrestrial Plants

Terrestrial plants serve several important habitat-related functions for the CRLF. In addition to providing habitat and cover for invertebrate and vertebrate prey items of the CRLF, terrestrial vegetation also provides shelter for the CRLF and cover from predators while foraging. Upland vegetation including grassland and woodlands provides cover during dispersal. Riparian vegetation helps to maintain the integrity of aquatic systems by providing bank and thermal stability, serving as a buffer to filter out sediment, nutrients, and contaminants before they reach the watershed, and serving as an energy source.

EFED concludes that propargite will have "no effect" on the CRLF via adverse effects to terrestrial plants within the CRLF habitat. Available registrant submitted terrestrial plant toxicity data demonstrates that propargite shows no adverse toxic effect to terrestrial plants. Inputs for the risk quotients calculated using the TERRPLANT model include the highest use rate of 4.8 lbs ai/acre for avocado and an assumed $EC_{25}$ and NOAEC of 2.5 lbs ai/acre (which is the highest concentration tested in registrant submitted terrestrial plant toxicity study and which also demonstrated no significant toxic effects to the plants tested). Based on this scenario risk quotient, there are no LOC exceedances for risk to terrestrial plants.

Finally, although there were two terrestrial plant incidents associated with the use of propargite, neither of the incidents appeared to definitively be caused by propargite. Additionally, the use of several other pesticides was associated with these incidents. Based on the information provided in the report, EFED concludes that propargite was most likely not the culprit of the terrestrial plant damage. This conclusion is based on the premises that the other pesticides associated with this incident may have been responsible for the terrestrial plant damage, and that the available registrant submitted plant toxicity data demonstrate that propargite causes no significant adverse effects to terrestrial plants.

### 5.2.4 Modification to Designated Critical Habitat

#### 5.2.4.1 Aquatic-Phase PCEs

Three of the four assessment endpoints for the aquatic-phase primary constituent elements (PCEs) of designated critical habitat for the CRLF are related to potential effects to aquatic and/or terrestrial plants:

- Alteration of channel/pond morphology or geometry and/or increase in sediment deposition within the stream channel or pond: aquatic habitat (including riparian vegetation) provides for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLFs.

- Alteration in water chemistry/quality including temperature, turbidity, and oxygen content necessary for normal growth and viability of juvenile and adult CRLFs and their food source.
- Reduction and/or modification of aquatic-based food sources for pre-metamorphs (*e.g.*, algae).

The effects determinations for indirect effects to the CRLF via direct effects to aquatic and terrestrial plants are used to determine whether modification to critical habitat may occur. Risks to both terrestrial plants and aquatic vascular and non-vascular plants are "no effect" for habitat modification of the CRLF.

The remaining aquatic-phase PCE is "alteration of other chemical characteristics necessary for normal growth and viability of CRLFs and their food source." Other than impacts to algae as food items for tadpoles (discussed in section 5.2.3.1), this PCE is assessed by considering direct and indirect effects to the aquatic-phase CRLF via acute and chronic freshwater fish and invertebrate toxicity endpoints as measures of effects. The PCE is HM via adverse effects to fish and aquatic invertebrate prey of the aquatic-phase CRLF.

#### 5.2.4.2 Terrestrial-Phase PCEs

Two of the four assessment endpoints for the terrestrial-phase PCEs of designated critical habitat for the CRLF are related to potential effects to terrestrial plants:

- Elimination and/or disturbance of upland habitat; ability of habitat to support food source of CRLFs: Upland areas within 200 ft of the edge of the riparian vegetation or drip line surrounding aquatic and riparian habitat that are comprised of grasslands, woodlands, and/or wetland/riparian plant species that provides the CRLF shelter, forage, and predator avoidance.

- Elimination and/or disturbance of dispersal habitat: Upland or riparian dispersal habitat within designated units and between occupied locations within 0.7 mi of each other that allow for movement between sites including both natural and altered sites which do not contain barriers to dispersal.

As discussed in Section 5.2.3.2, EFED concludes that propargite risk to terrestrial plants is a "no effect" and therefore, there is no effect to these PCEs.

The third terrestrial-phase PCE is "reduction and/or modification of food sources for terrestrial-phase juveniles and adults." To assess the impact of propargite on this PCE, acute and chronic toxicity endpoints for terrestrial invertebrates, mammals, and terrestrial-phase frogs are used as measures of effects. As discussed in Section 5.2.2.5, the terrestrial-phase CRLF is "likely to be adversely affected by propargite" via adverse effects to the mammalian and frog prey of the terrestrial-phase of the CRLF.

The fourth terrestrial-phase PCE is based on alteration of chemical characteristics of aquatic habitat necessary for normal growth and viability of juvenile and adult CRLFs and their food source. EFED concludes a LAA for the PCEs via effects to the food sources of terrestrial-phase of the CRLF.

# 6. Uncertainties

## 6.1 Exposure Assessment Uncertainties

### 6.1.1 Maximum Use Scenario

The screening-level risk assessment focuses on characterizing potential ecological risks resulting from a maximum use scenario, which is determined from labeled statements of maximum application rate and number of applications with the shortest time interval between applications. The frequency at which actual uses approach this maximum use scenario may be dependant on pest resistance, timing of applications, cultural practices, and market forces.

### 6.1.2 Aquatic Exposure Modeling of Propargite

The standard ecological water body scenario (EXAMS pond) used to calculate potential aquatic exposure to pesticides is intended to represent conservative estimates, and to avoid underestimations of the actual exposure. The standard scenario consists of application to a 10-hectare field bordering a 1-hectare, 2-meter deep (20,000 $m^3$) pond with no outlet. Exposure estimates generated using the EXAMS pond are intended to represent a wide variety of vulnerable water bodies that occur at the top of watersheds including prairie pot holes, playa lakes, wetlands, vernal pools, man-made and natural ponds, and intermittent and lower order streams. As a group, there are factors that make these water bodies more or less vulnerable than the EXAMS pond. Static water bodies that have larger ratios of pesticide-treated drainage area to water body volume would be expected to have higher peak EECs than the EXAMS pond. These water bodies will be either smaller in size or have larger drainage areas. Smaller water bodies have limited storage capacity and thus may overflow and carry pesticide in the discharge, whereas the EXAMS pond has no discharge. As watershed size increases beyond 10-hectares, it becomes increasingly unlikely that the entire watershed is planted with a single crop that is all treated simultaneously with the pesticide. Headwater streams can also have peak concentrations higher than the EXAMS pond, but they likely persist for only short periods of time and are then carried and dissipated downstream.

The Agency acknowledges that there are some unique aquatic habitats that are not accurately captured by this modeling scenario and modeling results may, therefore, under- or over-estimate exposure, depending on a number of variables. For example, aquatic-phase CRLFs may inhabit water bodies of different size and depth and/or are located adjacent to larger or smaller drainage areas than the EXAMS pond. The Agency does not currently have sufficient information regarding the hydrology of these aquatic habitats to develop a specific alternate scenario for the CRLF. CRLFs prefer habitat with perennial (present year-round) or near-perennial water and do not frequently inhabit vernal (temporary) pools because conditions in these habitats are generally not suitable (Hayes and Jennings 1988). Therefore, the EXAMS pond is assumed to be representative of exposure to aquatic-phase CRLFs. In addition, the Services agree that the existing

EXAMS pond represents the best currently available approach for estimating aquatic exposure to pesticides (USFWS/NMFS 2004).

In general, the linked PRZM/EXAMS model produces estimated aquatic concentrations that are expected to be exceeded once within a ten-year period. The Pesticide Root Zone Model is a process or "simulation" model that calculates what happens to a pesticide in an agricultural field on a day-to-day basis. It considers factors such as rainfall and plant transpiration of water, as well as how and when the pesticide is applied. It has two major components: hydrology and chemical transport. Water movement is simulated by the use of generalized soil parameters, including field capacity, wilting point, and saturation water content. The chemical transport component can simulate pesticide application on the soil or on the plant foliage. Dissolved, adsorbed, and vapor-phase concentrations in the soil are estimated by simultaneously considering the processes of pesticide uptake by plants, surface runoff, erosion, decay, volatilization, foliar wash-off, advection, dispersion, and retardation.

Uncertainties associated with each of these individual components add to the overall uncertainty of the modeled concentrations. Additionally, model inputs from the environmental fate degradation studies are chosen to represent the upper confidence bound on the mean values that are not expected to be exceeded in the environment approximately 90 percent of the time. Mobility input values are chosen to be representative of conditions in the environment. The natural variation in soils adds to the uncertainty of modeled values. Factors such as application date, crop emergence date, and canopy cover can also affect estimated concentrations, adding to the uncertainty of modeled values. Factors within the ambient environment such as soil temperatures, sunlight intensity, antecedent soil moisture, and surface water temperatures can cause actual aquatic concentrations to differ for the modeled values.

In order to account for uncertainties associated with modeling, available monitoring data were compared to PRZM/EXAMS estimates of peak EECs for the different uses. As discussed previously, several data values were available from the NAWQA/CDPR data sets for propargite concentrations measured in surface waters receiving runoff from agricultural areas. The specific use patterns (*e.g.*, application rates and timing, crops) associated with the agricultural areas are unknown, however, they are assumed to be representative of potential propargite use areas.

The PRZM/EXAMS EECs are, in general, higher than the concentrations observed in the NAWQA/CDPR data sets. The highest peak EEC (32 µg/L) was only 1.6 times the highest monitored value (20 µg/L). Considering that 1) the PRZM/EXAMS EECs are based on an assumption of 100% of the watershed area being treated compared with the more likely actual usage pattern would likely result in far less of the watershed being treated, 2) typical application rates are much lower than the assumed maximum application rates used in modeling, and 3) the extremely low probability that the actual highest peak concentrations were captured by infrequent grab samples at 80 sites spread across a large portion of California, it seems likely that the PRZM/EXAMS EECs for propargite under-estimate aquatic exposure.

Unlike spray drift, tools are currently not available to evaluate the effectiveness of a vegetative setback on runoff and loadings. The effectiveness of vegetative setbacks is highly dependent on the condition of the vegetative strip. For example, a well-established, healthy vegetative setback can be a very effective means of reducing runoff and erosion from agricultural fields. Alternatively, a setback of poor vegetative quality or a setback that is channelized can be ineffective at reducing loadings. Until such time as a quantitative method to estimate the effect of vegetative setbacks on various conditions on pesticide loadings becomes available, the aquatic exposure predictions are likely to overestimate exposure where healthy vegetative setbacks exist and underestimate exposure where poorly developed, channelized, or bare setbacks exist.

#### 6.1.3 Usage Uncertainties

County-level usage data were obtained from California's Department of Pesticide Regulation Pesticide Use Reporting (CDPR PUR) database. Four years of data (2002 – 2005) were included in this analysis because statistical methodology for identifying outliers, in terms of area treated and pounds applied, was provided by CDPR for these years only. No methodology for removing outliers was provided by CDPR for 2001 and earlier pesticide data; therefore, this information was not included in the analysis because it may misrepresent actual usage patterns. CDPR PUR documentation indicates that errors in the data may include the following: a misplaced decimal; incorrect measures, area treated, or units; and reports of diluted pesticide concentrations. In addition, it is possible that the data may contain reports for pesticide uses that have been cancelled. The CPDR PUR data does not include home owner applied pesticides; therefore, residential uses are not likely to be reported. As with all pesticide usage data, there may be instances of misuse and misreporting. The Agency made use of the most current, verifiable information; in cases where there were discrepancies, the most conservative information was used.

#### 6.1.4 Terrestrial Exposure Modeling of Propargite

The Agency relies on the work of Fletcher et al. (1994) for setting the assumed pesticide residues in wildlife dietary items. These residue assumptions are believed to reflect a realistic upper-bound residue estimate, although the degree to which this assumption reflects a specific percentile estimate is difficult to quantify. It is important to note that the field measurement efforts used to develop the Fletcher estimates of exposure involve highly varied sampling techniques. It is entirely possible that much of these data reflect residues averaged over entire above ground plants in the case of grass and forage sampling.

It was assumed that ingestion of food items in the field occurs at rates commensurate with those in the laboratory. Although the screening assessment process adjusts dry-weight estimates of food intake to reflect the increased mass in fresh-weight wildlife food intake estimates, it does not allow for gross energy differences. Direct comparison of a laboratory dietary concentration- based effects threshold to a fresh-weight pesticide residue estimate would result in an underestimation of field exposure by food consumption by a factor of 1.25 – 2.5 for most food items.

Differences in assimilative efficiency between laboratory and wild diets suggest that current screening assessment methods do not account for a potentially important aspect of food requirements. Depending upon species and dietary matrix, bird assimilation of wild diet energy ranges from 23 – 80%, and mammal's assimilation ranges from 41 – 85% (U.S. EPA 1993). If it is assumed that laboratory chow is formulated to maximize assimilative efficiency (*e.g.*, a value of 85%), a potential for underestimation of exposure may exist by assuming that consumption of food in the wild is comparable with consumption during laboratory testing. In the screening process, exposure may be underestimated because metabolic rates are not related to food consumption.

For the terrestrial exposure analysis of this risk assessment, a generic bird or mammal was assumed to occupy either the treated field or adjacent areas receiving a treatment rate on the field. Actual habitat requirements of any particular terrestrial species were not considered, and it was assumed that species occupy, exclusively and permanently, the modeled treatment area. Spray drift model predictions suggest that this assumption leads to an overestimation of exposure to species that do not occupy the treated field exclusively and permanently.

#### 6.1.5 Spray Drift Modeling

It is unlikely that the same organism would be exposed to the maximum amount of spray drift from every application made. In order for an organism to receive the maximum concentration of propargite from multiple applications, each application of propargite would have to occur under identical atmospheric conditions (*e.g.*, same wind speed and same wind direction) and (if it is an animal) the animal being exposed would have to be located in the same location (which receives the maximum amount of spray drift) after each application. Additionally, other factors, including variations in topography, cover, and meteorological conditions over the transport distance are not accounted for by the AgDRIFT/AGDISP model (*i.e.*, it models spray drift from aerial and ground applications in a flat area with little to no ground cover and a steady, constant wind speed and direction). Therefore, in most cases, the drift estimates from AgDRIFT/AGDISP may overestimate exposure, especially as the distance increases from the site of application, since the model does not account for potential obstructions (*e.g.*, large hills, berms, buildings, trees, *etc*.). Furthermore, conservative assumptions are made regarding the droplet size distributions being modeled ('ASAE Very Fine to Fine' for orchard uses and 'ASAE Very Fine' for agricultural uses), the application method (*i.e.*, aerial), release heights and wind speeds. Alterations in any of these inputs would decrease the area of potential effect.

## 6.2 Effects Assessment Uncertainties

### 6.2.1 Age Class and Sensitivity of Effects Thresholds

It is generally recognized that test organism age may have a significant impact on the observed sensitivity to a toxicant. The acute toxicity data for fish are collected on juvenile fish between 0.1 and 5 grams. Aquatic invertebrate acute testing is performed on recommended immature age classes (*e.g.*, first instar for daphnids, second instar for amphipods, stoneflies, mayflies, and third instar for midges).

Testing of juveniles may overestimate toxicity at older age classes for pesticide active ingredients that act directly without metabolic transformation because younger age classes may not have the enzymatic systems associated with detoxifying xenobiotics. In so far as the available toxicity data may provide ranges of sensitivity information with respect to age class, this assessment uses the most sensitive life-stage information as measures of effect for surrogate aquatic animals, and is therefore, considered as protective of the CRLF.

### 6.2.2 Use of Surrogate Species Effects Data

Guideline toxicity tests and open literature data on propargite are not available for frogs or any other aquatic-phase amphibian; therefore, freshwater fish are used as surrogate species for aquatic-phase amphibians. Therefore, endpoints based on freshwater fish ecotoxicity data are assumed to be protective of potential direct effects to aquatic-phase amphibians including the CRLF, and extrapolation of the risk conclusions from the most sensitive tested species to the aquatic-phase CRLF is likely to overestimate the potential risks to those species. Efforts are made to select the organisms most likely to be affected by the type of compound and usage pattern; however, there is an inherent uncertainty in extrapolating across phyla. In addition, the Agency's LOCs are intentionally set very low, and conservative estimates are made in the screening level risk assessment to account for these uncertainties.

### 6.2.3 Sublethal Effects

When assessing acute risk, the screening risk assessment relies on the acute mortality endpoint as well as a suite of sublethal responses to the pesticide, as determined by the testing of species response to chronic exposure conditions and subsequent chronic risk assessment. Consideration of additional sublethal data in the effects determination is exercised on a case-by-case basis and only after careful consideration of the nature of the sublethal effect measured and the extent and quality of available data to support establishing a plausible relationship between the measure of effect (sublethal endpoint) and the assessment endpoints. However, the full suite of sublethal effects from valid open literature studies is considered for the purposes of defining the action area.

Currently, there are no sublethal data available in the open literature. To the extent to which sublethal effects are not considered in this assessment, the potential direct and indirect effects of propargite on CRLF may be underestimated.

### 6.2.4 Location of Wildlife Species

For the terrestrial exposure analysis of this risk assessment, a generic bird or mammal was assumed to occupy either the treated field or adjacent areas receiving a treatment on the field. Actual habitat requirements of any particular terrestrial species were not considered, and it was assumed that species occupy, exclusively and permanently, the modeled treatment area. Spray drift model predictions suggest that this assumption leads to an overestimation of exposure to species that do not occupy the treated field exclusively and permanently.

## 7. Risk Conclusions

In fulfilling its obligations under Section 7(a)(2) of the Endangered Species Act, the information presented in this endangered species risk assessment represents the best data currently available to assess the potential risks of propargite to the CRLF and its designated critical habitat.

Based on the best available information, the Agency makes a "Likely to Adversely Affect" (LAA) determination for the CRLF from the use of propargite. Additionally, the Agency has determined that there is the potential for modification of CRLF designated critical habitat from the use of the chemical. A summary of the risk conclusions and effects determinations for the CRLF and its critical habitat, given the uncertainties discussed in Section 6, is presented in **Tables 7.1 and 7.2**.

**Table 7.1 Effects Determination Summary for Direct and Indirect Effects of Propargite on the CRLF**

| Assessment Endpoint | Effects Determination[1] | Basis for Determination |
|---|---|---|
| ***Aquatic-Phase CRLF (Eggs, Larvae, and Adults)*** | | |
| Direct Effects:<br>Survival, growth, and reproduction of CRLF individuals via direct effects on aquatic-phases | LAA | The LOC is exceeded for all uses except tree nut and tree fruit based on the modeled estimated environmental concentrations (EECs) and for all uses based on the monitored maximum concentrations. In addition, there are several other lines of evidence discussed in the risk description sec. 5.2.1.1 |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via effects to food supply (*i.e.*, freshwater invertebrates, non-vascular plants, fish, and frogs) | Freshwater invertebrates: NLAA | The effect on the CRLF is discountable as only a small percentage of the aquatic invertebrate prey will be acutely affected based on the results of the probit analysis. |
| | Non-vascular aquatic plants: NE | There are no LOC exceedances for risk to non-vascular aquatic plants for any of the modeled uses. |
| | Fish and frogs: LAA | The LOC is exceeded for all uses except jojoba based on the modeled EECs and for all uses based on the maximum concentration from available monitoring data |

| Table 7.1 Effects Determination Summary for Direct and Indirect Effects of Propargite on the CRLF | | |
|---|---|---|
| **Assessment Endpoint** | **Effects Determination[1]** | **Basis for Determination** |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat, cover, and/or primary productivity (*i.e.*, aquatic plant community) | Non-vascular aquatic plants: NE | There are no LOC exceedances for any of the modeled uses. |
| | Vascular aquatic plants: NE | There are no LOC exceedances for risk to vascular aquatic plants for any of the modeled uses. |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via effects to riparian vegetation, required to maintain acceptable water quality and habitat in ponds and streams comprising the species' current range. | NE | There are no LOC exeedances for risk to terrestrial plants. |
| ***Terrestrial-Phase CRLF (Juveniles and adults)*** | | |
| Direct Effects:<br>Survival, growth, and reproduction of CRLF individuals via direct effects on terrestrial-phase adults and juveniles (based on most sensitive toxicity data for birds) | LAA | Based on the RQ calculations from both the T-REX and T-HERPS models, there are LOC exceedances for risk to the terrestrial-phase CRLF for all the modeled uses except jojoba, sorghum, and other ornamentals. Additionally since there are a multitude of use patterns of propargite that could potentially overlap the habitat of the CRLF, the terrestrial-phase CRLF may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via effects on prey (*i.e.*, terrestrial invertebrates, small terrestrial vertebrates, including mammals and terrestrial-phase amphibians) | Terrestrial invertebrates: LAA | Based on the RQ calculations, there are LOC exceedances for risk to terrestrial invertebrate insect prey of the terrestrial-phase CRLF for all the modeled uses. Additionally since there are a multitude of use patterns of propargite that may potentially overlap the habitat of the CRLF, the terrestrial invertebrate prey may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| | Mammals: LAA | Based on the RQ calculations, there are LOC exceedances for risk to mammalian prey of the terrestrial-phase CRLF for all the modeled uses. Additionally since there are a multitude of use patterns of propargite that may potentially overlap the habitat of the CRLF, the mammalian prey may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| | Frogs: LAA | Based on the RQ calculations from both the T-REX and T-HERPS models, there are LOC exceedances for risk to frog prey of the terrestrial-phase CRLF for all the modeled uses. Additionally since there are a multitude of use patterns of propargite that may potentially overlap the habitat of the CRLF, frog prey of the terrestrial-phase CRLF may potentially be exposed to modeled propargite concentrations that will cause the Agency LOC to be exceeded. |
| Indirect Effects:<br>Survival, growth, and reproduction of CRLF individuals via indirect effects on habitat (*i.e.*, riparian vegetation) | NE | There are no LOC exeedances for risk to terrestrial plants. |
| [1] NE = no effect; NLAA = may affect, but not likely to adversely affect; LAA = likely to adversely affect. | | |

| Table 7 .2 Effects Determination Summary for the Critical Habitat Impact Analysis | | |
|---|---|---|
| **Assessment Endpoint** | **Effects Determination[1]** | **Basis for Determination** |
| ***Aquatic-Phase CRLF PCEs (Aquatic Breeding Habitat and Aquatic Non-Breeding Habitat)*** | | |
| Alteration of channel/pond morphology or geometry and/or increase in sediment deposition within the stream channel or pond: aquatic habitat (including riparian vegetation) provides for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult CRLFs. | NHM | There are no LOC exeedances for risk to terrestrial plants. |
| Alteration in water chemistry/quality including temperature, turbidity, and oxygen content necessary for normal growth and viability of juvenile and adult CRLFs and their food source.[6] | NHM | There are no LOC exceedances for risk to non-vascular or vascular aquatic plants for any of the modeled uses. |
| Alteration of other chemical characteristics necessary for normal growth and viability of CRLFs and their food source. | HM | There are LOC exceedances for all the modeled uses for all the prey of the aquatic-phase of the CRLF. |
| Reduction and/or modification of aquatic-based food sources for pre-metamorphs (*e.g.*, algae). | NHM | There are no LOC exceedances for risk to aquatic non-vascular plants (algae). |
| ***Terrestrial-Phase CRLF PCEs (Upland Habitat and Dispersal Habitat)*** | | |
| Elimination and/or disturbance of upland habitat; ability of habitat to support food source of CRLFs: Upland areas within 200 ft of the edge of the riparian vegetation or dripline surrounding aquatic and riparian habitat that are comprised of grasslands, woodlands, and/or wetland/riparian plant species that provide the CRLF shelter, forage, and predator avoidance. | NHM | There are no LOC exeedances for risk to terrestrial plants. |
| Elimination and/or disturbance of dispersal habitat: Upland or riparian dispersal habitat within designated units and between occupied locations within 0.7 mi of each other that allow for movement between sites including both natural and altered sites which do not contain barriers to dispersal. | NHM | |
| Reduction and/or modification of food sources for terrestrial-phase juveniles and adults. | HM | There are LOC exceedances for all the modeled uses for all terrestrial-phase CRLF food items including mammals, frogs, and terrestrial insects. |
| Alteration of chemical characteristics necessary for normal growth and viability of juvenile and adult CRLFs and their food sources. | HM | There are LOC exceedances for all the modeled uses for all terrestrial-phase CRLF food items including mammals, frogs, and terrestrial insects. |
| [1] NHM = No habitat modification HM = habitat modification | | |

Based on the conclusions of this assessment, a formal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act should be initiated.

When evaluating the significance of this risk assessment's direct/indirect and adverse habitat modification effects determinations, it is important to note that pesticide exposures and predicted risks to the species and its resources (*i.e.*, food and habitat) are

[6] Physico-chemical water quality parameters such as salinity, pH, and hardness are not evaluated because these processes are not biologically mediated and, therefore, are not relevant to the endpoints included in this assessment.

not expected to be uniform across the action area. In fact, given the assumptions of drift and downstream transport (*i.e.*, attenuation with distance), pesticide exposure and associated risks to the species and its resources are expected to decrease with increasing distance away from the treated field or site of application. Evaluation of the implication of this non-uniform distribution of risk to the species would require information and assessment techniques that are not currently available. Examples of such information and methodology required for this type of analysis would include the following:

- Enhanced information on the density and distribution of CRLF life stages within specific recovery units and/or designated critical habitat within the action area. This information would allow for quantitative extrapolation of the present risk assessment's predictions of individual effects to the proportion of the population extant within geographical areas where those effects are predicted. Furthermore, such population information would allow for a more comprehensive evaluation of the significance of potential resource impairment to individuals of the species.
- Quantitative information on prey base requirements for individual aquatic- and terrestrial-phase frogs. While existing information provides a preliminary picture of the types of food sources utilized by the frog, it does not establish minimal requirements to sustain healthy individuals at varying life stages. Such information could be used to establish biologically relevant thresholds of effects on the prey base, and ultimately establish geographical limits to those effects. This information could be used together with the density data discussed above to characterize the likelihood of adverse effects to individuals.
- Information on population responses of prey base organisms to the pesticide. Currently, methodologies are limited to predicting exposures and likely levels of direct mortality, growth or reproductive impairment immediately following exposure to the pesticide. The degree to which repeated exposure events and the inherent demographic characteristics of the prey population play into the extent to which prey resources may recover is not predictable. An enhanced understanding of long-term prey responses to pesticide exposure would allow for a more refined determination of the magnitude and duration of resource impairment, and together with the information described above, a more complete prediction of effects to individual frogs and potential modification to critical habitat.

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