Risks of Naled Use to Federally Threatened Bay Checkerspot Butterfly (*Euphydryas editha bayensis*), and Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*),

And the Federally Endangered California Clapper Rail (*Rallus longirostris obsoletus*), San Francisco Garter Snake (*Thamnophis sirtalis tetrataenia*), and San Joaquin Kit Fox (*Vulpes macrotis mutica*)

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List of Commonly Used Abbreviations and Nomenclature

µg/kg	Symbol for "micrograms per kilogram"
µg/L	Symbol for "micrograms per liter"
ºC	Symbol for "degrees Celsius"
AAPCO	Association of American Pesticide Control Officials
a.i.	Active Ingredient
AIMS	Avian Monitoring Information System
Acc#	Accession Number
amu	Atomic Mass Unit
BCB	Bay Checkerspot Butterfly
BCF	Bioconcentration Factor
BEAD	Biological and Economic Analysis Division
bw	Body Weight
CAM	Chemical Application Method
CARB	California Air Resources Board
CAW	California Alameda Whipsnake
CBD	Center for Biological Diversity
CCR	California Clapper Rail
CDPR	California Department of Pesticide Regulation
CDPR-PUR	California Department of Pesticide Regulation Pesticide Use Reporting Database
CFWS	California Freshwater Shrimp
CI	Confidence Interval
CL	Confidence Limit
CTS	California Tiger Salamander
CTS-CC	California Tiger Salamander Central California Distinct Population Segment
CTS-SB	California Tiger Salamander Santa Barbara County Distinct Population Segment
CTS-SC	California Tiger Salamander Sonoma County Distinct Population Segment
DS	Delta Smelt
EC	Emulsifiable Concentrate
EC_{05}	5% Effect Concentration
EC_{25}	25% Effect Concentration
EC_{50}	50% (or Median) Effect Concentration

ECOTOX	EPA managed database of Ecotoxicology data
EEC	Estimated Environmental Concentration
EFED	Environmental Fate and Effects Division
e.g.	Latin *exempli gratia* (“for example”)
EIM	Environmental Information Management System
EPI	Estimation Programs Interface
ESU	Evolutionarily significant unit
et al.	Latin *et alii* (“and others”)
etc.	Latin *et cetera* (“and the rest” or “and so forth”)
EXAMS	Exposure Analysis Modeling System
FIFRA	Federal Insecticide Fungicide and Rodenticide Act
FQPA	Food Quality Protection Act
ft	Feet
GENEEC	Generic Estimated Exposure Concentration model
HPLC	High Pressure Liquid Chromatography
IC_{05}	5% Inhibition Concentration
IC_{50}	50% (or median) Inhibition Concentration
i.e.	Latin for *id est* (“that is”)
IECV1.1	Individual Effect Chance Model Version 1.1
KABAM	$\underline{K}_{OW}$ (based) Aquatic BioAccumulation Model
kg	Kilogram(s)
kJ/mole	Kilojoules per mole
km	Kilometer(s)
K_{AW}	Air-water Partition Coefficient
Kd	Solid-water Distribution Coefficient
KF	Freundlich Solid-Water Distribution Coefficient
K_{OC}	Organic-carbon Partition Coefficient
K_{OW}	Octanol–water Partition Coefficient
LAA	Likely to Adversely Affect
lb a.i./A	Pound(s) of active ingredient per acre
LC_{50}	50% (or Median) Lethal Concentration
LD_{50}	50% (or Median) Lethal Dose
LOAEC	Lowest Observable Adverse Effect Concentration
LOAEL	Lowest Observable Adverse Effect Level
LOC	Level of Concern
LOD	Level of Detection

LOEC	Lowest Observable Effect Concentration
LOQ	Level of Quantitation
m	Meter(s)
MA	May Affect
MATC	Maximum Acceptable Toxicant Concentration
m^2/day	Square Meters per Days
ME	Microencapsulated
mg	Milligram(s)
mg/kg	Milligrams per kilogram (equivalent to ppm)
mg/L	Milligrams per liter (equivalent to ppm)
mi	Mile(s)
mmHg	Millimeter of mercury
MRID	Master Record Identification Number
MW	Molecular Weight
n/a	Not applicable
NASS	National Agricultural Statistics Service
NAWQA	National Water Quality Assessment
NCOD	National Contaminant Occurrence Database
NE	No Effect
NLAA	Not Likely to Adversely Affect
NLCD	National Land Cover Dataset
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOAEC	No Observable Adverse Effect Concentration
NOAEL	No Observable Adverse Effect Level
NOEC	No Observable Effect Concentration
NRCS	Natural Resources Conservation Service
OPP	Office of Pesticide Programs
OPPTS	Office of Prevention, Pesticides and Toxic Substances
ORD	Office of Research and Development
PCE	Primary Constituent Element
pH	Symbol for the negative logarithm of the hydrogen ion activity in an aqueous solution, dimensionless
pKa	Symbol for the negative logarithm of the acid dissociation constant, dimensionless
ppb	Parts per Billion (equivalent to µg/L or µg/kg)

ppm	Parts per Million (equivalent to mg/L or mg/kg)
PRD	Pesticide Re-Evaluation Division
PRZM	Pesticide Root Zone Model
ROW	Right of Way
RQ	Risk Quotient
SFGS	San Francisco Garter Snake
SJKF	San Joaquin Kit Fox
SLN	Special Local Need
SMHM	Salt Marsh Harvest Mouse
TG	Tidewater Goby
T-HERPS	Terrestrial Herpetofaunal Exposure Residue Program Simulation
T-REX	Terrestrial Residue Exposure Model
UCL	Upper Confidence Limit
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VELB	Valley Elderberry Longhorn Beetle
WP	Wettable Powder
wt	Weight

1. Executive Summary

1.1. Purpose of Assessment

The purpose of this assessment is to evaluate potential direct and indirect effects on the federally threatened Bay Checkerspot Butterfly (BCB) and Valley Elderberry Longhorn Beetle (VELB), as well as the federally endangered California Clapper Rail (CCR), San Francisco Garter Snake (SFGS), and the San Joaquin Kit Fox (SJKF) arising from FIFRA regulatory actions regarding use of Naled on agricultural and non-agricultural sites. In addition, this assessment evaluates whether these actions can be expected to result in modification of designated critical habitat for the CCR, SFGS, SJKF, VELB, and BCB. 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), procedures outlined in the Agency's Overview Document (USEPA, 2004), and consistent with a stipulated injunction ordered by the Federal District Court for the Norther District of California in the case *Center for Biological Diversity (CBD) vs. EPA et al*. (Case No. 07-2794-JCS).

Below is a brief description of when each San Francisco Bay species being assessed was listed, and a short description of their associated PCE's (when applicable).

- The CCR was listed by the USFWS as an endangered species in 1970. The species is found only in California in coastal wetlands along the San Francisco estuary and Suisun Bay.
- The SFGS was listed as endangered in 1967 by the USFWS. The species is endemic to the San Francisco Peninsula and San Mateo County in California in densely vegetated areas near marshes and standing open water.
- The SJKF was listed as endangered in 1967 by the USFWS. The species is found in a variety of habitats in the Central Valley area of California.
- The VELB was listed as threatened in 1980 by the USFWS. The species is found in areas with elderberry shrubs throughout California's Central Valley and associated foothills on the east and the watershed of the Central Valley on the west. Critical Habitat designated by the USFWS includes areas that contain its host plant (*i.e.*, elderberry trees).
- The BCB was listed as threatened in 1987 by the USFWS. The species primarily inhabits native grasslands on serpentine outcrops around the San Francisco Bay Area in California. Critical Habitat designated by the USFWS includes areas on serpentinite-derived soils that support the primary larval host plant (*i.e.*, dwarf plantain) and at least one of the species' secondary host plants. Critical to the species is also the presence of adult nectar sources, aquatic features that provide moisture during the spring drought and areas that provide adequate shelter during the summer diapause.

1.2. Scope of Assessment

1.2.1. Uses Assessed

Naled is an organophosphate insecticide that acts as a cholinesterase (ChE) inhibitor. Numerous application methods are employed for a vast array of naled uses. These uses include crop and non-crop applications, such as use on: orchards, row crops, vineyards bedding plants, and forests. Additionally, naled is registered for non-crop farming uses, residential uses, and many others.

Application methods include: aerial spray, ground spray, hand spray, airblast, mist/fogging, and bait stations. Aerial and ground spray methods may use ultra-low volume (ULV) nozzles which suspend the product in the air for a longer duration, in order to intercept flying insects. Naled can be applied indoors, around structures, on agricultural fields, in wetlands, urban areas, as an ambient atmospheric suspension – essentially in any form anywhere, at any time of the year (see Table 2-4 for a list of uses). Thus, there are no areas within the state of California where naled may not be used, so potential exposure to insects and other invertebrates, fish, and other wildlife exists statewide. Certain application methods/usages (aerial spray or ground spray) are expected to result in greater and more extensive (high-end) exposure than others (indoor uses, hand spray around structural perimeters, bait stations) because of higher application rates and more widespread applications. Formulation types registered include liquid and emulsifiable concentrate.

1.2.2. Environmental Fate Properties of Naled

Naled and its degradates are transformed largely by chemical hydrolysis and biodegradation. Volatilization from soils and/or water and spray drift are likely the major mode(s) of transport for naled and its bioactive degradate DDVP from application sites. There are targeted studies (e.g., Tulare County, CA, 1995) that indicate that measurable background levels of naled can be found even in the absence of local naled use in the atmosphere.

Under terrestrial, aquatic and forestry field conditions naled was observed to dissipate rapidly with half-lives of less than 2 days in all three cases. The dissipation of DDVP was also observed to be similarly rapid. While naled and DDVP are potentially mobile, their degradation is very rapid; thus residues of naled and its degradate DDVP are not likely to leach into ground water.

All labels clearly state “Do not apply directly to water”, but there are specific exceptions made for certain treatments; in particular, mosquito and fly control uses. In addition, substantial amounts of naled residues should be available for runoff to surface waters for approximately one or two days post-application. However, rapid hydrolysis and even faster biodegradation quickly decrease the concentration of naled available. The bioaccumulation potential for Naled and DDVP appears to be low.

The Agency has very little monitoring data on the concentrations of naled or its degradates in surface water; a single detection of DDVP (0.242 µg/L) in surface water was reported in the Del Puerto Creek (a tributary to San Joaquin River) in Stanislaus County, CA, 9/2/2003 (California Department of Pesticide Regulations (CDPR)). It is unknown whether this detection reflected naled use as the source of DDVP. No detections of parent naled were found in any local or national databases; however, it is not known whether any water monitoring studies targeted specifically to naled use have been conducted.

1.2.3. Evaluation of Degradates and Stressors of Concern

Dichlorvos (DDVP) is a major toxic degradate of naled. This assessment estimates risk from exposure to naled, and its degradate DDVP by evaluating “total naled residues of concern” (naled plus DDVP). Because DDVP is also an active ingredient in other pesticide products, and is also a degradate of pesticides other than naled (i.e., trichlorfon), the presence of DDVP in the environment in monitoring studies cannot necessarily be used as evidence of naled use.

1.3. Assessment Procedures

A description of routine procedures for evaluating risk to the San Francisco Bay Species are provided in Attachment I.

1.3.1. Exposure Assessment

1.3.1.1. Aquatic Exposures

Tier-II aquatic exposure models are used to estimate high-end exposures of Naled in aquatic habitats resulting from runoff and spray drift from different uses. The models used to predict aquatic EECs are the Pesticide Root Zone Model coupled with the Exposure Analysis Model System (PRZM/EXAMS). The AgDRIFT model is also used to estimate deposition of naled on aquatic habitats from spray drift. In addition to PRZM/EXAMS, the Rice model was also used to determine the EECs for direct water applications. Peak model-estimated environmental concentrations resulting from different naled uses range from 0.29 to 550 µg/L. These estimates are supplemented with analysis of available data from the California Department of Pesticide Regulation surface water database. The maximum concentration of DDVP reported was 0.542µg/L in surface water (Sutter County, CA, 10/18/2005) and is roughly 1,000 times *lower* than the highest peak estimated environmental concentration. There was no monitoring data available for naled. No detections of parent naled were found in any other local or national databases (California Department of Pesticide Regulation , USGS NAWQA Database for surface water and ground water,); however, it is not known whether any water monitoring studies targeted specifically to naled use have been conducted.

1.3.1.2. Terrestrial Exposures

To estimate and characterize the risk associated with naled exposures to terrestrial species resulting from applications of naled, the T-REX model is used. The T-HERPS model is used to further characterize dietary exposures of reptiles relative to screening exposure estimates based on birds in T-REX. Naled degrades rapidly to DDVP, and T-REX (and T-HERPS) do not track total toxic residues, therefore, two separate T-REX (and T-HERPS) runs were executed for each application scenario to capture the range in possible naled and DDVP residues: one run was conducted at 100% of the application rate (assuming 100% residue as naled), and one run was conducted at 20% of the application rate (which was converted in terms of DDVP using molecular weight conversion, thus representing the maximum possible DDVP residue level from naled). For each run, the resulting EECs were compared to their respective toxicity endpoints to generate estimates of risk (i.e., 100% application run was compared to naled toxicity endpoints, and the 20% application run was compared to DDVP toxicity endpoints). The RQ values that were generated from each run were not summed, but rather used to bound the range of possible RQ values resulting from naled and subsequently DDVP exposure. This allowed for further characterization of the direct and indirect risks to terrestrial organisms. The AgDRIFT model was also used to estimate deposition of naled on terrestrial habitats resulting from spray drift.

1.3.2. Toxicity Assessment

The assessment endpoints include direct toxic effects on survival, reproduction, and growth of individuals, as well as indirect effects, such as reduction of the food source and/or modification of habitat. Federally-designated critical habitat has been established for the VELB and the BCB. Primary constituent elements (PCEs) were used to evaluate whether naled (and DDVP) has the potential to modify designated critical habitat. The Agency evaluated registrant-submitted studies and data from the open literature to characterize toxicity. The most sensitive toxicity value available from acceptable or supplemental studies for each taxon relevant for estimating potential risks to the assessed species and/or their designated critical habitat was used.

For this assessment, evaluated taxa include freshwater fish and invertebrates (indirect effects to the SFGS and CCR), estuarine/marine fish and invertebrates (indirect effects to the CCR), aquatic plants (indirect effects as food/habitat to the SFGS and CCR), birds (used as a surrogate for terrestrial-phase amphibians and reptiles, direct and indirect effects to the SFGS and CCR, and indirect effects to the SJKF), mammals (direct effects to the SJKF, and indirect effects to the SFGS, CCR, and SJKF), terrestrial invertebrates (direct effects to the BCB and VELB, and indirect effects to the SFGS, CCR and SJKF), and terrestrial plants (indirect effects as food/habitat non-obligate relationship to the SFGS, CCR, and SJKF, and indirect effects as food/habitat obligate relationship to the BCB and VELB). 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 naled and DDVP (since the total toxic residue approach is being utilized for the aquatic analysis, and degradation is being accounted for in the terrestrial analysis as well).

Section 4 summarizes the aquatic and terrestrial ecotoxicity data available on naled and its degradate DDVP. Naled can be classified as moderately to very highly toxic to freshwater fish and very highly toxic to freshwater invertebrates on an acute exposure basis. Naled can be classified as being moderately to highly toxic to estuarine/marine fish, and highly to very highly toxic to estuarine/marine invertebrates on an acute basis. Naled can be classified as moderately to highly toxic to waterfowl and upland game species on an acute oral exposure basis, and slightly toxic to waterfowl and upland game species of birds on a subacute dietary exposure basis. Naled can be classified as moderately toxic to mammals on an acute oral exposure basis. Naled can be classified as highly toxic to honey bees (*Apis mellifera*) on an acute contact exposure basis.

1.3.3. Measures of Risk

Acute and chronic risk quotients (RQs) are compared to the Agency's Levels of Concern (LOCs) to identify instances where naled use and DDVP residues has the potential to adversely affect the assessed species or adversely modify their designated critical habitat. When RQs for a particular type of effect are below LOCs, the pesticide is considered to have "no effect" on the species and its designated critical habitat. Where RQs exceed LOCs, a potential to cause adverse effects or habitat modification is identified, leading to a conclusion of "may affect". If naled use or DDVP residues "may affect" the assessed species, and/or may cause effects to designated critical habitat, the best available additional information is considered to refine the potential for exposure and effects, and distinguish actions that are Not Likely to Adversely Affect (NLAA) from those that are Likely to Adversely Affect (LAA).

1.4. Summary of Conclusions

Based on the best available information, the Agency makes a May Affect, Likely to Adversely determination for the CCR, SFGS, SJKF, BCB and VELB. Additionally, the Agency has determined that there is the potential for modification of the designated critical habitat for both the BCB and VELB from the use of naled. A summary of the risk conclusions and effects determinations for each listed species assessed here and their designated critical habitat (for BCB and VELB, only) is presented in Table 1-1 and Table 1-2. Use-specific determinations are provided in Table 1-3 and Table 1-4. Further information on the results of the effects determination is included as part of the Risk Description in Section 5.2. Given the LAA determination for the CCR, SFGS, SJKF, BCB and VELB a description of the baseline status and cumulative effects for CCR, SFGS, SJKF, BCB and VELB is provided in Attachment II.

Table 1-1. Effects Determination Summary for Effects of naled on the CCR, SFGS, SJKF, BCB, and VELB.

Species	Effects Determination	Basis for Determination
California Clapper Rail (CCR) (*Rallus longirostris obsoletus)*	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects**
		Juveniles and Adults: There are direct acute and chronic effects for all uses of naled except insect pest control related to animal and human health issues (scenarios 7, 8, and 9). Acute dose-based RQs for small birds consuming tall grass and broadleaf plants ranged from 15.97 to 0.83 and 19.60 to 1.02, respectively assuming 100% of dietary requirements are met from those materials. Acute dose-based RQs for adult birds consuming tall grass and broadleaf plants ranged from 7.15 to 0.37 and 8.78 to 1.02, respectively. When considering the realistic percentage of the diet those materials make up at time of application (1%), the acute dose-based RQs still exceed the listed species LOC (0.1) for small birds consuming either tall grass or broadleaf plants. RQs ranged from 0.16 to 0.08 for tall grass, and 0.20 to 0.01 for broadleaf plants. When considering the realistic percentage of the diet those materials make up at time of application (1%), the acute dose-based RQs did not exceed the listed species LOC (0.1) for adult birds consuming either tall grass or broadleaf plants. RQs ranged from 0.071 to 0.004 for tall grass, and 0.088 to 0.005 for broadleaf plants.
		Potential for Indirect Effects
		Aquatic prey items, aquatic habitat, cover and/or primary productivity There are indirect acute and chronic effects to the CCR via effects to fish and aquatic invertebrates for all uses of naled. RQs are exceeded for all freshwater invertebrates on an acute and chronic basis, most freshwater fish on an acute basis and half on a chronic basis, estuarine/marine fish and invertebrates are assumed to be exceeded on an acute and chronic basis, a few of the non-vascular plants, and none of the vascular plants. The effects to fish and aquatic invertebrates result in an indirect effect to the CCR via loss of prey items.

Species	Effects Determination	Basis for Determination
		Terrestrial prey items, riparian habitat There are indirect acute and chronic effects to the CCR via effects to birds, mammals, and terrestrial invertebrates, for all uses of naled except insect pests – animal and human health concerns uses (scenarios 7, 8, and 9). Acute dose-based RQs for small birds consuming short grass ranged from 34.85 to 1.81, acute dietary-based RQs for birds consuming short grass ranged from 0.38 to 0.02, and chronic dietary-based RQs for birds consuming short grass ranged from 1.52 to 0.10. Acute dose-based RQs for small mammals consuming short grass ranged from 2.38 to 0.12, chronic dose-based RQs for small mammals consuming short grass ranged from 36.44 to 1.89, and chronic dietary-based RQs for small mammals consuming short grass ranged from 4.20 to 0.22. RQs for small insects ranged from 75.60 to 3.92 and RQs for large insects ranged from 8.40 to 0.43. The effects to birds, mammals, and terrestrial invertebrates result in an indirect effect to the CCR via loss of prey items.
San Francisco Garter Snake (SFGS) (*Thamnophis sirtalis tetrataenia*)	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects**
		Juveniles and Adults: There are direct acute and chronic effects to the SFGS for safflower, cole crops, tree nuts, citrus uses only (scenarios 1 and 2). Acute dose-based RQs for a 20g snake consuming small mammals ranged from 29.02 to 1.50, acute dietary-based RQs for a 20g snake consuming small mammals ranged from 0.29 to 0.02, and chronic RQs for a 20g snake consuming small mammals ranged from 1.49 to 0.08 (using the T-HERPS refinement).
		Potential for Indirect Effects
		Aquatic prey items, aquatic habitat, cover and/or primary productivity There are indirect acute and chronic effects to the SFGS via effects to fish, aquatic invertebrates for all uses of naled. RQs are exceeded for all freshwater invertebrates on an acute and chronic basis, most freshwater fish on an acute basis and half on a chronic basis, estuarine/marine fish and invertebrates are assumed to be exceeded on an acute and chronic basis, a few of the non-vascular plants, and none of the vascular plants. The effects to fish and aquatic invertebrates results in an indirect effect to the SFGS via loss of prey items.
		Terrestrial prey items, riparian habitat There are indirect acute and chronic effects to the SFGS via effects to birds (surrogate for terrestrial-phase amphibians), mammals, and terrestrial invertebrates, for safflower, cole crops, tree nuts, citrus uses of naled only (scenarios 1 and 2). Acute dose-based RQs for small birds (surrogate for terrestrial-phase amphibians) consuming short grass ranged from 34.85 to 1.81, acute dietary-based RQs for birds (surrogate for terrestrial-phase amphibians) consuming short grass ranged from 0.38 to 0.02, and chronic dietary-based RQs for birds (surrogate for terrestrial-phase amphibians) consuming short grass ranged from 1.52 to 0.10. Acute dose-based RQs for small mammals consuming short grass ranged from 2.38 to 0.12, chronic dose-based RQs for small mammals consuming short grass ranged from 36.44 to 1.89, and chronic dietary-based RQs for small mammals consuming short grass ranged from 4.20 to 0.22. From T-HERPS refinement, using medium snakes (20g) consuming herbivore mammals, the acute dose-based RQs ranged from 29.02 to 1.50, the acute dietary-based RQs range from 0.29 to 0.02, and the chronic dietary RQs ranged from 1.49 to 0.08. RQs for small insects ranged from 75.60 to 3.92 and RQs for large insects ranged from 8.40 to 0.43. The effects to birds (surrogate for terrestrial-phase amphibians), mammals, and terrestrial invertebrates result in an indirect effect to the SFGS via loss of prey items.

Species	Effects Determination	Basis for Determination
San Joaquin Kit Fox (SJKF) (*Vulpes macrotis mutica*)	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects** ***Juveniles and Adults***: There are direct acute and chronic effects to the SJKF for all uses (except for uses to control insect pests related to animal and human health concerns– scenarios 7, 8, and 9). Acute dose based RQs for large mammals consuming short grass ranged from 1.09 to 0.06, chronic dose-based RQs for large mammals consuming short grass ranged from 16.68 to 0.86, and chronic dietary-based RQs for large mammals consuming short grass ranged from 4.20 to 0.22. **Potential for Indirect Effects** ***Terrestrial prey items, riparian habitat*** There are indirect acute and chronic effects to the SJKF for all uses (except for insect pests – animal and human health concerns uses – scenarios 7, 8, and 9), via effects to birds, mammals and terrestrial invertebrates. Acute dose-based RQs for small birds consuming short grass ranged from 34.85 to 1.81, acute dietary-based RQs for birds consuming short grass ranged from 0.38 to 0.02, and chronic dietary-based RQs for birds consuming short grass ranged from 1.52 to 0.10. Acute dose-based RQs for small mammals consuming short grass ranged from 2.38 to 0.12, chronic dose-based RQs for small mammals consuming short grass ranged from 36.44 to 1.89, and chronic dietary-based RQs for small mammals consuming short grass ranged from 4.20 to 0.22. RQs for small insects ranged from 75.60 to 3.92 and RQs for large insects ranged from 8.40 to 0.43. The effects to birds, mammals, and terrestrial invertebrates result in an indirect effect to the SJKF via loss of prey items.
Bay Checkerspot Butterfly (BCB) (*Euphydryas editha bayensis*)	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects** ***Larvae and Adults***: There are direct effects to larvae and adult BCB for all uses of naled. RQs for small insects (representing the BCB larval stage) ranged from 75.60 to 3.92 and RQs for large insects (representing the BCB adult stage) ranged from 8.40 to 0.43. **Potential for Indirect Effects** There are no indirect effects to the larvae or adult BCB for any uses of naled. Effects to terrestrial plants cannot be quantified due to the lack of submitted data; the agency expects insignificant indirect effects to the BCB via effects to terrestrial plants, specifically the dwarf plantain to which they are obligate to.
Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*)	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects** ***Larvae and Adults***: There are direct effects to larvae and adult VELB for all uses of naled. RQs for small insects (representing the VELB larval stage) ranged from 75.60 to 3.92 and RQs for large insects (representing the VELB adult stage) ranged from 8.40 to 0.43. **Potential for Indirect Effects** The effects to terrestrial plants could not be quantified, and the presence of incident data indicate that risk to terrestrial plants could not be precluded; and therefore there is the potential for indirect effects to the VELB via effects to terrestrial plants, specifically the Elderberry to which they are an obligate to.

Table 1-2. Effects Determination Summary for the Critical Habitat Impact Analysis

Designated Critical Habitat for:	Effects Determination	Basis for Determination
Bay Checkerspot Butterfly (BCB) (*Euphydryas editha bayensis*)	**Habitat Modification**	The effects to terrestrial plants cannot be quantified, and the presence of incident data indicate that risk to terrestrial plants could not be precluded. Therefore, the Agency makes a **"Habitat Modification"** determination for the BCB designated critical habitat as risk to terrestrial plants cannot be precluded.
Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*)	**Habitat Modification**	The effects to terrestrial plants cannot be quantified, and the presence of incident data indicate that risk to terrestrial plants could not be precluded. Therefore, the agency makes a **"Habitat Modification" determination** for VELB designated critical habitat as risk to terrestrial plants cannot be precluded.

Table 1-3. Use Specific Summary of The Potential for Indirect Adverse Effects to Aquatic Taxa

Uses	Potential for Effects to Identified Taxa Found in the Aquatic Environment:									
	Estuarine/Marine Vertebrates[1]		Freshwater Vertebrates[2]		Freshwater Invertebrates[3]		Estuarine/Marine Invertebrates[4]		Vascular Plants[5]	Non-vascular Plants[5]
	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic		
orange, lemon, grapefruit, tangerine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
cabbage, broccoli, cauliflower, collards, kale	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
cotton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
peaches	No	No	No	No	Yes	Yes	Yes	Yes	No	No
grapes	No	No	No	No	Yes	Yes	Yes	Yes	No	No
Brussels sprouts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Swiss chard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
eggplant, summer squash	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
cantaloupes, muskmelons, melons	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
bedding plant, foliage plants, outdoor nursery ops.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
celery	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
beans, peas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
peppers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
strawberries	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
sugar beets	No	No	No	No	Yes	Yes	Yes	Yes	No	No
safflower	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes
hops	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No
forestry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
areas outside bldgs., impervious surfaces	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
residential (including lawns)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Rangeland, pasture	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
alfalfa	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No

1 A yes in this column indicates a potential for indirect effects to CCR.
2 A yes in this column indicates a potential for indirect effects to SFGS and CCR.
3 A yes in this column indicates a potential for indirect effects to SFGS and CCR.
4 A yes in this column indicates a potential for indirect effects to CCR.
5 A yes in this column indicates a potential for indirect effects to SFGS and CCR.

Table 1-4. Use Specific Summary of The Potential for Adverse Effects to Terrestrial Taxa.

Scenario (lbs ai/A)	Small Mammals[1]		SJKF and Large Mammals[2]		CCR and Small Birds[3]		SFGS and Reptiles[4]		BCB, VELB, & Terrestrial Invertebrates (Acute)[5]	Dicots[6]	Monocots[6]
	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic			
1- Safflower (2.1 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes**	Yes**
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes**	Yes**
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 3-d interval)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	No	No	No	No	No	No	No	No	Yes	Yes**	Yes**
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	No	No	No	No	No	No	No	No	Yes	Yes**	Yes**
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	No	No	No	No	No	No	No	No	Yes	Yes**	Yes**

1 A yes in this column indicates a potential for indirect effects to SFGS, CCR, SJKF.
2 A yes in this column indicates a potential for direct and indirect effects to SJKF.
3 A yes in this column indicates a potential for direct effects to CCR and indirect effects to the CCR, SFGS, SJKF.
4 A yes in this column indicates the potential for direct and indirect effects to SFGS and other reptiles.
5 A yes in this column indicates a potential for direct effect to BCB and VELB and indirect effects to SFGS, CCR, SJKF.
6 A yes in this column indicates a potential for indirect effects to BCB, VELB, SFGS, CCR. For the BCB and VELB this is based on the listed species LOC because of the obligate relationship with terrestrial monocots and dicots. For other species, the LOC exceedances are evaluated based on the LOC for non-listed species.
**There is no toxicity data for terrestrial plants, and there incident data is available, therefore risk cannot be precluded for terrestrial plants

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 CCR, SFGS, SJKF, BCB, and VELB life stages within the action area and/or applicable designated critical habitat. 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 assessed species.
- Quantitative information on prey base requirements for the assessed species. While existing information provides a preliminary picture of the types of food sources utilized by the assessed species, 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 species 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 (USEPA, 1998), the Services' *Endangered Species Consultation Handbook* (USFWS/NMFS, 1998) and is consistent with procedures and methodology outlined in the Overview Document (USEPA, 2004) and reviewed by the U.S. Fish and Wildlife Service and National Marine Fisheries Service (USFWS/NMFS/NOAA, 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 clapper rail (CCR), San Francisco garter snake (SFGS), and San Joaquin kit fox (SJKF), as well as the threatened valley elderberry longhorn beetle (VELB) and bay checkerspot butterfly (BCB) arising from FIFRA regulatory actions regarding use of naled on numerous agricultural sites such as celery, peaches, beans, peas, sugarbeets, almonds, and walnuts, and a number of non-agricultural sites such as telephone poles, cows, pastures, impervious surfaces, and swamps (see Table 2-4 for a complete listing of uses assessed in this document).

In this assessment, direct and indirect effects to the CCR, SFGS, SJKF, VELB, and BCB along with potential modification to designated critical habitat for these species are evaluated in accordance with the methods described in the Agency's Overview Document (USEPA, 2004). This assessment was also completed in accordance wit the US Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) *Endangered Species Consultation Handbook* (USFWS/NMFS, 1998), and consistent with a stipulated injunction ordered by the Federal District Court for the Norther District of California in the case *Center for Biological Diversity (CBD) vs. EPA et al*. (Case No. 07-2794-JCS).

For a brief description of when each San Francisco Bay species being assessed was listed, and a short description of their associated critical habitat (when applicable), please see Section 1.1.

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 naled 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 naled 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 CCR, SFGS, SJKF, VELB, and BCB and their designated critical habitat within the state of California. As part of the "effects determination," one of the following three conclusions will be reached separately for each of the assessed species in the lawsuits regarding the potential use of naled in accordance with current labels:

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

Additionally, for habitat and PCEs, a "No Effect" or a "Habitat Modification" determination is made.

A description of routine procedures for evaluating risk to the San Francisco Bay Species are provided in Attachment I.

2.2. Scope

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 naled in accordance with the approved product labels for California is "the action" relevant to this ecological risk assessment.

Naled is an insecticide registered for use on a variety of crop and non-crop sites. It has registered uses for areas with impervious surfaces and well as areas such as swamps. It is used to control a variety of insect pests including use to manage mosquitoes and other flying insects (see Table 2-4 for a complete list of uses subject to this assessment).

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

2.2.1. Evaluation of Degradates and Other Stressors of Concern

There are several degradates of naled that are found in various amounts under different conditions. The primary degradate of concern, DDVP, is considered to have attributes and effects similar to parent naled, and can account for as much as 20% of applied parent under certain conditions (MRID 41310702, 42445103). Thus, DDVP degradate residue levels are considered along with naled residue levels as 'total toxic residues (TTR) of concern' in this assessment, and model results (exposure estimates) reflect the predicted fate of both naled and DDVP resulting from naled usage.

Although DDVP is a major degradate of naled, this assessment does not evaluate the usage or impact of DDVP as a primary active ingredient or as a degradate of other compounds. DDVP that is applied separately as the active ingredient or results as degradation of other products is considered independent of naled usage and will be considered when DDVP itself is assessed.

Two other major degradates that form from naled are bromodichloroacetaldehyde (BDCA) and dichloroacetic acid (DCAA). These may constitute as much as 77% and 26% of applied naled, respectively (MRID 41310701, 42445104). However, toxicity data is only available for DCAA in the public ECOTOX database (USEPA, 2004, discussed in Section 4.1), and the available data for DCAA relative to naled and DDVP appears to be much lower and would therefore not add significantly to estimates of acute risk from the use of naled. Additionally, DCAA is not considered likely to add to chronic risk estimates as compared to exposure from naled and DDVP, as it degrades too rapidly to pose long-term exposure risk under likely field conditions. There is no available toxicity data for BDCA, and therefore the toxicity relative to naled and/or DDVP cannot be examined. However, like DCAA it degrades rapidly and would not likely cause additional exposure risk under field conditions. Therefore, neither BDCA nor DCAA are further considered in this assessment. The other degradates either formed below 10% of applied naled and/or were not considered particularly toxic compared to naled and DDVP and as such are not likely to add significantly to risk estimates based on exposure to naled and DDVP.

2.2.2. Evaluation of Mixtures

The Agency does not routinely include, in its risk assessments, an evaluation of mixtures of active ingredients, 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).

Naled does not have any registered products that contain multiple active ingredients.

2.3. Previous Assessments

Arising from a FIFRA regulatory action, an assessment was performed in 2008 concerning naled's use on agricultural and non-agricultural sites to evaluate potential direct and indirect effects on the California red-legged frog (*Rana aurora draytonii*) (CRLF) and the species' designated critical habitat. For details, see the original CRLF document (http://www.epa.gov/espp/litstatus/effects/redleg-frog/index.html#naled).

In summary, the effects determinations for the CRLF were as follows:

- "No Effect" determination was made for the CRLF or its designated critical habitat for indoor uses of naled since they will not result in exposure to the CRLF or its designated critical habitat.
- "May effect but NLAA" for spot treatments (e.g., utility poles, refuse sites, structural perimeters), and bait stations, because while there may be exposure/effects at the sites of application, these sites are discrete and very limited in extent. No significant impact on CRLFs, their prey, or habitat were expected.
- A "Likely to Adversely Affect" (LAA) determination was made for all other uses due primarily to indirect effects to the aquatic and terrestrial invertebrate prey base, and the mammalian and amphibian prey base. Modification to the designated critical habitat was also expected primarily due to changes in food resources for juvenile and adult CRLFs

(aquatic and terrestrial invertebrates, small mammals, and amphibians). However, insignificant effects to terrestrial and aquatic plants of the designated critical habitat were expected.

The most recent major naled registration-related documents produced by the Agency are a 2002 Interim Reregistration Eligibility Document (IRED) and a 1997 Reregistration Eligibility Document (RED). The 1997 RED was incorporated into the 2002 IRED. The 2002 IRED cited ecological risks and recommended the registrant adopt measures to reduce ecological risk beyond what had been implemented since 1999; these included setbacks, buffers, application rate reductions, and application method restrictions for some uses (see 2002 IRED for details). For details see the original RED and IRED documents (http://epa.gov/oppsrrd1/REDs/naled_ired.pdf and http://www.epa.gov/pesticides/reregistration/REDs/naled_red.pdf).

Rate and other product changes required in the naled IRED have been implemented since the 2002 IRED. These changes are:

- Reduce the maximum application rate for use on almonds and peaches to 1.875 lbs ai/A and prohibit aerial use on almonds and peaches.
- Prohibit ready to use formulations.
- Delete wet and dry bait uses.
- Delete spot treatment for cockroach control.
- Prohibit all residential uses either by resident or professional applicator. Use in residential areas by mosquito control districts would still be allowed.
- Reduce application rates for control of black fly from 0.25 to 0.1 lbs/ai/A, and reduce rates on peaches and almonds from 2.8 to 1.875 lbs/ai/A.
- Require buffer zones around permanent bodies of water to reduce runoff.
- Establish spray setbacks to reduce spray drift for agricultural uses.

Naled had exceedances for birds, mammals, and freshwater invertebrates on an acute and chronic basis. Freshwater fish did not have any exceedances on an acute or chronic basis. Aquatic plants exposed to naled through drift and runoff from treated areas (from aerial and ground application) and direct exposure of wetlands and aquatic habitats from mosquito/black fly control applications was exceeded for two uses of naled (cole crops and almonds).

Because no terrestrial plant data were available, they were not considered in previous assessments. In the RED assessment plants were considered qualitatively in the absence of definitive quantitative toxicity data.

2.4. Environmental Fate Properties

The chemical structure of naled is shown in Figure 2-1. Figure 2-2 depicts the chemical structure of the degradate Dichlorvos (DDVP).

Figure 2-1. Naled Chemical Structure

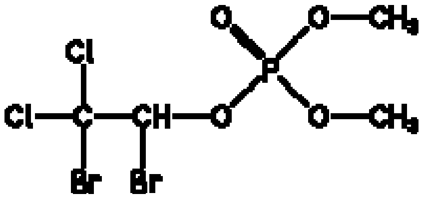
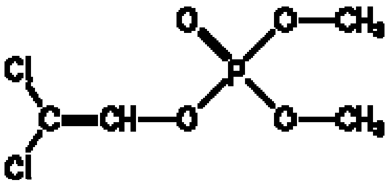


Figure 2-2. Dichlorvos (DDVP) Chemical Structure



Naled and its degradates are transformed largely by chemical hydrolysis and possibly biodegradation (due to the fact that naled appears to degrade more rapidly in acidic environments). Volatilization from soils and/or water and spray drift are likely the major mode(s) of transport for naled and its degradate DDVP from application sites. It is unclear to what extent transport of naled residues in the atmosphere results directly from spray drift or from re-suspension in the atmosphere due to volatilization of deposited naled. Since naled has a relatively short half-life, it is not expected to be re-suspended except in minute amounts. It is likely that a substantial portion of airborne naled results from spray drift, since it is typically applied as ultra-fine droplets or mist with the intent that it remain suspended in the air as long as possible. It is probable that both factors contribute to overall atmospheric transport, so it is best to consider in terms of 'total atmospheric transport' rather than attempting to distinguish between volatilization and spray drift as separate phenomena.

Under terrestrial, aquatic and forestry field conditions naled dissipated rapidly with half-lives of less than 2 days in all three cases. The dissipation of DDVP was also observed to be similarly rapid. While naled and DDVP are potentially mobile, they degrade rapidly; thus residues of naled and its degradate DDVP are not likely to leach into ground water.

Substantial amounts of naled residues should be available for runoff to surface waters for only one or two days post-application; rapid hydrolysis and even faster biodegradation in more acidic climates help quickly decrease the concentration of naled available for runoff. This should also be the case for naled in the atmosphere; however, there are targeted studies (e.g., Tulare County, CA, 1995) that indicate that measurable background levels of naled can be found even in the absence of local naled use. This is likely due to the widespread and extensive spray usage of naled, often applied aerially as very fine droplets or mist – which can enhance the probability of short-term atmospheric transport within catchments and to neighboring catchments. Thus, it is more likely for naled to remain suspended in the atmosphere, with frequent uses allowing detectable amounts to 'persist' over wide areas; once adhered to soil, vegetation, or water, however, it will likely dissipate and degrade fairly quickly. Generally, though, runoff may be the most likely mode of transport if rain occurs soon after application – otherwise, atmospheric transport is probably dominant. Naled and DDVP appear to have low bioaccumulation potential.

Major routes of possible transport of naled to surface waters are spray drift associated with aerial or ground spray – especially for direct applications to water (swamps, wetlands, saturated areas) for mosquito abatement. Although all labels clearly state "Do not apply directly to water" there are specific exceptions made for certain treatments; in particular, mosquito and fly control uses. Thus, there are uses where direct application to water must be considered.

Table 2-1 lists the physical-chemical properties of naled and DDVP. Table 2-2 lists the other environmental fate properties of naled, along with the major and minor degradates detected in the submitted environmental fate and transport studies. Table 2-3 lists environmental fate properties of DDVP.

Table 2-1. Physical-chemical Properties of Naled.

Property	Parent Compound		Transformation Product	
	Value and units	MRID or Source	Value and units	MRID or Source
Molecular Weight	381 g/mol	TOXNET	221 g/mol	TOXNET
Chemical Formula	C4-H7-Br2-Cl2-O4-P	TOXNET	C4-H7-Cl2-O4-P	TOXNET
Density/ Relative Density/ Bulk Density	1.96 g/cm^3 @ 25 ^oC	TOXNET	1.42 g/cm^3 @ 25 ^oC	TOXNET
Vapor Pressure	2E-3 torr	EXTOXNET	1.2E-2 torr	EXTOXNET
Henry's Law Constant	1E-4 atm-m^3/mole	Estimated from water solubility and vapor pressure	5E-8 atm-m^3/mole	Estimated from water solubility and vapor pressure
Water Solubility	1 mg/L	EXTOXNET	15600 mg/L	EXTOXNET
Octanol – water partition coefficient (K_{OW})	24 @ 25^{o}C	TOXNET	27 (temperature unknown)	TOXNET

1 – TOXNET: http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, May 2010
2 – EXTOXNET : http://www.inchem.org/pages/pds.html, May 2010

Table 2-2. Summary of Naled Environmental Fate Properties

Study	Value and unit	Major Degradate *Minor Degradates*	MRID # or Citation	Study Classification, Comment
Abiotic Hydrolysis	Half-life[1] = pH 5 = 4 days pH 7 = 0.642 days pH 9 = 0.067 days	Desmethyl naled @pH 9 (91.7%), Bromodichloro acetaldehyde (BDCA) @ pH 5 (86.5%)	MRID 40034902 41354101	Acceptable Supplemental
Air Photolysis	Half-life[1] = 57.8 hr	DDVP (32%) BDCA (55%)	MRID 41310703 42445102	Supplemental
Direct Aqueous Photolysis	Half-life[1] = 4.4 - 4.7 days (Direct,	BDCA (80%) Desmethyl-naled	MRID 41310702	Acceptable

Study	Value and unit	Major Degradate *Minor Degradates*	MRID # or Citation	Study Classification, Comment
	absence of sensitizer), (0.98 days for Indirect w/sensitizer)	(5.6%) *DDVP (21%)* *Desmthyl-DDVP (<2%)* *Formic acid and glycolic acid (combined 52%)*	42445103	Supplemental
Soil Photolysis	Half-life[1] = 0.4 days, sandy loam soil	BDCA (77%) Dichlrocoaceticacid (DCAA) (26%) DDVP (12%)	MRID 41310701 42445104	Acceptable Supplemental
Aerobic Soil Metabolism	Half-life[1] = 1 day, Oakley loam sand (pH 7.3)	CO_2 (82%) DCAA (20%) 2,2-Dichloroethanol (DCE) (23%)	MRID 00085408	Supplemental
Anaerobic Soil Metabolism	No Study	No Study	No Study	No Study
Aerobic Aquatic Metabolism	No Study	No Study	No Study	Waived
Anaerobic Aquatic Metabolism	Half-life[1] = 0.2-0.5 days in water[2] Sand soil, flooded cranberry bog 0.2-0.5 days in water[2]	DDVP (15%) DCAA (20%) *5 unidentified degradates (each <7%)* CO_2 (76%) Unextractables (11%) Desmethyl *DDVP (<10%)* *DCE (<10%)*	MRID 40618201 41354102 42445101	Acceptable Supplemental Acceptable
Solid-water distribution coefficient (K_d)	K_d = 1.3 L/kg		MRID 41354105	Acceptable
Organic-carbon normalized distribution coefficient (K_{OC})	K_{OC} = 160 L/kg (sandy loam)		MRID 41354105 40279200	Acceptable
Soil Column Leaching	Residues very mobile in sand, 2.71% radioactivity remained in soil column and 67% recovered in leachate.	DDVP <0.093 ppm DCE <0.085 ppm DCAA <1.86 ppm (very mobile) "Carbonates" <0.282 ppm (Detected in leachate)	MRID 0016110 40279200 40394904 41354104 41354105 41354106	Acceptable
Volatility from Soil (Laboratory)	Flux = 1.19×10^{-4} to 12.5×10^{-4} $\mu g/m^2$-s, loamy sand soil	CO_2 (48%) *DDVP (8%)*	MRID 41310704 42445105	Acceptable
Terrestrial Field Dissipation	Dissipation Half-life[1,2] = <2 days, bare plot of sand soil, Ocoee. (pH 6.8)	DDVP 0.02 ppm, 0 to 5 cm depth	MRID 00160040	Supplemental
Aquatic Field Dissipation	Dissipation Half-life[1,2] = <1 day pond water,	DDVP 0.013 ppm (MS) and 0.014 ppm	MRID 40494101	Acceptable

Study	Value and unit	Major Degradate *Minor Degradates*	MRID # or Citation	Study Classification, Comment
	Lexington, MS and Titusville, FL (MS: pH pond 5.0 to 5.2, soil 5.2, FL: pH pond not reported, soil 7.7)	(FL)	40976401 40976402 41354107	
Bioconcentration Factor (BCF)	Naled did not accumulate in killifish (*Fundulus heteroclitus)* after a 7 day exposure period.	DDVP found at 0.04 ppm 1 hr post treatment.	MRID 00074643	Supplemental

Abbreviations: wt=weight
[1]Half-lives were calculated using the single-first order equation and nonlinear regression, unless otherwise specified.
[2]The value may reflect both dissipation and degradation processes.

Table 2-3. Summary of DDVP Environmental Fate Properties

Study	Value and unit	MRID # or Citation	Study Classification, Comment
Abiotic Hydrolysis	Half-life[1] = pH 5 = 11.6 days pH 7 = 5.2 days pH 9 = 0.88 days	MRID 41723101	Acceptable
Direct Aqueous Photolysis	Half-life[1] = 10 days	MRID 43326601	Acceptable
Soil Photolysis	Half-life[1] = 0.65 days	MRID 43642501	Acceptable
Aerobic Soil Metabolism	Half-life[1] = 0.42 days	MRID 41723102	Acceptable
Anaerobic Soil Metabolism	Half-life[1] = 6.3 days	MRID 43835701	Acceptable
Aerobic Aquatic Metabolism	No Valid Data Submitted	No Valid Data Submitted	No Valid Data Submitted
Anaerobic Aquatic Metabolism	Half-life[1] = 4.5 days	MRID 40618201 41354102 42445101	Acceptable Supplemental Acceptable
Organic-carbon normalized distribution coefficient (K_{OC})	K_{OC} = 37 L/kg (sandy loam)	MRID 41354105 40279200	Acceptable

2.4.1. 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. Surface water runoff and spray drift are expected to be the major routes of exposure for naled.

A number of studies have documented atmospheric transport and re-deposition of pesticides from the Central Valley to the Sierra Nevada Mountains (Fellers *et al.*, 2004; LeNoir *et al.*, 1999; McConnell *et al.*, 1998; Sparling *et al.*, 2001). Prevailing winds blow across the Central Valley eastward to the Sierra Nevada Mountains, transporting airborne industrial and agricultural pollutants into the Sierra Nevada ecosystems (Fellers *et al.*, 2004; LeNoir *et al.*, 1999; McConnell *et al.*, 1998). Several sections of the range and critical habitat for the VELB and BCB are located east of the Central Valley. The magnitude of transport via secondary drift depends on the naled's ability to be mobilized into air and its eventual removal through wet and dry deposition of gases/particles and photochemical reactions in the atmosphere. Therefore, physicochemical properties of naled that describe its potential to enter the air from water or soil (*e.g.*, Henry's Law constant and vapor pressure), pesticide use data, modeled estimated concentrations in water and air, and available air monitoring data from the Central Valley and the Sierra Nevadas are considered in evaluating the potential for atmospheric transport of naled to locations where it could impact the VELB and BCB.

In general, deposition of drifting or volatilized pesticides is expected to be greatest close to the site of application. The computer model AgDRIFT is used to determine potential exposures to aquatic and terrestrial organisms via spray drift. The distance of potential impact away from the use sites is determined by the distance required to fall below the LOC for the taxonomic group that has the largest RQ to LOC ratio, which is the freshwater invertebrate for the aquatic species, and the honey bee for the terrestrial species

2.4.2. Mechanism of Action

Naled is an organophosphate insecticide. It is a cholinesterase (ChE) inhibitor, causing reversible inhibition of erythrocyte acetylcholinesterase (RBC ChE) as well as plasma butyryl ChE by binding to the active site of the enzyme. Acetylcholinesterase is an enzyme necessary for the degradation of the neurotransmitter acetylcholine (ACh) and subsequent cessation of synaptic transmission. Inhibition of these enzymes results in the accumulation of ACh at cholinergic nerve endings and continual nerve stimulation, resulting in insect death. The naled degradate of concern, dichlorvos (DDVP), has an identical mode of action.

2.4.3. Use Characterization

Analysis of labeled use information is the critical first step in evaluating the federal action. The current labels for naled represent 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.

Certain naled uses are not specifically incorporated into this risk assessment because it is believed that they present minimal capacity to affect the overall risk conclusions (based upon uses with much higher risk likelihood), and individually they are discountable. Specifically, bait uses, indoor uses, hand spray applications, and utility pole applications are not quantified here because either preliminary results from modeling yielded very low estimated environmental concentrations (EECs), or total exposure resulting from these uses is likely to be very low and limited in scope. For example, because of very low application "rates" and limited "spot" treatments at designated areas (i.e.: 6 square inches of diluted bait applied only to utility poles linearly at 200-foot intervals; small containers of sugar water and naled bait placed around structural perimeters), bait station applications will almost certainly have minimal effect on total environmental exposure (especially when compared to widespread spray applications that may occur in the same area). Hand spray applications require much lower application rates than aerial/ground spray, ULV, and airblast applications, and are used over much smaller areas (as 'spot' treatments); thus their impact and contribution to total pesticide load should be less as well. Any of these uses individually should result in negligible and discountable effect on the SF Bay species being assessed. Finally, indoor uses that result in the pesticide remaining indoors will have No Effect on federally listed threatened or endangered species or their designated critical habitat. Therefore, such uses are not considered further in this assessment.

Table 2-4 presents the uses and corresponding application rates and methods of application considered in this assessment.

Table 2-4. Naled Uses Assessed for California
(Generalized Screening Level Portrayal of Current Label Uses, Current as of- 01-14-10)

Use Site	Maximum Application rate	Minimum Retreatment Interval	Maximum No. of Applications	Maximum application rate/season
Alfalfa (SLN CA000006)	**1.4 lbs a.i./A**	**7 days**	**3**	**4.2 lbs a.i./A**
Almond (ground only)	**1.9 lbs a.i./A**	**---**	**1 (dormant or dormant delayed, only)**	**1.9 lbs a.i./A**
Beans, lima beans and Peas (dry and succulent form)	**Ground: 1.4 lbs a.i./A Aerial (CA only): 0.9 lbs a.i./A**	**7 days**	**5**	**4.2 lbs a.i./A**
Broccoli, cabbage (includes tight head varieties of Chinese cabbage), cauliflower, Brussels sprouts, kale, and collards	**1.9 lbs a.i./A**	**7 days**	**5**	**9.4 lbs a.i./A**
Cantaloupes, muskmelons	**0.9 lbs a.i./A**	**7 days**	**---**	**1.9 lbs a.i./A**
Hops	**0.9 lbs a.i./A**	**14 days**	**5**	**4.7 lbs a.i./A**
Melons (grown for seed only)	**0.9 lbs a.i./A**	**7 days**	**2**	**1.9 lbs a.i./A**
Celery	**1.4 lbs a.i./A**	**7 days**	**5**	**7.0 lbs a.i./A**
Cotton (Section 3 and SLN CA050011)	**0.9 lbs a.i./A**	**7 days**	**---**	**4.7 lbs a.i./A**
	1.4 lbs a.i./A	**---**		
Eggplant, peppers	**1.9 lbs a.i./A**	**7 days**	**5**	**5.6 lbs a.i./A**
Grapes	**Airblast (CA only): 0.9 lbs a.i./A Groundboom: 0.6 lbs ai/A**	**---**	**---**	**5.6 lbs a.i./A**

Use Site	Maximum Application rate	Minimum Retreatment Interval	Maximum No. of Applications	Maximum application rate/season
Oranges, lemons, grapefruit, tangerines	**1.9 lbs a.i./A**	**7 days**	**5 (aerial only)**	**5.6 lbs a.i./A**
Peaches (ground only)	**1.9 lbs a.i./A**	**N/A**	**1 (dormant or delayed dormant)**	**1.9 lbs a.i./A**
Safflower (CA and AZ only)	**2.1 lbs a.i./A**	**7 days**	**2**	**4.2 lbs a.i./A**
Strawberries	**0.9 lbs a.i./A**	**7 days**	**5**	**4.7 lbs a.i./A**
Sugar beets	**0.9 lbs a.i./A**	**7 days**	**5**	**4.7 lbs a.i./A**
Summer squash	**1.9 lbs a.i./A**	**7 days**	**5**	**5.6 lbs a.i./A**
Swiss chard (ground only with fine mist spray)	**0.9 lbs a.i./A**	**7 days**	**7**	**7.0 lbs a.i./A**
Walnuts	**1.9 lbs a.i./A**	**7 days**	**4**	**3.8 lbs a.i./A**
Forest and shade trees, ornamental shrubs and flowering plants (ground only)	**0.9 lbs a.i./A**	**---**	**---**	**Repeat as necessary**
Roses and other ornamental plants (hot plate application)	**0.06 lb ai/10,000 cu ft. ***	**4-7 days**	**2-4**	**Repeat as necessary**
In and around food processing plants, loading docks, cull piles, refuse areas. (ground only)	**0.1 lb a.i./2.5 gallons water**	**5-7 days**	**---**	**Repeat as necessary**
Livestock Pastures including Dairy Cattle.	**Aircraft: 0.1 lb a.i./A** **Mist or cold fog: 0.1 lb a.i./A**	**---**	**---**	**---**
For reduction of livestock pests in confined animal feeding operations (e.g. corrals, holding pens, feedlots) containing dairy and beef cattle, hogs, sheep, or horses	**Aerial: 0.1 lb a.i./A** **Ground: 0.1 lb a.i./A**	**7 days (only for ground applications)**	**---**	**---**
For reduction of pests in rangelands containing dairy and beef cattle	**0.1 lb a.i./A**	**7 days**	**---**	**---**
In and around dairy barns, livestock barns, pig pens, poultry houses, feed lots, cattle pens, garbage dumps, outside meat packing establishments, pens, docks, ramps, disposal areas and cider mills (space spray only)	**0.9 lbs ai/40 gallons water** **0.06 lbs ai/2.5 gallons water**	**---**	**---**	**---**
In and around food processing plants, loading docks, cull piles and refuse areas and cider mills	**2.2 lbs ai/100 gallons water** **0.06 lbs ai/2.5 gallons water ^**	**---**	**---**	**---**

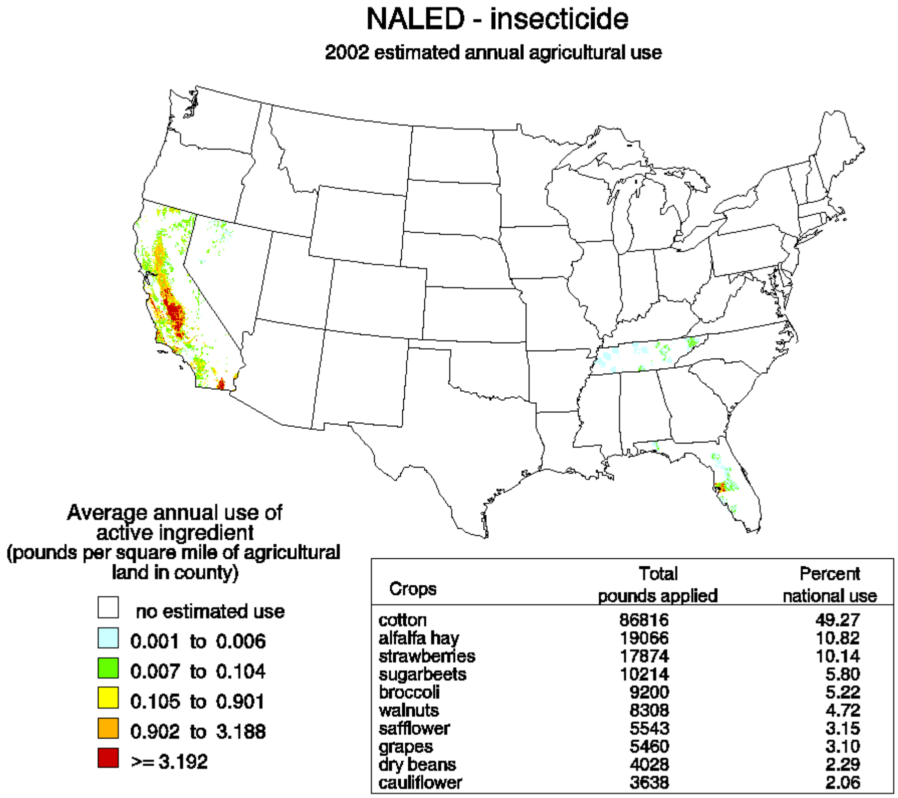
Use Site	Maximum Application rate	Minimum Retreatment Interval	Maximum No. of Applications	Maximum application rate/season
Telephone or light poles (ground hand-spray only) **(SLN CA860005)**	**1.14 lbs a.i./gallon of attractant; 6 inches of material per bait station**	**2-4 weeks**	**600 bait stations/ square mile**	**Repeat spot applications until infestation has been eradicated**
Agricultural Areas, Woodlands, Wide Area Public Pest Programs Sponsored by Government Entities (Consult state or tribal agency before applying; this application rate will kill shrimp, do not apply to tidal or marsh waters)	**Aircraft: 01. lb ai/A** **Mist or cold fog: 0.1 lb ai/A**	**---**	**---**	**---**
Residential areas, municipalities, tidal marshes, swamps, woodlands, and agricultural areas	**0.1 lb a.i./A**	**24 hours**	**---**	**Dibrom 8 Emulsive:** **0.22 lbs a.i./week** **10.4 lbs a.i./year (180 oz. = 10.5 lbs a.i./year)** **Dibrom Concentrate:** **0.21 lb a.i./week** **10.73 lb a.i./year** **Trumpet EC Insecticide:** **0.17 lb a.i./week** **10.73 lb a.i./year** **More frequent treatments may be made, if determined necessary by a state, tribe, or local health or vector control agency.**

Use Site	Maximum Application rate	Minimum Retreatment Interval	Maximum No. of Applications	Maximum application rate/season
Livestock pastures, including dairy cattle	**0.1 lb a.i./A**	**7 days (label interval is incorrect; see letter from RD)**	**---**	**0.22 lbs a.i./week 10.4 lbs a.i./year (180 oz. = 10.5 lbs a.i./year) More frequent treatments may be made, if determined necessary by a state, tribe, or local health or vector control agency.**
Feed lots including dairy cattle, and pastures including woodlands, swamps (direct application to water is prohibited)	**Aircraft: 0.06 lbs a.i./A Mist blower: 0.1 lbs a.i./A**	**7 days (unless monitoring demonstrates that mosquitoes have re-infested the area)**	**---**	**---**

Abbreviations: App. = applications; Form. = formulation

Some crops have multiple crop cycles per year. For naled, succulent beans, broccoli, cabbage, cauliflower, celery, collards, grapes, leafy green vegetables, and melons have more than one crop cycle per year in California. However, since naled residues are very short-lived, repeated applications through multiple crop cycles are believed to have negligible effects on resultant EEC values. Rather, the application timing and amount applied in a single event have a much greater effect on model results. Therefore, multiple crop cycles were not considered in this assessment; but timing of applications was considered – application dates were assigned to each scenario according to the part of the year when maximum application rates are likely and also environmental impact greatest, but there is still the potential for chronic exposure due to numerous applications over time.

According to the United States Geological Survey's (USGS) national pesticide usage data (based on information from 1999 to 2004), an average of 170,147 lbs of naled is applied nationally to agricultural use sites in the U.S. (non-agricultural uses are not included) (Figure 2-3). Majority of naled usage appears to be in the state of California. Approximately 50% of naled usage is on cotton. The next two top usages are alfalfa hay at 10.82%, and strawberries at 10.14%.



Crops	Total pounds applied	Percent national use
cotton	86816	49.27
alfalfa hay	19066	10.82
strawberries	17874	10.14
sugarbeets	10214	5.80
broccoli	9200	5.22
walnuts	8308	4.72
safflower	5543	3.15
grapes	5460	3.10
dry beans	4028	2.29
cauliflower	3638	2.06

Figure 2-3. Naled Use in Total Pounds per County
(from http://water.usgs.gov/nawqa/pnsp/usage/maps/show_map.php?year=02&map=m6044)[1]

The Agency's Biological and Economic Analysis Division (BEAD) provides an analysis of both national- and county-level usage information (BEAD Memo November 4, 2009) 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]. CDPR PUR is considered a more comprehensive source of usage data than USDA-NASS or databases used by EPA, and thus the usage data reported for naled by county in this California-specific assessment were generated using CDPR PUR data. Nine years (1999-2007) of usage data were included in this analysis. Data from CDPR PUR were obtained for every agricultural pesticide application made on every

[1] The pesticide use maps available from this site show the average annual pesticide use intensity expressed as average weight (in pounds) of a pesticide applied to each square mile of agricultural land in a county. The area of each map is based on state-level estimates of pesticide use rates for individual crops that were compiled by the CropLife Foundation, Crop Protection Research Institute based on information collected during 1999 through 2004 and on 2002 Census of Agriculture county crop acreage. The maps do not represent a specific year, but rather show typical use patterns over the five year period 1999 through 2004.
[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.pestmanagement.info/nass/app_usage.cfm.
[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.

use site at the section level (approximately one square mile) of the public land survey system.[4] BEAD summarized these data to the county level by site, pesticide, and unit treated. Calculating county-level usage involved summarizing across all applications made within a section and then across all sections within a county for each use site and for each pesticide. The county level usage data that were calculated include: average annual pounds applied, average annual area treated, and average and maximum application rate across all nine years. The units of area treated are also provided where available.

The uses considered in this risk assessment represent all currently registered uses according to a review of all current labels. No other uses are relevant to this assessment. Any other reported use, such as may be seen in the CDPR PUR database, represent either historic uses that have been cancelled, misreported uses, or misuse. Historical uses, misreported uses, and misuse are not considered part of the federal action and, therefore, are not considered in this assessment.

A summary of naled usage for all California use sites based on the CDPR PUR data is provided below in Table 2-5**.**

Table 2-5. Summary of California Department of Pesticide Registration (CDPR) Pesticide Use Reporting (PUR) Data from 1999 to 2007 for Currently Registered Naled Uses[1]

Site Name	Average Annual Pounds Applied	Average Application Rate (lbs a.i./A)	Maximum Application Rate (lbs a.i./A)
ALFALFA	780	0.9	15.1
ALMOND	148	1	4
ANIMAL PREMISE	250	3.1	88.0
BEAN, DRIED	225	0.9	3.1
BEAN, SUCCULENT	96	0.9	2.6
BEAN, UNSPECIFIED	12	1	1
BROCCOLI	1,360	1	4
BRUSSELS SPROUT	35	1	2
CABBAGE	151	1	2
CANTALOUPE	28	1	1
CATTLE	20	3	4
CAULIFLOWER	320	1	3
CELERY	8	1	2
CHINESE CABBAGE (NAPPA)	2	1	1

[4] Most pesticide applications to parks, golf courses, cemeteries, rangeland, pastures, and along roadside and railroad rights of way, and postharvest treatments of agricultural commodities are reported in the database. The primary exceptions to the reporting requirement are home-and-garden use and most industrial and institutional uses (http://www.cdpr.ca.gov/docs/pur/purmain.htm).

Site Name	Average Annual Pounds Applied	Average Application Rate (lbs a.i./A)	Maximum Application Rate (lbs a.i./A)
COLLARD	97	2	4
COTTON	8,325	1	4
DAIRY EQUIPMENT	54	3	5
EGGPLANT	1	1	1
FOOD PROCRESSING PLANT	30	3	3
FOREST, TIMBERLAND	2	1	1
GRAPE	89	1	2
GRAPE, WINE	66	1	1
GRAPEFRUIT	6	1	1
KALE	51	2	3
LEMON	2	1	2
LIVESTOCK	21	4	9
MELON	5	1	1
N-GRNHS FLOWER	45	1	4
N-GRNHS PLANTS IN CONTAINERS	2	1	3
N-GRNHS TRANSPLANTS	5	1	1
N-OUTDR FLOWER	21	1	2
N-OUTDR PLANTS IN CONTAINERS	8	1	2
N-OUTDR TRANSPLANTS	1	1	1
ORANGE	198	1	4
PASTURELAND	4	0	0
PEACH	3	1	4
PEPPER, FRUITING	50	1	2
PEPPER, SPICE	13	1	1
RANGELAND	34	1	1
REGULATORY PEST CONTROL	102	1	1
SAFFLOWER	442	1	1
SQUASH, SUMMER	6	1	2

Site Name	Average Annual Pounds Applied	Average Application Rate (lbs a.i./A)	Maximum Application Rate (lbs a.i./A)
STRAWBERRY	951	1	3
SUGARBEET (FORAGE - FODDER)	903	1	1
SUNFLOWER	86	1	1
SWISS CHARD	7	0	1
SUGARBEET	21	1	2
TANGERINE	9	1	2
WALNUT	669	1	4
WATER AREA	5	3	3
WATERMELON	4	4	4

1- Based on data supplied by BEAD (November 4, 2009).

2.5. Assessed Species

Table 2-6 provides a summary of the current distribution, habitat requirements, and life history parameters for the listed species being assessed. More detailed life-history and distribution information can be found in Attachment III. See Figure 2-4 through Figure 2-8 for a map of the current range and designated critical habitat, if applicable, of the assessed listed species.

Table 2-6. Summary of Current Distribution, Habitat Requirements, and Life History Information for the Assessed Listed Species[1]

Assessed Species	Size	Current Range	Habitat Type	Designated Critical Habitat?	Reproductive Cycle	Diet
San Francisco Garter Snake (SFGS) (*Thamnophis sirtalis tetrataenia*)	Adult (46-131 cm in length), Females – 227 g, Males – 113 g; Juveniles – 2 g (Cover Jr. and Boyer, 1988) (18–20 cm in length)	San Mateo County	Densely vegetated freshwater ponds near open grassy hillsides; emergent vegetation; rodent burrows	No	Oviparous Reproduction[2] Breeding: Spring (Mar. and Apr.) and Fall (Sept. to Nov.) Ovulation and Pregnancy: Late spring and early summer Young: Born 3-4 months after mating	Juveniles: frogs (Pacific tree frog, CRLF, and bullfrogs depending on size) and insects Adults: primarily frogs (mainly CRLFs; also bullfrogs, toads); to a lesser extent newts; freshwater fish and invertebrates; insects and small mammals
California Clapper Rail (CCR) (*Rallus longirostris obsoletus)*	250 - 350 g Juveniles ~50 g[3]	Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties	Tidal marsh habitat	No	Breeding: Feb. - August Nesting: mid-March-Aug. Lay Eggs: March - July Incubation: 23 to 29 days; Leave nest: 35 to 42 days after hatch; Juveniles fledge at ten weeks and can breed during the spring after they hatch	Opportunistic feeders: freshwater and estuarine invertebrates, seeds, worms, mussels, snails, clams, crabs, insects, and spiders; occasionally consume small birds and mammals, dead fish, up to 15% plant material

Assessed Species	Size	Current Range	Habitat Type	Designated Critical Habitat?	Reproductive Cycle	Diet
Bay Checkerspot Butterfly (BCB) (*Euphydryas editha bayensis*)	Adult butterfly - 5 cm in length	Santa Clara and San Mateo Counties [Because the BCB distribution is considered a metapopulation, any site with appropriate habitat in the vicinity of its historic range (Alameda, Contra Costa, San Francisco, San Mateo, and Santa Clara counties) should be considered potentially occupied by the butterfly (USFWS 1998, p. II-177)].	1) Primary habitat – native grasslands on large serpentine outcrops; 2) Secondary habitat – 'islands' of smaller serpentine outcrops with native grassland; 3) Tertiary habitat – non-serpentine areas where larval food plants occur	Yes	Larvae hatch in March – May and grow to the 4th instar in about two weeks. The larvae enter into a period of dormancy (diapause) that lasts through the summer. The larvae resume activity with the start of the rainy season. Larvae pupate once they reach a weight of 300 - 500 milligrams. Adults emerge within 15 to 30 days depending on thermal conditions, feed on nectar, mate and lay eggs during a flight season that lasts 4 to 6 weeks from late February to early May	Obligate with dwarf plantain. Primary diet is dwarf plantain plants (may also feed on purple owl's-clover or exserted paintbrush if the dwarf plantains senesce before the larvae pupate). Adults feed on the nectar of a variety of plants found in association with serpentine grasslands
Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*)	Males: 1.25–2.5 cm length Females: 1.9–2.5 cm length	Central Valley of California (from Shasta County to Fresno County in the San Joaquin Valley)	Completely dependent on its host plant, elderberry (*Sambucus species*), which is a common component of the remaining riparian forests and adjacent upland habitats of California's Central Valley	Yes	The larval stage may last 2 years living within the stems of an elderberry plant. Then larvae enter the pupal stage and transform into adults. Adults emerge and are active from March to June feeding and mating, when the elderberry produces flowers.	Obligates with elderberry trees (*Sambucus* sp). Adults eat the elderberry foliage until about June when they mate. Upon hatching the larvae tunnel into the tree where they will spend 1-2 years eating the interior wood which is their sole food source.

Assessed Species	Size	Current Range	Habitat Type	Designated Critical Habitat?	Reproductive Cycle	Diet
San Joaquin Kit Fox (SJKF) (*Vulpes macrotis mutica*)	Adult ~2 kg	Alameda, Contra Costa, Fresno, Kern, Kings, Madera, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Barbara, Santa Clara, Stanislaus, Tulare and Ventura counties	A variety of habitats, including grasslands, scrublands (*e.g.*, chenopod scrub and sub-shrub scrub), vernal pool areas, oak woodland, alkali meadows and playas, and an agricultural matrix of row crops, irrigated pastures, orchards, vineyards, and grazed annual grasslands. Kit foxes dig their own dens, modify and use those already constructed by other animals (ground squirrels, badgers, and coyotes), or use human-made structures (culverts, abandoned pipelines, or banks in sumps or roadbeds). They move to new dens within their home range often (likely to avoid predation by coyotes)	No, but has designated core areas	Mating and conception: late December - March. Gestation period: 48 to 52 days. Litters born: February - late March Pups emerge from their dens at about 1-month of age and may begin to disperse after 4 – 5 months usually in Aug. or Sept.	Small animals including blacktailed hares, desert cottontails, mice, kangaroo rats, squirrels, birds, lizards, insects and grass. It satisfies its moisture requirements from prey and does not depend on freshwater sources.

[1] For more detailed information on the distribution, habitat requirements, and life history information of the assessed listed species, see Attachment II.
2 Oviparous = eggs hatch within the female's body and young are born live.
3 No data on juvenile CCR body weights are available at this time. As a surrogate for CCR juveniles, data on captive 21-day king rails were averaged for the juvenile body weight. King rails make an appropriate proxy for the CCR in the absence of information. The birds were once considered the same species by taxonomists, are members of the same genus (*Rallus*), and occasionally interbreed where habitats overlap.
4 See Page 369 of Trenham *et al.* (Trenham *et al.*, 2000).

Bay Checkerspot Butterfly Habitat

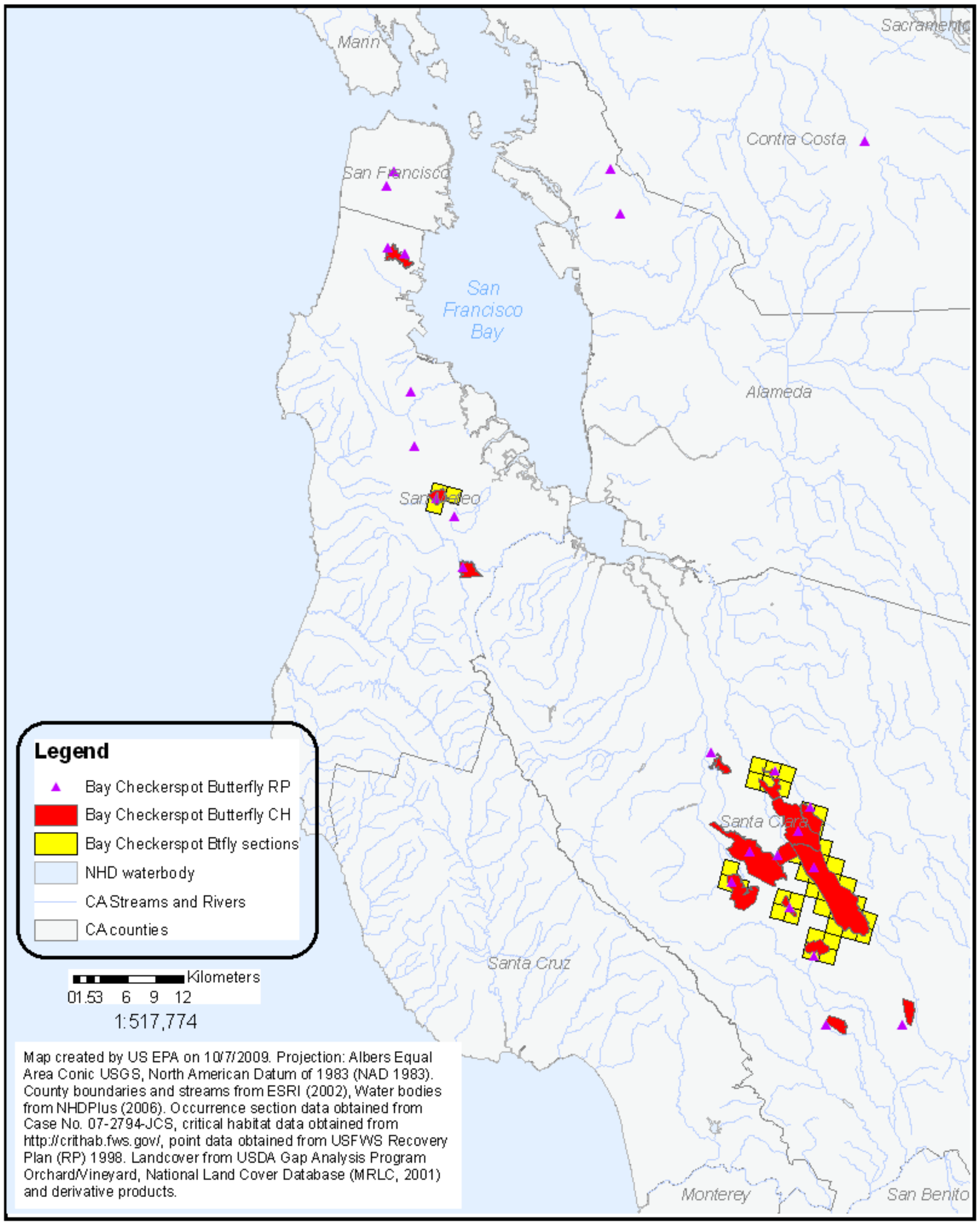


Figure 2-4. Bay Checkerspot Butterfly (BCB) Critical Habitat and Occurrence Sections identified in Case No. 07-2794-JCS

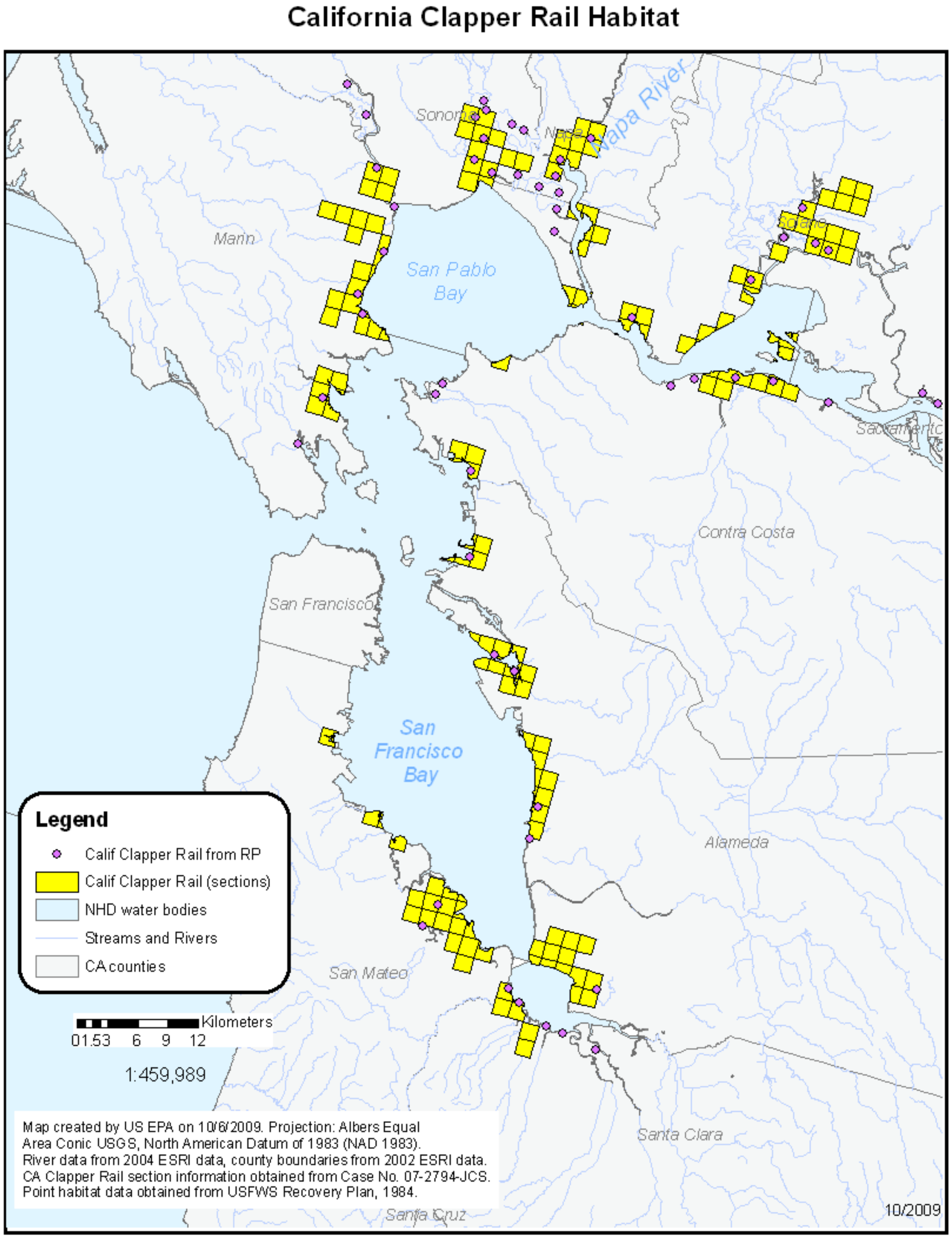


Figure 2-5. California Clapper Rail (CCR) Critical Habitat and Occurrence Sections identified in Case No. 07-2794-JCS

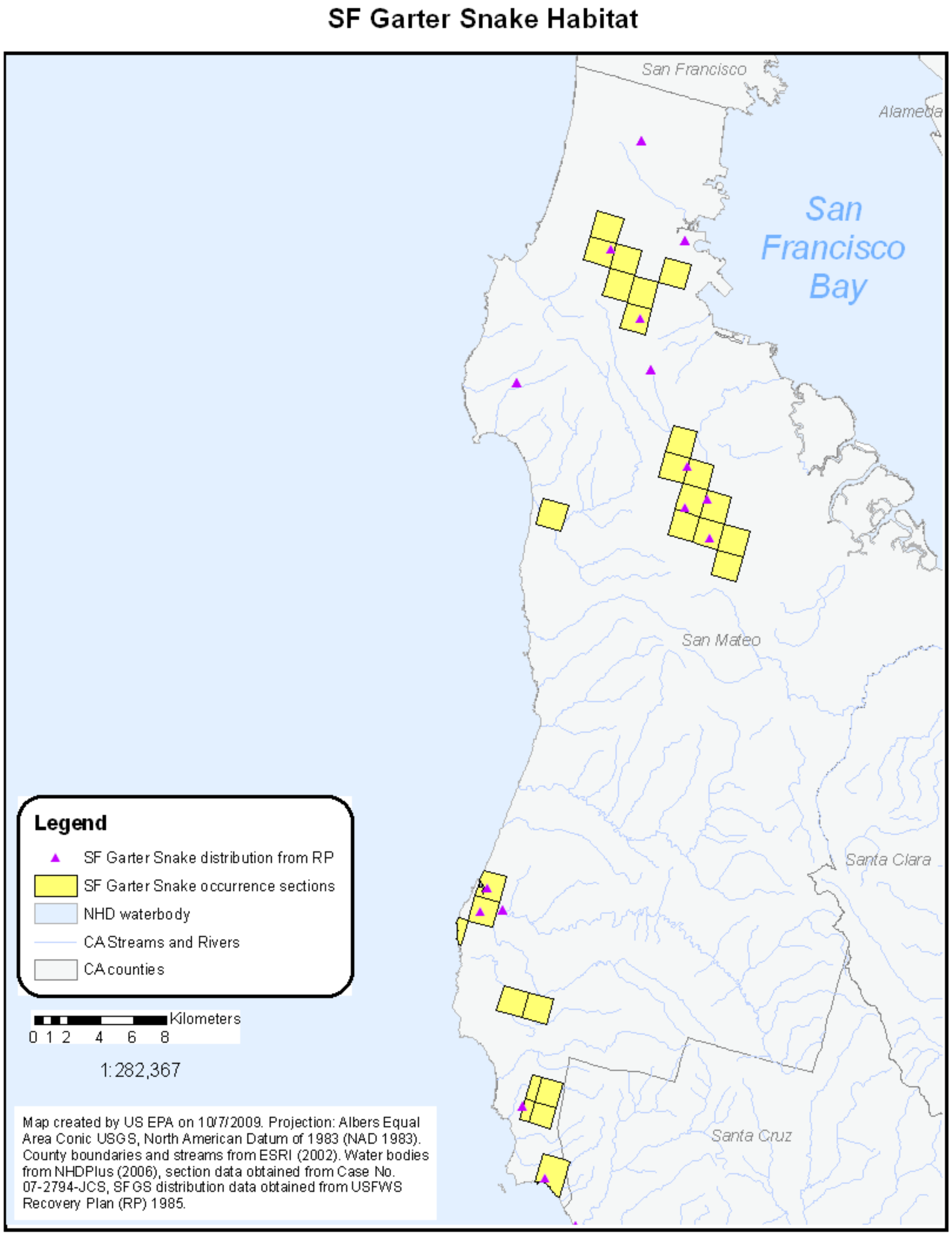


Figure 2-6. San Francisco Garter Snake (SFGS) Critical Habitat and Occurrence Sections identified in Case No. 07-2794-JCS

San Joaquin Kit Fox Habitat

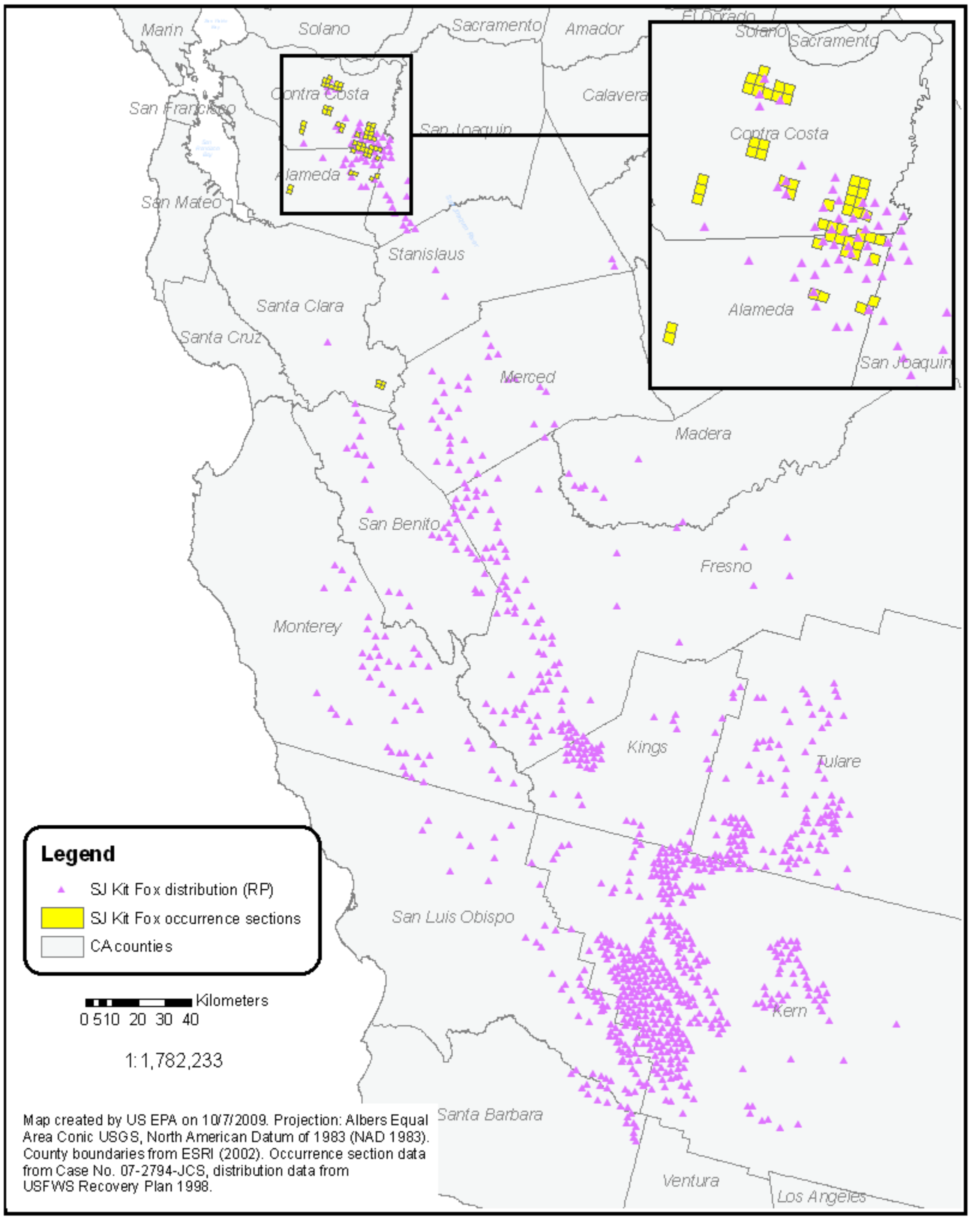


Figure 2-7. San Joaquin Kit Fox (SJKF) Critical Habitat and Occurrence Sections identified in Case No. 07-2794-JCS

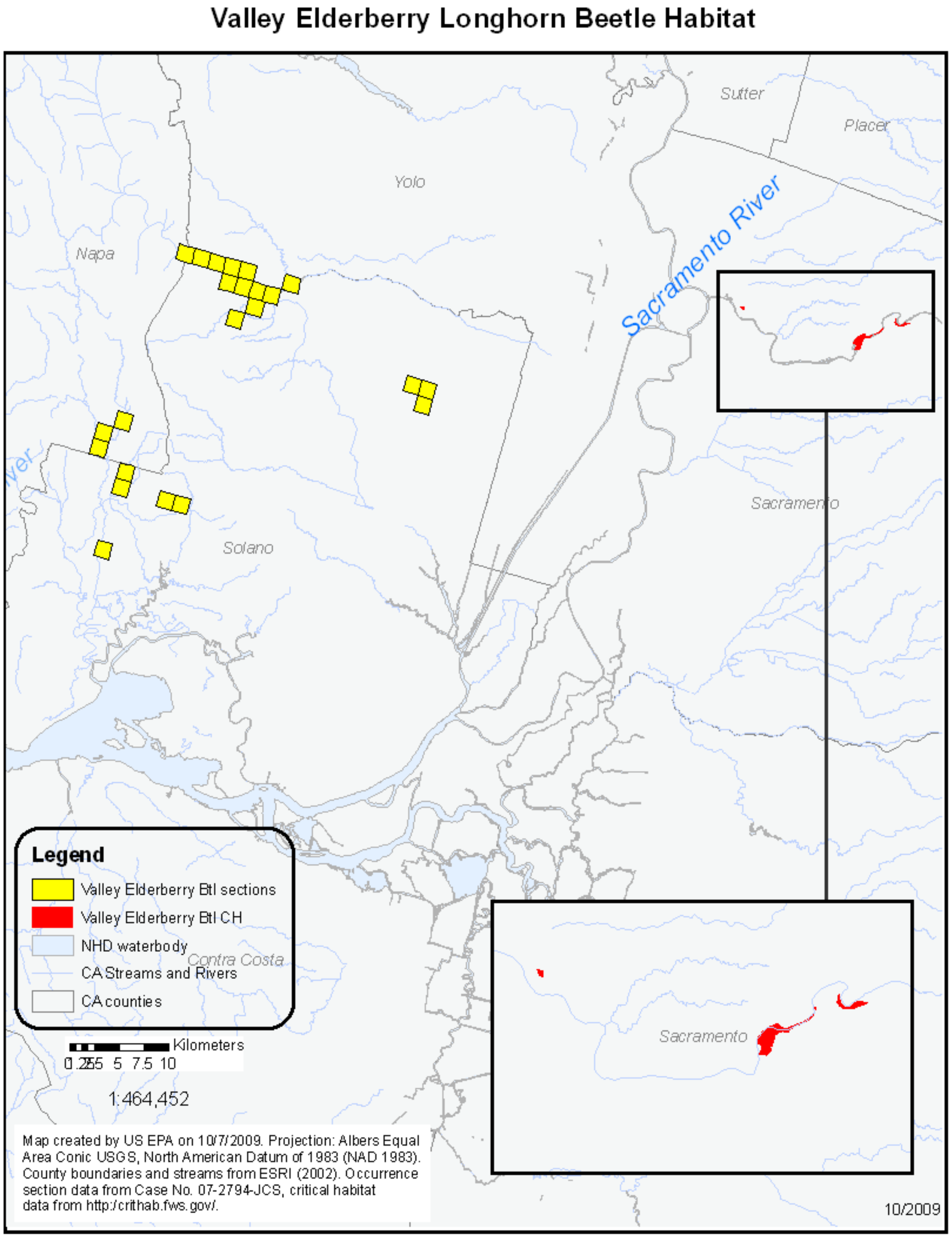


Figure 2-8. Valley Elderberry Longhorn Beetle (VELB) Critical Habitat and Occurrence Sections identified in Case No. 07-2794-JCS

2.6. Designated Critical Habitat

Critical habitat has been designated for the VELB and BCB. Although the SJKF does not have designated critical habitat, it does have designated "core areas" which relate to the three geographically distinct 'core' populations of SJKF (USFWS, 1998). "The three core populations are: the Carrizo Plain Natural Area in San Luis Obispo County; the natural lands of western Kern County (i.e., Elk Hills, Buena Vista Hill, and the Buena Vista Valley, Lokern Natural Area and adjacent natural land) inhabited by kit foxes; and the Ciervo-Panoche Natural Area of western Fresno and eastern San Benito Counties (USFWS, 1998).

Risk to critical habitat is evaluated separately from risk to effects on the species. "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. 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)). Table 2-7 describes the PCEs for the critical habitats designated for the VELB and BCB.

Table 2-7. Designated Critical Habitat PCEs for the VELB and BCB Species[1].

Species	PCEs	Reference
Valley Elderberry Longhorn Beetle	Areas that contain the host plant of this species [*i.e*., elderberry trees (*Sambucus* sp.)] (a dicot)	43 FR 35636 35643, 1978
Bay Checkerspot Butterfly	The presence of annual or perennial grasslands with little to no overstory that provide north/south and east/west slopes with a tilt of more than 7 degrees for larval host plant survival during periods of atypical weather (*e.g*., drought).	66 FR 21449 21489, 2001
	The presence of the primary larval host plant, dwarf plantain (*Plantago erecta*) (a dicot) and at least one of the secondary host plants, purple owl's-clover or exserted paintbrush, are required for reproduction, feeding, and larval development.	
	The presence of adult nectar sources for feeding.	
	Aquatic features such as wetlands, springs, seeps, streams, lakes, and ponds and their associated banks, that provide moisture during periods of spring drought; these features can be ephemeral, seasonal, or permanent.	
	Soils derived from serpentinite ultramafic rock (Montara, Climara, Henneke, Hentine, and Obispo soil series) or similar soils (Inks, Candlestick, Los Gatos, Fagan, and Barnabe soil series) that provide areas with fewer aggressive, nonnative plant species for larval host plant and adult nectar plant survival and reproduction.[2]	
	The presence of stable holes and cracks in the soil, and surface rock outcrops that provide shelter for the larval stage of the bay checkerspot butterfly during summer diapause.[2]	

[1] These PCEs are in addition to more general requirements for habitat areas that provide essential life cycle needs of the species such as, 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.
[2] PCEs that are abiotic, including, physical-chemical water quality parameters such as salinity, pH, and hardness are not evaluated.

More detail on the designated critical habitat applicable to this assessment can be found in Attachment II. 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 naled that may alter the PCEs of the designated critical habitat for the VELB and BCB form the basis of the critical habitat impact analysis.

As previously noted in Section 1.1, 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 naled is expected to directly impact living organisms within the action area, critical habitat analysis for naled 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 and LAA Effects Determination Area

2.7.1. Action Area

The action area is used to identify areas that could be affected by the Federal action. The Federal action is the authorization or registration of pesticide use or uses as described on the label(s) of pesticide products containing a particular active ingredient. The action area is defined by the Endangered Species Act as, “all areas to be affected directly or indirectly by the Federal action and not merely the immediate are involved in the action” (50 CFR §402.2). Based on an analysis of the Federal action, the action area is defined by the actual and potential use of the pesticide and areas where that use could result in effects. Specific measures of ecological effect for the assessed species that define the action area include any direct and indirect toxic effect to the assessed species and any potential modification of its critical habitat, including reduction in survival, growth, and fecundity as well as the full suite of sublethal effects available in the effects literature. It is recognized that the overall action area for the national registration of naled is likely to encompass considerable portions of the United States based on the large array of agricultural and/or non-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 CCR, SFGS, SJKF, BCB, and VELB species and their designated critical habitat within the state of California. For this assessment, the entire state of California is considered the action area. The purpose of defining the action area as the entire state of California is to ensure that the initial area of consideration encompasses all areas where the pesticide may be used now and in the future, including the potential for off-site transport via spray drift and downstream dilution that could influence the San Francisco Bay Species. Additionally, the concept of a state-wide action area takes into account the potential for direct and indirect effects and any potential modification to critical habitat based on ecological effect measures associated with reduction in survival, growth, and reproduction, as well as the full suite of sublethal effects available in the effects literature.

It is important to note that the state-wide action area does not imply that direct and/or indirect effects and/or critical habitat modification are expected to or are likely to occur over the full extent of the action area, but rather to identify all areas that may potentially be affected by the action. The Agency uses more rigorous analysis including consideration of available land cover data, toxicity data, and exposure information to determine areas where CCR, SFGS, SJKF, BCB, and VELB species and designated critical habitat may be affected or modified via endpoints associated with reduced survival, growth, or reproduction.

2.7.2. LAA Effects Determination Area

A stepwise approach is used to define the Likely to Adversely Affect (LAA) Effects Determination Area. An LAA effects determination applies to those areas where it is expected that the pesticide's use will directly or indirectly affect the species and/or modify its designated critical habitat using EFED's standard assessment procedures (see Attachment I) and effects endpoints related to survival, growth, and reproduction. This is the area where the "Potential Area of LAA Effects" (initial area of concern + drift distance or downstream dilution distance) overlaps with the range and/or designated critical habitat for the species being assessed. If there is no overlap between the potential area of LAA effects and the habitat or occurrence areas, a no effect determination is made. The first step in defining the LAA Effects Determination Area is to understand the federal action. The federal action is defined by the currently labeled uses for naled. An analysis of labeled uses and review of available product labels was completed. A few of the currently labeled uses are special local needs (SLN) uses not specified for use in California 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 assessed species please see Table 2-4.

Following a determination of the assessed uses, an evaluation of the potential "footprint" of naled use patterns (*i.e.*, the area where pesticide application may occur) 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. For naled, these land cover types include forestry, citrus, developed high/medium/low intensity, cultivated crops, wetlands, pastures/hay, and developed open space. Due to the vast amount of land cover areas that represent the labeled uses of naled, the initial area of concern is the entire state of California.

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

The AgDRIFT model (Version 2.01) is used to define how far from the initial area of concern an effect to a given species may be expected via spray drift (*e.g.*, the drift distance). The spray drift analysis for naled uses the most sensitive endpoint of 0.01 ppb (*i.e.*, NOAEC for Freshwater invertebrates). Further detail on the spray drift analysis is provided in Section 5.

Typically, in addition to the buffered area from the spray drift analysis, the Potential Area of LAA Effects area considers the downstream extent of naled that exceeds the LOC based on downstream dilution analysis. However, due to naled having direct applications to water, a downstream dilution analysis is not performed (discussed in Section 5.2.1.7).

An evaluation of usage information was conducted to determine the area where use of naled may impact the assessed species. This analysis is used to characterize where predicted exposures are most likely to occur, but does not preclude use in other portions of the action area. A more detailed review of the county-level use information was also completed. These data suggest that naled has historically been used on a wide variety of agricultural and non-agricultural uses.

2.8. Assessment Endpoints and Measures of Ecological Effect

For more information on the assessment endpoints, measures of ecological effect, see Attachment I.

2.8.1. Assessment Endpoints

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 included in Section 4 of this document. Table 2-8 identifies the taxa used to assess the potential for direct and indirect effects from the uses of naled for each listed species assessed here. The specific assessment endpoints used to assess the potential for direct and indirect effects to each listed species are provided in Table 2-9.

Table 2-8. Taxa Used in the Analyses of Direct and Indirect Effects for the Assessed Listed Species.

Listed Species	Birds	Mammals	Terr. Plants	Terr. Inverts.	FW Fish	FW Inverts.	Estuarine/ Marine Fish	Estuarine/ Marine Inverts.	Aquatic Plants
San Francisco Garter Snake (SFGS)**	Direct Indirect (prey)	Indirect (prey/ habitat)	Indirect (habitat)	Indirect (prey)	Indirect (prey)	Indirect (prey)	n/a	n/a	Indirect (habitat)
California Clapper Rail (CCR)**	Direct Indirect (prey)	Indirect (prey)	Indirect (food/ habitat)	Indirect (prey)	Indirect (prey)	Indirect (prey)	Indirect (prey)	Indirect (prey)	Indirect (food/ habitat)
Bay Checkerspot Butterfly (BCB)	n/a	n/a	Indirect (food/ habitat) *	Direct	n/a	n/a	n/a	n/a	n/a
Valley Elderberry Longhorn Beetle (VELB)	n/a	n/a	Indirect (food/ habitat) *	Direct	n/a	n/a	n/a	n/a	n/a
San Joaquin Kit Fox (SJKF)	Indirect (prey)	Direct Indirect (prey)	Indirect (food/ habitat)	Indirect (prey)	n/a	n/a	n/a	n/a	n/a

Abbreviations: n/a = Not applicable; Terr. = Terrestrial; Invert. = Invertebrate; FW = Freshwater
* obligate relationship
** Consumption of residues of naled in aquatic organisms may result in direct effects to the San Francisco Garter Snake and the Clapper Rail.

Table 2-9. Taxa and Assessment Endpoints Used to Evaluate the Potential for Naled and DDVP to Result in Direct and Indirect Effects to the Assessed Listed Species or Modification of Critical Habitat.

Taxa Used to Assess Direct and Indirect Effects to Assessed Species and/or Modification to Critical Habitat or Habitat	Assessed Listed Species	Assessment Endpoints	Measures of Ecological Effects
1. Freshwater Fish and Aquatic-Phase Amphibians	Indirect Effect (prey) -SFGS -CCR	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on aquatic prey food supply (*i.e.*, fish and aquatic-phase amphibians)	**1a.** Most sensitive freshwater fish acute LC_{50} (MRID 40098001): **Lake Trout 96-hr LC_{50} = 92 ppb** **1b.** Most sensitive freshwater fish chronic NOAEC (guideline or ECOTOX): **No data** **1c.** Most sensitive freshwater fish early-life stage NOAEC (MRID 42602201): **Fathead Minnow 35-d NOAEC = 2.9 µg ai/L (length)**
2. Freshwater Invertebrates	Indirect Effect (prey) -SFGS -CCR	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on aquatic prey food supply (*i.e.*, freshwater invertebrates)	**2a.** Most sensitive freshwater invertebrate EC_{50} (MRID 40098001): **Daphnid 48-hr LC_{50} = 0.0668 ppb[1] (0.114 ppb)[2]** **2b.** Most sensitive freshwater invertebrate chronic NOAEC (MRID 43890301): ***Daphnia magna* 21-d NOAEC = 0.0058 µg ai/L (ppb)[1] (0.01 ppb)[2] (length)**
3. Estuarine/Marine Fish	Indirect Effect (prey) -CCR	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on aquatic prey food supply (*i.e.*, estuarine/marine fish)	**3a.** Most sensitive estuarine/marine fish LC_{50} (MRID 00160746): **Sheepshead minnow 96-hr LC_{50} = 1200 µg/L** **3b.** Most sensitive estuarine/marine fish chronic NOAEC (guideline or ECOTOX): **No data** **3c.** Most sensitive estuarine/marine fish early-life stage NOAEC (MRID 43790401): **Sheepshead minnow 34-d NOAEC = 960 µg/L (ppb)[1] (1654 ppb)[2] (survival and length)**
4. Estuarine/Marine Invertebrates	Indirect Effect (prey) -CCR	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on aquatic prey food supply (*i.e.*, estuarine/marine invertebrates)	**4a.** Most sensitive estuarine/marine invertebrate LC_{50} (MRID 42637202): **Mysid 96-hr LC_{50} = 8.8 µg ai/L (ppb ai)** **4b.** Most sensitive estuarine/marine invertebrate chronic NOAEC (MRID 43854301): **Mysid shrimp 28-d NOAEC = 1.48 µg/L (ppb)[1] (2.55 ppb)[2] (length & weight)**
5. Aquatic Plants (freshwater/marine)	Indirect Effect (food/habitat) -SFGS -CCR	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on habitat, cover, food supply, and/or primary	**5a.** Vascular plant acute EC_{50} (MRID 42529601): **Duckweed 14-d EC_{50} > 1800 ppb, NOAEC < 1800 ppb** **5b.** Non-vascular plant acute EC_{50} (MRID 42529603): **Freshwater diatom (*Navicula pelliculosa*) 5-d EC_{50} = 24 ppb, NOAEC = 4.2 ppb**

Taxa Used to Assess Direct and Indirect Effects to Assessed Species and/or Modification to Critical Habitat or Habitat	Assessed Listed Species	Assessment Endpoints	Measures of Ecological Effects
		productivity (*i.e.*, aquatic plant community)	
6. Birds	<u>Direct Effect</u> -SFGS -CCR	Survival, growth, and reproduction of individuals via direct effects	**6a.** Most sensitive bird[a] or reptilian acute LD_{50} Naled (MRID 44585416): **Canada Goose 14-d LD_{50} = 36.9 mg/kg ai-bw** DDVP (MRID 00160000): **Mallard Duck 14-d LD_{50} = 7.8 mg ai/kg-bw[1] (13.4 mg ai/kg -bw)[2]** **6b.** Most sensitive bird[a] or reptilian acute LC_{50} Naled (MRID 00022923): **Japanese Quail 8-d LC_{50} = 1327 mg ai/kg-diet (ppm ai)** DDVP (MRID 00022923): **Japanese Quail 8-d LC_{50} = 298 mg ai/kg-diet (ppm ai)[1] (513 ppm ai)[2]** **6c.** Most sensitive bird[a] or reptilian chronic NOAEC Naled (MRID 44517902): **Mallard Duck 22-wks NOAEC = 260 mg ai/kg-diet (ppm ai)** (based on reductions in egg production & % of eggs set of eggs laid) DDVP (MRID 44233401): **Mallard Duck 20-wks NOAEC = 5 mg ai/kg-diet (ppm ai)[1] (8.6 ppm ai)[2]** (Based on reduction in eggshell thickness, and a reduction in the # of eggs lair, set, viable embryos and live 3-wk embryos)
	<u>Indirect Effect (prey/rearing sites)</u> -SFGS -CCR - SJKF	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on terrestrial prey (birds)	
7. Mammals	<u>Direct Effect</u> -SJKF	Survival, growth, and reproduction of individuals via direct effects	**7a.** Most sensitive laboratory mammalian acute LD_{50} Naled (MRID 00142660): **Rat LD_{50} = 92 mg/kg-bw (F)** DDVP (MRID 00005467): **Rat LD_{50} = 56 mg/kg (F)[1] (96.5 mg/kg (F)[2])** **7b.** Most sensitive laboratory mammalian chronic NOAEC Naled (MRID 00146498): **Rat NOAEC = 6 mg/kg- day (parental systemic effects) 18 mg/kg-day (reproductive toxicity)** (based on decreased body weight gain in both generations) DDVP (MRID 42483901): **Rat NOAEC = 2.3 mg/kg/day[1] = 20 ppm[1] (4.0 mg/kg/day) = 34.5 ppm[2] parental/ systemic & offspring effects** (Based offspring effects based on reduced # of dams bearing litter, fertility index, pregnancy index, and pup weight)
	<u>Indirect Effect (prey/habitat from burrows/rearing sites)</u> -SFGS -CCR - SJKF	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on terrestrial prey (mammals) and/or burrows/rearing sites	
8. Terrestrial Invertebrates	<u>Direct Effect</u> -BCB -VELB	Survival, growth, and reproduction of individuals via direct effects	**8a.** Most sensitive terrestrial invertebrate acute LD_{50} Naled (MRID 00036935): **Honeybee LD_{50} = 0.48 µg/bee** DDVP (MRID 00036935): **Honeybee LD_{50} = 0.495 µg/bee[1] (0.85 µg/bee)[2]** **8c.** Most sensitive terrestrial invertebrate chronic NOAEC (guideline or ECOTOX): **No Data**
	<u>Indirect Effect (prey)</u> -SFGS -CCR - SJKF	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on terrestrial prey (terrestrial invertebrates)	

Taxa Used to Assess Direct and Indirect Effects to Assessed Species and/or Modification to Critical Habitat or Habitat	Assessed Listed Species	Assessment Endpoints	Measures of Ecological Effects
9. Terrestrial Plants	Indirect Effect (food/habitat) (non-obligate relationship) -SFGS -CCR - SJKF	Survival, growth, and reproduction of individuals or modification of critical habitat/habitat via indirect effects on food and habitat (*i.e.*, riparian and upland vegetation)	**9a.** Distribution of EC_{25} for monocots (seedling emergence, vegetative vigor, or ECOTOX): **No data** **9b.** Distribution of EC_{25} (EC_{05} or NOAEC for the BCB and the VELB) for dicots (seedling emergence, vegetative vigor, or ECOTOX): **No data**
	Indirect Effect (food/habitat) (obligate relationship) -BCB -VELB		

Abbreviations: CCR = California Clapper Rail, SFGS = San Francisco Garter Snake, SJKF = San Joaquin Kit Fox, BCB = Bay Checkerspot Butterfly, VELB = Valley Elderberry Longhorn Beetle

*The most sensitive fish species across freshwater and estuarine/marine environments is used to assess effects for these species because they may be found in freshwater or estuarine/marine environments.

[a] Birds are used as a surrogate for terrestrial-phase amphibians and reptiles.

[1] Expressed in terms of parent DDVP

[2] Expressed in terms of Naled – A conversion is made from DDVP to Naled on a molecular weight basis. Multiply DDVP toxicity endpoint (e.g., LD_{50} value) by the ratio of the molecular weight of Naled divided by the molecular weight DDVP (380.8 g/mol/220.98 g/mol = 1.7232).

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 naled that may alter the PCEs of the assessed species' designated critical habitat. PCEs for the assessed species 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 assessed species. 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 naled effects data are available.

Assessment endpoints used to evaluate potential for direct and indirect effects are equivalent to the assessment endpoints used to evaluate potential effects to designated critical habitat. If a potential for direct or indirect effects is found, then there is also a potential for effects to critical habitat. 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.

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 (USEPA, 1998). For this assessment, the risk is stressor-linked, where the stressor is the release of naled to the environment. The following risk hypotheses are presumed in this assessment:

The labeled uses of naled within the action area may:

- directly affect CCR, SFGS, SJKF, BCB, and VELB by causing mortality or by adversely affecting growth or fecundity;
- indirectly affect CCR, SFGS, SJKF, BCB, and VELB and/or modify their designated critical habitat by reducing or changing the composition of food supply;
- indirectly affect CCR, SFGS, SJKF, BCB, and VELB and/or modify their designated critical habitat by reducing or changing the composition of the aquatic plant community in the species' current range, thus affecting primary productivity and/or cover;
- indirectly affect CCR, SFGS, SJKF, BCB, and VELB and/or modify their designated critical habitat by reducing or changing the composition of the terrestrial plant community in the species' current range;
- indirectly affect CCR, SFGS, SJKF, BCB, and VELB and/or modify their designated critical habitat by reducing or changing aquatic habitat in their current range (via modification of water quality parameters, habitat morphology, and/or sedimentation).

2.9.2. Diagram

The conceptual model is a graphic representation of the structure of the risk assessment. It specifies the naled release mechanisms, biological receptor types, and effects endpoints of potential concern. The conceptual models for CCR, SFGS, SJKF, VELB, and BCB and the conceptual models for the aquatic and terrestrial PCE components of critical habitat are shown in Figure 2-9 and Figure 2-10. Although the conceptual models for direct/indirect effects and modification of designated critical habitat PCEs are shown on the same diagrams, the potential for direct/indirect effects and modification of PCEs will be evaluated separately in this assessment. Exposure routes shown in dashed lines are not quantitatively considered because the contribution of those potential exposure routes to potential risks to CCR, SFGS, SJKF, VELB, and BCB and modification to designated critical habitat is expected to be negligible.

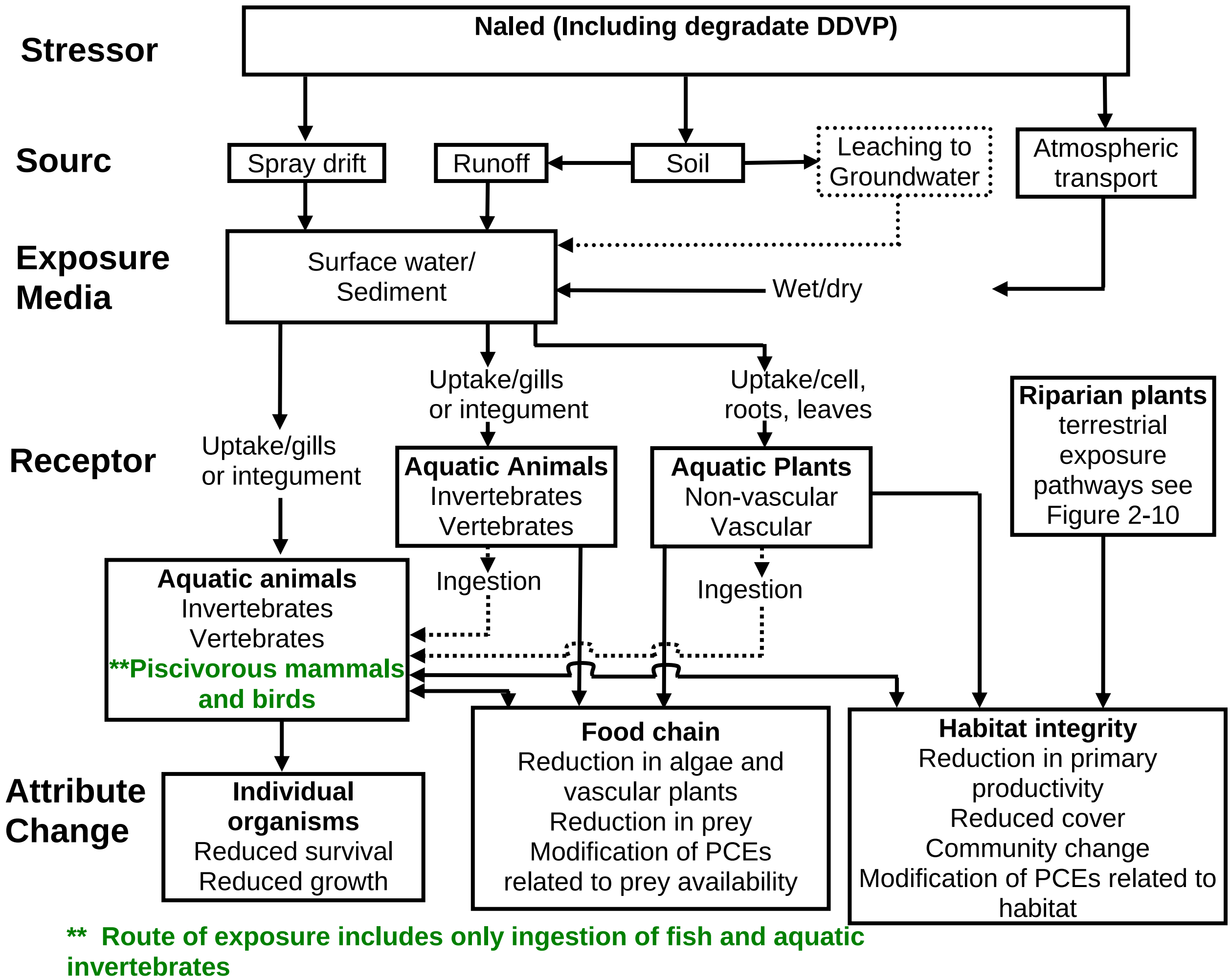


Figure 2-9. Conceptual Model Depicting Stressors, Exposure Pathways, and Potential Effects to Aquatic Organisms from the Use of Naled.
Dotted lines indicate exposure pathways that have a low likelihood of contributing to ecological risk.

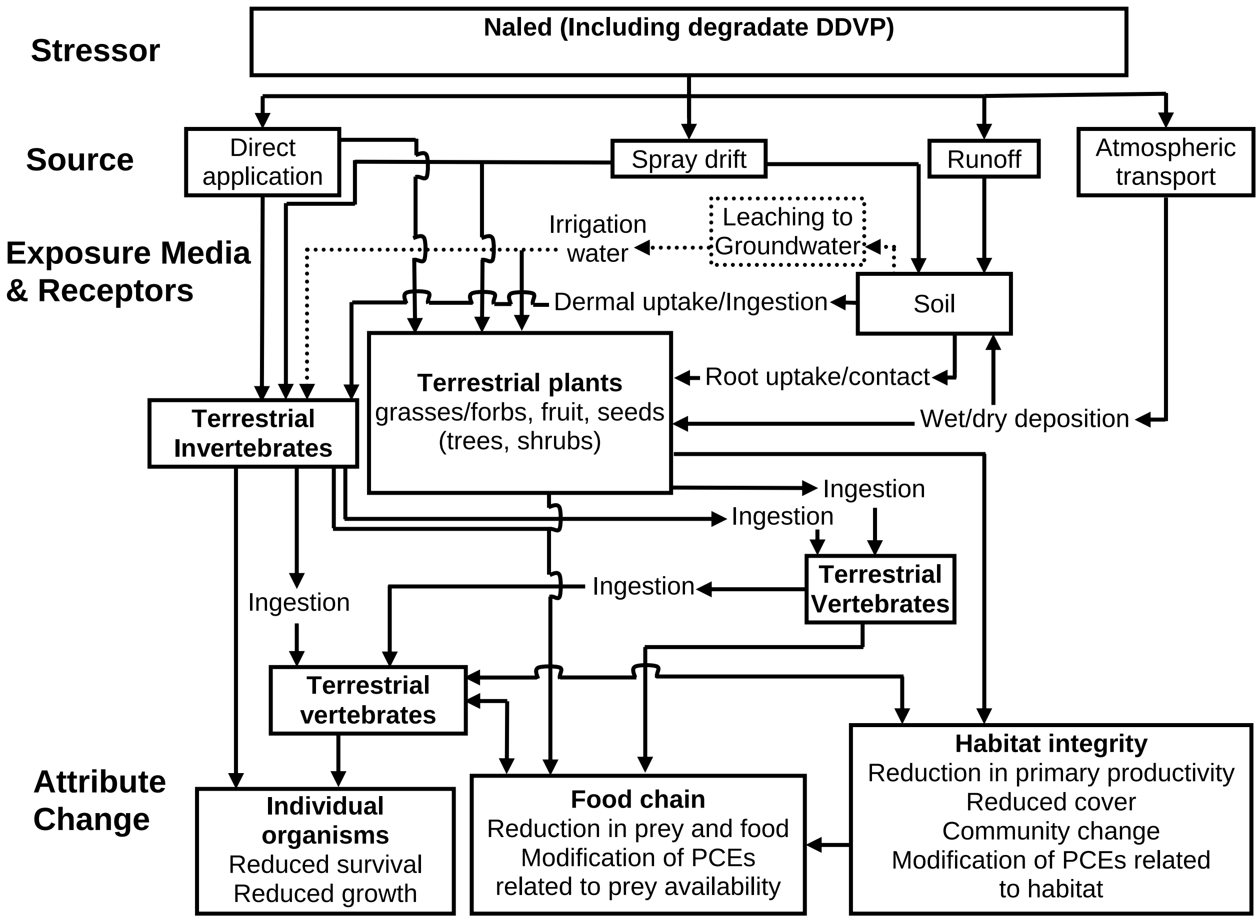


Figure 2-10. Conceptual model depicting stressors, exposure pathways, and potential effects to terrestrial organisms from the use of Naled.
Dotted lines indicate exposure pathways that have a low likelihood of contributing to ecological risk.

2.10. Analysis Plan

In order to address the risk hypothesis, the potential for direct and indirect effects to the assessed species, prey items, and habitat is estimated based on a taxon-level approach. In the following sections, the use, environmental fate, and ecological effects of naled 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 (USEPA, 2004), the likelihood of effects to individual organisms from particular uses of naled is estimated using the probit dose-response slope and either the level of concern (discussed below) or actual calculated risk quotient value.

Descriptions of routine procedures for evaluating risk to the San Francisco Bay Species are provided in Attachment I.

2.10.1. Measures of Exposure

The environmental fate properties of naled along with available monitoring data indicate that water and sediment runoff and spray drift are the principle potential transport mechanisms of naled to the aquatic and terrestrial habitats. However, monitoring data shows that atmospheric transport may also be potential pathway of concern. In this assessment, transport of naled through runoff and spray drift is considered in deriving quantitative estimates of naled exposure to CCR, SFGS, SJKF, VELB, and BCB, their prey and habitats.

Measures of exposure are based on aquatic and terrestrial models that predict estimated environmental concentrations (EECs) of naled 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 Terrestrial Residue Exposure (T-REX) model. The model used to derive EECs relevant to terrestrial and wetland plants is TerrPlant. These models are parameterized using relevant reviewed registrant-submitted environmental fate data. More information on these models is available in Attachment I.

2.10.1.1. Estimating Exposure in the Aquatic Environment

Surface water concentrations will be estimated using appropriate EFED aquatic exposure models. Considering the wide variety of uses for naled, and the different application methods (aerial spray, ground spray, hand spray, airblast, ULV, baiting) and settings (application allowed in one form or another essentially throughout the entire state of California) in which naled is applied, several models will be used for estimating/predicting surface water naled concentrations. Ground spray applications are to be modeled using PRZM-EXAMS and/or AgDRIFT, aerial spray with PRZM-EXAMS, RICE Model, and/or AgDRIFT, and airblast modeled using AgDRIFT. Hand spray and bait uses will not be modeled because they are not expected to contribute significantly to total pesticide loading within a catchment or to independently adversely affect the CCR, SFGS, SJKF, VELB, and BCB species.

Specifically, the fate inputs used for the PRZM-EXAMS aquatic exposure estimations reflect the characteristics of both compounds (naled and DDVP), so the results should also represent aspects of both chemicals. In practice, though, the important fate parameters of naled and DDVP are so similar that changing the input values from one to the other does not appreciably alter the aquatic model results; nevertheless, results presented in this document reflect combined residues.

2.10.1.2. Estimating Exposure in the Terrestrial Environment

The method used to evaluate potential terrestrial exposure also considers total toxic residues (naled + DDVP). However, because of differences between the models (PRZM vs. T-REX and T-HERPS) and how they process data, terrestrial exposures are estimated in a manner different from that used in the aquatic exposure estimations. For these estimations, two separate T-REX model runs were conducted for each application type/amount: one run was conducted at 100% of the application rate (assuming 100% residue as naled), and one run was conducted at 20% of the application rate (which was converted in terms of DDVP using molecular weight conversion, thus representing the maximum possible DDVP residue level from naled). For each run, the resulting EECs were compared to their respective toxicity endpoints to generate estimates of risk (i.e., 100% application run was compared to naled toxicity endpoints, and the 20% application run was compared to DDVP toxicity endpoints). The RQ values generated from each run were not summed, but rather used to bound the range of possible RQ values resulting from naled and subsequently DDVP exposure. This allowed for further characterization of the direct and indirect risks to terrestrial organisms. While this is likely an over-estimation of actual DDVP exposure (since 20% conversion to DDVP is the maximum observed, with most studies indicating a conversion of 12% or less), it fails to account for the additional 80% of naled that is expected to be concurrent with 20% DDVP. However, as potential additive effects cannot be adequately quantified, it should simply be noted that for cases where DDVP terrestrial exposure endpoints are used, there is less confidence that the most conservative possible determination has been made. The T-HERPS model was also used to allow for further characterization of dietary exposures to reptiles relative to screening exposure estimates based on birds in T-REX.

2.10.2. Measures of Effect

Data identified in Section 4 are used as measures of effect for direct and indirect effects. Data were obtained from registrant submitted studies or from literature studies identified by ECOTOX. More information on the ECOTOXicology (ECOTOX) database and how toxicological data is used in assessments is available in Attachment I.

2.10.2.1. 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 naled, and the likelihood of direct and indirect effects to the assessed species 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. 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). More information on standard assessment procedures is available in Attachment I.

2.10.3. Data Gaps

There are no acceptable anaerobic soil metabolism studies available for this assessment. Aerobic aquatic metabolism studies were waived for the registration of naled. However, lack of available data in for these parameters will not appreciably alter the results of this assessment.

There are no terrestrial plant toxicity data for naled or DDVP and no chronic estuarine/marine fish studies for naled. To account for the terrestrial plant toxicity data gap for naled, incident data was reviewed. From the presence of terrestrial plant incidents it was determined that risk could not be precluded. Although there were no chronic estuarine/marine fish studies available for naled, there were studies available for DDVP. The aquatic exposure analysis was conducted using total toxic residue (TTR) approach, naled + DDVP, using the most sensitive toxicity endpoint in terms of naled. Therefore, the DDVP estuarine/marine chronic fish endpoint was converted in terms of naled, and was used to estimate chronic risk to estuarine/marine fish, resulting from naled exposure.

3. Exposure Assessment

Naled is formulated as both a liquid (undiluted) and an emulsifiable concentrate. Naled can be applied by: ground spray application, aerial application, Ultra-Low Volume (ULV), airblast, hand spray (spot treatments), and bait stations (mixed with sugar water in open containers, or applied to poles, trees, etc. as gel). Risks from ground boom and aerial applications are emphasized in this assessment because they are expected to result in the highest off-target levels of naled due to generally higher spray drift levels. Ground boom and aerial modes of application tend to use lower volumes of application applied in finer sprays than other applications and thus have a higher potential for off-target movement via spray drift.

3.1. Label Application Rates and Intervals

Naled labels may be categorized into two types: labels for manufacturing uses (including technical grade naled and its formulated products) and end-use products. While technical products, which contain naled 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 insects (particularly mosquitoes). The formulated product labels legally limit naled's potential use to only those sites that are specified on the labels.

Aquatic exposure scenarios used to assess currently registered agricultural and non-agricultural uses of naled within California are summarized in Table 2-4. In addition, naled uses, scenarios and application information for PRZM/EXAMS as well as other aquatic modeling inputs can be found in Table 3-1 (see Appendix M for buffers and the determination of the % spray drift using AgDRIFT).

Table 3-1. Modeled Naled Uses.

PRZM Scenario	Uses Covered	App. Method(s)	App. Rate(s) (lbs a.i./A)	# of Apps.	App. Intervals (days)	Seasonal Total (lbs a.i./A)	Application Date
CA almond STD	almond, walnut	Aerial spray	1.9	2	8	3.8	Apr. 15
CA almond STD	almond, walnut	Ground spray	1.9	2	8	3.8	Apr. 15

PRZM Scenario	Uses Covered	App. Method(s)	App. Rate(s) (lbs a.i./A)	# of Apps.	App. Intervals (days)	Seasonal Total (lbs a.i./A)	Application Date
CA citrus STD	orange, lemon, grapefruit, tangerine	Aerial spray only* (Used Ag Drift – 12% spray fraction)	1.9	3	7	5.7	Apr. 15
CA cole crop RLF ("minimum" application rate)	cabbage, broccoli, cauliflower, collards, kale	Aerial spray (Used Ag Drift – 12% spray fraction)	1.9	5	7	4.5	Mar. 15
CA cole crop RLF ("minimum" application rate)	cabbage, broccoli, cauliflower, collards, kale	Ground spray	1.9	5	7	4.5	Mar. 15
CA cotton STD	cotton	Aerial spray (Used Ag Drift – 12% spray fraction)	0.9	5	7	4.5	July 1
CA cotton STD	cotton	Ground spray	0.9	5	7	4.5	July 1
CA fruit STD	peaches	Ground spray (Used Ag Drift – 2.7% spray fraction)	1.9	1		1.9	June 1
CA grapes STD	grapes	Airblast (Used Ag Drift – 0.006% spray fraction)	0.5	11 (max number of apps)	8	5.5	May 1
CA grapes STD	grapes	Airblast (Used Ag Drift – 0.006% spray fraction)	0.9 (max app rate)	6	8	5.5	May 1
CA grapes STD	grapes	Ground spray	0.5	11	8	5.5	May 1

PRZM Scenario	Uses Covered	App. Method(s)	App. Rate(s) (lbs a.i./A)	# of Apps.	App. Intervals (days)	Seasonal Total (lbs a.i./A)	Application Date
CA lettuce STD	Brussels sprouts, Swiss chard	Aerial spray (Used Ag Drift – 12% spray fraction)	1.9	5	7	9.5	June 15
CA melons RLF	cantaloupes, muskmelons, melons, eggplant, summer squash	Aerial spray (Used Ag Drift – 12% spray fraction)	1.4	4 (max number of apps)	7	5.6	May 15
CA melons RLF	cantaloupes, muskmelons, melons, eggplant, summer squash	Aerial spray (Used Ag Drift – 12% spray fraction)	1.9 (max app rate)	4	7	5.6	May 15
CA Nursery	bedding plant, foliage plants, outdoor nursery ops. Ornamental shrubs	Ground spray only	0.9	25	3	Not Applicable	Apr. 1
CA row crop RLF	celery, beans, peas	Ground spray	1.4	5	7	7	Mar. 15
CA row crop RLF	celery, beans, peas	Aerial spray (Used Ag Drift – 12% spray fraction)	1.4	5	7	7	Mar. 15
CA row crop RLF	peppers	Aerial spray (Used Ag Drift – 12% spray fraction)	1.9	3	7	5.7	Apr. 15
CA strawberry (non plastic) RLF	strawberries	Aerial spray (Used Ag Drift – 12% spray fraction)	0.9	5	7	4.5	May 1
CA sugarbeet	sugar beets	Ground spray	0.9	5	7	4.5	May 1

PRZM Scenario	Uses Covered	App. Method(s)	App. Rate(s) (lbs a.i./A)	# of Apps.	App. Intervals (days)	Seasonal Total (lbs a.i./A)	Application Date
CA sugarbeet	sugar beets	Aerial spray (Used Ag Drift – 12% spray fraction)	0.9	5	7	4.5	May 1
CA wheat RLF	safflower	Aerial spray (Used Ag Drift – 12% spray fraction)	2.1	2	7	4.2	June 1
OR hops	hops	Aerial spray (Used Ag Drift – 12% spray fraction)	0.9	5	14	4.5	May 1
OR hops	hops	Ground spray	0.9	5	14	4.5	May 1
CA forestry RLF	forestry	Aerial spray (Used Ag Drift – 11% spray fraction)	0.9	25	3	2.5	July 1
CA impervious RLF	areas outside bldgs., impervious surfaces	Aerial spray (Used Ag Drift – 11% spray fraction)	0.1	25	3	2.5	Sep. 1
CA residential RLF	residential (including lawns)	Aerial spray (Used Ag Drift – 11% spray fraction)	0.1	25	3	2.5	Sep. 1
CA rangeland hay RLF	rangeland	Aerial spray (Used Ag Drift – 11% spray fraction)	1.1	25	3	2.5	Apr. 15

PRZM Scenario	Uses Covered	App. Method(s)	App. Rate(s) (lbs a.i./A)	# of Apps.	App. Intervals (days)	Seasonal Total (lbs a.i./A)	Application Date
CA alfalfa	alfalfa	Aerial spray (Used Ag Drift – 12% spray fraction)	1.4	3	7	4.2	Mar. 15

* CA turf RLF not modeled – should be adequately represented (bounded) by residential/forestry/impervious uses and other models. Swamps were not modeled using PRZM-EXAMS. See modeling approach (section 3.2.1) for more information.

There were a few uses that had their maximum application rates decreased since the most recent assessment (2008 CRLF). However, even with the decrease in application rate, these uses are already represnted by other modeled uses. Please see below for a list of changes and the equivalent uses (Table 3-2):

Table 3-2. Changes in application rates since the most recent assessment

Use Site	Maximum Application rate	Minimum Retreatment Interval	Equivalent Use
For reduction of livestock pests in confined animal feeding operations (e.g., corrals, holding pens, feedlots) containing dairy and beef cattle, hogs, sheep, or horses	**Aerial: 0.1 lbs ai/A** **Ground: 0.1 lbs ai/A**	**7 days (only for ground applications)**	Revised use is included in the Residential uses (mosquito treatment, lawns) Max App Rate: 0.1 lb a.i./A, Interval: 3 days, Max Apps: 25
In and around food processing plants, loading docks, cull piles, and refuse areas and cider mills	**2.2 lbs ai/100 gallons water**	**---**	Revised use is included in the Impervious uses (mosquito treatment) Max App Rate: 0.1 lb a.i./A, Interval: 3 days, Max Apps: 25
Wide Area Public Pest Control (mosquitoes, flies) Note: There are spray droplet size requirements for aerial and ground applications, specified on each product label.			
Agricultural Areas, Woodlands, Wide Area Public Pest Programs Sponsored by Government Entities (Consult state or tribal agency before applying; this application rate will kill shrimp, do not apply to tidal or marsh waters)	**Aircraft: 0.1 lb ai/A** **Mist or cold fog: 0.1 lb ai/A**	---	Revised use is included in the Forestry uses (mosquito treatment) Max App Rate: 0.9 lb a.i./A, Interval: 3 days, Max Apps: 25

3.2. Aquatic Exposure Assessment

3.2.1. Modeling Approach

The EECs (Estimated Environmental Concentrations) are calculated using the EPA Tier II PRZM (Pesticide Root Zone Model) and EXAMS (Exposure Analysis Modeling System) with the EFED Standard Pond environment. PRZM is used to simulate pesticide transport as a result of runoff and erosion from an agricultural field, and EXAMS estimates environmental fate and transport of pesticides in surface water.

The conceptual model of exposure envisions primarily aerial and ground spray applications of very fine droplet size, allowing much of the chemical to remain suspended aboveground for some time (as many applications are intended to control flying insects). Thus, spray drift becomes a crucial component of exposure. Naled is expected to degrade to the toxic degradate DDVP fairly quickly (< 1 day); however, the action and toxicity of DDVP are such that it effectively functions much the same as parent naled.

Total toxic residues (naled + DDVP) are used to establish most chemical fate half-lives; where degradation rates for DDVP were slower (hydrolysis, photolysis), the values for DDVP were used as model inputs. Short half-lives for fate parameters obviate the need to evaluate vadose zone storage and potential leaching to groundwater; terrestrial and surface water environments are the dominant venues for potential non-target exposure.

Substantial amounts of naled and DDVP are likely available for runoff to surface waters for only a few days post-application. Even though both these chemicals are mobile, they have low persistence. If a runoff event occurs very soon (1-2 days) after an application and if naled or DDVP is transported into surface water, naled will degrade rapidly (half-life ≈ 0.6 days at pH 7, MRID 40034902, 41354101) and DDVP will persist for somewhat longer (half-life ≈ 5.2 days at pH 7, MRID 41723101). Therefore, the impact of both of these chemicals on chronic surface water concentrations should be minimal.

Use-specific management practices for all of the assessed uses of naled 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 use.

Since most naled uses entail spray applications of some type, often requiring ultra-fine droplet sizes (with the intent that the chemical remain airborne), it is not sufficiently protective to assume a default spray drift value of 1% for ground spray and 5% for aerial spray. Naled labels contain instructions to include buffers of specific widths according to type and method of application. The model AgDrift is used to obtain estimations of the percentage of applied chemical that may be transported onto a nearby surface water body, according to prescribed buffer width. A footnote in Table 3-3 gives buffer widths for each major type of naled use according to application method. The spray drift percentages are then used instead of the PRZM default values, and the PRZM-EXAMS model is run with the appropriate recalculated spray drift percent input (see Table 3-3 footnote or Table 13 from the 2008 CRLF located in Appendix M).

For 'swamp' uses (mosquito and other insect control), it was assumed that essentially all the applied chemical went directly into the water body, so the mass of naled applied to the swamp (0.9 lb a.i./A or 1.01 kg/ha) in a 10 ha pond (standard PRZM-EXAMS pond) with a volume of 20 million liters (volume of water in the standard PRZM-EXAMS pond). Therefore, to determine the peak concentration for the swamp use was determined by the following equation:

$$Swamp \quad Exposure \cong \frac{1.01 kg/ha \times 10\,ha \quad pond}{20\,x \quad 10^{6}\ Liters} \cong 5.05 \quad x \quad 10^{-7} \frac{kg}{L}$$

$$Swamp \quad Exposure \cong (5.05 \times 10^{-7} \frac{kg}{L}) \times 10^{9} \frac{\mu g}{kg} \cong 505 \frac{\mu g}{L} \quad or \quad ppb$$

The date of first application was developed based on several sources of information including data provided by BEAD, a summary of individual applications from the CDPR PUR data, and Crop Profiles maintained by the USDA.

More detail on the crop profiles and the previous assessments may be found at:

http://www.ipmcenters.org/CropProfiles/

3.2.2. Model Inputs

The appropriate PRZM and EXAMS input parameters for naled and related compounds were selected from the environmental fate data submitted by the registrant and in accordance with US EPA-OPP EFED water model parameter selection guidelines, *Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides. Version II*, February 28, 2002 (http://www.epa.gov/oppefed1/models/water/input_parameter_guidance.htm) and *PE4 User's Manual. (P)RZM (E)XAMS Model Shell, Version (4)*, August 8, 2003 (http://www.epa.gov/oppefed1/models/water/pe4_instructions_public.htm). Input parameters can be grouped by physical-chemical properties and other environmental fate data, application information, and use scenarios. Physical and chemical properties relevant to assess the behavior of naled and related compounds in the environment are presented in Table 2-1 to Table 2-3 and application information from the label in Table 2-4. The input parameters for PRZM and EXAMS are in Table 3-3. Appendix D contains example model output files and tables showing the data used to calculate input values.

The PRZM-EXAMS model runs are intended to represent total toxic residues (naled + DDVP), using the most conservative input values (naled or DDVP) where applicable: naled input values for aerobic and anaerobic metabolic half-lives, DDVP for abiotic half-lives and mobility inputs. However, since both compounds appear to degrade/dissipate rapidly, it was often impractical to establish a specific half-life for some parameters with any degree of certitude. The selection of aerobic soil half-life of 3 days (3x single study showing half-life of about 1 day for combined residues – MRID 00085408) was conservative insofar as degradation was too rapid and data were inadequate to establish a time-series decay curve. In the absence of a verifiable, suitable aerobic aquatic study, the naled aerobic soil half-life is multiplied by two (as per Input Parameter Guidance Document). For all model input parameters, the most conservative reasonable estimate was used since both naled and DDVP degrade rapidly and have similar physical/chemical properties.

Table 3-3. Summary of PRZM/EZAMS Environmental Fate Data Used for Aquatic Exposure Inputs for Naled Endangered Species Assessment[1]

Fate Property, (Parent/Degradate)	Value ((unit)	MRID (or source)
Molecular Weight (Naled)	381 (g/mol)	TOXNET
Henry's constant (DDVP)	5E-8 (atm-m^3/mole)	Estimated using solubility and MW.
Vapor Pressure (DDVP)	1.2E-2 (torr)	EXTOXNET
Solubility in Water (DDVP)	15600 (mg/L)	EXTOXNET
Photolysis in Water (DDVP)	10 (days)	MRID 43326601
Aerobic Soil Metabolism Half-lives (Naled)	3 (days)	MRID 00085408 – 3X single value of ~1 day, Input Parameter Guidance 2002
Hydrolysis Half-lives (DDVP)	pH 5 = 11.6 (days) pH 7 = 5.2 (days) pH 9 = 0.88 (days)	MRID 41723101
Aerobic Aquatic Metabolism Half-life (water column) (Naled)	6 (days)	2X aerobic soil half-life, Input Parameter Guidance 2002
Anaerobic Aquatic Metabolism Half-life (benthic) (DDVP)	4.5 (days)	MRIDs 40618201, 41354102, 42445101
Organic-carbon water partition coefficient (K_{OC}, L/kg OC) or Solid-water distribution coefficient (Kd, L/kg soil) (DDVP)	37	MRID 41354105
Application rate and frequency	See CRLF 2008*	Label
Application intervals	See CRLF 2008*	Label
Chemical Application Method (CAM)	2 (ground) 1 (aerial)	Spray
Application Efficiency	0.99 (ground) 0.95 (aerial)	Input Parameter Guidance 2002
Spray Drift Fraction	0.05 (default aerial)[2] 0.01 (default ground)[2]	Input Parameter Guidance 2002

1 – Inputs determined in accordance with EFED "*Guidance for Selecting Input Parameters in Modeling the Environmental Fate and Transport of Pesticides. Version II*" dated February 28, 2002.
2 – A spray drift fraction was calculated for those uses containing buffers. The spray drift fractions for buffers were 0.006 (airblast application for grapes), 0.11 (aerial application/specifically for mosquito/fly uses), 0.027 (ground

applications with 25 foot buffer for peaches), 0.12 (aerial application with 150 foot buffer for sugarbeets), and 0.227 (ULV application).
*- There were a few label changes since the CRLF 2008 assessment. The changes are listed in Section 3.1.

3.2.3. Results

The aquatic EECs for the various scenarios and application practices are listed in Table 3-1, with notations to any changes listed above in Section 3.1. An example of output from PRZM-EXAMS is provided in Appendix D.

EECs for the use of naled are as follows: Peak EECs ranged from 0.29 ppb (ground spray application to grapes) to 505 ppb (use on swamps for control of mosquitoes and other flying insects). 21-day EECs ranged from 0.1 ppb (use on grapes- ground application) to 505 ppb (swamp use for control of mosquito, fly, and other flying insects). 60-day EECs ranged from 0.08 ppb (use on grapes- ground application) to 505 ppb (swamp use for control of mosquito, fly, and other flying insects). The highest Peak EEC concentration, not calculated using PRZM-EXAMS (see modeling approach in Section 3.2.1), was for the swamps to remove mosquitoes and flying insects (505 ppb).

3.2.4. Existing Monitoring Data

A critical step in the process of characterizing EECs is comparing the modeled estimates with available monitoring data.

3.2.4.1. USGS NAWQA Surface Water Data

There are no known targeted aquatic monitoring studies found on the USGS NAWQA database. Naled is not included in the list of chemicals analyzed by USGS NAWQA. Limited analyses for DDVP (dichlorvos) found no detections of DDVP in streams in the Central Arizona Basins. Based on the NAWQA data warehouse, this is the only NAWQA basin that included DDVP in its analysis.

3.2.4.2. USGS NAWQA Groundwater Data

There are no known targeted aquatic monitoring studies found on the USGS NAWQA database. Naled is not included in the list of chemical analyzed by USGS NAWQA. Limited analyses for DDVP (dichlorvos) found no detections of DDVP in ground water in the Central Arizona Basins. Based on the NAWQA data warehouse, this is the only NAWQA basin that included DDVP in its analysis.

3.2.4.3. California Department of Pesticide Regulation (CDPR) Data

Five detections of DDVP out of 2291 samples were reported and zero detections of naled out of 679 samples taken. The five detections of DDVP were in Yolo County, CA, 9/6/2005 (0.0146 µg/L), Sutter County, CA, 10/18/2005 (0.542 µg/L), Stanislaus County, CA, 9/2/2003 (0.242 µg/L), Sutter County, CA, 9/20/2006 (0.1012), and a second detect in Yolo County, CA 9/5/2007 (0.0847 µg/L). It is unknown whether the detections reflected naled use as the source of DDVP or use of DDVP since it is a registered active ingredient itself. Although no detections of parent naled were reported, it is not known whether any water monitoring studies targeted specifically to naled use have been conducted.

3.2.4.4. Atmospheric Monitoring Data

Naled and DDVP have been detected in air monitoring studies, verifying that atmospheric transport is a viable transmission mode for naled and DDVP. In a targeted ambient air monitoring study in Tulare County, CA (June 1995), naled and DDVP were both detected at elevated air concentrations following naled airblast application. Air samples were collected before, during, and for 72 hours after application of naled to an orange grove. Maximum air concentrations detected for naled and DDVP were 6.30 ug/m^3 and 0.994 ug/m^3, respectively. Moreover, naled was detected at measurable concentrations (0.016 ug/m^3) in samples taken prior to application, indicating that naled residues can be carried across land catchments through the airshed. An earlier (non-targeted) urban ambient air monitoring program in Tulare County in 1991 yielded lower concentrations: 0.077 ug/m^3 for naled and 0.059 ug/m^3 for DDVP. However, model results indicate that exposure risk is significantly greater for aerial (and ground) spray applications than for orchard airblast, so these studies probably under-represent atmospheric concentrations during and soon after spray applications. The relatively short half-lives of both naled and DDVP help limit real mobility, but widespread and frequent usage can allow background levels to persist in high-use areas during high-use periods (such as during summer, when agricultural spraying is likeliest to occur simultaneously and in proximity to other pest control operations).

3.3. Terrestrial Animal Exposure Assessment

3.3.1. Exposure to Residues in Terrestrial Food Items

T-REX (Version 1.4.1) is used to calculate dietary and dose-based EECs of naled and DDVP for the CCR, SFGS, SJKF, BCB, and VELB, and their potential prey (e.g., birds (including reptiles), mammals, and terrestrial invertebrates). T-REX simulates a 1-year time period. T-HERPS may be used as a refinement of dietary and dose-based EECs for snakes and amphibians when risk quotients from T-REX are higher than LOCs. T-HERPS was also set up to simulate a 1-year time period. For this assessment, spray applications of naled are considered. Terrestrial EECs were derived for the uses previously summarized in Table 2-4. Exposure estimates generated using T-REX and T-HERPS are for the both the parent, and its degradate DDVP.

Terrestrial EECs for foliar formulations of naled were derived for the uses summarized in Table 2-4. A foliar dissipation half-life study was not available for naled or DDVP; however, naled studies indicate a field dissipation half-life of greater than one day. A half-life of 2 days was extrapolated from field dissipation studies (MRID 160040). Therefore, a foliar dissipation half life of 2 days will be used as the input value for the TREX model[5]. Since both chemicals exhibit similar behavior in the environment, the same value will be used for naled and DDVP. Use specific input values, including number of applications, application rate and application interval are provided in Table 2-4.

An initial screening using T-REX revealed that the residues were reduced below the level of concern rapidly after introduction of the next application. Due to the degradation rate of naled and DDVP (Table 2-4) it is likely that in most applications there will be little to no naled/DDVP residue remaining in the environment when the next application of naled is made. Therefore, the maximum single application rate was modeled in T-REX, and will adequately address the potential risk of naled and resulting DDVP residues from the application of naled. In instances where the application interval/frequency was not clearly defined (e.g., forest, ornamental, and some insect pest uses), multiple applications were used to capture the potential risk when residues could still be present in the environment. Uses were first grouped by the maximum allowable one time application rate then by the number of applications and the application interval, creating 'scenarios.' The similar scenarios were grouped and numbered 1 through 9, with Scenario 1 having the highest one-time application rate, and 9 the lowest (Table 3-4). An example output from T-REX and T-HERPS is available in Appendix E.

In addition to dietary exposure, there is the potential for inhalation exposure to birds via volatization. Both naled and DDVP volatilize, and there is the potential for birds to be exposed to naled and/or DDVP as the result of naled application. However, no further toxicological data is available to evaluate this route of exposure. Therefore, as a result there is an uncertainty associated with the potential exposure route of avian inhalation resulting from the use of naled and the subsequent degradation to DDVP.

Table 3-4. Input Parameters for Foliar Applications Used to Derive Terrestrial EECs for Naled with T-REX and T-HERPS

Scenario	Scenario Summary	Rate (lbs a.i./A)	# of Applications	Application Interval (Days)	Uses
1	Safflower	2.1	1	7	Safflower
2	Cole crops, tree nuts, citrus	1.9	1	7	almond, broccoli, cabbage, cauliflower, Brussels sprouts, kale, and collards, eggplant, peppers, oranges, lemons, grapefruit, tangerines, peaches, summer squash, walnuts
3	Alfalfa, row crops, cotton	1.4	1	7	alfalfa, beans, lima beans, and peas, celery, cotton,
4	Melons, misc food and non-food plants	0.9	1	7	Beans (aerial), cantaloupes, muskmelons, hops, melons grown for seed, grapes, strawberries, sugar beets, Swiss chard, forest and shade trees, ornamental shrubs and flowering plants

[5] USEPA. Organosphosphate (OP) Cumulative Risk Assessment. July 2006

Scenario	Scenario Summary	Rate (lbs a.i./A)	# of Applications	Application Interval (Days)	Uses
5*	Forest and Non-food plants	0.9	52	7	forest and shade trees, ornamental shrubs and flowering plants
6*	Forest and Non-food plants	0.9	104	3	forest and shade trees, ornamental shrubs and flowering plants
7	Insect pests-animal and human health concerns	0.25	2	7	Swamps and pastures, for reduction of livestock pests in confined animal feeding operations (0.2 aerial, 0.25 by ground)
8	Insect pests-animal and human health concerns	0.1	2	1	in and around food processing plants, loading docks, cull piles, refuse areas, or reduction of rangeland pests, residential areas, municipalities, tidal marshes, swamps, woodlands, and agricultural areas, livestock areas including dairy cattle
9	Insect pests-animal and human health concerns	0.1	2	7	in and around food processing plants, loading docks, cull piles, refuse areas, reduction of rangeland pests, residential areas, municipalities, tidal marshes, swamps, woodlands, and agricultural areas, livestock areas including dairy cattle

* For these scenarios assumptions were made regarding the number of applications and application interval because the information was not provided on the label

Organisms consume a variety of dietary items and may exist in a variety of sizes at different life stages. T-REX estimates exposure for the following dietary items: short grass, tall grass, broadleaf plants/small insects, and fruits/pods/seeds/large insects, and seeds for granivores. Birds, including the CCR, and mammals, including the SJKF consume all of these items. The size classes of birds represented in T-REX are small (20 g), medium (100 g), and large (1000 g). The size classes for mammals are small (15 g), medium (35 g), and large (1000 g). EECs are calculated for the most sensitive dietary item and size class for birds (surrogate for reptiles) and mammals. For mammals and birds, the most sensitive EECs are for the smallest size class consuming short grass. The percentages of the EECs for the different dietary items are discussed in the discussion on uncertainties (see Section 6.1.1.1). For foliar applications of liquid formulations, T-HERPS estimates exposure for the following dietary items: broadleaf plants/small insects, fruits/pods/seeds/large insects, small herbivore mammals, small insectivore mammals, and small amphibians. Snakes may consume all of these items. The default size classes for snakes are small (2 g), medium (20 g), and large (800 g). The default vertebrate prey size that medium and large snakes can consume is 25 g and 1286 g, respectively (small snakes are not expected to eat vertebrate prey). EECs are calculated for the most sensitive dietary item and size class for snakes. For reptiles, the most sensitive EECs and RQs are for a 20-gram animal that consumes small herbivore mammals. If dietary RQs are more sensitive than acute dose based RQs for acute exposures they are shown as well. Dietary based EECs and RQs are used to characterize risk from chronic exposure. The percentages of the EECs for the different dietary items are discussed in the discussion on uncertainties (see Section 6.1.1.2).

3.3.1.1. Dietary Exposure to Mammals, Birds, and Reptiles Derived Using T-REX

Upper-bound Kenaga nomogram values reported by T-REX are used for derivation of dietary EECs for the CCR, SFGS, and SJKF and their potential prey (Table 3-5 and Table 3-6).

EECs in T-REX that are applicable to direct effects to the CCR are for small (20 g, juveniles) and medium (100 g, adult) birds consuming a variety of dietary items. The most sensitive EEC for the CCR is for the small bird consuming short grass. EECs in T-REX that are applicable to assess direct effect to the SFGS are for small birds (20g) consuming short grass[6]. EECs in T-REX that are applicable to assess direct effects to the SJKF are for large (1,000 g) mammals consuming a variety of dietary items (Table 3-5 and Table 3-6). The most sensitive EEC for the SJKF is for the large mammal consuming short grass. For birds (surrogates for reptiles), EECs and RQs for acute dose based and chronic dietary based exposure are calculated as these are the most sensitive values. If the LC_{50} is lower than the LD_{50}, the highest acute dietary EEC and RQ are shown as well. For mammals, EECs and RQs for acute dose based and chronic dose based exposure are calculated as these are typically the most sensitive values. If the dietary assessment results in higher RQs than the dose-based assessment, the highest dietary RQs are shown as well.

Table 3-5. Upper-bound Kenaga Nomogram EECs for Dietary- and Dose-based Exposures of Birds and Mammals Derived Using T-REX for Naled.

Scenario	Scenario Summary App Rate (lb a.i./A), # Apps, Interval (days)	EECs for SJKF (large mammals consuming short grass)		EECs for CCR, SFGS, and Birds (small birds consuming short grass)		EECs for Mammals (small mammals consuming short grass)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
1	Safflower (2.1 lbs ai/a, 1 application)	504.00	77.00	504.00	574.01	504.00	480.53
2	Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 application)	456.00	69.67	456.00	519.34	456.00	434.76
3	Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 application)	336.00	51.33	336.00	382.67	336.00	320.35

[6] The short grass EECs and RQs are used for reptiles and amphibians to represent a conservative screen. It is not being assumed that amphibians and snakes eat short grass, the result of modeling the 20 gram bird consuming short grass is more conservative than modeling an alternative diet for amphibians and snakes and is therefore, a valid conservative screen and is protective of these species. If the short grass assessment does not result in LOC exceedances, there is a high confidence that effects are unlikely to occur.

Scenario	Scenario Summary App Rate (lb a.i./A), # Apps, Interval (days)	EECs for SJKF (large mammals consuming short grass)		EECs for CCR, SFGS, and Birds (small birds consuming short grass)		EECs for Mammals (small mammals consuming short grass)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
4	Melons, misc food and non-food plants (0.9 lbs ai/A, 1 application)	216.00	33.00	216.00	246.00	216.00	205.94
5	Forest and Non-food plants (0.9 lbs ai/A, 52 applications, 7 day interval)	236.94	36.20	236.94	269.85	236.94	225.91
6	Forest and Non-food plants (0.9 lbs ai/A, 104 applications, 3 day interval)	334.13	51.05	334.13	380.55	334.13	318.57
7	Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 applications, 7 day interval)	65.30	9.98	65.30	74.37	65.30	62.26
8	Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 applications, 1 day interval)	40.97	6.26	40.97	46.66	40.97	39.06
9	Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 applications, 7 day interval)	26.12	3.99	26.12	29.75	26.12	24.90

Table 3-6. Upper-bound Kenaga Nomogram EECs for Dietary- and Dose-based Exposures of Birds and Mammals Derived Using T-REX for DDVP as a degradate of Naled.

Scenario (DDVP)	Scenario Summary DDVP Rate (lb a.i./A), # Apps, Interval (days)	EECs for SJKF (large mammals consuming short grass)		EECs for CCR, SFGS, and Birds (small birds consuming short grass)		EECs for Mammals (small mammals consuming short grass)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
1	Safflower (0.24 lbs ai/a, 1 application)	57.60	8.80	57.60	65.60	57.60	54.92
2	Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 application)	52.80	8.07	52.80	60.13	52.80	50.34

Scenario (DDVP)	Scenario Summary DDVP Rate (lb a.i./A), # Apps, Interval (days)	EECs for SJKF (large mammals consuming short grass)		EECs for CCR, SFGS, and Birds (small birds consuming short grass)		EECs for Mammals (small mammals consuming short grass)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
3	Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 application)	38.40	5.87	38.40	43.73	38.40	36.61
4	Melons, misc food and non-food plants (0.10 lbs ai/A, 1 application)	24.00	3.67	24.00	27.33	24.00	22.88
5	Forest and Non-food plants (0.10 lbs ai/A, 52 applications, 7 day interval)	26.33	4.02	26.33	29.98	26.33	25.10
6	Forest and Non-food plants (0.10 lbs ai/A, 104 applications, 3 day interval)	37.13	5.67	37.13	42.28	37.13	35.40
7	Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 applications, 7 day interval)	7.84	1.20	7.84	8.92	7.84	7.47
8	Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 applications, 1 day interval)	4.10	0.63	4.10	4.67	4.10	3.91
9	Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 applications, 7 day interval)	2.61	0.40	2.61	2.97	2.61	2.49

3.3.2. Exposure to Terrestrial Invertebrates Derived Using T-REX

T-REX is also used to calculate EECs for terrestrial invertebrates exposed to Naled and DDVP. Available acute contact toxicity data for bees exposed to Naled and DDVP (in units of µg a.i./bee), are converted to µg a.i./g (of bee) by multiplying by 1 bee/0.128 g. Dietary-based EECs calculated by T-REX for small and large insects (units of a.i./g) are used to estimate exposure to terrestrial invertebrates (Table 3-7 and Table 3-8). The EECs are later compared to the adjusted acute contact toxicity data for bees in order to derive RQs. Both small and large insect EECs in T-REX are applicable to evaluate direct effects to the BCB and VELB, and estimating indirect effects based on reduction in prey to the CCR and SJKF. The most sensitive insect is the small insect. An example output from T-REX v. 1.4.1 is available in Appendix E.

Table 3-7. Summary EECs Used for Estimating Risk to Terrestrial Invertebrates and Derived Using T-REX ver. 1.4.1. for Naled

Scenario	Scenario Summary App Rate (lb a.i./A), # Apps, Interval (days)	Small Insect (ppm)	Large Insect (ppm)
1	Safflower (2.1 lbs ai/a, 1 application)	283.50	31.50
2	Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 application)	256.50	28.50
3	Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 application)	189.00	21.00
4	Melons, misc food and non-food plants (0.9 lbs ai/A, 1 application)	121.50	13.50
5	Forest and Non-food plants (0.9 lbs ai/A, 52 applications, 7 day interval)	133.28	14.81
6	Forest and Non-food plants (0.9 lbs ai/A, 104 applications, 3 day interval)	187.95	20.88
7	Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 applications, 7 day interval)	36.73	4.08
8	Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 applications, 1 day interval)	23.05	2.56
9	Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 applications, 7 day interval)	14.69	1.63

Table 3-8. Summary EECs Used for Estimating Risk to Terrestrial Invertebrates and Derived Using T-REX ver. 1.4.1. for DDVP

Scenario (DDVP)	Scenario Summary DDVP Rate (lb a.i./A), # Apps, Interval (days)	Small Insect (ppm)	Large Insect (ppm)
1	Safflower (0.24 lbs ai/a, 1 application)	32.40	3.60
2	Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 application)	29.70	3.30
3	Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 application)	21.60	2.40
4	Melons, misc food and non-food plants (0.10 lbs ai/A, 1 application)	13.50	1.50
5	Forest and Non-food plants (0.10 lbs ai/A, 52 applications, 7 day interval)	14.81	1.65
6	Forest and Non-food plants (0.10 lbs ai/A, 104 applications, 3 day interval)	20.88	2.32
7	Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 applications, 7 day interval)	4.41	0.49
8	Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 applications, 1 day interval)	2.30	0.26
9	Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 applications, 7 day interval)	1.47	0.16

3.3.2.1. Dietary Exposure to Reptiles Derived Using T-HERPS

Birds were used as surrogate species for SFGS. T-REX may underestimate exposure to snakes when birds are used as a surrogate and are assumed to eat similar dietary items because of the large meal size a snake may consume on a single day.[7] That is why birds consuming short grass in T-REX are used as the screen to determine whether further refinement in T-HERPS is needed for snakes. T-HERPS was modified (version 1.1) to estimate exposure to snakes based on the maximum size prey item they could consume and is used to refine a risk estimate when LOCs are exceeded for small birds consuming short grass based on RQs estimated in T-REX. The following allometric equation developed by King 2002 was used to estimate the maximum size prey items for snakes (King, 2002).

$$\text{Prey Size} = \text{Snake Mass}^{1.015}$$

The 95% confidence limits on the coefficient are 0.959 and 1.071 (King, 2002). The upper limit was used in T-HERPS to estimate exposure to snakes.

EECs in T-HERPS that are applicable to the SFGS are small (2 g, juveniles) snakes consuming small and large insects and medium (20 g) snakes consuming small and large insects, small herbivorous and insectivorous mammals, and amphibians. The most sensitive EECs and RQs for SFGS are for the medium animal consuming small herbivorous mammals. EECs calculated using T-HERPS for the SFGS are shown in Table 3-9 and Table 3-10.

Table 3-9. Upper-bound Kenaga Nomogram EECs for Dietary- and Dose-based Exposures of Reptiles Derived Using T-HERPS for Naled

Scenario	Scenario Summary App Rate (lb a.i./A), # Apps, Interval (days)	EEC for Small SFGS (small reptiles consuming small insects)		EEC for Medium SFGS (medium reptiles consuming small herbivorous mammals)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
1	Safflower (2.1 lbs ai/a, 1 application)	283.50	15.74	1132.20	477.90
2	Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 application)	256.50	14.25	256.50	432.39
3	Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 application)	189.00	10.50	754.80	318.60
4	Melons, misc food and non-food plants (0.9 lbs ai/A, 1 application)	121.50	6.75	485.23	204.82
5	Forest and Non-food plants (0.9 lbs ai/A, 52 applications, 7 day interval)	133.28	7.40	532.28	224.68

[7] When examining the same application rates and types, RQs calculated in T-REX for small birds consuming short grass are higher than or equal to the highest RQs estimated in T-HERPs for medium snakes consuming small herbivore mammals. Therefore, RQs calculated in T-REX for the small birds consuming short grass may be used as a screen for examining risk to snakes.

Scenario	Scenario Summary App Rate (lb a.i./A), # Apps, Interval (days)	EEC for Small SFGS (small reptiles consuming small insects)		EEC for Medium SFGS (medium reptiles consuming small herbivorous mammals)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
6	Forest and Non-food plants (0.9 lbs ai/A, 104 applications, 3 day interval)	187.95	10.44	750.61	316.83
7	Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 applications, 7 day interval)	36.73	2.04	146.70	61.92
8	Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 applications, 1 day interval)	23.05	1.28	92.04	38.85
9	Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 applications, 7 day interval)	14.69	0.82	58.68	24.77

Table 3-10. Upper-bound Kenaga Nomogram EECs for Dietary- and Dose-based Exposures of Reptiles Derived Using T-HERPS for DDVP

Scenario (DDVP)	Scenario Summary DDVP Rate (lb a.i./A), # Apps, Interval (days)	EEC for Small SFGS (small reptiles consuming small insects)		EEC for Medium SFGS (medium reptiles consuming small herbivorous mammals)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
1	Safflower (0.24 lbs ai/a, 1 application)	32.40	1.80	129.39	54.62
2	Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 application)	29.70	1.65	118.61	50.07
3	Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 application)	21.60	1.20	86.26	36.41
4	Melons, misc food and non-food plants (0.10 lbs ai/A, 1 application)	13.50	0.75	18.40	22.76
5	Forest and Non-food plants (0.10 lbs ai/A, 52 applications, 7 day interval)	14.81	0.82	59.14	24.96

Scenario (DDVP)	Scenario Summary DDVP Rate (lb a.i./A), # Apps, Interval (days)	EEC for Small SFGS (small reptiles consuming small insects)		EEC for Medium SFGS (medium reptiles consuming small herbivorous mammals)	
		Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)	Dietary-based EEC (mg/kg-diet)	Dose-based EEC (mg/kg-bw)
6	Forest and Non-food plants (0.10 lbs ai/A, 104 applications, 3 day interval)	20.88	1.16	83.40	35.20
7	Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 applications, 7 day interval)	4.41	0.24	17.60	7.43
8	Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 applications, 1 day interval)	2.30	0.13	9.20	3.88
9	Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 applications, 7 day interval)	1.47	0.08	5.87	2.48

3.4. Terrestrial Plant Exposure Assessment

Since there are no terrestrial plant toxicity data available, exposures were not quantitatively estimated. See Section 5.2 for a qualitative discussion regarding the potential effects of naled and DDVP on the CCR, SFGS, SJKF, BCB, and VELB via effects to terrestrial plants.

4. Effects Assessment

This assessment evaluates the potential for naled to directly or indirectly affect the federally threatened Bay Checkerspot Butterfly (BCB) and Valley Elderberry Longhorn Beetle (VELB), as well as the federally endangered California Clapper Rail (CCR), San Francisco Garter Snake (SFGS), and the San Joaquin Kit Fox (SJKF) or modify their designated critical habitat. Assessment endpoints for the effects determination for each assessed species include direct toxic effects on the survival, reproduction, and growth, 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 each assessed species. Direct effects to the San Francisco garter snake (SFGS) are based on avian toxicity data, given that birds are generally used as a surrogate for terrestrial-phase amphibians and reptiles.

4.1. Ecotoxicity Study Data Sources

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) (USEPA, 2004). Open literature data presented in this assessment were obtained from ECOTOX information obtained on February 15, 2010 (refresh), as well as previous runs on November 12, 2008, July 31, 2008, June 4, 2007, and March 16, 2004. 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.

There were two reviewed open literature studies that examined the effects of naled on bees (E70351 and E39126). One study examined the effects of naled on honeybee brood after application to food in the bottom of brood cells; therefore it was considered an oral dosage to larval bees (E70351). It was determined that the earlier life stages were more sensitive to oral exposure (via ingestion) to naled. The 1-2, 3-4, and 5-6 day old larvae LD_{50} values were 0.159, 0.197, and 0.429 µg/individual, respectively (E70531). This study will be utilized qualitatively in the assessment to evaluate/characterize direct effects to the BCB and VELB via oral exposure to naled. The second open literature study examined the relative toxicity of naled to the honey bee, alkali bee, and the alfalfa leafcutting bee (E39126). The contact LD_{50} for the honey bee, alkali bee, and the alfalfa leafcutting bee were 0.0008, 0.0016, and 0.0245 µg/individual, respectively. This study will be utilized qualitatively in the assessment to evaluate/characterize direct effects to the BCB and VELB via contact exposure to naled.

Open literature toxicity data for other 'target' insect species (not including bees, butterflies, beetles, and non-insect invertebrates including soil arthropods and worms), which include efficacy studies, are not currently considered in deriving the most sensitive endpoint for terrestrial insects. Efficacy studies do not typically provide endpoint values that are useful for risk assessment (*e.g.*, NOAEC, EC50, *etc.*), but rather are intended to identify a dose that maximizes a particular effect (*e.g.*, EC100). Therefore, efficacy data and non-efficacy toxicological target insect data are not included in the ECOTOX open literature summary table provided in Appendix H. For the purposes of this assessment, 'target' insect species are defined as all terrestrial insects with the exception of bees, butterflies, beetles, and non-insect invertebrates (*i.e.*, soil arthropods, worms, *etc*.) which are included in the ECOTOX data presented in Appendix H. The list of citations including toxicological and/or efficacy data on target insect species not considered in this assessment is provided in Appendix G.

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.*, survival, reproduction, and growth) identified in Section 0. For example, endpoints such as behavior modifications are likely to be qualitatively evaluated, because quantitative relationships between modifications and reduction in species survival, reproduction, and/or growth are not 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, as they are relevant to the understanding of the area with potential effects, as defined for the action area.

There is no registrant submitted terrestrial plant data, and one open literature study was found in the ECOTOX screen (E63164). This study found and examined a connection between naled application and celery petiole lesion damage (E63164). Moisture levels in conjunction with naled exposure resulted in increased instances of petiole lesion damage seen in celery (E63164). This study will be utilized qualitatively in the assessment to evaluate/characterize indirect effects (food/habitat) non-obligate relationship to the SFGS, CCR and SJKF, and indirect effects (food/habitat) obligate relationship to the BCB and VELB.

Naled is rapidly converted to the toxic degradate DDVP, and to assess the risk from naled uses exposure was estimated using a total toxic residues approach. For the aquatic analysis, the toxicity of naled and DDVP are compared and the chemical that is most toxic to each taxa (expressed as naled) is used in the risk assessment. For terrestrial analysis the EEC values are compared to both the naled and DDVP toxicity endpoints (which was described in the problem formulation section).

In addition to the ECOTOX screen for naled an ECOTOX screen was completed for DDVP (most recent screen was October 31, 2008). After review, the study that was found to be more sensitive than the naled registrant submitted studies (when expressed in terms of naled) (E19281) was found not to be valid for use in risk assessment. All other studies that were found within the ECOTOX search for DDVP were not more sensitive than those submitted by the registrant, when comparing those values expressed in terms of naled.

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 sublethal endpoints is presented in Appendix H. Appendix I includes a summary of the human health effects data for naled.

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 ecological incident data, are considered to further refine the characterization of potential ecological effects associated with exposure to naled. A summary of the available aquatic and terrestrial ecotoxicity information and the incident information for naled are provided in Sections 4.1 through 4.4.

Available toxicity of degradates and other stressors of concern are summarized for each taxa in the appropriate Sections for the taxa. A detailed summary of the available ecotoxicity information for all naled degradates and formulated products can be found Appendix F.

4.2. Toxicity of Naled to Aquatic Organisms

Table 4-1 summarizes the most sensitive aquatic toxicity endpoints (naled or DDVP, as appropriate), 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 Bay Checkerspot Butterfly (BCB), Valley Elderberry Longhorn Beetle (VELB), California Clapper Rail (CCR), San Francisco Garter Snake (SFGS), and the San Joaquin Kit Fox (SJKF) is presented below. Additional information is provided in Appendix F. All endpoints are expressed in terms of the naled active ingredient (a.i.) unless otherwise specified. Based on the available data, naled is classified as very highly toxic to both freshwater fish and invertebrates.

Table 4-1. Aquatic Toxicity Profile for Naled*

Assessment Endpoint	Acute/ Chronic	Species	Toxicity Value Used in Risk Assessment	Citation or MRID # (Author, Date)[a]	Comment
Indirect Toxicity to SFGS and/or CCR via Toxicity to Freshwater Fish (*i.e. prey items*)	Acute	Lake Trout (*Salvelinus namaycush*)	96-hr LC_{50} = 92 µg/L (ppb)	MRID 40098001 (Mayer & Ellersieck 1986)	**Supplemental**
	Chronic	Fathead Minnow (*Pimephales promelas*)	35-d NOAEC = 2.9 µg/L (ppb) (length)	MRID 42602201 (Bettencourt 1992)	**Acceptable** LOAEC = 6.3 µg/L (ppb)
Indirect Toxicity to SFGS and/or CCR via Toxicity to Freshwater Invertebrates (*i.e. prey items*)	Acute	Water flea (*Daphnia pulex*) (DDVP)	48-hr LC_{50} = 0.066 (0.068) µg/L (ppb)[1] **(0.114 ppb)[2]**	MRID 40098001 (Mayer & Ellersieck 1986)	**Acceptable**
	Chronic	Water flea (*Daphnia magna*) (DDVP)	21-d NOAEC = 0.0058 µg ai/L (ppb)[1] **(0.01 ppb)[2]** (survival & reproduction- # young/surviving female)	MRID 43890301 (Ward & Davis 1995)	**Acceptable** LOAEC = 0.0122 µg ai/L (ppb)[1] (0.0210 ppb)[2] (survival & reproduction- # young/surviving female)
Indirect Toxicity to CCR via Toxicity to Estuarine/ Marine Fish (*i.e. prey items*)	Acute	Striped Bass (*Marone saxatilis*)	96-hr LC_{50} = 500 µg ai/L (ppb)	MRID 05000819 (Korn & Earnest 1974)	**Supplemental**
	Chronic	Sheepshead Minnow (*Cyprinodon variegatus*) (DDVP)	34-d NOAEC = 960 µg/L (ppb)[1] **(1654 ppb)[2]** (survival and length)	MRID 43790401 (Wards & Davis 1995)	**Acceptable** LOAEC = 1840 µg/L (ppb)[1] (31701 ppb)[2]

Assessment Endpoint	Acute/ Chronic	Species	Toxicity Value Used in Risk Assessment	Citation or MRID # (Author, Date)[a]	Comment
Indirect Toxicity to CCR via Toxicity to Estuarine/ Marine Invertebrates (*i.e. prey items*)	Acute	Mysid (*Americamysis bahia*)	96-hr LC_{50} = 8.8 µg ai/L (ppb ai)	MRID 42637202 (Bettencourt 1993)	**Acceptable** sublethal effects seen at concentrations below LC_{50} at 96 hours included erratic swimming behavior, darkened pigmentation, and lethargy
	Chronic	Mysid (*Americamysis bahia*) (DDVP)	28-d NOAEC = 1.48 µg/L (ppb)[1] **(2.55 ppb)[2]** (length & weight)	MRID 43854301 (Ward & Davis 1996)	**Acceptable** LOAEC = 3.25 µg/L (ppb)[1] (5.5 ppb)[2]
Indirect Toxicity to SFGS and/or CCR via Toxicity to Aquatic Plants	Vascular	Duckweed (*Lemna gibba*)	14-d EC_{50} > 1800 ppb NOAEC < 1800 ppb	MRID 42529601 (Hoberg 1992)	**Supplemental**
	Non-vascular	Freshwater diatom (*Navicula pelliculosa*)	5-d EC_{50} = 24 ppb NOAEC = 4.2 ppb	MRID 42529603 (Hoberg 1992)	**Acceptable**

[**] **Bolded** values (the most sensitive toxicity endpoint) were used for modeling – all DDVP toxicity values were converted and compared in terms of naled (see below ([2]) for conversion).
[1] Expressed in terms of parent DDVP
[2] Expressed in terms of Naled – A conversion is made from DDVP to Naled on a molecular weight basis. Multiply DDVP toxicity endpoint (e.g., LD_{50} value) by the ratio of the molecular weight of Naled divided by the molecular weight DDVP (380.8 g/mol/220.98 g/mol = 1.7232).
[a] ECOTOX references are designated with an E followed by the ECOTOX reference number.

Toxicity to fish and aquatic invertebrates is categorized using the system shown in Table 4-2 (USEPA, 2004). Toxicity categories for aquatic plants have not been defined.

Table 4-2. Categories of Acute Toxicity for Fish and Aquatic Invertebrates

LC_{50} (mg/L)	Toxicity Category
< 0.1	Very highly toxic
> 0.1 - 1	Highly toxic
> 1 - 10	Moderately toxic
> 10 - 100	Slightly toxic
> 100	Practically nontoxic

4.2.1. Toxicity to Freshwater Fish

Freshwater fish toxicity data was used to assess potential indirect effects of naled to the SFGS and/or CCR. Effects to freshwater fish resulting from exposure to naled could indirectly affect the SFGS or CCR via reduction in available prey items. A summary of acute and chronic freshwater fish data, including data from the open literature, is provided below in Sections 4.2.1.1 through 4.2.1.3.

4.2.1.1. Freshwater Fish: Acute Exposure (Mortality) Studies

<u>*Technical Grade Active Ingredient*</u>

Ten freshwater fish acute toxicity studies with naled (technical) were submitted by the registrant. Eight species were tested and included: Bluegill sunfish *Lepomis macrochirus*; Channel catfish, *Ictalurus punct*atus; Cutthroat trout, *Oncorhynchus clarki*; Fathead minnow, *Pimephales promelas*; Lake trout, *Salvelinus namaycush*; Largemouth bass, *Micropterus salmoides*; Rainbow trout, *Oncorhynchus mykiss*; and Striped bass, *Morone saxatilis.* The 96-hr LC_{50} values ranged from 92 ppb for the lake trout (*S. namaycush*) (MRID 40098001) to 3300 ppb for the fathead minnow (*P. promelas*) (MRID 40098001). Naled technical can be classified as moderately to very highly toxic to freshwater fish on an acute basis.

<u>*Product Formulations*</u>

Nine freshwater fish acute toxicity studies using six product formulations of naled were tested; four formulations were tested using Bluegill sunfish (*L. macrochirus*), four formulations were tested using Rainbow trout (*O. mykiss*), and one formulation was tested using Atlantic salmon (*Salmo salar*). The 96-hr LC_{50} values ranged from 130 ppb for the Rainbow trout (*O. mykiss*, MRID 00263578) to 4,000 ppb for the Bluegill sunfish (*L. macrochirus*, MRID 00160741). Naled formulations can be classified as moderately to very highly toxic to freshwater fish on an acute basis. The toxicity results using formulations of naled were not more toxic than the TGAI. Therefore, TGAI study values will be used for the freshwater invertebrate analysis.

<u>*Degradate DDVP*</u>

Eleven freshwater fish acute toxicity studies with technical grade DDVP were submitted by the registrant. Species tested included Bluegill sunfish (*L. macrochirus*); Cutthroat trout (*O. clarki*); Fathead minnow (*P. promelas*); Lake trout (*S. namaycush*); Mosquito fish (*Gambusia affinis*); and Rainbow trout (*O. mykiss*). Based on reported results the 96-hr LC_{50} values ranged from 100 ppb DDVP (172 ppb expressed as naled, TN 104) for Rainbow trout (*O. mykiss*) to 11,600 ppb DDVP (19900 ppb expressed as naled, MRID 40098001) for Fathead minnow (*P. promelas*). In addition the next lowest endpoints are the Lake trout (*S. namaycush*) with a 96-hr LC_{50} value of 187 ppb and 183 ppb (MRID 40098001). These studies are classified "supplemental" because they were completed under static conditions, and due to the hydrolysis and photolysis processes of degradation, the nominal concentration was not present at 96 hours. Therefore by using the nominal concentrations risk to fish would be underestimated. DDVP is categorized as highly toxic to freshwater fish on an acute basis.

<u>*Measurement Endpoint Selected*</u>

There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic residues (naled + DDVP) approach was employed for the aquatic assessment. Based on the available naled and DDVP data, the most sensitive endpoint in terms of naled is the Lake trout study with naled resulting in an LC_{50} of 92 ppb. Therefore, the measurement endpoint selected for use in estimating indirect effects to the SFGS and/or CCR from effects to fish from total toxic residues (naled + DDVP) in surface water was the Lake trout naled result of 92 ppb (Table 4-1).

4.2.1.2. Freshwater Fish: Chronic Exposure (Growth/Reproduction) Studies

Technical Grade Active Ingredient
There was one fish early life-stage toxicity study with the Fathead minnow (*P. promelas*) that was submitted (MRID 42602201), with a NOAEC and LOAEC for length of 2.9 and 6.3 ppb naled, respectively. Fathead minnow embryos were exposed to nominal concentrations of naled at 2.2, 4.4, 8.7, 17, and 35 ppb a.i. for 35 days. Hatch was complete in 5 days in all chambers and was unaffected by exposure to the test material. Compared to pooled controls, larval survival at hatch and at the end of the test was unaffected by the concentration of naled technical. The test was a flow-through design and mean measured naled concentrations of the test solutions were about 70 to 80% of nominal concentrations. They were 1.6, 2.9, 6.3, 13 and 27 ppb a.i., respectively. The concentration of DDVP in solution was also measured and was observed to increase over the exposure duration.

The increase in DDVP was likely due to naled degradation in the stock solution. If the concentrations of naled and DDVP are combined, the mean measured concentration can be considered "total naled equivalents" and the concentrations were therefore 1.7, 3.4, 6.9, 15, and 33 ppb naled equivalents. For this assessment, the measured naled concentrations, rather than naled equivalents, are used.

Degradate DDVP
There was one fish early life stage toxicity study with the Rainbow trout (*O. mykiss*) that was submitted (MRID 43788001) for the degradate DDVP, with a post-hatch larval survival NOAEC and LOAEC of 5.2 and 10.1 ppb DDVP, respectively (9.0 and 17.4 ppb expressed as naled).

Measurement Endpoint Selected
There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic approach was employed for the aquatic assessment. Therefore, based on the fish early life stage toxicity tests, when expressed in terms of naled the NOAEC value of 2.9 ppb for Fathead minnow was the most sensitive endpoint, and was selected for determining risk estimates for total naled residues (Table 4-1).

The use of the Fathead minnow NOAEC may potentially underestimate risk to some degree because it is not the most acutely sensitive species to naled. However given that under environmental conditions the half-life for naled to DDVP is less than a day, long-term exposure is likely to be to DDVP rather than the parent naled. In this case, the use of the naled value may appropriately estimate risk given that it is more sensitive than the DDVP fish early life stage value for Rainbow trout which was also the most acutely sensitive fish species to DDVP.

4.2.1.3. Freshwater Fish: Sublethal Effects and Open Literature Data

There were no sublethal effects studies available for freshwater fish. There available open literature studies found within the ECOTOX database for both naled and DDVP were found not to be more sensitive than the registrant submitted studies. Further details on ECOTOX studies are provided in Appendix G and H, which also contains the rejection codes and other information as to why studies from ECOTOX were not used.

4.2.2. Toxicity to Freshwater Invertebrates

Freshwater aquatic invertebrate toxicity data are used to assess potential indirect effects of naled to the SFGS and/or CCR. Effects to freshwater invertebrates resulting from exposure to naled could indirectly affect the SFGS and/or CCR via reduction in available prey items. A summary of acute and chronic freshwater invertebrate data, including data published in the open literature, is provided below in Sections 4.2.2.1 through 4.2.2.3.

4.2.2.1. Freshwater Invertebrates: Acute Exposure Studies

Technical Grade Active Ingredient

There were several scientifically sound studies with naled and seven species of freshwater invertebrates, six crustaceans and one aquatic insect, submitted by the registrant. Species tested include the aquatic sowbug (*Asellus brevicaudus*), three species of water flea (*Daphnia magna*, *D. pulex*, and *Simocephalus serrulatus*), two species of scud or amphipods (*Gammarus fasciatus* and *G. lacustris*), and a stonefly (*Pteronarcys californica*). Acute toxicity values for naled range from 0.3 ppb a.i. for the 48-hr LC_{50} for the *D. magna* (MRID 00097572) to 160 ppb a.i. for the 48-hr LC_{50} for the *G. lacustris* amphipod (MRID 05009242). Naled technical can be classified highly to very highly toxic to freshwater invertebrates on an acute basis.

Product Formulations

Four freshwater invertebrate acute toxicity studies using four product formulations of naled were tested using *Daphnia magna*. The 48-hr LC_{50} values ranged from 0.5 ppb (MRID 00084406) to 2.9 ppb (MRID 00160742). Naled formulations can be classified as very highly toxic to freshwater invertebrates on an acute basis. The toxicity results using formulations of naled were not more toxic than the TGAI. Therefore, TGAI study values will be used for the freshwater invertebrate analysis.

Degradate DDVP

There were several scientifically sound studies with DDVP and five species of freshwater invertebrates, four crustaceans and one aquatic insect, submitted by the registrant. Species tested include two species of water flea (*D. pulex* and *S. serrulatus*), two species of scud or amphipods (*G. fasciatus* and *G. lacustris*), and a stonefly (*P. californica*). Acute toxicity values for DDVP range from 0.067 ppb (0.114 ppb, expressed as naled, MRID 40098001) for the 48-hr EC_{50} for the water flea *D. pulex* to 0.50 ppb (0.862 ppb expressed as naled, MRID 40098001) for the 96-hr LC_{50} for the amphipod *G. fasciatus*. The effect measured for the *D. pulex* study was immobilization as a surrogate for mortality. DDVP is classified as very highly toxic to freshwater invertebrates.

Measurement Endpoint Selected
There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic residue approach was employed for the aquatic assessment. Therefore, based on the available naled and DDVP data, the most sensitive endpoint (expressed in terms of naled) was the 48-hr EC50 water flea *D. pulex* study with DDVP (0.114 ppb, expressed as naled). This was the measurement endpoint selected for use in estimating indirect effects to the SFGS and/or CCR from effects to freshwater invertebrate fauna from total naled residues (naled + DDVP) in surface water was the *D. pulex* DDVP result of 0.114 ppb (expressed as naled) (Table 4-1).

4.2.2.2. Freshwater Invertebrates: Chronic Exposure Studies

Technical Grade Active Ingredient
There was one freshwater invertebrate life cycle study with *D. magna* using naled technical that was submitted (MRID 42908801). The most sensitive endpoint were survival and reproduction (number of young produced by surviving female), and the resulting 21-d NOAEC and LOAEC values were 0.098 ppb and 0.180 ppb, respectively. Daphnids were exposed to nominal concentrations of naled at 0.027, 0.054, 0.110, 0.220, and 0.430 ppb ai/L for 21 days. The test was a flow-through design, and mean measured naled concentrations of the test solutions were about 81-101% of nominal concentrations. They were 0.029, 0.045, 0.098, 0.181, and 0.360 ppb ai, respectively. The highest test concentration was analyzed for naled and DDVP using gas chromatography (GC), and it was determined that no measurable levels of DDVP were present in the highest test concentration or stock solution. Adult survival was observed on days 1, 2, 4, 7, 10, 12, 14, 17, 19, and 21, and offspring production was documented of day 7, and three times weekly throughout the remainder of the test. At test termination total body length and dry weight of the surviving adults was also recorded. Survival and reproduction (number of young per female) were compared to the solvent control. Length and dry-weight statistics were not calculated correctly by the reviewer (pooled controls, Bonferroni analysis); however, the mode of action impacted survival and reproduction which influenced the length and dry-weight of the surviving individuals. Also if the statistics were re-calculated for Daphnid length and/or dry-weight using the negative control only, looking at the data it is not likely that the results would be significantly different than using the pooled control data.

Degradate DDVP
There was one freshwater invertebrate life cycle study with *D. magna* using DDVP technical that was submitted by the registrant (MRID 43890301). The most sensitive endpoints were egg production and growth (length and weight), and the resulting 21-d NOAEC and LOAEC values were 0.0058 ppb and 0.0122 ppb (0.010 and 0.021 ppb expressed as naled), respectively.

Measurement Endpoint Selected
There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic approach

was employed for the aquatic assessment. Therefore, based on the available data, the DDVP *D. magna* NOAEC value of 0.010 ppb (expressed as naled) is the most sensitive endpoint, and was used for estimating indirect effects to the SFGS and/or CCR from reproductive effects to freshwater invertebrates from total naled residues (naled + DDVP) (Table 4-1).

4.2.2.3. Freshwater Invertebrates: Sublethal Effects and Open Literature Data

There were no sublethal effects studies available for freshwater inveterbrates. The available open literature studies found within the ECOTOX database for both naled and DDVP were found not to be more sensitive than the registrant submitted studies. Further details on ECOTOX studies are provided in Appendix G and H which also contains the rejection codes and other information as to why studies from ECOTOX were not used.

4.2.3. Toxicity to Estuarine/Marine Fish

Estuarine/marine fish toxicity data was used to assess potential indirect effects of naled to the CCR. Effects to estuarine/marine fish resulting from exposure to naled could indirectly affect the CCR via reduction in available prey items. A summary of acute and chronic estuarine/marine fish data, including data published in the open literature is provided below in Sections 4.2.3.1 through 4.2.3.2.

4.2.3.1. Estuarine/Marine Fish: Acute Exposure Studies

Technical Grade Active Ingredient
Two scientifically sound acute estuarine/marine fish toxicity studies using naled technical were submitted (MRID 00160746 and MRID 05000819). The first study test species was the Sheepshead minnow (*Cyprinodon variegates*), and the 96-hr LC_{50} acute toxicity value for the Sheepshead minnow was 1200 ppb (MRID 00160746). The second study test species was the Striped Bass (*Marone saxatilis*), and the 96-hr LC_{50} value was 500 ppb (MRID 05000819). Therefore, naled technical can be classified as being highly to moderately toxic to estuarine/marine fish on an acute basis.

Product Formulations
One scientifically sound acute estuarine/marine fish toxicity study using one formulation of naled was submitted (MRID 42637201). The test species used was the Sheepshead minnow (*C. variegates*). The 96-hr LC_{50} acute toxicity value for the tested formulated product was 1200 ppb (MRID 42637201). The naled formulation tested can be classified as moderately toxic to estuarine/marine fish on an acute basis. The toxicity results using formulations of naled were not more toxic than the TGAI. Therefore, TGAI study values will be used for the estuarine/marine fish analysis.

Degradate DDVP
One scientifically sound acute estuarine/marine fish toxicity study using DDVP technical was submitted (MRID 43571403). The test species used was the Sheepshead minnow (*C.*

variegates). The 96-hr LC_{50} acute toxicity value for DDVP was 7350 ppb (12, 666 ppb, expressed as naled, MRID 43571403). DDVP can be classified as moderately toxic to estuarine/marine fish on an acute basis.

Measurement Endpoint Selected
There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic approach was employed for the aquatic assessment. Therefore, based on the available data, the naled LC_{50} value of 1200 ppb, was the most sensitive endpoint, and therefore was the measurement endpoint used to estimate indirect effects to the CCR from total toxic residues (naled + DDVP) acute exposure to estuarine/marine fish (Table 4-1).

4.2.3.2. Estuarine/Marine Fish: Chronic Exposure Studies

Technical Grade Active Ingredient
No available estuarine/marine fish early life-stage test studies have been identified for naled.

Degradate DDVP
There is one scientifically sound estuarine/marine fish early life-stage study with the Sheepshead minnow using DDVP technical that was submitted (MRID 43790401). The most sensitive endpoints were survival and length, and the resulting 35-d NOAEC and LOAEC values were 960 ppb and 1840 ppb (1654 and 3171 ppb expressed as naled), respectively.

Measurement Endpoint Selected
There is no estuarine/marine fish early life-stage test available for naled, therefore the DDVP study will be used to estimate indirect effects to the CCR resulting from total toxic residues (naled + DDVP) chronic exposure to estuarine/marine fish (Table 4-1).

4.2.3.3. Estuarine/Marine Fish: Sublethal Effects and Open Literature Data

There were no sublethal effects studies available for estuarine/marine fish. The available open literature studies were found not to be more sensitive than the registrant submitted studies. Further details on ECOTOX studies are provided in Appendix G and H, which also contains the rejection codes and other information as to why studies from ECOTOX were not used.

4.2.4. Toxicity to Estuarine/Marine Invertebrates

Estuarine/marine invertebrate toxicity data was used to assess potential indirect effects of naled to the CCR. Effects to estuarine/marine invertebrates resulting from exposure to naled could indirectly affect the CCR via reduction in available prey items. A summary of acute and chronic E/M invertebrate data, including data published in the open literature, is provided below in Sections 4.2.4.1 through 4.2.4.3.

4.2.4.1. Estuarine/Marine Invertebrates: Acute Exposure Studies

Technical Grade Active Ingredient

There were several scientifically sound studies with naled and one estuarine/marine invertebrate, and one mollusc, submitted by the registrant. Species tested included the Grass shrimp (*Paleamonetes vulgaris*) and the Eastern oyster (*Crassotrea virginica*). Acute toxicity values for naled range from 9.3 ppb a.i. for the 96-hr LC_{50} for the Grass shrimp (*P. vulgaris*, MRID 00160747) to 190 ppb a.i. for the 96-hr EC_{50} for the Eastern oyster (*C. virginica*, MRID 00160748). Naled technical can be classified as highly to very highly toxic to estuarine/marine invertebrates on an acute basis.

Product Formulations

Two scientifically sound estuarine/marine invertebrate acute toxicity studies using one product formulation of naled were tested using one invertebrate and one mollusc. The species that were tested included the Mysid shrimp (*A. bahia*) and the Eastern oyster (*C. virginica*). The 96-hr LC_{50} values ranged from 8.8 ppb (MRID 42637202) for the mysid shrimp to 91 ppb (MRID 42751101) for the Eastern oyster. Naled formulations can be classified as moderately to slightly toxic to estuarine/marine invertebrates on an acute basis. The naled formulation that was tested, Dibrom 8EC is used for mosquito control, and therefore there is the potential for direct exposure to aquatic organisms. The toxicity results using formulations of naled were slightly more toxic than the TGAI, however the most sensitive species was not tested using both TGAI and formulated product. Grass shrimp were tested using TGAI, and Mysid shrimp were tested using the formulated product. Therefore, the comparison of toxicity of TGAI versus formulated product has uncertainty associated with it, the TGAI data can be used looking at runoff, and the formulated product data can be used for spray drift analyses. From the available information there appears that there is no real difference in toxicity between the formulated product and the TGAI, therefore the TGAI LC_{50} values will be used for the estuarine/marine invertebrate analysis.

Degradate DDVP

Two scientifically sound studies using DDVP technical and one species of estuarine/marine invertebrate and one mollusc was submitted. The species that were tested included the Mysid shrimp (*A. bahia*) and the Eastern oyster (*C. virginica*). Acute toxicity values for DDVP range from 19.1 ppb (32.7 ppb, expressed as naled, MRID 43571405) for the 96-hr LC_{50} for the Mysid shrimp (*A. bahia*) to 89, 100 ppb (153, 540 ppb, expressed as naled, MRID 43571404) for the 96-hr EC_{50} for the Eastern oyster (*C. virginica*). DDVP is classified as slightly to very highly toxic to estuarine/marine invertebrates on an acute basis.

Measurement Endpoint Selected

There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic approach was employed for the aquatic assessment. Therefore, based on the available data, the naled Mysid shrimp LC_{50} value of 9.3 ppb (for the TGAI), was the most sensitive endpoint, and therefore was the measurement endpoint used to estimate indirect effects to the CCR from total toxic residues (naled + DDVP) acute exposure to estuarine/marine invertebrates (Table 4-1).

4.2.4.2. Estuarine/Marine Invertebrates: Chronic Exposure Studies

Technical Grade Active Ingredient
There is one scientifically sound estuarine/marine invertebrate life cycle test with Mysid shrimp (*A. bahia*) using naled technical that was submitted (MRID 45031701). The most sensitive endpoints based on mean measured concentrations were male and female body length, and the resulting 31-d NOAEC and LOAEC values were ≤ 0.2 ppb and < 0.2 ppb, respectively due to growth effects at all treatment levels the NOAEC could not be determined.

Degradate DDVP
There is one scientifically sound estuarine/marine invertebrate life cycle test with Mysid shrimp (*A. bahia*) using DDVP technical that was submitted (MRID 43854301). The most sensitive endpoints were weight and length, and the resulting 28-d NOAEC and LOAEC values were 1.48 ppb and 3.25 ppb (2.55 ppb and 5.60 ppb expressed as naled), respectively.

Measurement Endpoint Selected
There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic approach was employed for the aquatic assessment. Therefore, based on the available data, the naled estuarine/marine invertebrate life cycle test with Mysid shrimp was not definitive, and without a NOAEC determined, a "may affect" determination would be concluded for naled exposure to estuarine/marine invertebrates (See Section 5.1.1.4). However, since there were definitive values for DDVP, those were used to estimate indirect effects to the CCR resulting from total toxic residues (naled + DDVP) chronic exposure to estuarine/marine fish (Table 4-1).

4.2.4.3. Estuarine/Marine Invertebrates: Sublethal Effects and Open Literature Data

There were no sublethal effects studies available for estuarine/marine invertebrates. The available ECOTOX open literature studies were reviewed, and no studies using naled or DDVP were found to be more sensitive than the registrant submitted studies or acceptable for use within the risk assessment. Further details on ECOTOX studies are provided in Appendix G and H, which also contains the rejection codes and other information as to why studies from ECOTOX were not used.

4.2.5. Toxicity to Aquatic Plants

Aquatic plant toxicity studies are used as one of the measures of effect to evaluate whether naled may affect primary production. Aquatic plants may also serve as dietary items of SFGS and CCR. In addition, freshwater vascular and non-vascular plant data are used to evaluate a number of the PCEs associated with the critical habitat impact analysis.

Technical Grade Active Ingredient
Four species of freshwater aquatic plants and one species of marine aquatic plants were tested for toxic effects of naled exposure: the duckweed, *Lemna gibba*; the green algae *Selenastrum*

capricornutum; the freshwater diatom *Navicula pelliculosa*; the cyanobacteria (formerly known as bluegreen algae) *Anabaena flos-aquae*, and the marine diatom *Skeletonema costatum*. Biomass or growth-based EC_{50} values ranged from 25 ppb a.i. for the freshwater diatom *N. pelliculosa* (MRID 42529603), to >1,800 ppb a.i. for the duckweed *L. gibba* (MRID 42529601) for the freshwater species and was 50 ppb a.i. for the marine diatom *S. costatum* (MRID 42529602).

To assess risk to endangered species, the NOAEC values, or EC_{05} where a NOAEC could not be determined, are used as measurement endpoints. The NOAEC values ranged from 4.2 ppb a.i. for *N. pelliculosa* (MRID 42529603), to 1,800 ppb for duckweed *L. gibba* (MRID 42529601).

The most sensitive non-vascular freshwater plant is the freshwater diatom, *N. pelliculosa*. Toxicity tests resulted in a 5-day EC_{50} value of 25 ppb a.i., based on cell density. The initial measured concentrations of the test solutions were 4.2, 10.0, 16.0, 30.0, 53.0 and 110.0 ppb. These values indicate average recoveries between 72 and 92%. Because the hydrolytic half-life of naled is 15.4 and 1.6 hours at pH 7 and 9, respectively, the results are therefore based on these initially measured concentrations. Cells were found to be bloated and fragmented in the two highest concentrations (53 and 110 ppb), cells were fragmented in the two median concentrations (16.0 and 30.0 ppb), and in the cells in the remaining concentrations (0 – control, 4.2 and 10 ppb) were normal in appearance (MRID 42529603).

In a Tier I 14-day toxicity study with the aquatic vascular plant duckweed (*L. gibba*), the EC_{50} and NOAEC were determined to be >1800 ppb a.i. and 1800 ppb a.i., respectively, based on dry weight and frond production. At test termination (14 days), naled was not detected in the test solutions but the degradate DDVP was present at a concentration of 0.31 ppb. Plants exposed to the test material were curled, and appeared smaller and chlorotic, and lacked root development in comparison to the control plants but no significant difference in terms of biomass or growth were detected (MRID 42529601).

Product Formulations
No scientifically sound freshwater aquatic plant testing was performed by registrants with product formulations of naled.

Degradate DDVP
When registered aquatic plant testing was not required for DDVP. The DDVP RED identified available supplemental data (F.L. Mayer, 1986; MRID 40228401) showing 48 hour EC_{50} values of >100,000 ppb for green algae (*Dunaliella tertiolecta*), 14,000 ppb for algae (*species not given*) and 17,00-28,000 pbb for marine diatoms (*Thalassiosira pseudonana* and *Skeletonema costatum*), respectively.

Measurement Endpoint Selected
There is some uncertainty associated when comparing naled and DDVP toxicity endpoints with each other due to the degradation rate to DDVP from naled, which is why a total toxic approach was employed for the aquatic assessment. Therefore, based on the available aquatic plant toxicity data the freshwater diatom (*N. pelliculosa*) and duckweed (*L. gibba*) toxicity endpoints were the

most sensitive non-vascular and vascular plant studies, and will be used to estimate indirect effects to the CCR resulting from total toxic residues (naled + DDVP) exposure to aquatic plants (Table 4-1).

4.2.6. Aquatic Field Studies

There were several aquatic field studies that were submitted for naled. All studies submitted used product formulations of naled to simulate real applications in the field.

South Carolina Field Study, MRID 00062358: A simulated field study examined the effects associated with aerial applications (4 and 6 oz/Acre) of Dibrom 14 to four estuarine species (white shrimp, Hardback shrimp, and blue crabs). Test animals were held in Church Creek, an estuarine habitat near Charleston, SC in floating cages and were removed 1 hour post-application to laboratory holding tanks. Observations of mortality were recorded 1, 3, 24, and 48 hours post-treatment. Mortality was measured in both test concentrations for all test organisms. The data from this study is not scientifically unsound, but it is limited in its use, as it can only suggest an acute toxic effect to the organisms tested.

Maryland Field Study, MRID 00142651: A field study examined the effects of aerial application of Dibrom 14 (from aircraft) to a tidal marsh and adjacent upland habitat in Somerset Co., MD. Mortality to ten non-target marsh species (the Eastern oyster, hooked mussel, salt marsh snail, salt marsh periwinkle, red-jointed fiddler crab, spot, and salt marsh killifish) was recorded and compared to an untreated control plot. Organisms were placed in holding cages by species, according to habitat preference for each species. Dibrom 14 was applied at low tide at an application rate of 0.109 lbs a.i./A. Mortality observations occurred one hour prior to application and 24 and 48 hours post application. Missing information includes lack of description for both the control site (i.e., size, habitat type, other treatments if applicable), and species test sites. Test species had low to no mortality being observed. Overall this study was classified as supplemental, due to the lack of information provided regarding site descriptions for both the control and test sites. This study did provide information regarding the potential impacts Dibrom 14 use in salt marshes on non-target species.

Field Study, MRID 00074874: A simulated field study examined the effects of spray application of Naled 8, EC on two aquatic wildlife species; the mosquito fish (*Gambusia affinis*) and North American Bullfrog tadpoles (*Rana catesbeiana*). Test organisms were placed in small screen cages within the test ponds, which had a water depth of 8-12 inches. *G. affinis* was exposed to two different concentrations of naled (0.5 and 2.0 lbs a.i./A), and *R. catesbeiana* tadpoles were exposed to one concentration of naled (0.5 lbs a.i./A). Mortality was recorded 1, 2, 3, 7 and 10 days after exposure for *G. affinis*, and only 24 hours after exposure for *R. catesbeiana*. The study concluded that naled was not toxic at the applied concentrations to the fish and tadpoles that were tested. The experimental design only addresses acute exposures of naled to fish and tadpoles, no other extrapolations can be made from the data.

South Florida Field Study, MRID 00074679: A field study was completed to examine the effects of Ultra-low volume (ULVC) application of Dibrom 14 on fish and wildlife (i.e., aquatic insects, birds, and mammals) in South Florida. The application of Dibrom 14 was made to an area of mangroves, marshes, and poorly drained land. Chemical sensitive cards were used to verify application to the area; however the actual concentration reaching the surface was not determined. A very brief pre-treatment survey of fish and wildlife in the area was made via non-quantitative methods. Both fish (killifish, snook, and mangrove snapper) and rodents (cotton and black rats) were collected before and after treatment to determine the brain cholinesterase level (naled is from the organophosphate class of pesticides). A slight increase in brain cholinesterase levels were found in both fish and rodents after exposure, however the significance is not known. Observations of mortality after pesticide application were limited to 1 hour, as darkness prevented extended observations. Because of this, the evidence of mortality could have been washed away from the overnight tidal flushing or foraging crabs in the area. The only evidence of mortality that was observed was four juvenile blue crabs that were found in a shallow area. The amount of pesticide that was deposited was not measured, therefore there is some uncertainty pertaining to the conclusions relating to effects seen (or not seen) at the listed application rate.

4.3. Toxicity of Naled to Terrestrial Organisms

Table 4-3 summarizes the most sensitive terrestrial toxicity endpoints, based on an evaluation of both the submitted studies and the open literature for naled, and Table 4-4 summarizes the data for DDVP. A brief summary of submitted and open literature data considered relevant to this ecological risk assessment is presented below. Based on the available data naled is classified as highly toxic to birds (and subsequently reptiles as birds are a surrogate species) on an acute oral basis. Naled is classified as slightly toxic to birds on a sub-acute basis. Naled is classified as highly toxic to terrestrial invertebrates, and moderately toxic to mammals on an acute basis. Additional information is provided in Appendix F.

Table 4-3. Terrestrial Toxicity Profile for Naled

Endpoint	Acute/ Chronic	Species	Toxicity Value Used in Risk Assessment*	Citation or MRID # (Author, Date)[a]	Comment
Direct Toxicity to SFGS and/or CCR Indirect Toxicity to SFGS, or CCR, and/or SJKF via Toxicity to Birds (*i.e., prey items and rearing sites*) (Birds are a surrogate for terrestrial-phase amphibians and reptiles)	Acute Oral	Canada Goose (*Branta canadensis*)	14d LD_{50} = **36.9 mg/kg ai-bw**	MRID 44585416 (Smith 1987)	**Supplemental**
	Subacute Dietary	Japanese Quail (*Coturnix japonica*)	8d LC_{50} = **1327 mg/kg ai-diet (ppm ai)**	MRID 00022923 (Hill et al. 1975)	**Supplemental**
	Chronic	Mallard Duck (*Anas platyrhynchos*) &	22–wks NOAEC = **260 mg/kg ai-diet (ppm ai)**	MRID 44517902 (Frey et al. 1998)	**Acceptable** LOAEC = 520 ppm a.i. based on reductions in egg production & % of eggs set of eggs laid
		Northern Bobwhite Quail (*Colinus virginiaus*)	22–wks NOAEC = 260 mg/kg ai-diet (ppm ai)	MRID 44517901 (Frey et al. 1998)	**Acceptable** LOAEC = 520 ppm a.i. based on reductions in male body weight

Endpoint	Acute/ Chronic	Species	Toxicity Value Used in Risk Assessment*	Citation or MRID # (Author, Date)[a]	Comment
Direct Toxicity to SJKF Indirect Toxicity to SFGS, or CCR, and/or SJKF via Toxicity to Mammals (*i.e. prey items, loss of habitat from burrows/rearing sites*)	Acute	Rat	LD_{50} = **92 mg/kg-bw (F)**, 191 mg/kg-bw (M) (Vehicle used 0.5% Carboxymethyl-cellulose, CMC)	MRID 00142660 (Cerkanowicz 1984)	**Acceptable**
	Chronic	Rat	NOAEC = **6 mg/kg-day** (parental systemic effects) 18 mg/kg-day (reproductive toxicity)	MRID 00146498 (Schroeder 1985)	**Acceptable** LOAEC = 18 mg/kg based on decreased body weight gain in both generations.
Direct Toxicity to BCB and/or VELB Indirect Toxicity to SFGS, or CCR, and/or SJKF via Toxicity to Terrestrial Invertebrates (*i.e. prey items*)	Acute Contact	Honey Bee (*Apis mellifera*)	48-hr LD_{50} = **0.48 μg/bee**	MRID 00036935 (Atkins et al. 1975)	**Acceptable**
Indirect Toxicity to SFGS, or CCR, and/or SJKF via Toxicity to Terrestrial Plants (non-obligate relationship) Indirect Toxicity to BCB and/or VELB via Toxicity to Terrestrial Plants (obligate relationship)	n/a	Seedling Emergence Monocots	No Data		
	n/a	Seedling Emergence Dicots	No Data		
	n/a	Vegetative Vigor Monocots	No Data		
	n/a	Vegetative Vigor Dicots	No Data		

* **Bolded** values were used as inputs into T-REX for modeling.
n/a: not applicable; ND = not determined; bw = body weight
[a] ECOTOX references are designated with an E followed by the ECOTOX reference number.

Table 4-4. Terrestrial Toxicity Profile for DDVP

Endpoint	Acute/ Chronic	Species	Toxicity Value Used in Risk Assessment*	Citation or MRID # (Author, Date)[a]	Comment
Direct Toxicity to SFGS and/or CCR Indirect Toxicity to SFGS, or CCR, and/or SJKF via Toxicity to Birds (*i.e., prey items and rearing sites*) (Birds are a surrogate for terrestrial-phase amphibians and reptiles)	Acute Oral	Mallard Duck (*Anas platyrhynchos*)	14d LD_{50} = **7.8 mg/kg ai-bw**[1] (13.4 mg/kg ai-bw)[2]	MRID 00160000 (Hudson et al. 1984)	**Supplemental**
	Subacute Dietary	Japanese Quail (*Coturnix japonica*)	8d LC_{50} = **298 mg/kg ai-diet (ppm ai)**[1] (513 ppm ai)[2]	MRID 00022923 (Hill et al. 1975)	**Supplemental**
	Chronic	Mallard Duck (*Anas platyrhynchos*)	20–wks NOAEC = **5 mg/kg ai-diet (ppm ai)**[1] (8.6 ppm ai)[2]	MRID 44233401 (Redgrave and Mansell 1997)	**Acceptable** LOAEC = 15 ppm[1] (25.9 ppm)[2] Based on reduction in eggshell thickness, and a reduction in the # of eggs laid, set, viable embryos and live 3-wk embryos
Direct Toxicity to SJKF Indirect Toxicity to SFGS, or CCR, and/or SJKF via Toxicity to Mammals (*i.e. prey items, loss of habitat from burrows/rearing sites*)	Acute	Rat	LD_{50} = **56 mg/kg (F)** & 80 mg/kg (M)[1] 96.5 mg/kg (F) & 137.9 mg/kg (M)[2]	MRID 00005467 (Gaines 1960)	**Acceptable**
	Chronic	Rat	NOAEC = **2.3 mg/kg/day**[1] **= 20 ppm**[1] (4.0 mg/kg/day) = 34.5 ppm[2] parental/ systemic & offspring effects	MRID 42483901 (Tyl et al. 1992)	**Acceptable** LOAEC = 8.3 mg/kg/day[1] (14.3 mg/kg/day)[2] Based offspring effects based on reduced # of dams bearing litter, fertility index, pregnancy index, and pup weight.
Direct Toxicity to BCB and/or VELB Indirect Toxicity to SFGS, or CCR, and/or SJKF via Toxicity to Terrestrial Invertebrates (*i.e. prey items*)	Acute Contact	Honey Bee (*Apis mellifera*)	48-hr LD_{50} = **0.495 µg/bee**[1] (0.85 µg/bee)[2]	MRID 00036935 (Atkins et al. 1975)	**Acceptable**
Indirect Toxicity to SFGS, or CCR, and/or SJKF via	n/a	Seedling Emergence Monocots	No Data		

Endpoint	Acute/ Chronic	Species	Toxicity Value Used in Risk Assessment*	Citation or MRID # (Author, Date)[a]	Comment
Toxicity to Terrestrial Plants (non-obligate relationship) Indirect Toxicity to BCB and/or VELB via Toxicity to Terrestrial Plants (obligate relationship)	n/a	Seedling Emergence Dicots	No Data		
	n/a	Vegetative Vigor Monocots	No Data		
	n/a	Vegetative Vigor Dicots	No Data		

[*] **Bolded** values were used as inputs into T-REX for modeling.
[1] Expressed in terms of parent DDVP
[2] Expressed in terms of Naled – A conversion is made from DDVP to Naled on a molecular weight basis. Multiply DDVP toxicity endpoint (e.g., LD_{50} value) by the ratio of the molecular weight of Naled divided by the molecular weight DDVP (380.8 g/mol/220.98 g/mol = 1.7232).
[a] ECOTOX references are designated with an E followed by the ECOTOX reference number.

Acute toxicity to terrestrial animals is categorized using the classification system shown in Table 4-5 (USEPA, 2004). Toxicity categories for terrestrial plants have not been defined.

Table 4-5. Categories of Acute Toxicity for Avian and Mammalian Studies

Toxicity Category	Oral LD_{50}	Dietary LC_{50}
Very highly toxic	< 10 mg/kg	< 50 mg/kg-diet
Highly toxic	10 - 50 mg/kg	50 - 500 mg/kg-diet
Moderately toxic	51 - 500 mg/kg	501 - 1000 mg/kg-diet
Slightly toxic	501 - 2000 mg/kg	1001 - 5000 mg/kg-diet
Practically non-toxic	> 2000 mg/kg	> 5000 mg/kg-diet

4.3.1. Toxicity to Birds and Reptiles

Avian toxicity data was used to assess potential direct effects of naled to the SFGS and CCR, as well as indirect effects of naled to the SFGS, CCR, and SJKF. Effects to avian species resulting from exposure to naled could directly affect the affect the survival, growth and/or reproduction of the SFGS and CCR, as well as indirectly affect the SFGS, CCR, and SJKF via reduction in available prey items. As specified in the Overview Document, the Agency uses birds as a surrogate for reptiles when toxicity data for each specific taxon are not available (USEPA, 2004). A summary of acute and chronic bird and reptile data, including data published in the open literature, is provided below in Sections 4.3.1.1 through 4.3.1.5.

4.3.1.1. Birds: Acute Exposure (Mortality) Studies

Technical Grade Active Ingredient
There are three available avian acute oral studies; all published by U.S. Fish and Wildlife Service, US Department of Interior, Hudson et al., 1984, MRID 00160000, and Smith, 1987,

MRID 44585416. Although listed as separate studies the data presented in them are the same, except one Canada goose endpoint. In the Hudson study, three species of birds were evaluated: the mallard duck (*Anas platyrhynchos*), Canada goose (*Branta canadensis*), and sharp tailed grouse (*Tympanuchus phasianellus*). The resultant acute oral LD_{50} values were 52.2, 49.9, and 64.9 mg/kg-bw, respectively (MRID 00160000). For all species, signs of intoxication included ataxia, goose-stepping, ataxia, tachypnea, salivation, tremors, loss of righting reflex, violent wing-beat convulsions, and opisthotonos. Signs appeared as soon as 5 minutes and mortalities usually occurred between 15 minutes and 3.5 hours after treatment; however, one pheasant died between 2 and 3 days after treatment. Remission took up to 2 weeks. A treatment level as low as 22.2 mg/kg caused mortality in Canada geese. However, the most sensitive avian acute oral endpoint is the Canada goose LD_{50} value of 36.9 mg/kg-bw (MRID 44585416). One key observation was that the smaller (weight) of the bird, the less toxic it was to naled. Overall, naled can be classified as highly toxic to waterfowl and upland game species on an acute oral basis.

Degradate DDVP

Three species of birds were tested with DDVP and include the Bobwhite quail (*Colinus virginiaus*, MRID 40818301), Mallard duck (*A. platyrhynchos*), and Ring-necked pheasant (*Phasianus colchicus*). The LD_{50} values ranged from 7.8 mg/kg-bw (13.44 mg/kg-bw, expressed as naled) for the Mallard duck to 11.3 mg/kg-bw (19.47 mg/kg-bw, expressed as naled) for Ring-necked pheasant (MRID for both results 00160000).

Acute symptoms included goose stepping ataxia, use of wings to aid in balance, tremors, and convulsions. Both the Mallard duck and Ring-necked pheasant data are considered scientifically sound as supplementary data, but do not meet acceptable guideline requirements for an avian acute oral study. This is due of lack of reporting on dose levels tested, number of birds tested per level, mortality/dosage data, and study only tests one sex of both mallards and pheasants. However, the northern bobwhite quail study (MRID 40818301) is considered scientifically sound and fulfills the guideline requirements for an avian single-dose oral LD_{50} study. DDVP can be classified is very highly to highly toxic to waterfowl and upland game species of birds on an acute oral basis.

Measurement Endpoint Selection

The total toxic residue approach that was done for the aquatic assessment (Naled + DDVP) using the most sensitive endpoint in terms of naled, cannot be done for the terrestrial assessment. Therefore, the most sensitive values for DDVP and naled will be analyzed separately. Based on the available naled data, the most sensitive endpoint is the Canada goose LD_{50} value 36.9 mg/kg-bw. Based on the available DDVP data, the most sensitive endpoint is the Mallard duck LD_{50} value of 7.8 mg/kg-bw (as DDVP). These endpoints are the acute oral measurement endpoints that will be used in estimating both direct and indirect effects to the SFGS and/or CCR from effects to avian fauna and the taxa for which they are a surrogate (reptiles) from naled exposures, and subsequent DDVP residue from naled (Table 4-3 and Table 4-4).

4.3.1.2. Birds: Subacute Dietary Exposure (Mortality and Growth) Studies

Technical Grade Active Ingredient
In a subacute study the effects of naled were evaluated on four avian species: Bobwhite quail (*C. virginiaus*), Japanese quail (*Coturnix japonica*), Ring-necked pheasant (*P. colchicus*), and Mallard duck (*A. platyrhynchos*) (MRID 00022923). The resulting 5-day dietary LC_{50} values ranged from 1,327 ppm (mg/kg-diet) for the Japanese quail to 2,724 ppm (mg/kg-diet) for the Mallard duck (MRID 00022923). The LC_{50} is defined as ppm naled (mg/kg-diet) in an ad libitum diet expected to produce 50 percent mortality among 2- to 3-week-old birds in 8 days comprising 5 days on treated diet followed by 3 days on untreated diet. Naled can be classified as slightly toxic to waterfowl and upland game species of birds on an acute dietary basis.

Product Formulations
Product formulation toxicity data is not available from either submitted studies or the open literature.

Degradate DDVP
Three species of birds were tested with DDVP and include the Mallard duck (*A. platyrhynchos*), the Japanese quail (*C. japonica*), and the Ring-necked pheasant (*P. colchicus*) (MRID 00022923). The Mallard duck was tested both with 5 day old birds and 16 day old birds. The LC_{50} values ranged from 298 ppm (513.5 ppm (mg/kg-diet), expressed in terms of naled) for the Japanese quail to >5,000 ppm (>8616 ppm (mg/kg-diet), expressed in terms of naled) for the 16 day old Mallard ducks. Based on the Mallard duck studies, even the slight age difference between the birds appears to affect sensitivity to DDVP with the younger 5 day old birds being more sensitive than the 16 day old birds (1,317 ppm versus >5000 ppm, respectively). DDVP can be classified as slightly toxic to highly toxic to waterfowl and upland game species of birds on an acute dietary basis.

Measurement Endpoint Selected
The total toxic residue approach that was done for the aquatic assessment (Naled + DDVP) using the most sensitive endpoint in terms of naled, cannot be done for the terrestrial assessment. Therefore, the most sensitive values for DDVP and naled will be analyzed separately. Based on the available naled data, the most sensitive endpoint is the Japanese quail LC_{50} value of 1,327 ppm (mg/kg-diet). Based on the available DDVP data, the most sensitive endpoint is the Japanese quail LC_{50} value of 298 ppm (mg/kg-diet) (as DDVP). These endpoints are the dietary measurement endpoints that will be used in estimating both direct and indirect effects to the SFGS and/or CCR from effects to avian fauna and the taxa for which they are a surrogate (reptiles) from naled exposures, and subsequent DDVP residues resulting from naled exposures (Table 4-3 and Table 4-4).

4.3.1.3. Birds: Chronic Exposure (Growth, Reproduction) Studies

Technical Grade Active Ingredient
Two studies on the toxic effects of naled to reproduction of birds were submitted. The test species were the Northern bobwhite quail (*C. virginiaus*, MRID 44517901) and the Mallard duck

(*A. platyrhynchos*, MRID 44517902). Both species had a NOAEC of 260 ppm a.i. (mg/kg-diet), and a LOAEC of 520 ppm a.i. (mg/kg-diet). For the Northern bobwhite quail, the NOAEC was based on significant reductions in male body weights. For the Mallard duck, the NOAEC was based on reductions in egg production (eggs laid, egg set, etc.) and in percentage of eggs set and eggs laid. The following reproductive endpoints were measured in both studies: eggs laid, eggs cracked, eggs set, viable embryos, live 3-week embryos, normal hatchlings, weights for 14-day-old survivors, egg shell thickness, total food consumption, and initial and final body weights, by sex.

Degradate DDVP
Two species of birds were tested with DDVP and include the Mallard duck (*A. platyrhynchos*, MRID 44233401) and the Northern bobwhite quail (*C. virginiaus*, MRID 43981701). The Mallard duck was more sensitive to DDVP than the Northern bobwhite quail. The NOAEC for the Mallard duck, based on a reduction in eggshell thickness and a reduction in the number of eggs laid, eggs set, viable embryos and live three-week embryos was 5 ppm (mg/kg-diet) (8.62 ppm, expressed as naled) and the LOAEC was 15 ppm (mg/kg-diet) (25.8 ppm, expressed as naled). The NOAEC for the Northern bobwhite quail, based on eggs laid, viable embryos, live three-week embryos, normal hatchlings, 14-day old survivors, 14-day survivor weight, food consumption, terminal adult male and female body weight was 30 ppm (mg/kg-diet) (51.7 ppm, expressed as naled) and the LOAEC was 100 ppm (mg/kg-diet) (172 ppm, expressed as naled).

Measurement Endpoint Selected
The total toxic residue approach that was done for the aquatic assessment (Naled + DDVP) using the most sensitive endpoint in terms of naled, cannot be done for the terrestrial assessment. Therefore, the most sensitive values for DDVP and naled will be analyzed separately. Based on the available naled data, the mallard duck and bobwhite quail endpoints were equal with a NOAEC value of 260 ppm a.i. (mg/kg-diet), however the mallard duck species was placed into the modeling system. Based on the available DDVP data, the most sensitive endpoint is the Mallard duck NOAEC value of 5 ppm (mg/kg-diet) (as DDVP). These endpoints are the chronic measurement endpoints that will be used in estimating both direct and indirect effects to the SFGS and/or CCR from effects to avian fauna and the taxa for which they are a surrogate (reptiles) from naled exposures, and subsequent DDVP residues resulting from naled exposures (Table 4-3 and Table 4-4).

4.3.1.4. Reptiles

No reptile data, either submitted by the registrant or found in the open literature, is available for naled or DDVP. Therefore, both the direct and indirect effects to the SFGS and CCR will be analyzed using the avian toxicity data described above, as a surrogate for reptilian toxicity data.

4.3.1.5. Birds: Sublethal Effects and Open Literature Data

There were sublethal effects observed in the avian toxicity data. In the acute oral LD_{50} sublethal effects were observed. Acute symptoms included goose stepping, ataxia, use of wings to aid in balance, tremors, and convulsions (MRID 0160000). Two studies on the toxic effects of DDVP to reproduction of birds were submitted. The Mallard duck (*A. platyrhynchos*, MRID 44233401) endpoints were based on a reduction in eggshell thickness and a reduction in the number of eggs laid, eggs set, viable embryos and live three-week embryos. The Northern bobwhite quail (*C. virginiaus*, MRID 43981701) endpoints were based on eggs laid, viable embryos, live three-week embryos, normal hatchlings, 14-day old survivors, 14-day survivor weight, food consumption, and terminal adult male and female body weight.

There were numerous studies found within the ECOTOX database for both naled and DDVP however, these studies were found not to be more sensitive than the registrant submitted studies. Further details on ECOTOX studies are provided in Appendix G and H, which also contains the rejection codes and other information as to why studies from ECOTOX were not used.

4.3.2. Toxicity to Mammals

Mammalian toxicity data was used to assess potential direct effects of naled to the SJKF, as well as indirect effects of naled to the SFGS, CCR, and SJKF. Effects to mammals resulting from exposure to naled could directly affect the survival, growth and/or reproduction of the SJKF, as well as indirectly affect the SFGS, CCR, and SJKF via reduction in available prey items. A summary of acute and chronic mammalian data, including data published in the open literature, is provided below in Sections 4.3.2.1 through 4.3.2.3. A more complete analysis of toxicity data to mammals is available in Appendix I, which is a copy of the Health Effects Division (HED) chapter prepared in support of the Reregistration eligibility decision completed in 1999, is the most recently completed HED chapter for Naled. The most recent DDVP HED chapter was completed in 2002.

4.3.2.1. Mammals: Acute Exposure (Mortality) Studies

Technical Grade Active Ingredient
The most sensitive acute oral rat LD_{50} value is 92 mg/kg-bw (F) and 191 mg/kg-bw (M), using the Carboxymethyl-cellulose (CMC) carrier, (MRID 00142660). The acute oral studies indicated that naled was more toxic when administered as an aqueous suspension in 0.5% Carboxymethyl-cellulose (CMC) than when administered as a corn oil preparation 92 mg/kg-bw (F) versus 230 mg/kg-bw, respectively. Naled can be classified as moderately toxic to mammals on an acute oral basis.

Degradate DDVP
The most sensitive acute oral rat LD_{50} value is 56 mg/kg-bw (96.5 mg/kg-bw, expressed as naled) for females and 80 mg/kg-bw (137.8 mg/kg-bw) for males. DDVP can be classified as moderately toxic to mammals on an acute oral basis.

Measurement Endpoint Selected
The total toxic residue approach that was done for the aquatic assessment (Naled + DDVP) using the most sensitive endpoint in terms of naled, cannot be done for the terrestrial assessment. Therefore, the most sensitive values for DDVP and naled will be analyzed separately. Based on the available naled data, the most sensitive endpoint is the female LD_{50} value of 92 mg/kg-bw

(using the CMC carrier). Based on the available DDVP data, the most sensitive endpoint is the female LD_{50} value of 56 mg/kg-bw (as DDVP). These endpoints are the acute oral measurement endpoints that will be used in estimating direct effects to the SJKF and indirect effects to the SFGS, CCR, and/or SJKF from effects to mammalian fauna from naled exposures, and subsequent DDVP residues resulting from naled exposures (Table 4-3 and Table 4-4).

4.3.2.2. Mammals: Chronic Exposure (Growth, Reproduction) Studies

Technical Grade Active Ingredient
A two-generation reproduction study was conducted with Sprague-Dawley-derived Charles River CD rats (MRID 00146498). Naled was administered at doses of 0, 2, 6, or 18 mg/kg-bw per day by gavage. Systemic effects were observed in adult male rats of both generations. Body weight gain was depressed at the 18 mg/kg-bw per day dose for F0 males and at all dose levels for F1 males. Survival of pups was reduced at 18 mg/kg-bw/day in the F1 and F2b generations. A consistent decrease in pup weight was also noted during lactation in both generations. The NOAEL for parental systemic effects was 6 mg/kg-bw/day. The LOAEL was 18 mg/kg-bw/day based on decreased body weight gain in both generations. The reproductive toxicity NOAEL was 18 mg/kg-bw/day, which was the highest dose tested (MRID 00146498). The most sensitive reproductive rat NOAEL value is 6 mg/kg-bw (parental systemic effects, MRID 00146498).

Degradate DDVP
The most sensitive reproductive rat parental/systemic NOAEL value was 2.3 mg/kg-bw/day (3.9 mg/kg-bw/day, expressed as naled) with a LOAEL value of 8.3 mg/kg-bw/day (14.3 mg/kg-bw/day, expressed as naled) (MRID 42483901 - Revised Human Health Risk Assessment for Dichlorvos, March 26, 2002). The endpoint is based on decreased percent of females with estrous cycle and increased percent of females with abnormal cycling. The offspring NOAEL value was 2.3 mg/kg-bw/day (3.9 mg/kg-bw/day, expressed as naled), with a LOAEL value of 8.3 mg/kg-bw/day (14.3 mg/kg-bw/day, expressed as naled) based on reduced number of dams bearing litter, fertility index, pregnancy index and pup weight (MRID 42483901).

Measurement Endpoint Selected
The total toxic residue approach that was done for the aquatic assessment (Naled + DDVP) using the most sensitive endpoint in terms of naled, cannot be done for the terrestrial assessment. Therefore, the most sensitive values for DDVP and naled will be analyzed separately. Based on the available naled data, the most sensitive endpoint is the NOAEL value of 6 mg/kg-bw/day. Based on the available DDVP data, the most sensitive endpoint is the NOAEL value of 2.3 mg/kg-bw/day (as DDVP). These endpoints are the chronic measurement endpoints that will be used in estimating direct effects to the SJKF and indirect effects to the SFGS, CCR, and/or SJKF from effects to mammalian fauna from naled exposures, and subsequent DDVP residues resulting from naled exposures (Table 4-3 and Table 4-4).

4.3.2.3. Mammals: Sublethal Effects and Open Literature Data

There were several sublethal effects, from sub-chronic studies that were discussed in the most recent HED Human Health Assessment for naled (the Revised HED Risk Assessment for RED, in 1999). These studies are described below.

Sub-chronic Inhalation Study: A 13-week inhalation study exposed male and female Fischer-344 rats to filtered air (control group) or aerosols containing 0.2, 1, or 6 μg/L of naled for 6 hours/day, 5 days/week. Additional control and high-dose groups recovered for six weeks. Exposure to the highest concentration of 6 μg/L resulted in clinical signs of toxicity manifested as tremors, salivation, nasal discharge, abnormal respiration and anogenital staining. The clinical signs were consistent with cholinergic effects and the observed inhibition of ChE activity. Brain ChE was inhibited at 6 μg/L, while plasma and RBC cholinesterases were inhibited at 1 and 6 μg/L. Only plasma ChE continued to be inhibited six weeks after exposure to the high concentration. No other treatment-related effects were observed. The NOAEL for ChE inhibition was 0.2 μg/L and the LOAEL was 1 μg/L based on depression of plasma (25-30% throughout the study) and RBC (50-60% early in study and 25-30% at 13-weeks) ChE activities. The NOAEL for systemic toxicity was 1 μg/L and the LOAEL was 6 μg/L based on clinical signs of toxicity (MRID 00164224).

Sub-chronic Dermal Study 1: A 28-day dermal study conducted with male and female CD/Sprague-Dawley rats applied naled to intact skin at dose levels of 0, 1, 20, or 80 mg/kg-bw/day for 6 hours/day, 5 days/week. Carboxymethyl-cellulose was the vehicle. The two highest doses were extremely irritating to the skin and produced severe erythema and edema, necrosis and exfoliation. After 28 days, histopathological findings in the skin included acute ulcerative inflammation, necrosis and epidermal hyperplasia. Exposure to 20 and 80 mg/kg-bw/day also produced systemic toxicity. Body weight gain by males was depressed despite increased food consumption. Plasma, RBC and brain cholinesterases were inhibited by 20 and 80 mg/kg-bw/day. Other treatment-related findings were confined to the 80 mg/kg-bw/day groups. Liver and adrenal weights of females were increased and clinical chemistry changes were suggestive of mild renal effects. Both sexes displayed increased blood urea nitrogen and decreased creatinine, total protein and albumin. No treatment-related histopathological changes were observed other than those of the skin. The NOAEL was 1 mg/kg-bw/day for dermal irritation, systemic toxicity and ChE inhibition. The LOAEL was 20 mg/kg-bw/day based on the findings of dermal irritation, reduced weight gain and ChE (60% brain, approximately 50% plasma and approximately 25% RBC) inhibition (MRID 00160750).

Sub-chronic Dermal Study 2: In a 28-day oral study rats (10/sex/dose level) received 0, 0.25, 1, 10 or 100 mg/kg/day of naled by gavage. The 100 mg/kg-bw/day dose level produced mortality and marked cholinergic signs. The 10 mg/kg/day dose produced mild cholinergic signs and 50% reduction in plasma and brain ChE. The 1 mg/kg-bw/day dosage produced 15% plasma ChE inhibition without clinical signs. Although this study was classified as supplemental, it was adequate to establish a NOAEL of 1 mg/kg-bw/day and a LOAEL of 10 mg/kg-bw/day based on cholinergic effects (MRID 00088871).

However, for the purposes of this assessment the effects observed above are not appropriate for RQ calculations because a direct link has not been established between the sublethal effects noted and effects on survival, growth, and reproduction.

In addition to these sublethal endpoints, there were numerous studies found within the ECOTOX database for both naled and DDVP with both lethal and sublethal endpoints. However, these studies from ECOTOX were found either not to be more sensitive than the registrant submitted studies or utilized techniques (i.e., injection) that are not applicable for our risk assessment purposes. Further details on ECOTOX studies are provided in Appendix G and H, which also contains the rejection codes and other information as to why studies from ECOTOX were not used.

4.3.3. Toxicity to Terrestrial Invertebrates

Terrestrial invertebrate toxicity data was used to assess potential direct effects of naled to the BCB and VELB, as well as indirect effects of naled to the SFGS, CCR, and SJKF. Effects to terrestrial invertebrates resulting from exposure to naled could directly affect the survival, growth and/or reproduction of the BCB and/or VELB, as well as indirectly affect the SFGS, CCR, and SJKF via reduction in available prey items. A summary of acute terrestrial invertebrate data, including data published in the open literature, is provided below in Sections 4.3.3.a. through 4.3.3.b.

4.3.3.1. Terrestrial Invertebrates: Acute Exposure (Mortality) Studies

Technical Grade Active Ingredient

Naled was classified as highly toxic to honey bees (*Apis mellifera*) on an acute contact basis (MRID 00036935). A bell-jar vacuum duster was used to apply the pesticide, which was mixed with a pyrolite dust diluent. Dosages of the dust were weighed. The bees were aspirated into dusting cages and treated, after treatment bees were then transferred into holding cages. Observations are recorded at 12, 24, 48, 72, and 96 hours post-treatment. The LD_{50} was determined to be 0.480 µg/bee, and the reported slope value was 18.18. This toxicity value is converted to units of µg a.i./g (of bee) by multiplying by 1 bee/0.128 g (Mayer and Johansen, 1990), thereby resulting in an LD_{50} = 3.75 µg a.i./g.

Degradate DDVP

DDVP was determined to be highly toxic to honey bees (*Apis mellifera*) on an acute contact basis (MIRD 00036935). The LD_{50} value was 0.495 ug/bee (0.85 ug/bee, expressed as naled), and the reported slope was 8.97. This toxicity value is converted to units of µg a.i./g (of bee) by multiplying by 1 bee/0.128 g (Mayer and Johansen, 1990), thereby resulting in an LD_{50} = 3.87 µg a.i. DDVP/g (6.64 µg a.i./g, expressed as naled).

Measurement Endpoint Selected

The total toxic residue approach that was done for the aquatic assessment (Naled + DDVP) using the most sensitive endpoint in terms of naled, cannot be done for the terrestrial assessment.

Therefore, the most sensitive values for DDVP and naled will be analyzed separately. Upon review of the open literature data, it was determined that there were more sensitive values for naled than those submitted by the registrant (E70351 and E39126). The acute contact LD_{50} value of 0.0008 µg/bee (E39126), and the acute oral LD_{50} value of 0.006 µg a.i./g (as calculated from the most sensitive acute contact LD_{50} value, E39126). Based on the available toxicity data for DDVP, the acute contact LD_{50} value of 0.495 ug/bee (3.87 µg a.i./g). These endpoints are the measurement endpoints that will be used in estimating direct effects to the BCB and VELB, and indirect effects to the SFGS, CCR, and/or SJKF from effects to terrestrial invertebrate fauna from naled exposures, and subsequent DDVP residues resulting from naled exposures (Table 4-3 and Table 4-4).

4.3.3.2. Terrestrial Invertebrates: Open Literature Data

There were numerous studies found within the ECOTOX database for both naled and DDVP. Two of these studies (E70351 and E39126) were found to be more sensitive than the naled acute contact LD_{50} value of 0.480 ug/bee), and were reviewed further to determine acceptability for use in this risk assessment.

The first study examined the effects of naled on honeybee brood after application to food in the bottom of brood cells; therefore it was considered an oral dosage to larval bees (*A. mellifera*) (E70351). It was determined that the earlier life stages were more sensitive to oral exposure (via ingestion) to naled. The 1-2, 3-4, and 5-6 day old larvae LD_{50} values were 0.159, 0.197, and 0.429 µg/individual (ppm), respectively (E70531). This study will be utilized qualitatively in the assessment to evaluate/characterize direct effects to the BCB and VELB via oral exposure to naled, and indirect effects to SFGS, CCR, and SJKF.

The second open literature study examined the relative toxicity of naled to the honey bee (*A. mellifera*), alkali bee (*Nomia melanderi*), and the alfalfa leafcutting bee (*Megachile rotundata*) (E39126). The contact LD_{50} for the honey bee, alkali bee, and the alfalfa leafcutting bee were 0.0008, 0.0016, and 0.0245 µg/individual, respectively. The most sensitive toxicity value (0.0008 µg/individual) is converted to units of µg a.i./g (of bee) by multiplying by 1 bee/0.128 g (Mayer and Johansen, 1990), thereby resulting in an LD_{50} = 0.006 µg a.i./g. This study will be utilized qualitatively in the assessment to evaluate/characterize direct effects to the BCB and VELB via contact exposure to naled, and indirect effects to SFGS, CCR, and SJKF.

Further details on ECOTOX studies are provided in Appendix G and H, which also contains the rejection codes and other information as to why studies from ECOTOX were not used.

4.3.4. Toxicity to Terrestrial Plants

Plant toxicity data was previously not required for naled; therefore there are no registrant-submitted studies available for this assessment. However, there is a study from the open literature that was reviewed for use in this assessment. In previous assessments (CRLF, 2008), in lieu of the registrant submitted data, a number of alternatives were used to assess plant toxicity. First, naled is foliarly applied to agricultural crops, and the label cautions that application under certain conditions (humidity, etc) will result in crop damage and there are reported incidents that give validity to this warning (see Section 4.5 for incident information). However, effects to plants include spots and burns and significance of such an effect is unknown.

The open literature study that was reviewed found and examined a connection between naled application and celery petiole lesion (CPL) damage (E63164, Koike, 1997). Affected plants exhibited sunken, brown to tan, dry areas or lesions on the lower portions of petioles, which is an indication of soft, rotten tissues. The study authors concluded that CPL should be considered a phytotoxicity endpoint resulting from naled sprays applied by ground equipment. In fields were naled was applied via aircraft, no CPL was observed. Water volume and crop coverage may also be involved in CPL development, as significantly more water is applied in ground applications when compared to aerial. Moisture levels (pooling and accumulation of liquid at the base of the celery petioles) in conjunction with naled exposure resulted in increased instances of petiole lesion damage seen in celery. The combination of the extra moisture and chemical naled after ground spray application results in CPL in celery, as naled is causing entrance for bacteria.

The BCB and VELB each have obligate relationships with terrestrial plants (dwarf plantain and elderberry, respectively). However, it does not seem probable that other native plant populations will exhibit this characteristic (CPL) since they usually do not have water intensive petioles like celery. There are also no other indications that other crop species are also affected like celery to naled exposure. Therefore it does not appear that naled will have a significant effect on native populations or on obligate species such as elderberry or the dwarf plantain. This study will be utilized qualitatively in the assessment to evaluate/characterize indirect effects (food/habitat) non-obligate relationship to the SFGS, CCR and SJKF, and indirect effects (food/habitat) obligate relationship to the BCB and VELB.

4.3.5. Terrestrial Field Studies

Naled

Numerous terrestrial field studies have been submitted for naled. All studies submitted used product formulations of naled to simulate real applications in the field. Naled was shown to be highly toxic to honey bees (MRID 00037799, 00060628) and alfalfa leafcutter bees (05000837, 00060628) when bees were exposed to direct treatment or to short-term (less than three hours) residues.

Field Study 1, MRID 00037799: Residue toxicity to bees was examined using two formulations (Dibrom E and WP) of naled. Naled formulations (Dibrom) were applied by hand to small plots of alfalfa. Cages of honey bees were placed into the plots prior to pesticide treatment. At intervals after treatment (0, 3 and 24 hours), foliage samples from each plot were placed in cages and the cages were loaded with bees. Bees were checked for mortality after 24 hours. At 1 lb a.i./A, both dibrom formulations (WP and E) caused 100% mortality of bees treated during the application. All bees were dead within 30 minutes. The three hour residues of the WP formulation (1 lb a.i./A) caused 100% mortality, while residues of the E formulation (same time and rate) caused 59% mortality. The 24-hour residues of either formulation were not toxic to honey bees.

Field Study 2, MRID 05000837: The toxicity of field-weathered residue samples on three species of bees was examined. Species tested included the honey bee (*A. mellifera*), alkali bee (*N. melanderi*), and alfalfa leafcutting bee (*M. rotundata*). Field-weathered residue samples were obtained by applying the recommended rates of various insecticides to 1/100-acre plots of alfalfa with a hand sprayer at 25 gal/acre and 20 psi pressure. The sample foliages were collected from each plot at desired post-application intervals (3 hours), chopped and placed into the various bee cages. The experiments were conducted with four replicates and mortality was checked at 24 hours. Experimental conditions for various bees were described as follows:

A) Honey bees: 50-100 bees/cage were fed sugar syrup and held at 78 degrees Fahrenheit
B) Alkali bees and alfalfa leafcutter bees: 10-15 alkali bee/cage or 20-30 leafcutter bees/cage were fed with honey syrup at 88 degrees Fahrenheit.

The susceptibility of three most important bee pollinators to 25 common insecticides was compared. The typical pattern of susceptibility was listed in descending order from alfalfa leafcutter bee > alkali bee > honey bee in 17 of the 25 insecticides tested. For naled, the order was the same.

Field Study 3, MRID 00060628: Residue toxicity to bees was examined using one formulation (Dibrom E) of naled. Naled (Dibrom) was applied by hand to small plots of alfalfa. Three species of bees were tested, the honey bee (*A. mellifera*), alkali bee (*N. melanderi*), and alfalfa leafcutting bee (*M. rotundata*). Bees were caged with foliage samples and fed sugar syrup. Bees were checked for mortality after 24 hours. At 1 lb a.i./A, 1 hour old Dibrom residue was extremely toxic to all three species (95-100% mortality, evaluated at 24 hours). The 24-hour residues were relatively non-toxic to all species of bees (0-12 % mortality).

The terrestrial field studies showed that short-term residues of naled were highly toxic to honey bees, moderately to highly toxic to alkali and alfalfa leafcutting bees (MRIDs 00037799 05000837, 00060628). In all of the above studies which dealt with residues, data indicated there was a significant decrease in residual toxicity from 3 to 24 hours post-treatment. The results indicate that the residual toxicity of naled (Dibrom) was short-lived.

4.4. Toxicity of Chemical Mixtures

As previously discussed in Section 2.2.2, naled does not have any registered products that contain multiple active ingredients. Therefore, toxicity data for mixtures of naled with other pesticides is not applicable.

4.5. Incident Database Review

A review of the Ecological Incident Information System (EIIS, version 2.1), the 'Aggregate Incident Reports' (v. 1.0) database, and the Avian Monitoring Information System (AIMS) for ecological incidents involving naled was completed on April 29, 2010. The results of this review for terrestrial, plant, and aquatic incidents are discussed below in Sections 4.5.1 through 4.5.3. A complete list of the incidents involving naled including associated uncertainties is included as Appendix K.

4.5.1. Terrestrial Incidents

Terrestrial Invertebrates

There were a total of 5 reported incidents relating to terrestrial invertebrates found in the EIIS database (I005855-001, I005980-002, I003870-001, I014341-015, I013884-024). Two of these incidents categorize naled as a probable cause (I005980-002 & I003870-001), and three categorize naled as a possible cause (I005855-001, I014341-015 & I013884-024). In the first incident, documented the loss of approximately 700 bees in a bee hive adjacent to an agricultural area where pesticides were applied (I005980-002). There were three registered uses of pesticides on the adjacent agricultural area; including Dibrom (Naled), Lorsban (Chlorpyrifos), and Monitor (Methamidophos). It is unclear how or when applications occurred in relation to each other, but all three pesticides are categorized as being probable causes of the incident. In the second reported incident, a private citizen complained about the aerial application of Dibrom (Naled) (I003870-001). However, no data was reported, and the report provides subjective observations by the citizen of the "eradication of dragonflies, butterflies, praying mantis, honey bees and other insects and birds associated with water" (I003870-001). The third incident reported from the American Beekeeping Federation describes the impacts pesticides are having on bee populations (I005855-001). The incidents included took place between January 1 and June 16, 1997. There were four other pesticides (Methyl Parathion, Carbaryl, Parathion, and Carbofuran) listed as being highly probable cause of the incidents, whereas naled was listed as a possible cause of bee kills mentioned in the report (I005855-001). The fourth incident documented a total of 20 hives were killed as the possible result of Naled or Dimethoate exposure from aerial application for use on beans (I014341-015). Tissue samples reported that naled was found at a concentration of 0.07 ppm on one bee specimen (I014341-015). In the final reported incident a honeybee kill was alleged to have occurred in August 1998 from a dimethoate application to a nearby bean field (I013884-024). However, naled is also listed as a possible cause of the kill in addition to dimethoate (I013884-024). A total of 20 Colonies, Apiary #398 were impacted. The lab did not detect OP on samples of bees or off target samples, but they did find OP breakdown products on target. No more information was provided in terms of concentrations of the samples that were taken (I013884-024).

Birds

There were three reported bird incidents within the EIIS and AIMS databases, and naled was categorized as the possible cause of all three (I019411-016, I003062-001, and B0000-506-03, Section 4.5.1). One of the incidents, I019411-016, documented a debilitated adult male red-tailed hawk (Ladner, BC – 11/1997) with 14.0 ppm of fonofos, 28 ppm of dichlorvos, and 73 ppm of naled within its crop. There were the remnants of a bird within its GI tract. Further analysis showed that the plasma had a cholinesterase activity of 744 umol/min/L. Although this level was greater than in other debilitated raptors observed in this study, it was still about 33% below normal. Any of the three detected OP insecticides may cause ChE inhibition; therefore, the contribution of each chemical to the cause of this incident is uncertain. The hawk survived under the care of a rehabilitation facility and was later released. Naled, DDVP and fonfos are all categorized as being a possible cause of the incident. The second incident was reported in order to comply with 6(a)2 regulations. Valent Corporation reported a complaint (neither state nor county identified) that a bird died as the result of exposure to Naled (I003062-001). The symptom was marked as "respiratory arrest" and no other information was provided. Naled is categorized as being a possible cause of the incident. The last reported incident, which is found in both EIIS (B0000-506-03) and AIMS (Event Id: 200) was a complaint submitted by a citizen that had approximately 60 pheasants, 3 wild turkeys, and 3 barn swallows killed on his property after exposure to Dibrom 14 (naled) from application to a road in front of his house. His property was sprayed on July 14 at 12:15 AM, and a second pass was made at 12:35 AM, after he requested it not be. Birds were observed dying in the days following application. Symptoms were first observed within 6 hours of application, and included limping, which was followed by leg paralysis and eventually death. This citizen felt that the birds found to be dying after day 1 did so because they stopped eating. Approximately 63 birds were dead by July 19 (5 days after application). There was a portion of his flock that was left indoors and therefore were not exposed to Dibrom (naled) and were not affected. The health department officials took birds for analysis but seemed more interested in bacterial causes and discounted the possibility of pesticides as a factor in the death of these birds. Therefore, naled was categorized as being a possible cause of the incident. There are documented incidents of naled impacting birds near areas of application.

4.5.2. Plant Incidents

There were four plant incidents reported in the EIIS database (Appendix K), (I002969-055, I012366-025, I007467-021, and I002969-051). Three incidents were categorized naled as possibly responsible for the incident (I002969-055, I012366-025, and I002969-051), and one categorized naled as probably responsible for the incident (I007467-021). All incidents were associated with applications to agricultural areas; cabbage, celery and cotton uses. Observations included defoliation of cotton plant, which was attributed to fertilizer burn or tank contamination (I002969-055). This incident occurred after direct treatment to cotton, which was potentially associated to use on cotton, and naled was categorized as being a possible cause of the incident (I002969-055). The second incident reported plant damage to cabbage; however, environmental conditions in the area may have also contributed to cabbage leaf spot (I002969-051). This incident occurred after direct treatment to cabbage, which was potentially associated to a use on cabbage, and naled was categorized as being a possible cause of the incident (I002969-051). The third incident was reported to comply with 6(a)2 requirements, Dow reported a complaint from Fresno, CA, that LORSBAN 4E damaged a total of 751 acres of cotton (I012366-025). There were 4 growers who had 9 fields ranging from 34 acres to 155 acres, and one applicator sprayed aerially the various fields with Lorsban @ 1 qt/acre, Dibrom @ 1 pt/acre, and Britz Buffer @ 3.2 oz/acre; the Britz Buffer is a petroleum distillate and contains no pesticide (I012366-025). Symptoms of damage were burned leaves and dropped bolls, and the yield losses ranged from 250- to 470-pounds/acre, and naled was categorized as being a possible cause of the incident (I012366-025). In the fourth reported incident, celery was damaged by Dibrom, showing symptoms of celery skin burn (I007467-021). This incident occurred after direct treatment to celery, which was potentially associated to the use of naled on celery, and naled was categorized as being a possible cause of the incident (I007467-021).

4.5.3. Aquatic Incidents

Fish

There were two reported fish incidents found in the EIIS database (B0000-501-32 and I003870-001, Appendix K). However one of the incidents involving fish categorized naled as an unlikely cause of the incident and Toxaphene was listed as the probable cause of the incident (B0000-501-32). Whereas the second incident categorized naled as the probable cause of the incident in which an unknown amount of an unknown fish were killed after Dibrom (naled) was applied by aerial spray application in association to a registered use on water in Worcester County Maryland (I003870-001).

4.6. 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 (USEPA, 2004). As part of the risk characterization, an interpretation of acute RQs 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 naled (and DDVP residues) 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. The default slope is 4.5 (95% CI 2-9). There are three instances in which slope information is provided, one for freshwater invertebrates (DDVP), and two for terrestrial invertebrates (one for naled and one for DDVP). For freshwater invertebrates, a probit slope of 7.71 (95% C.I. = 3.29 and 12.12). For terrestrial invertebrates, a probit slope of 18.2 and 8.9 is reported for naled and DDVP, respectively, confidence intervals were not provided in the study (MRID 00036935). These values will be used to characterize the likelihood of risk to individuals with the IEC model.

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 Bay Checkerspot Butterfly (BCB), Valley Elderberry Longhorn Beetle (VELB), California Clapper

Rail (CCR), San Francisco Garter Snake (SFGS), and the San Joaquin Kit Fox (SJKF) or for modification to their designated critical habitat from the use of naled in CA. 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 assessed species or their designated critical habitat (*i.e.*, "no effect," "likely to adversely affect," or "may affect, but not likely to adversely affect"). In the risk estimation section, risk quotients are calculated using standard EFED procedures and models. In the risk description section, additional analyses may be conducted to help characterize the potential for risk.

Some differences between the most recent assessment and this assessment are that the RQs in this assessment use EECs and endpoints in ppb instead of micromoles/liter and the method used for determining the EECs for the use of naled on swamps (see Section 3.2.1 for more information) is revised. The revised RQs and swamp values can be seen in Appendix M.

5.1. Risk Estimation

5.1.1. Exposures in the Aquatic Habitat

5.1.1.1. Freshwater Fish and Aquatic-phase Amphibians

Acute risk to fish and aquatic-phase reptiles is based on 1 in 10 year peak EECs in the standard pond and the lowest acute toxicity value for freshwater fish. Chronic risk is based on the 1 in 10 year 60-day EECs and the lowest chronic toxicity value for freshwater fish.

Risk quotients for freshwater fish on an acute basis ranged from < 0.01 (ground application to grapes) to 5.49 (swamp use for the control of mosquitoes and other flying insects). Acute RQs exceed the acute risk LOC (0.05) for more than half of the modeled naled scenarios.

The risk quotients for freshwater fish on a chronic basis ranged from 0.01 (ground application to peaches) to 174.14 (swamp use for the control of mosquitoes and other flying insects). Chronic RQs exceed the chronic risk LOC (1.0) for naled scenarios.

For a list of all RQs, please refer to Appendix M.

The CCR and the SFGS rely on freshwater fish at some point in their life cycle, looking at the acute and chronic RQs for aquatic freshwater fish determines if there will be indirect effects to these species. In addition, since the SJKF, VELB, and BCB do not rely on aquatic freshwater fish, it is assumed that effects to these species via freshwater fish as prey items are unlikely and are not being assessed.

Based on naled and it's degradate DDVP resulting in exceedances for both acute and chronic exposure, naled does have the potential for indirect effects to those listed species that rely on fish and aquatic-phase amphibians during at least some portion of their life-cycle (*i.e.*, CCR, SFGS).

5.1.1.2. Freshwater Invertebrates

Acute risk to freshwater invertebrates is based on 1 in 10 year peak EECs in the standard pond and the lowest acute toxicity value for freshwater invertebrates. Chronic risk is based on 1 in 10 year 21-day EECs and the lowest chronic toxicity value for freshwater invertebrates. Risk quotients for freshwater invertebrates are shown in Table 31 (Acute and Chronic) in the CRLF Assessment.[8].

Acute and chronic RQs exceed the acute and chronic LOCs (0.05 and 1.0, respectively) for all scenarios modeled. The acute RQs ranged from 2.54 (grapes- ground application) to 4,429.82 (mosquito use on swamps). The chronic RQ values for aquatic invertebrates ranged from 10 (grapes – ground application) up to 50,500 (mosquito use on swamps). For a list of all RQs, please refer to Appendix M.

Since the CCR and the SFGS rely on freshwater invertebrates at some point in their life cycle, looking at the acute and chronic RQs for aquatic freshwater invertebrates determines if there will be indirect effects to these species. Since the SJKF, VELB, and BCB do not rely on aquatic freshwater invertebrates, it is assumed that effects to these species via freshwater invertebrates as prey items are unlikely and are not being assessed.

Based on naled and its degradate DDVP resulting in an LOC exceedance for every use, naled does have the potential for indirect effects to those listed species that rely on freshwater invertebrates during at least some portion of their life-cycle (*i.e.*, CCR, SFGS).

5.1.1.3. Estuarine/Marine Fish

Acute risk to estuarine/marine fish is based on 1 in 10 year peak EECs in the standard pond and the lowest acute toxicity value for estuarine/marine fish. Chronic risk is based on 1 in 10 year 60-day EECs and the lowest chronic toxicity value for estuarine/marine fish is used. . Due to exceedances for freshwater fish on an acute and chronic basis, and since both freshwater fish and estuarine/marine fish are measures of indirect effect to the CCR, it is assumed that even if there are no risks based on effects to estuarine/marine fish, CCR are still indirectly affected because of effects to freshwater fish and invertebrates. The endpoints for the freshwater fish are more sensitive than the estuarine/marine fish endpoints.

Since the CCR relies on estuarine/marine fish at some point in their life cycle, looking at the acute and chronic RQs for aquatic estuarine/marine fish determines if there will be indirect effects to these species. Since the SFGS, SJKF, VELB, and BCB do not rely on aquatic estuarine/marine fish, it is assumed that effects to these species via estuarine/marine fish as prey items are unlikely and are not being assessed.

Due to exceedances for freshwater fish on an acute and chronic basis it is assumed that CCR are indirectly affected. Therefore, it can be assumed that naled has the potential for indirect effects

[8] USEPA California Red Legged Frog Risk Assessment, 2008

to those listed species that rely on estuarine/marine fish during at least some portion of their life-cycle (*i.e.*, CCR).

5.1.1.4. Estuarine/Marine Invertebrates

Acute risk to estuarine/marine invertebrates is based on peak EECs in the standard pond and the lowest acute toxicity value for estuarine/marine invertebrates. Chronic risk is based on 21-day EECs and the lowest chronic toxicity value for estuarine/marine invertebrates. Due to exceedances for freshwater invertebrates on an acute and chronic basis, and since both freshwater invertebrates and estuarine/marine invertebrates are measures of indirect effect to the CCR, it is assumed that even if there are no risks based on effects to estuarine/marine invertebrates, CCR are still indirectly affected because of effects to freshwater fish and invertebrates. The endpoints for the freshwater invertebrates are more sensitive than the estuarine/marine invertebrate endpoints.

The CCR relies on estuarine/marine invertebrates at some point in their life cycle. Looking at the acute and chronic RQs for aquatic estuarine/marine invertebrates determines if there will be indirect effects to these species. Since the SFGS, SJKF, VELB, and BCB do not rely on aquatic estuarine/marine fish, it is assumed that effects to these species via estuarine/marine invertebrates as prey items are unlikely and are not being assessed.

Due to exceedances for freshwater invertebrates on an acute and chronic basis it is assumed that CCR are still indirectly affected. Therefore, it can be assumed that naled has the potential for indirect effects to those listed species that rely on estuarine/marine invertebrates during at least some portion of their life-cycle (*i.e.*, CCR).

5.1.1.5. Non-vascular Aquatic Plants

Acute risk to aquatic non-vascular plants is based on 1 in 10 year peak EECs in the standard pond and the lowest acute toxicity value. Risk quotients are shown in Table 5-1.

Table 5-1. Summary of Acute RQs for Non-Vascular Aquatic Plants.

Uses	Peak EEC (µg/L)	RQ*
almond, walnut Max App Rate: 1.9 lb a.i./A, Interval: NA days, Max apps: 1, Ground spray	2.47	0.10
orange, lemon, grapefruit, tangerine Max App Rate: 1.9 lb a.i./A, Interval: 7 days, Max apps: 3, Aerial spray (12%)	17.54	0.73
cabbage, broccoli, cauliflower, collards, kale Max App Rate: 1.9 lb a.i./A, Interval: 7 days, Max apps: 5, Ground spray	12.88	0.54
cabbage, broccoli, cauliflower, collards, kale Max App Rate: 1.9 lb a.i./A, Interval: 7 days, Max apps: 5, Aerial spray (12%)	24.66	**1.03**
Cotton Max App Rate:0.9 lb a.i./A, Interval: 7 days, Max apps: 5, Aerial spray (12%)	11.16	0.46

Uses	Peak EEC (µg/L)	RQ*
Cotton Max App Rate:1.4 lb a.i./A, Interval: 7 days, Max apps: 3, Ground spray	8.74	0.36
Peaches Max App Rate: 1.9 lb a.i./A, Interval: NA days, Max apps: 1, Ground spray (2.7%)	3.35	0.14
Grapes Max App Rate: 0.9 lb a.i./A, Interval: 8 days, Max apps: 6, Airblast	0.71	0.03
Grapes Max App Rate: 0.5 lb a.i./A, Interval: 8 days, Max apps: 9, Ground spray	0.29	0.01
Brussels sprouts, Swiss Chard* Max App Rate: 1.9 lb a.i./A, Interval: 7 days, Max apps: 5, Aerial spray (12%)	17.24	0.72
Eggplant, summer squash, cataloupes, muskmelons, melons Max App Rate: 1.9 lb a.i./A, Interval: 7 days, Max apps: 3, Aerial spray (12%)	16.60	0.69
Celery Max App Rate: 1.4 lb a.i./A, Interval: 7 days, Max apps: 5, Ground spray Ground spray	6.52	0.27
Celery Max App Rate: 1.4 lb a.i./A, Interval: 7 days, Max apps: 5, Aerial spray (12%)	16.86	0.70
beans, peas Max App Rate: 1.4 lb a.i./A, Interval: 7 days, Max apps: 3, Ground spray	1.06	0.04
beans, peas Max App Rate: 1.4 lb a.i./A, Interval: 7 days, Max apps: 5, Aerial spray (12%)	12.93	0.54
Peppers Max App Rate: 1.9 lb a.i./A, Interval: 7 days, Max apps: 3, Aerial spray (12%)	17.49	0.73
Strawberries Max App Rate: 0.9 lb a.i./A, Interval: 7 days, Max apps: 5, Aerial spray (12%)	8.52	0.36
Safflower Max App Rate: 2.1 lb a.i./A, Interval: 7 days, Max apps: 2, Aerial spray (12%)	41.16	**1.67**
Hops Max App Rate: 0.9 lb a.i./A, Interval: 14 days, Max apps: 5, Aerial spray (12%)	7.10	0.30
Hops Max App Rate: 0.9 lb a.i./A, Interval: 14 days, Max apps: 5, Ground spray	2.43	0.10
Mosquitoes, Flies, etc. (Rangeland) Max App Rate: 0.1 lb a.i./A, Interval: 3 days, Max apps: 25, Aerial spray (11%)	1.31	0.05
Mosquitos, Flies, etc. (Impervious Surfaces) Max App Rate: 0.1 lb a.i./A, Interval: 3 days, Max apps: 25, Aerial spray (11%)	5.25	0.22
Mosquitos, Flies, etc. (Forestry) Max App Rate: 0.9 lb a.i./A, Interval: 3 days, Max apps: 25, Aerial spray (11%)	13.75	0.57
Mosquitoes, Flies, etc. (Residential) Max App Rate: 0.1 lb a.i./A, Interval: 3 days, Max apps: 25, Aerial spray (11%)	2.58	0.11

Uses	Peak EEC (μg/L)	RQ*
Swamp (mosquito, Flying Insects)	505	**21.04**
sugar beets Max App Rate: 0.9 lb a.i./A, Interval: 7 days, Max apps: 5, Ground spray	1.99	0.08
sugar beets Max App Rate: 0.9 lb a.i./A, Interval: 7 days, Max apps: 5, Aerial spray (12%)	7.23	0.30
Alfalfa Max App Rate: 1.4 lb a.i./A, Interval: 7 days, Max apps: 3, Aerial spray (12%)	14.39	0.60
Ornamental shrubs, flowering plants, outdoor nursery ops Max App Rate: 0.9 lb a.i./A, Interval: 3 days, Max apps: 25, Ground spray	93.59	**3.90**

*LOC exceedances (RQ $\geq$ 1) are **bolded**. RQ = use-specific peak EEC/ [24 ppb - non-vascular aquatic plant endpoint].

Since the CCR and the SFGS rely on non-vascular plants at some point in their life cycle, looking at the acute and chronic RQs for non-vascular aquatic plants determines if there will be indirect effects to these species. Since the SJKF, VELB, and BCB do not rely on non-vascular aquatic plants, it is assumed that effects to these species via non-vascular aquatic plants as habitat or food items are unlikely and are not being assessed.

Based on naled and it's degradate DDVP, naled does have the potential for indirect effects to those listed species that rely on non-vascular aquatic plants during at least some portion of their life-cycle (*i.e.*, CCR, SFGS) for ornamental, cabbage, broccoli, cauliflower, collards, kale, safflower, forestry, and direct water (swamps for mosquitoes) uses.

5.1.1.6. Aquatic Vascular Plants

Acute risk to aquatic vascular plants is based on 1 in 10 year peak EECs in the standard pond and the lowest acute toxicity value.

Since the CCR and the SFGS rely on vascular plants at some point in their life cycle, looking at the acute and chronic RQs for vascular aquatic plants determines if there will be indirect effects to these species. Since the SJKF, VELB, and BCB do not rely on vascular aquatic plants, it is assumed that effects to these species via vascular aquatic plants as habitat or food items are unlikely and are not being assessed.

Resulting unicellular plant RQs do not exceed the LOC (1.0) for aquatic plants. The RQs ranged from <0.01 ppb for multiple uses to 0.28 ppb for the use of naled on swamps. For a list of all the RQs, please refer to Appendix M.

Based on naled and its degradate DDVP, naled does not have the potential for indirect effects when used on cole crops to those listed species that rely on vascular aquatic plants during at least some portion of their life-cycle (*i.e.*, CCR, SFGS).

5.1.2. Exposures in the Terrestrial Habitat

5.1.2.1. Birds (surrogate for Reptiles)

As previously discussed in Section 3.3, potential direct effects to terrestrial species are based on foliar applications of naled and resulting DDVP residues. Potential risks to birds and, thus, reptiles are evaluated using T-REX, acute and chronic toxicity data for the most sensitive bird species for which data are available, and the most sensitive dietary item and size class for that species. For birds the most sensitive RQ in T-REX is for the small bird consuming short grass. RQs are also calculated using T-HERPS only if the "standard" avian RQs (based on the 20 g bird consuming short grass) calculated by T-REX (v.1.4.1) exceed the listed species LOC for acute or chronic exposures (LOC of 0.1 and 1.0, respectively). RQs incorporate the food intake allometric equation for herptiles, as herptiles have lower food intake relative to birds. An example T-REX and T-HERPS output are available in Appendix E. In addition to dietary exposure, there is the potential for inhalation exposure to birds via volatization. Both naled and DDVP volatilize, and there is the potential for birds to be exposed to naled and/or DDVP as the result of naled application. However, no further toxicological data is available to evaluate this route of exposure. Therefore, as a result there is an uncertainty associated with the potential exposure route of avian inhalation resulting from the use of naled and the subsequent degradation to DDVP.

Potential direct acute effects of naled and DDVP to the CCR and SFGS are derived by considering dose- and dietary-based EECs modeled in T-REX for a small bird [20 g (for juveniles) and 100 g (for adults)] consuming a variety of dietary items (Table 3-5 and Table 3-6) and acute oral and subacute dietary toxicity endpoints for avian species (Table 4-3 and Table 4-4). EECs are divided by toxicity values to estimate acute dose- and dietary-based RQs.

Potential direct chronic effects of naled and DDVP to the CCR are derived by considering dietary-based EECs modeled in T-REX for a small bird [20 g (juveniles) and 100 g (adults)] consuming a variety of dietary items and acute oral and subacute dietary toxicity endpoints for avian species. Potential direct chronic effects of naled and DDVP to the SFGSS are derived by considering dietary-based exposures modeled in T-REX for a small bird (20g) consuming small invertebrates. The specific EECs for each species are for the same size birds and same dietary items as those considered for acute exposure. Chronic effects are estimated using the lowest available toxicity data for birds. EECs are divided by toxicity values to estimate chronic dietary-based RQs. Acute and chronic RQs for the CCR and SFGS, birds and reptiles, derived using T-REX are shown in Table 5-2 through Table 5-5. Percent and probability of individual effect of acute exposure to naled and/or DDVP on birds and reptiles are presented in Table 5-2 and Table 5-4.

T-HERPS is used to assess potential risk to snakes and as a refinement to RQs for reptiles if T-REX indicates potential risk to reptiles. Potential direct acute effects to the SFGS are evaluated by considering dose- and dietary-based EECs modeled in T-HERPS for medium snakes consuming small herbivorous mammals (Table 3-5 and Table 3-6) and acute oral and subacute dietary toxicity endpoints for avian species (Table 4-3 and Table 4-4). Potential direct chronic effects to the SFGS are evaluated by considering dietary-based EECs modeled in T-HERPS consuming a variety of dietary items. Chronic effects are estimated using the lowest available toxicity data for birds. EECs are divided by toxicity values to estimate chronic dietary-based RQs. Small snakes only consume insects (small and large) while medium and large snakes consume small and large insects, mammals (herbivorous and insectivorous), and amphibians. The most sensitive RQ for snakes are for medium snakes consuming small herbivore mammals. Acute and chronic RQs for the SFGS, and reptiles, derived using T-HERPS are shown in Table 5-6 through Table 5-9. Percent and probability of individual effect of acute exposure to naled and/or DDVP on reptiles, based on the refinement are presented in Table 5-6 and Table 5-8.

Potential for indirect effects to the CCR, SJKF, and SFGS may result from direct acute effects to birds and/or amphibians due to a reduction in prey. RQs for indirect effects are calculated in the same manner as those for direct effects. The most sensitive EEC calculated in T-REX is for small birds consuming short grass. Acute and chronic RQs for the CCR and SFGS, birds and reptiles, derived using T-REX are shown in Table 5-2 through Table 5-5.

Table 5-2. Acute and Chronic RQs Derived Using T-REX for CCR, SFGS & Birds – Naled

Scenario (lb ai/A)	RQs for Birds, CCR and SFGS (small bird (20 g) consuming short grass)			Percent and Probability of Individual Effect at RQ*	
	Acute Dose-Based	Acute Dietary Based	Chronic Dietary Based	Acute Dose-Based	Acute Dietary-Based
1- Safflower (2.1 lbs ai/a, 1 app.)	**34.85**	**0.38**	**1.52**	100% 1 in 1 (95% CI : 1 in 1 to 1 in 1)	29.3% 1 in 3.41 (95% CI : 1 in 5 to 1 in $1.3*10^{4}$)
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	**31.53**	**0.34**	**1.75**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	1.75% 1 in 57.1 (95% CI: 1 in 5.7 to 1 in $8.1*10^{4}$)
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	**23.23**	**0.25**	**1.29**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.34% 1 in 297 (95% CI: 1 in 8.7 to 1 in $3.3*10^{7}$)
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	**14.94**	**0.16**	0.83	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.017% 1 in 5800 (95% CI: 1 in 17.9 to 1 in $3.5*10^{12}$)
5- Forest and Non-food plants (0.9 lbs ai/A, 52 applications, 7-d interval)	**16.38**	**0.18**	0.91	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.04% 1 in 2500 (95% CI: 1 in 14.7 to 1 in $9.8*10^{10}$)
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 3-d interval)	**23.10**	**0.25**	**1.29**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.34% 1 in 297 (95% CI: 1 in 8.7 to 1 in $3.3*10^{7}$)
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	**4.52**	0.05	0.25	100% 1 in 1 (95% CI: 1 in 1.1 to 1 in 1)	<1 in one million (95% CI: 1 in 216 to 1 in $1.7*10^{31}$)

Scenario (lb ai/A)	RQs for Birds, CCR and SFGS (small bird (20 g) consuming short grass)			Percent and Probability of Individual Effect at RQ*	
	Acute Dose-Based	Acute Dietary Based	Chronic Dietary Based	Acute Dose-Based	Acute Dietary-Based
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1 day interval)	**2.83**	0.03	0.16	100% 1 in 1 (95% CI: 1 in 1.22 to 1 in 1)	<1 in one million (95% CI: 1 in 862 to 1 in $2.1*10^{42}$)
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7 day interval)	**1.81**	0.02	0.10	90.9% 1 in 1.1 (95% CI: 1 in 1.4 to 1 in 1)	<1 in one million (95% CI: 1 in 2950 to 1 in $2.3*10^{52}$)

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.
[1]Based on dose-based EEC and Canada goose acute oral LD_{50} = 36.9 mg/kg-bw
[2]Based on dose-based EEC and Japanese Quail subacute dietary LC_{50} =1327 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 260 mg/kg-diet.
[*] A probit slope value for the acute avian toxicity test is not available; therefore, the effect probability was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986).

Table 5-3. Acute and Chronic RQs Derived Using T-REX for the CCR and Birds – Naled

Scenario (lb ai/A)	Diet	Dose-Based RQs		Dietary-Based RQs	
		Small (20 g)	Adult (100 g)	Small (20 g)/Adult (100 g)	
		Acute RQ	Acute RQ	Acute RQ	Chronic RQ
1- Safflower (2.1 lbs ai/a, 1 app.)	Short Grass	**34.85**	**15.61**	**0.38**	**1.94**
	Tall Grass	**15.97**	**7.15**	**0.17**	0.89
	Broadleafplants/sm Insects	**19.60**	**8.78**	**0.21**	**1.09**
	Fruits/pods/seeds/lg insects	**2.18**	**0.98**	0.02	0.12
	Seeds (granivore)	**0.48**	**0.22**	----	**----**
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	Short Grass	**31.53**	**14.12**	**0.34**	**1.75**
	Tall Grass	**14.45**	**6.47**	**0.16**	0.80
	Broadleaf plants/sm Insects	**17.74**	**7.94**	**0.19**	0.99
	Fruits/pods/seeds/lg insects	**1.97**	**0.88**	0.02	0.11
	Seeds (granivore)	**0.44**	**0.20**	----	**----**
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	Short Grass	**23.23**	**10.41**	**0.25**	**1.29**
	Tall Grass	**10.65**	**4.77**	**0.12**	0.59
	Broadleaf plants/sm Insects	**13.07**	**5.85**	**0.14**	0.73
	Fruits/pods/seeds/lg insects	**1.45**	**0.65**	0.02	0.08
	Seeds (granivore)	**0.32**	**0.14**	----	**----**
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	Short Grass	**14.94**	**6.69**	**0.16**	0.83
	Tall Grass	**6.85**	**3.07**	0.07	0.38
	Broadleaf plants/sm Insects	**8.40**	**3.76**	0.09	0.47
	Fruits/pods/seeds/lg insects	**0.93**	**0.42**	0.01	0.05
	Seeds (granivore)	**0.21**	0.09	----	----
5- Forest and Non-food plants	Short Grass	**16.38**	**7.34**	**0.18**	0.91
	Tall Grass	**7.51**	**3.36**	0.08	0.42

Scenario (lb ai/A)	Diet	Dose-Based RQs		Dietary-Based RQs	
		Small (20 g)	Adult (100 g)	Small (20 g)/Adult (100 g)	
		Acute RQ	Acute RQ	Acute RQ	Chronic RQ
(0.9 lbs ai/A, 52 apps., 7-d interval)	Broadleaf plants/sm Insects	**9.22**	**4.13**	**0.10**	0.51
	Fruits/pods/seeds/lg insects	**1.02**	**0.46**	0.01	0.06
	Seeds (granivore)	**0.23**	**0.10**	----	----
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 7-d interval)	Short Grass	**23.10**	**10.35**	**0.25**	**1.29**
	Tall Grass	**10.59**	**4.74**	**0.12**	0.59
	Broadleaf plants/sm Insects	**13.00**	**5.82**	**0.14**	0.72
	Fruits/pods/seeds/lg insects	**1.44**	**0.65**	0.02	0.08
	Seeds (granivore)	**0.32**	**0.14**	----	----
7- Insect pests- animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**4.52**	**2.02**	0.05	0.25
	Tall Grass	**2.07**	**0.93**	0.02	0.12
	Broadleaf plants/sm Insects	**2.54**	**1.14**	0.03	0.14
	Fruits/pods/seeds/lg insects	**0.28**	**0.13**	< 0.01	0.02
	Seeds (granivore)	0.06	0.03	----	----
8- Insect pests- animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	Short Grass	**2.83**	**1.27**	0.03	0.16
	Tall Grass	**1.30**	**0.58**	0.01	0.07
	Broadleaf plants/sm Insects	**1.59**	**0.71**	0.02	0.09
	Fruits/pods/seeds/lg insects	**0.18**	0.08	< 0.01	0.01
	Seeds (granivore)	0.04	0.02	----	----
9- Insect pests- animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**1.81**	**0.81**	0.02	0.10
	Tall Grass	**0.83**	**0.37**	0.01	0.05
	Broadleaf plants/sm Insects	**1.02**	**0.46**	0.01	0.06
	Fruits/pods/seeds/lg insects	**0.11**	0.05	< 0.01	0.01
	Seeds (granivore)	0.03	0.01	----	----

LOC exceedances (acute RQ $\geq$ 0.1 and chronic RQ $\geq$ 1.0) are **bolded.**
[1]Based on dose-based EEC and Canada Goose acute oral LD_{50} = 36.9 mg/kg-bw
[2]Based on dose-based EEC and Japanese Quail subacute dietary LC_{50} =1327 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 260 mg/kg-diet.

Table 5-4. Acute and Chronic RQs Derived Using T-REX for the CCR, SFGS & Birds – DDVP

Scenario (lb ai/A) (DDVP)	RQs for Birds, CCR and SFGS (small bird consuming short grass)			Percent and Probability of Individual Effect at RQ*	
	Acute Dose-Based	Acute Dietary Based	Chronic Dietary Based	Acute Dose-Based	Acute Dietary- Based
1- Safflower (0.24 lbs ai/a, 1 app.)	**16.20**	**0.19**	**11.52**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.06% 1 in $1.7*10^3$ (95% CI: 1 in 1.3 to 1 in $2.3*10^{10}$)
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	**14.85**	**0.18**	**10.56**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.04% 1 in $2.5*10^3$ (95% CI: 1 in 14.7 to 1 in $9.8*10^{10}$)

Scenario (lb ai/A) (DDVP)	RQs for Birds, CCR and SFGS (small bird consuming short grass)			Percent and Probability of Individual Effect at RQ*	
	Acute Dose-Based	Acute Dietary Based	Chronic Dietary Based	Acute Dose-Based	Acute Dietary- Based
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	**10.80**	**0.13**	**7.68**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.003% 1 in $3.0*10^{4}$ (95% CI: 1 in 26.2 to 1 in $1.3*10^{15}$)
4- Melons, misc food and non-food plants (0.10 lbs ai/A, 1 app.)	**6.75**	0.08	**4.80**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	1 in $2.5*10^{6}$ (95% CI: 1 in 70.8 to 1 in $3.6*10^{22}$)
5- Forest and Non-food plants (0.10 lbs ai/A, 52 apps., 7-d interval)	**7.40**	0.09	**5.27**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	1 in $7.9*10^{5}$ (95% CI: 1 in 54.8 to 1 in $4.1*10^{20}$)
6- Forest and Non-food plants (0.10 lbs ai/A, 104 apps., 3-d interval)	**10.44**	**0.12**	**7.43**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.002% 1 in $5.8*10^{4}$ (95% CI: 1 in 30.5 to 1 in $1.7*10^{16}$)
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	**2.20**	0.03	**1.57**	90.9% 1 in 1.1 (95% CI: 1 in 1.2 to 1 in 1)	<1 in one million (95% CI: 1 in 862 to 1 in $2.1*10^{42}$)
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-d interval)	**1.15**	0.01	0.82	62.5% 1 in 1.6 (95% CI: 1 in 1.8 to 1 in 1.4)	<1 in one million (95% CI: 1 in $3.2*10^{4}$ to 1 in $1.0*10^{72}$)
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7 day interval)	**0.73**	0.01	0.52	27% 1 in 3.7 (95% CI: 1 in 2.5 to 1 in 9.1)	<1 in one million (95% CI: 1 in $3.2*10^{4}$ to 1 in $1.0*10^{72}$)

LOC exceedances (acute RQ $\geq$ 0.1 and chronic RQ $\geq$ 1.0) are **bolded**.
[1]Based on dose-based EEC and Mallard Duck acute oral LD_{50} = 7.8 mg/kg-bw
[2]Based on dose-based EEC and Japanese quail subacute dietary LC_{50} =298 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 5 mg/kg-diet.
[*] A probit slope value for the acute avian toxicity test is not available; therefore, the effect probability was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986).

Table 5-5. Acute and Chronic RQs Derived Using T-REX for the CCR and Birds – DDVP

Scenario (lb ai/A)	Diet	Dose-Based RQs		Dietary-Based RQs	
		Small (20 g)	Adult (100 g)	Small (20 g)/ Adult (100 g)	
		Acute RQ	Acute RQ	Acute RQ	Chronic RQ
1- Safflower (0.24 lbs ai/a, 1 app.)	Short Grass	**16.20**	**7.26**	**0.19**	**11.52**
	Tall Grass	**7.42**	**3.33**	0.09	**5.28**
	Broadleafplants/sm Insects	**9.11**	**4.08**	**0.11**	**6.48**
	Fruits/pods/seeds/lg insects	**1.01**	**0.45**	0.01	0.72
	Seeds (granivore)	**0.22**	**0.10**	----	----

Scenario (lb ai/A)	Diet	Dose-Based RQs		Dietary-Based RQs	
		Small (20 g)	Adult (100 g)	Small (20 g)/ Adult (100 g)	
		Acute RQ	Acute RQ	Acute RQ	Chronic RQ
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	Short Grass	**14.85**	**6.65**	**0.18**	**10.56**
	Tall Grass	**6.81**	**3.05**	0.08	**4.84**
	Broadleaf plants/sm Insects	**8.35**	**3.74**	**0.10**	**5.94**
	Fruits/pods/seeds/lg insects	**0.93**	**0.42**	0.01	0.66
	Seeds (granivore)	**0.21**	0.09	----	----
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	Short Grass	**10.80**	**4.84**	**0.13**	**7.68**
	Tall Grass	**4.95**	**2.22**	0.06	**3.52**
	Broadleaf plants/sm Insects	**6.07**	**2.72**	0.07	**4.32**
	Fruits/pods/seeds/lg insects	**0.67**	**0.30**	0.01	0.48
	Seeds (granivore)	**0.15**	0.07	----	----
4- Melons, misc food and non-food plants (0.1 lbs ai/A, 1 app.)	Short Grass	**6.75**	**3.02**	0.08	**4.80**
	Tall Grass	**3.09**	**1.39**	0.04	**2.20**
	Broadleaf plants/sm Insects	**3.80**	**1.70**	0.05	**2.70**
	Fruits/pods/seeds/lg insects	**0.42**	**0.19**	0.01	0.30
	Seeds (granivore)	0.09	0.04	----	----
5- Forest and Non-food plants (0.1 lbs ai/A, 52 apps., 7-d interval)	Short Grass	**7.40**	**3.32**	0.09	**5.27**
	Tall Grass	**3.39**	**1.52**	0.04	**2.41**
	Broadleaf plants/sm Insects	**4.16**	**1.87**	0.05	**2.96**
	Fruits/pods/seeds/lg insects	**0.46**	**0.21**	0.01	0.33
	Seeds (granivore)	**0.10**	0.05	----	----
6- Forest and Non-food plants (0.1 lbs ai/A, 104 apps., 7-d interval)	Short Grass	**10.44**	**4.68**	**0.12**	**7.43**
	Tall Grass	**4.79**	**2.14**	0.06	**3.40**
	Broadleaf plants/sm Insects	**5.87**	**2.63**	0.07	**4.18**
	Fruits/pods/seeds/lg insects	**0.65**	**0.29**	0.01	0.46
	Seeds (granivore)	**0.15**	0.06	----	----
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**2.20**	**0.99**	0.03	**1.57**
	Tall Grass	**1.01**	**0.45**	0.01	0.72
	Broadleaf plants/sm Insects	**1.24**	**0.56**	0.01	0.88
	Fruits/pods/seeds/lg insects	**0.14**	0.06	< 0.01	0.10
	Seeds (granivore)	0.03	0.01	----	----
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-d interval)	Short Grass	**1.15**	**0.52**	0.01	0.82
	Tall Grass	**0.53**	**0.24**	0.01	0.38
	Broadleaf plants/sm Insects	**0.65**	**0.29**	0.01	0.46
	Fruits/pods/seeds/lg insects	0.07	0.03	< 0.01	0.05
	Seeds (granivore)	0.02	0.01	----	----
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**0.73**	**0.33**	0.01	0.52
	Tall Grass	**0.34**	**0.15**	< 0.01	0.24
	Broadleaf plants/sm Insects	**0.41**	**0.19**	< 0.01	0.29
	Fruits/pods/seeds/lg insects	0.05	0.02	< 0.01	0.03
	Seeds (granivore)	0.01	< 0.01	----	----

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.
[1]Based on dose-based EEC and Mallard Duck acute oral LD_{50} = 7.8 mg/kg-bw
[2]Based on dose-based EEC and Japanese quail subacute dietary LC_{50} =298 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 5 mg/kg-diet.

Table 5-6. Acute and Chronic RQs Derived Using T-HERPS for SFGS – Naled

Scenario (lb ai/A)	RQs for SFGS (20g reptile consuming herbivore mammals)			Percent and Probability of Individual Effect at RQ*	
	Acute Dose-Based	Acute Dietary-Based	Chronic Dietary Based	Acute Dose-Based	Acute Dietary-Based
1- Safflower (2.1 lbs ai/a, 1 app.)	**29.02**	**0.29**	**1.49**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.77% 1 in 129 (95% CI: 1 in 7.1 to 1 in $1.5*10^6$)
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	**26.25**	**0.26**	**1.34**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.42 % 1 in 236 (95% CI: 1 in 8.3 to 1 in $1.4*10^7$)
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	**19.34**	**0.19**	0.99	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.06% 1 in $1.7*10^3$ (95% CI: 1 in 1.3 to 1 in $2.3*10^{10}$)
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	**12.44**	**0.12**	0.64	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.002% 1 in $5.8*10^4$ (95% CI: 1 in 30.5 to 1 in $1.7*10^{16}$)
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	**13.64**	**0.14**	0.70	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.006 % 1 in $1.6*10^4$ (95% CI: 1 in 22.8 to 1 in $1.3*10^{14}$)
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 3-d interval)	**19.24**	**0.19**	0.99	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.06% 1 in $1.7*10^3$ (95% CI: 1 in 1.3 to 1 in $2.3*10^{10}$)
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	**3.76**	0.04	0.19	100% 1 in 1 (95% CI: 1 in 1.1 to 1 in 1)	<1 in one million (95% CI: 1 in 386 to 1 in $7.5*10^{35}$)
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	**2.36**	0.02	0.12	100% 1 in 1 (95% CI: 1 in 1.3 to 1 in 1)	<1 in one million (95% CI: 1 in 2950 to 1 in $2.3*10^{52}$)
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	**1.50**	0.02	0.08	77% 1 in 1.3 (95% CI: 1 in 1.6 to 1 in 1.1)	<1 in one million (95% CI: 1 in 2950 to 1 in $2.3*10^{52}$)

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.
[1]Based on dose-based EEC and Canada Goose acute oral LD_{50} = 36.9 mg/kg-bw
[2]Based on dose-based EEC and Japanese Quail subacute dietary LC_{50} =1327 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 260 mg/kg-diet.

[*] A probit slope value for the acute avian toxicity test is not available; therefore, the effect probability was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986).

Table 5-7. Acute and Chronic RQs Derived Using T-HERPS for the SFGS – Naled

Scenario (lb ai/A)	Diet	Dose-Based Acute RQs			Dietary-Based RQs	
		Small (2 g)	Medium (20 g)	Large (200 g)	Acute RQ	Chronic RQ
1- Safflower (2.1 lbs ai/a, 1 app.)	Small invertebrates	**1.35**	**0.57**	**0.24**	**0.21**	**1.09**
	Large invertebrates	**0.15**	0.06	0.03	0.02	0.12
	Herbivore mammals	**N/A**	**29.02**	**8.25**	**0.29**	**1.49**
	Insectivore mammals	**N/A**	**1.81**	**0.52**	0.02	0.09
	Terrestrial-phase amphibians	**N/A**	**0.67**	**0.32**	0.01	0.03
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	Small invertebrates	**1.22**	**0.51**	**0.22**	**0.19**	0.99
	Large invertebrates	**0.14**	0.06	0.02	0.02	0.11
	Herbivore mammals	**N/A**	**26.25**	**7.47**	**0.26**	**1.34**
	Insectivore mammals	**N/A**	**1.64**	**0.47**	0.02	0.08
	Terrestrial-phase amphibians	**N/A**	**0.60**	**0.29**	0.01	0.03
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	Small invertebrates	**0.90**	**0.38**	**0.16**	**0.14**	0.73
	Large invertebrates	**0.10**	0.04	0.02	0.02	0.08
	Herbivore mammals	**N/A**	**19.34**	**5.50**	**0.19**	0.99
	Insectivore mammals	**N/A**	**1.21**	**0.34**	0.01	0.06
	Terrestrial-phase amphibians	**N/A**	**0.45**	**0.21**	< 0.01	0.02
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	Small invertebrates	**0.58**	**0.24**	**0.10**	0.09	0.47
	Large invertebrates	0.06	0.03	0.01	0.01	0.05
	Herbivore mammals	**N/A**	**12.44**	**3.54**	**0.12**	0.64
	Insectivore mammals	**N/A**	**0.78**	**0.22**	0.01	0.04
	Terrestrial-phase amphibians	**N/A**	**0.29**	**0.14**	< 0.01	0.01
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	Small invertebrates	**0.63**	**0.27**	**0.11**	**0.10**	0.51
	Large invertebrates	0.07	0.03	0.01	0.01	0.06
	Herbivore mammals	**N/A**	**13.64**	**3.88**	**0.14**	0.70
	Insectivore mammals	**N/A**	**0.85**	**0.24**	0.01	0.04
	Terrestrial-phase amphibians	**N/A**	**0.31**	**0.15**	< 0.01	0.02
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 7-d interval)	Small invertebrates	**0.90**	**0.38**	**0.16**	**0.14**	0.72
	Large invertebrates	**0.10**	0.04	0.02	0.02	0.08
	Herbivore mammals	**N/A**	**19.24**	**5.47**	**0.19**	0.99
	Insectivore mammals	**N/A**	**1.20**	**0.34**	0.01	0.06
	Terrestrial-phase amphibians	**N/A**	**0.44**	**0.21**	< 0.01	0.02
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	Small invertebrates	**0.17**	0.07	0.03	0.03	0.14
	Large invertebrates	0.02	0.01	< 0.01	< 0.01	0.02
	Herbivore mammals	**N/A**	**3.76**	**1.07**	0.04	0.19
	Insectivore mammals	**N/A**	**0.23**	0.07	< 0.01	0.01
	Terrestrial-phase amphibians	**N/A**	0.09	0.04	< 0.01	< 0.01
8- Insect pests-animal and human health concerns	Small invertebrates	**0.11**	0.05	0.02	0.02	0.09
	Large invertebrates	0.01	0.01	< 0.01	< 0.01	0.01
	Herbivore mammals	**N/A**	**2.36**	**0.67**	0.02	0.12

Scenario (lb ai/A)	Diet	Dose-Based Acute RQs			Dietary-Based RQs	
		Small (2 g)	Medium (20 g)	Large (200 g)	Acute RQ	Chronic RQ
(0.1 lbs ai/A, 2 apps., 1-d interval)	Insectivore mammals	**N/A**	**0.15**	0.04	< 0.01	0.01
	Terrestrial-phase amphibians	**N/A**	0.05	0.03	< 0.01	< 0.01
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	Small invertebrates	0.07	0.03	0.01	0.01	0.06
	Large invertebrates	0.01	< 0.01	< 0.01	< 0.01	0.01
	Herbivore mammals	**N/A**	**1.50**	0.43	0.02	0.08
	Insectivore mammals	**N/A**	0.09	0.03	< 0.01	< 0.01
	Terrestrial-phase amphibians	**N/A**	0.03	0.02	< 0.01	< 0.01

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.

[1]Based on dose-based EEC and Canada Goose acute oral LD_{50} = 36.9 mg/kg-bw

[2]Based on dose-based EEC and Japanese Quail subacute dietary LC_{50} =1327 mg/kg-diet

[3]Based on dietary-based EEC and Mallard Duck NOAEC = 260 mg/kg-diet.

Table 5-8. Acute and Chronic RQs Derived Using T-HERPS for SFGS – DDVP

Scenario (lb ai/A) (DDVP)	RQs for SFGS (20g reptile consuming herbivore mammals)			Percent and Probability of Individual Effect at RQ*	
	Acute Dose-Based	Acute Dietary Based	Chronic Dietary Based	Acute Dose-Based	Acute Dietary-Based
1- Safflower (0.24 lbs ai/a, 1 app.)	**13.49**	**0.15**	**8.83**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.01 % 1 in $9.6*10^{3}$ (95% CI: 1 in 20.1 to 1 in $1.6*10^{13}$)
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	**12.36**	**0.14**	**8.09**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	0.006 % 1 in $1.6*10^{4}$ (95% CI: 1 in 22.8 to 1 in $1.3*10^{14}$)
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	**8.99**	**0.10**	**5.89**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	< 0.001 % 1 in $2.9*10^{5}$ (95% CI: 1 in 44.0 to 1 in $8.9*10^{18}$)
4- Melons, misc food and non-food plants (0.10 lbs ai/A, 1 app.)	**5.62**	0.06	**3.68**	100% 1 in 1 (95% CI: 1 in 1.1 to 1 in 1)	1 in $5.2*10^{7}$ (95% CI: 1 in 138 to 1 in $5.0*10^{27}$)
5- Forest and Non-food plants (0.10 lbs ai/A, 52 apps., 7-d interval)	**6.16**	0.07	**4.04**	100% 1 in 1 (95% CI: 1 in 1.1 to 1 in 1)	1 in $9.9*10^{6}$ (95% CI: 1 in 95.7 to 1 in $7.6*10^{24}$)
6- Forest and Non-food plants (0.10 lbs ai/A, 104 apps., 3-d interval)	**8.69**	**0.10**	**5.69**	100% 1 in 1 (95% CI: 1 in 1 to 1 in 1)	< 0.001 % 1 in $2.9*10^{5}$ (95% CI: 1 in 44.0 to 1 in $8.9*10^{18}$)
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	**1.83**	0.02	**1.20**	90.9% 1 in 1.1 (95% CI: 1 in 1.4 to 1 in 1)	<1 in one million (95% CI: 1 in 2950 to 1 in $2.3*10^{52}$)

Scenario (lb ai/A) (DDVP)	RQs for SFGS (20g reptile consuming herbivore mammals)			Percent and Probability of Individual Effect at RQ*	
	Acute Dose-Based	Acute Dietary Based	Chronic Dietary Based	Acute Dose-Based	Acute Dietary-Based
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-d interval)	**0.96**	0.01	0.63	47.6% 1 in 2.1 (95% CI: 1 in 2.1 to 1 in 2.3)	<1 in one million (95% CI: 1 in $3.2*10^4$ to 1 in $1.0*10^{72}$)
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7-d interval)	**0.61**	0.01	0.40	16.7% 1 in 6.0 (95% CI: 1 in 3 to 1 in 37.5)	<1 in one million (95% CI: 1 in $3.2*10^4$ to 1 in $1.0*10^{72}$)

LOC exceedances (acute RQ $\geq$ 0.1 and chronic RQ $\geq$ 1.0) are **bolded**.
[1]Based on dose-based EEC and Mallard Duck acute oral LD_{50} = 7.8 mg/kg-bw
[2]Based on dose-based EEC and Japanese quail subacute dietary LC_{50} =298 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 5 mg/kg-diet.
* A probit slope value for the acute avian toxicity test is not available; therefore, the effect probability was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986).

Table 5-9. Acute and Chronic RQs Derived Using T-HERPS for the SFGS – DDVP

Scenario (lb ai/A) (DDVP)	Diet	Dose-Based Acute RQs			Dietary-Based RQs	
		Small (2 g)	Medium (20 g)	Large (200 g)	Acute RQ	Chronic RQ
1- Safflower (0.24 lbs ai/a, 1 app.)	Small invertebrates	**0.63**	**0.26**	**0.11**	**0.11**	**6.48**
	Large invertebrates	0.07	0.03	0.01	0.01	0.72
	Herbivore mammals	**N/A**	**13.49**	**3.84**	**0.15**	**8.83**
	Insectivore mammals	**N/A**	**0.84**	**0.24**	0.01	0.55
	Terrestrial-phase amphibians	**N/A**	**0.31**	**0.15**	< 0.01	0.20
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	Small invertebrates	**0.58**	**0.24**	**0.10**	**0.10**	**5.94**
	Large invertebrates	0.06	0.03	0.01	0.01	0.66
	Herbivore mammals	**N/A**	**12.36**	**3.52**	**0.14**	**8.09**
	Insectivore mammals	**N/A**	**0.77**	**0.22**	0.01	0.51
	Terrestrial-phase amphibians	**N/A**	**0.28**	**0.14**	< 0.01	0.19
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	Small invertebrates	**0.42**	**0.18**	0.07	0.07	**4.32**
	Large invertebrates	0.05	0.02	0.01	0.01	0.48
	Herbivore mammals	**N/A**	**8.99**	**2.56**	**0.10**	**5.89**
	Insectivore mammals	**N/A**	**0.56**	**0.16**	0.01	0.37
	Terrestrial-phase amphibians	**N/A**	**0.21**	**0.10**	< 0.01	0.14
4- Melons, misc food and non-food plants (0.1 lbs ai/A, 1 app.)	Small invertebrates	**0.26**	**0.11**	0.05	0.05	**2.70**
	Large invertebrates	0.03	0.01	0.01	0.01	0.30
	Herbivore mammals	**N/A**	**5.62**	**1.60**	0.06	**3.68**
	Insectivore mammals	**N/A**	**0.35**	**0.10**	< 0.01	0.23
	Terrestrial-phase amphibians	**N/A**	**0.13**	0.06	< 0.01	0.08
5- Forest and Non-food plants	Small invertebrates	**0.29**	**0.12**	0.05	0.05	**2.96**
	Large invertebrates	0.03	0.01	0.01	0.01	0.33

Scenario (lb ai/A) (DDVP)	Diet	Dose-Based Acute RQs			Dietary-Based RQs	
		Small (2 g)	Medium (20 g)	Large (200 g)	Acute RQ	Chronic RQ
(0.1 lbs ai/A, 52 apps., 7-d interval)	Herbivore mammals	**N/A**	**6.16**	**1.75**	0.07	**4.04**
	Insectivore mammals	**N/A**	**0.39**	**0.11**	< 0.01	0.25
	Terrestrial-phase amphibians	**N/A**	**0.14**	0.07	< 0.01	0.09
6- Forest and Non-food plants (0.1 lbs ai/A, 104 apps., 7-d interval)	Small invertebrates	**0.40**	**0.17**	0.07	0.07	**4.18**
	Large invertebrates	0.04	0.02	0.01	0.01	0.46
	Herbivore mammals	**N/A**	**8.69**	**2.47**	**0.10**	**5.69**
	Insectivore mammals	**N/A**	**0.54**	**0.15**	**0.01**	0.36
	Terrestrial-phase amphibians	**N/A**	**0.20**	**0.10**	< 0.01	0.13
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	Small invertebrates	0.09	0.04	0.02	0.01	0.88
	Large invertebrates	0.01	< 0.01	< 0.01	< 0.01	0.10
	Herbivore mammals	**N/A**	**1.83**	**0.52**	0.02	**1.20**
	Insectivore mammals	**N/A**	**0.11**	0.03	< 0.01	0.08
	Terrestrial-phase amphibians	**N/A**	0.04	0.02	< 0.01	0.03
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-d interval)	Small invertebrates	0.04	0.02	0.01	0.01	0.46
	Large invertebrates	< 0.01	< 0.01	< 0.01	< 0.01	0.05
	Herbivore mammals	**N/A**	**0.96**	**0.27**	0.01	0.63
	Insectivore mammals	**N/A**	0.06	0.02	< 0.01	0.04
	Terrestrial-phase amphibians	**N/A**	0.02	0.01	< 0.01	0.01
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7-d interval)	Small invertebrates	0.03	0.01	0.01	< 0.01	0.29
	Large invertebrates	< 0.01	< 0.01	< 0.01	< 0.01	0.03
	Herbivore mammals	**N/A**	**0.61**	**0.17**	0.01	0.40
	Insectivore mammals	**N/A**	0.04	0.01	< 0.01	0.03
	Terrestrial-phase amphibians	**N/A**	0.01	0.01	< 0.01	0.01

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.
[1]Based on dose-based EEC and Mallard Duck acute oral LD_{50} = 7.8 mg/kg-bw
[2]Based on dose-based EEC and Japanese quail subacute dietary LC_{50} =298 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 5 mg/kg-diet.

Based on the results, the acute dose-based RQs for both naled and DDVP exposure exceed the acute LOC (0.1) for all uses of naled. Acute dose-based RQs range from 34.85 to 1.81 for naled exposure, and 16.20 to 0.73 for DDVP exposure (Table 5-2). Acute Dietary-based RQs for naled exposure exceed the acute LOC (0.1) for all uses of naled with an application rate ≥ 0.9 lbs ai/A (regardless of interval), and the naled acute dietary-based RQs range from 0.38 to 0.02 (Table 5-2). The acute dietary-based RQs for DDVP exposure exceed the acute LOC (0.1) for uses of naled with an application rate > 0.1 lbs ai/A (naled), (0.01 lbs ai/A, DDVP except when applied at 0.01 twice at a 7-d interval), and the DDVP acute dietary-based RQs range from 0.19 to 0.01 (Table 5-4).

For both naled and DDVP, the probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). All uses of naled represent a very high probability of individual effect to small birds when considering dose-based acute naled exposure. DDVP exposure resulting from all uses of naled > 0.1 lbs ai/A (0.01 lbs ai/A, as DDVP) represent a very high probability of individual effect to small birds when considering dose-based acute DDVP exposure, and uses of naled ≤ 0.1 lbs ai/A (0.01 lbs ai/A, as DDVP) represent a medium to low probability of individual effect to small birds when considering dose-based acute DDVP exposure. When considering dietary-based acute naled exposure, there is a low to very low probability of individual effect to small birds for all uses of naled > 1.4 lbs ai/A (scenario 3) and > 0.9 lbs ai/A, 104 applications at 3 day intervals (scenario 6). When considering dietary-based acute DDVP exposure resulting from naled use, there is a very low probability of individual effect to small birds for any use of naled.

The chronic dietary-based RQs for naled exposure exceed the acute LOC for uses of naled with an application rate > 0.9 lbs ai/A, and equal to 0.9 lbs ai at 3 day intervals (with 104 applications) (Table 5-2). All other uses either with an application rate equal to 0.9 lbs ai/A, (at either 1 application or 52 applications) or with an application rate less than 0.9 lbs ai/A, do not exceed the chronic LOC of 1.0, for naled exposures. The chronic dietary-RQs range from 1.94 to 0.10 from naled exposures (Table 5-2). The chronic dietary-based RQs for DDVP exposure exceed the chronic LOC (1.0) for uses of naled with an application rate ≥ 0.25 lbs ai/A (of naled) (equal to 0.03 lbs ai/A of DDVP), and the DDVP chronic dietary-based RQs range from 11.52 to 0.52 (Table 5-4).

Based on these results, naled and DDVP does have the potential to directly impact the CCR and SFGS. Additionally, since both acute and chronic RQs exceeded the acute/chronic LOC, there is the potential for indirect effects to those listed species that rely on birds (and, thus, reptiles) during at least some portion of their life-cycle (*i.e.*, CCR, SFGS and SJKF).

5.1.2.2. Mammals

Potential direct effects to terrestrial species are based on foliar applications of naled and resulting DDVP residues. Potential risks to mammals are evaluated using T-REX, acute and chronic mammalian toxicity data, and a variety of body-size and dietary categories. The most sensitive RQ in T-REX is for the mammal consuming short grass.

Potential direct acute effects of naled and DDVP to the SJKF are derived by considering dose-based EECs modeled in T-REX for a large mammal (1,000 g) consuming a variety of dietary items and acute oral toxicity endpoints for rats (Table 4-3 and Table 4-4). EECs are divided by toxicity values to estimate acute dose-based RQs. Acute dose-based RQs for the SJKF derived using T-REX are shown in Table 5-10 through Table 5-15. An example of a T-REX output can be found in Appendix E.

Potential for indirect effects to the SFGS, CCR, and SJKF may result from direct effects to mammals due to a reduction in prey. Potential indirect effects to the SFGS may result from direct effects to mammals due effects to habitat or a reduction in rearing sites. RQs for indirect effects are calculated in the same manner as those for direct effects. In addition to the large mammal EECs, the small mammal consuming short grass are also modeled. The most sensitive EECs calculated in T-REX are for small mammals consuming short grass. Acute dose-based RQs for small and large mammals derived using T-REX are shown in Table 5-10 through Table

5-15. Percent and probability of individual effect of naled and DDVP on mammals are presented in Table 5-11 and Table 5-14, respectively.

Potential direct chronic effects to the mammals and SJKF are evaluated by considering dietary-based EECs modeled in T-REX consuming a variety of dietary items. The specific EECs for each species are for the same size mammals and same dietary items as those considered for acute exposure. Chronic effects are estimated using the lowest available NOAEC from a chronic reproductive study for mammals (Table 4-3 and Table 4-4). Dietary-based EECs are divided by toxicity values to estimate chronic dietary-based RQs. Chronic dietary-based RQs for the SJKF and mammals derived using T-REX are shown in Table 5-10 through Table 5-15, respectively.

Table 5-10. Acute and Chronic RQs Derived Using T-REX for SJKF & Mammals – Naled.

Scenario (lb ai/A)	RQs for Small Mammals (small mammals consuming short grass)			RQs for Large Mammals and SJKF (large mammal consuming short grass)		
	Acute Dose-Based	Chronic Dose-Based	Chronic Dietary-Based	Acute Dose-Based	Chronic Dose-Based	Chronic Dietary-Based
1- Safflower (2.1 lbs ai/a, 1 app.)	**2.38**	**36.44**	**4.20**	**1.09**	**16.68**	**4.20**
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	**2.15**	**32.97**	**3.80**	**0.98**	**15.10**	**3.80**
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	**1.58**	**24.29**	**2.80**	**0.73**	**11.12**	**2.80**
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	**1.02**	**15.62**	**1.80**	**0.47**	**7.15**	**1.80**
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7 day interval)	**1.12**	**17.13**	**1.97**	**0.51**	**7.84**	**1.97**
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 3 day interval)	**1.58**	**24.16**	**2.78**	**0.72**	**11.06**	**2.78**
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7 day interval)	**0.31**	**4.72**	0.54	**0.14**	**2.16**	0.54
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1 day interval)	**0.19**	**2.96**	0.34	0.09	**1.36**	0.34
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7 day interval)	**0.12**	**1.89**	0.22	0.06	0.86	0.22

LOC exceedances (acute RQ $\geq$ 0.1 and chronic RQ $\geq$ 1.0) are **bolded**.
[1]Based on dose-based EEC and Rat acute oral LD_{50} = 92 mg/kg-bw
[2]Based on dose-based EEC and Rat NOAEC = 6 mg/kg-bw
[3]Based on dietary-based EEC and Estimated Chronic Diet Concentration Equivalent to Reported Chronic Daily Dose = 120 mg/kg-diet

Table 5-11. Percent and Probability of Individual Effect to Mammals – Naled.

Scenario (lb ai/A)	RQs for Small Mammals (small mammals consuming short grass)	Percent and Probability of Individual Effect to small mammals at RQ*	RQs for Large Mammals & SJKF (large mammals consuming short grass)	Percent and Probability of Individual Effect to SJKF & large mammals at RQ*
	Acute Dose-Based		Acute Dose-Based	
1- Safflower (2.1 lbs ai/a, 1 app.)	**2.38**	100% 1 in 1 (95% CI: 1 in 1.3 to 1 in 1)	**1.09**	55.6% 1 in 1.8 (95% CI: 1 in 1.9 to 1 in 1.6)
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	**2.15**	90.9% 1 in 1.1 (95% CI: 1 in 1.3 to 1 in 1)	**0.98**	47.6% 1 in 2.1 (95% CI: 1 in 2.0 to 1 in 2.1)
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	**1.58**	83.3% 1 in 1.2 (95% CI: 1 in 1.5 to 1 in 1)	**0.73**	27% 1 in 3.7 (95% CI: 1 in 2.5 to 1 in 9.1)
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	**1.02**	51.5% 1 in 1.9 (95% CI: 1 in 2.0 to 1 in 1.9)	**0.47**	7.0% 1 in 14.3 (95% CI: 1 in 3.9 to 1 in $6.3*10^{2}$)
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	**1.12**	58.8% 1 in 1.7 (95% CI: 1 in 1.8 to 1 in 1.5)	**0.51**	9.4% 1 in 10.6 (95% CI: 1 in 3.6 to 1 in 236)
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 3-d interval)	**1.58**	83.3% 1 in 1.2 (95% CI: 1 in 1.5 to 1 in 1)	**0.72**	26.3% 1 in 3.8 (95% CI: 1 in 2.6 to 1 in 10)
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	**0.31**	1.1% 1 in 90.6 (95% CI: 1 in 6.5 to 1 in $4.3*10^{5}$)	**0.14**	0.006 % 1 in $1.6*10^{4}$ (95% CI: 1 in 22.8 to 1 in $1.3*10^{14}$)
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	**0.19**	0.06% 1 in $1.7*10^{3}$ (95% CI: 1 in 1.3 to 1 in $2.3*10^{10}$)	0.09	1 in $7.9*10^{5}$ (95% CI: 1 in 54.8 to 1 in $4.1*10^{20}$)
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	**0.12**	0.002% 1 in $5.8*10^{4}$ (95% CI: 1 in 30.5 to 1 in $1.7*10^{16}$)	0.06	1 in $5.2*10^{7}$ (95% CI: 1 in 138 to 1 in $5.0*10^{27}$)

LOC exceedances (acute RQ ≥ 0.1) are **bolded**.
[1]Based on dose-based EEC and Rat acute oral LD_{50} = 92 mg/kg-bw
* A probit slope value for the acute mammalian toxicity test is not available; therefore, the effect probability was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986).

Table 5-12. Acute Dose-Based and Chronic Dietary-Based RQs Derived Using T-REX for SJKF – Naled

Scenario (lb ai/A)	Diet	Large (1000 g)	
		Acute RQ	Chronic RQ
1- Safflower (2.1 lbs ai/a, 1 app.)	Short Grass	**1.09**	**4.20**
	Tall Grass	**0.50**	**1.93**
	Broadleaf plants/sm Insects	**0.61**	**2.36**
	Fruits/pods/seeds/lg insects	0.07	0.26
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	Short Grass	**0.98**	**3.80**
	Tall Grass	**0.45**	**1.74**
	Broadleaf plants/sm Insects	**0.55**	**2.14**
	Fruits/pods/seeds/lg insects	0.06	0.24
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	Short Grass	**0.73**	**2.80**
	Tall Grass	**0.33**	**1.28**
	Broadleaf plants/sm Insects	**0.41**	**1.58**
	Fruits/pods/seeds/lg insects	0.05	0.18
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	Short Grass	**0.47**	**1.80**
	Tall Grass	**0.21**	0.83
	Broadleaf plants/sm Insects	**0.26**	**1.01**
	Fruits/pods/seeds/lg insects	0.03	0.11
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	Short Grass	**0.51**	**1.97**
	Tall Grass	**0.23**	0.90
	Broadleaf plants/sm Insects	**0.29**	**1.11**
	Fruits/pods/seeds/lg insects	0.03	0.12
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 7-d interval)	Short Grass	**0.72**	**2.78**
	Tall Grass	**0.33**	**1.28**
	Broadleaf plants/sm Insects	**0.41**	**1.57**
	Fruits/pods/seeds/lg insects	0.05	0.17
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**0.14**	0.54
	Tall Grass	0.06	0.25
	Broadleaf plants/sm Insects	0.08	0.31
	Fruits/pods/seeds/lg insects	0.01	0.03
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	Short Grass	0.09	0.16
	Tall Grass	0.04	0.07
	Broadleaf plants/sm Insects	0.05	0.09
	Fruits/pods/seeds/lg insects	0.01	0.01
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	Short Grass	0.06	0.22
	Tall Grass	0.03	0.10
	Broadleaf plants/sm Insects	0.03	0.12
	Fruits/pods/seeds/lg insects	< 0.01	0.01

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.

[1]Based on dose-based EEC and Rat acute oral LD_{50} = 92 mg/kg-bw
[2]Based on dose-based EEC and Rat NOAEC = 6 mg/kg-bw
[3]Based on dietary-based EEC and Estimated Chronic Diet Concentration Equivalent to Reported Chronic Daily Dose = 120 mg/kg-diet

Table 5-13. Acute and Chronic RQs Derived Using T-REX for SJKF & Mammals – DDVP

Scenario (lb ai/A) (DDVP)	RQs for Small Mammals (small mammals consuming short grass)			RQs for Large Mammals and SJKF (large mammal consuming short grass)		
	Acute Dose-Based	**Chronic Dose-Based**	**Chronic Dietary-Based**	**Acute Dose-Based**	**Chronic Dose-Based**	**Chronic Dietary-Based**
1- Safflower (0.24 lbs ai/a, 1 app.)	**0.45**	**10.86**	**2.88**	**0.20**	**4.97**	**2.88**
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	**0.41**	**9.96**	**2.64**	**0.19**	**4.56**	**2.64**
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	**0.30**	**7.24**	**1.92**	**0.14**	**3.32**	**1.92**
4- Melons, misc food and non-food plants (0.10 lbs ai/A, 1 app.)	**0.19**	**4.53**	**1.20**	0.09	**2.07**	**1.20**
5- Forest and Non-food plants (0.10 lbs ai/A, 52 apps., 7 day interval)	**0.20**	**4.97**	**1.32**	0.09	**2.27**	**1.32**
6- Forest and Non-food plants (0.10 lbs ai/A, 104 apps., 3 day interval)	**0.29**	**7.00**	**1.86**	**0.13**	**3.21**	**1.86**
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7 day interval)	0.06	**1.48**	0.39	0.03	0.68	0.39
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1 day interval)	0.03	0.77	0.20	0.01	0.35	0.20
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7 day interval)	0.02	0.49	0.13	0.01	0.23	0.13

LOC exceedances (acute RQ $\geq$ 0.1 and chronic RQ $\geq$ 1.0) are **bolded**.
[1]Based on dose-based EEC and Rat acute oral LD_{50} = 56 mg/kg-bw
[2]Based on dose-based EEC and Rat NOAEC = 2.3 mg/kg-bw
[3]Based on dietary-based EEC and Rat NOAEC = 20 mg/kg-diet

Table 5-14. Percent and Probability of Individual Effect to Mammals – DDVP

Scenario (lb ai/A) (DDVP)	RQs for Small Mammals (small mammals consuming short grass)	Percent and Probability of Individual Effect to small mammals at RQ*	RQs for Large Mammals & SJKF (large mammals consuming short grass)	Percent and Probability of Individual Effect to SJKF & large mammals at RQ*
	Acute Dose-Based[1]		**Acute Dose-Based[1]**	
1- Safflower (0.24 lbs ai/a, 1 app.)	**0.45**	5.9 % 1 in 16.9 (95% CI: 1 in 4.1 to 1 in $1.1*10^{3}$)	**0.20**	0.08% 1 in $1.2*10^{3}$ (95% CI: 1 in 12.3 to 1 in $6.3*10^{9}$)
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	**0.41**	4.1% 1 in 24.6 (95% CI: 1 in 4.6 to 1 in $4.1*10^{3}$)	**0.19**	0.06% 1 in $1.7*10^{3}$ (95% CI: 1 in 1.3 to 1 in $2.3*10^{10}$)
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	**0.30**	0.93 % 1 in 107 (95% CI: 1 in 6.8 to 1 in $7.9*10^{5}$)	**0.14**	0.006 % 1 in $1.6*10^{4}$ (95% CI: 1 in 22.8 to 1 in $1.3*10^{14}$)
4- Melons, misc food and non-food plants (0.10 lbs ai/A, 1 app.)	**0.19**	0.06% 1 in $1.7*10^{3}$ (95% CI: 1 in 1.3 to 1 in $2.3*10^{10}$)	0.09	1 in $7.9*10^{5}$ (95% CI: 1 in 54.8 to 1 in $4.1*10^{20}$)
5- Forest and Non-food plants (0.10 lbs ai/A, 52 apps., 7-d interval)	**0.20**	0.08% 1 in $1.2*10^{3}$ (95% CI: 1 in 12.3 to 1 in $6.3*10^{9}$)	0.09	1 in $7.9*10^{5}$ (95% CI: 1 in 54.8 to 1 in $4.1*10^{20}$)
6- Forest and Non-food plants (0.10 lbs ai/A, 104 apps., 3-d interval)	**0.29**	0.77 % 1 in 129 (95% CI: 1 in 7.1 to 1 in $1.5*10^{6}$)	**0.13**	0.003 % 1 in $3.0*10^{4}$ (95% CI: 1 in 26.2 to 1 in $1.3*10^{15}$)
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	0.06	1 in $5.2*10^{7}$ (95% CI: 1 in 138 to 1 in $5.0*10^{27}$)	0.03	<1 in one million (95% CI: 1 in 862 to 1 in $2.1*10^{42}$)
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-d interval)	0.03	<1 in one million (95% CI: 1 in 862 to 1 in $2.1*10^{42}$)	0.01	<1 in one million (95% CI: 1 in $3.2*10^{4}$ to 1 in $1.0*10^{72}$)
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7-d interval)	0.02	<1 in one million (95% CI: 1 in 2950 to 1 in $2.3*10^{52}$)	0.01	<1 in one million (95% CI: 1 in $3.2*10^{4}$ to 1 in $1.0*10^{72}$)

LOC exceedances (acute RQ $\geq$ 0.1) are **bolded**.
[1]Based on dose-based EEC and Rat acute oral LD_{50} = 56 mg/kg-bw

* A probit slope value for the acute mammalian toxicity test is not available; therefore, the effect probability was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986).

Table 5-15. Acute Dose-Based and Chronic Dietary-Based RQs Derived Using T-REX for SJKF – DDVP

Scenario (lb ai/A) (DDVP)	Diet	Large (1000 g)	
		Acute RQ	**Chronic RQ**
1- Safflower (0.24 lbs ai/a, 1 app.)	Short Grass	**0.20**	**2.88**
	Tall Grass	0.09	**1.32**
	Broadleaf plants/sm Insects	**0.11**	**1.62**
	Fruits/pods/seeds/lg insects	0.01	0.18
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	Short Grass	**0.19**	**2.64**
	Tall Grass	0.09	**1.21**
	Broadleaf plants/sm Insects	**0.11**	**1.49**
	Fruits/pods/seeds/lg insects	0.01	0.17
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	Short Grass	**0.14**	**1.92**
	Tall Grass	0.06	0.88
	Broadleaf plants/sm Insects	0.08	**1.08**
	Fruits/pods/seeds/lg insects	0.01	0.12
4- Melons, misc food and non-food plants (0.1 lbs ai/A, 1 app.)	Short Grass	0.09	**1.20**
	Tall Grass	0.04	0.55
	Broadleaf plants/sm Insects	0.05	0.68
	Fruits/pods/seeds/lg insects	0.01	0.08
5- Forest and Non-food plants (0.1 lbs ai/A, 52 apps., 7-d interval)	Short Grass	0.09	**1.32**
	Tall Grass	0.04	0.60
	Broadleaf plants/sm Insects	0.05	0.74
	Fruits/pods/seeds/lg insects	0.01	0.08
6- Forest and Non-food plants (0.1 lbs ai/A, 104 apps., 7-d interval)	Short Grass	**0.13**	**1.86**
	Tall Grass	0.06	0.85
	Broadleaf plants/sm Insects	0.07	**1.04**
	Fruits/pods/seeds/lg insects	0.01	0.12
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	Short Grass	0.03	0.39
	Tall Grass	0.01	0.18
	Broadleaf plants/sm Insects	0.02	0.22
	Fruits/pods/seeds/lg insects	< 0.01	0.02
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-d interval)	Short Grass	0.01	0.20
	Tall Grass	0.01	0.09
	Broadleaf plants/sm Insects	0.01	0.12
	Fruits/pods/seeds/lg insects	< 0.01	0.01
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7-d interval)	Short Grass	0.01	0.13
	Tall Grass	< 0.01	0.06
	Broadleaf plants/sm Insects	0.01	0.07
	Fruits/pods/seeds/lg insects	< 0.01	0.01

LOC exceedances (acute RQ $\geq$ 0.1 and chronic RQ $\geq$ 1.0) are **bolded**.

[1]Based on dose-based EEC and Rat acute oral LD_{50} = 56 mg/kg-bw
[2]Based on dose-based EEC and Rat NOAEC = 2.3 mg/kg-bw
[3]Based on dietary-based EEC and Rat NOAEC = 20 mg/kg-diet

Based on the results, the large mammal acute dose-based RQs for naled exposure exceed the acute LOC (0.1) for all uses of naled with an application rate ≥ 0.25 lbs ai/A, and the large mammal acute dose-based RQs for DDVP only exceed the acute LOC (0.1) for naled uses with an application rate > 0.9 lbs ai/A, and equal to 0.9 lbs ai at 3 day intervals (with 104 applications), (0.9 lbs ai/A naled is equal to 0.1 lbs ai/A DDVP) (Table 5-13 to Table 5-15). The large mammal acute dose-based RQs ranged from 1.09 to 0.06 for naled exposure, and 0.20 to 0.01 for DDVP exposure (Table 5-13 to Table 5-15). The small mammal acute dose-based RQs for naled exposure exceed the acute LOC (0.1) for all uses of naled, and the small mammal acute dose-based RQs exceed the acute LOC (0.1) for all uses of naled ≥ 0.9 lbs ai/A naled (equal to 0.1 lbs ai/A DDVP), regardless of interval. The small mammal acute dose-based RQs ranged from 2.88 to 0.12 from naled exposure, and 0.45 to 0.02 from DDVP exposure (Table 5-10 to Table 5-15).

The probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). Uses of naled ≥ 0.9 lbs ai/A represent a very high to high probability of individual effect to small mammals, and uses of naled < 0.9 lbs ai/A represent a very low probability of individual effect to small mammals when considering dose-based acute naled exposure. Uses of naled > 1.4 lbs ai/A (scenario 3) and > 0.9 lbs ai/A, 104 applications at 3 day intervals (scenario 6) represent a medium probability of individual effect to large mammals, and uses < 0.9 lbs ai/A represent a very low probability of individual effect when considering dose-based acute naled exposure. DDVP exposure from any use of naled represents a low to very low probability of individual effect to both small and large mammals when considering dose-based acute DDVP exposure.

The mammalian chronic dietary-based RQs for both naled and DDVP exposure only exceed the acute LOC for uses of naled > 0.25 lbs ai/A (equal to 0.03 lbs ai/A DDVP). The mammalian chronic dietary-RQs range from 4.20 to 0.22 from naled exposure, and 2.88 to 0.13 from DDVP exposure (Table 5-10 to Table 5-15).

Based on these results, naled and DDVP do have the potential to directly impact the SJKF. Additionally, since both acute and chronic RQs exceeded the acute/chronic LOC for some uses, there is the potential for indirect effects to those listed species that rely on mammals during at least some portion of their life-cycle (*i.e.*, CCR, SFGS and SJKF).

5.1.2.3. Terrestrial Invertebrates

In order to assess the risks of naled and DDVP exposure to terrestrial invertebrates, 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 0.48 µg a.i./bee (naled) or 0.495 µg a.i./bee (DDVP) by 1 bee/0.128g, which is based on the weight of an adult honey bee. Dietary EECs (µg a.i./g of bee) calculated by T-REX for small insects and large insects are divided by the calculated toxicity value for terrestrial invertebrates, which is

3.75 µg a.i./g of bee for naled and . Larvae for both the BCB and the VELB are considered 'small insects' in this assessment, while the adults of these species are considered 'large insects.' RQs are shown for both small and large insects in Table 5-16 and Table 5-17.

Potential for indirect effects to the SFGS, CCR, and SJKF may result from direct acute effects to terrestrial invertebrates due to a reduction in prey. RQs for indirect effects are calculated in the same manner as those for direct effects. RQs are shown for both small and large insects in Table 5-16 and Table 5-17.

Table 5-16. Summary of RQs for Terrestrial Invertebrates – Naled.

Scenario Summary App Rate (lb a.i./A), # Apps, Interval (days)	Small Insect	Percent and Probability of Individual Effect*	Large Insect	Percent and Probability of Individual Effect*
1- Safflower (2.1 lbs ai/a, 1 app.)	**75.60**	100% 1 in 1	**8.40**	100% 1 in 1
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	**68.40**	100% 1 in 1	**7.60**	100% 1 in 1
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	**50.40**	100% 1 in 1	**5.60**	100% 1 in 1
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	**32.40**	100% 1 in 1	**3.60**	100% 1 in 1
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	**35.50**	100% 1 in 1	**3.95**	100% 1 in 1
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 3-d interval)	**50.12**	100% 1 in 1	**5.57**	100% 1 in 1
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	**9.79**	100% 1 in 1	**1.09**	76.9% 1 in 1.3
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	**6.15**	100% 1 in 1	**0.68**	0.12% 1 in 860
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	**3.92**	100% 1 in 1	**0.43**	< 0.001% 1 in $7.5*10^{10}$

* = LOC exceedances (RQ $\geq$ 0.05) are **bolded**.
[1]Based on dietary-based EEC and LD_{50} = 3.75 ppm
* A probit slope value for the acute contact honeybee toxicity test is available; the slope was 18.18. However, confidence intervals were not provided in the study (MRID 00036935), therefore there is uncertainty associated with the lack of confidence intervals.

Table 5-17. Summary of RQs for Terrestrial Invertebrates – DDVP.

Scenario Summary DDVP Rate (lb a.i./A), # Apps, Interval (days)	Small Insect	Percent and Probability of Individual Effect*	Large Insect	Percent and Probability of Individual Effect*
1- Safflower (0.24 lbs ai/a, 1 app.)	**8.37**	100% 1 in 1	**0.93**	38.5% 1 in 2.6
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	**7.67**	100% 1 in 1	**0.85**	26.3% 1 in 3.8
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	**5.58**	100% 1 in 1	**0.62**	3.1% 1 in 32

Scenario Summary DDVP Rate (lb a.i./A), # Apps, Interval (days)	Small Insect	Percent and Probability of Individual Effect*	Large Insect	Percent and Probability of Individual Effect*
4- Melons, misc food and non-food plants (0.10 lbs ai/A, 1 app.)	**3.49**	100% 1 in 1	**0.39**	0.01% 1 in 8200
5- Forest and Non-food plants (0.10 lbs ai/A, 52 apps., 7-d interval)	**3.83**	100% 1 in 1	**0.43**	0.05% 1 in 2000
6- Forest and Non-food plants (0.10 lbs ai/A, 104 apps., 3-d interval)	**5.39**	100% 1 in 1	**0.60**	2.33% 1 in 42.9
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	**1.14**	71.4% 1 in 1.4	**0.13**	<< 0.001% < 1 in one million
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-dinterval)	**0.59**	1.99% 1 in 50.2	**0.07**	<< 0.001% < 1 in one million
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7-d interval)	**0.38**	0.008% 12000	0.04	< 1 in one million

* = LOC exceedances (RQ > 0.05) are **bolded**.
[1]Based on dietary-based EEC and LD_{50} = 3.87 ppm
* A probit slope value for the acute contact honeybee toxicity test is available; the slope was 8.97. However, confidence intervals were not provided in the study (MRID 00036935), therefore there is uncertainty associated with the lack of confidence intervals.

Based on the results, the acute RQs for small insects exposed to either naled or DDVP residues exceed the terrestrial invertebrate LOC (0.05) for all uses of naled. For large insects exposed to naled residues only, the acute RQs exceed the terrestrial invertebrate LOC (0.5) for all uses of naled. However, for large insects exposed to DDVP residues, all uses with an application rate ≥ 0.1 lbs ai/A (naled), equivalent to 0.01 lbs ai/A (DDVP) with 2 applications at a 7 day interval exceed the terrestrial invertebrate LOC (0.05). The acute RQs for small insects range from 75.60 to 3.92 for exposure to naled residues, and 8.37 to 0.38 for exposure to DDVP residues (Table 5-16 and Table 5-17, respectively). The acute RQs for large insects range from 8.40 to 0.43 for exposure to naled residues and 0.93 to 0.04 for exposure to DDVP residues (Table 5-16 and Table 5-17, respectively).

The probability of individual effect was calculated based on a probit slope value for the acute contact honeybee toxicity test, which was available for both naled and DDVP LD_{50} values. The slope was 18.18 for naled and 8.97 for DDVP (MRID 00036935, Atkins 1975). However, confidence intervals were not provided in the study for either naled or DDVP, therefore, there is uncertainty associated with the lack of confidence intervals. All uses of naled represent a very high probability of individual effect to small insects resulting from naled exposure. DDVP exposure resulting from all uses of naled > 0.25 lbs ai/A (0.1 lbs ai/A, as DDVP) represent a very high probability of individual effect to small insects, DDVP exposure resulting from uses of naled equal to 0.25 lbs ai/A (0.03 lbs ai/A, as DDVP) represent a high probability of individual effect to small insects, and DDVP exposure resulting from uses of naled ≤ 0.1 lbs ai/A (0.01 lbs ai/A, as DDVP) represent a very low probability of individual effect to small insects. All uses of naled > 0.25 lbs ai/A represent a very high probability of individual effect to large insects, uses of naled equal to 0.25 lbs ai/A represent a high probability of individual effect to large insects, and uses of naled ≤ 0.1 lbs ai/A represent a very low probability of individual effect to large insects resulting from naled exposure. DDVP exposure resulting from any use of naled represents a low to very low probability of individual effect to large insects.

Based on these results, naled and DDVP do have the potential to directly affect the BCB and VELB. Additionally, since the acute RQs are exceeded, there is a potential for indirect effects to those listed species that rely on terrestrial invertebrates during at least some portion of their life-cycle (*i.e.*, CCR, SFGS and SJKF).

5.1.2.4. Terrestrial Plants

Generally, for indirect effects, potential effects on terrestrial vegetation are assessed using RQs from terrestrial plant seedling emergence and vegetative vigor EC_{25} data as a screen. However, there were no terrestrial plant toxicity data available, and as a result RQs could not be calculated. See Section 5.2 for a qualitative discussion regarding the potential effects of naled and DDVP on the CCR, SFGS, SJKF, BCB, and VELB via effects to terrestrial plants.

Based on these results, since the non-listed plant RQs could not be calculated due to lack of information, there is the potential for indirect effects to those listed species that rely on terrestrial plants during at least some portion of their life-cycle (*i.e*., CCR, SFGS, SJKF, BCB, and VELB).

5.1.3. Primary Constituent Elements of Designated Critical Habitat

For naled use, the assessment endpoints for designated critical habitat PCEs involve the same endpoints as those being assessed relative to the potential for direct and indirect effects to the listed species assessed here. Therefore, the effects determinations for direct and indirect effects are used as the basis of the effects determination for potential modification to designated critical habitat.

5.2. Risk Description

The risk description synthesizes overall conclusions regarding the likelihood of adverse impacts leading to a preliminary effects determination (*i.e*., “no effect,” “may affect, but not likely to adversely affect,” or “likely to adversely affect”) for the assessed species and the potential for modification of their designated critical habitat based on analysis of risk quotients and a comparison to the Level of Concern. The final No Effect/May Affect determination is made after the spatial analysis is completed at the end of the risk description, Section 5.3. In Section 5.2.1.5, a discussion of any potential overlap between areas where potential usage may result in LAA effects and areas where species are expected to occur (including any designated critical habitat) is presented. If there is no overlap of the species habitat and occurrence sections with the Potential Area of LAA Effects a No Effect determination is made.

If the RQs presented in the Risk Estimation (Section 5.1) show no direct or indirect effects for the assessed species, and no modification to PCEs of the designated critical habitat, a preliminary “no effect” determination is made, based on naled’s use and subsequent DDVP residues within the action area. However, if LOCs for direct or indirect effect are exceeded or effects may modify the PCEs of the critical habitat, the Agency concludes a preliminary "may affect" determination for the FIFRA regulatory action regarding naled. The preliminary effects determination for the CCR is "may affect," the preliminary effects determination for the SFGS is "may affect," the preliminary effects determination for the SJKF is "may affect," the preliminary effects determination for the BCB (and associated critical habitat) is "may affect," and the preliminary effects determination for the VELB (and associatated critical habitat) is "may affect."

A summary of the risk estimation results are provided in Table 5-18 for direct and indirect effects to the listed species assessed here and in Table 5-19 for the PCEs of their designated critical habitat.

Table 5-18. Risk Estimation Summary for Naled - Direct and Indirect Effects

Taxa	LOC Exceedances (Yes/No)	Description of Results of Risk Estimation	Assessed Species Potentially Affected
Freshwater Fish and Aquatic-phase Amphibians	Non-listed Species **(Yes)**	Acute RQs for non-listed species are exceeded for most uses. Chronic RQs for non-listed species are exceeded for half the uses.	Indirect Effects: CCR, SFGS
Freshwater Invertebrates	Non-listed Species **(Yes)**	Acute RQs for non-listed species are exceeded for all uses. Chronic RQs for non-listed species are exceeded for all uses.	Indirect Effects: CCR, SFGS
Estuarine/Marine Fish	Non-listed Species **(Yes)**	Acute and Chronic RQs assumed to be exceeded for most uses due to freshwater fish having indirect effects.	Indirect Effects: CCR
Estuarine/Marine Invertebrates	Non-listed Species **(Yes)**	Acute and Chronic RQs assumed to be exceeded for most uses due to freshwater invertebrates having indirect effects.	Indirect Effects: CCR
Vascular Aquatic Plants	Non-listed Species **(No)**	RQs are not exceeded for any uses.	Indirect Effects: CCR, SFGS
Non-Vascular Aquatic Plants	Non-listed Species **(Maybe)**	RQs are exceeded for a few uses (ornamental, cabbage, broccoli, cauliflower, collards, kale, safflower, swamps/mosquitoes)	Indirect Effects: CCR, SFGS
Birds, Reptiles, and Terrestrial-Phase Amphibians	Non-listed Species **(Yes)** - Naled	Acute dose-based RQs for non-listed species are exceeded for all uses. Acute dietary-based RQs for non-listed species are not exceeded for any uses of naled. Chronic dietary-based RQs are exceeded for uses ≥ 0.9 lbs ai/A (at 104 apps., at a 3-day interval only)	Indirect Effects: CCR, SFGS & SJKF

Taxa	LOC Exceedances (Yes/No)	Description of Results of Risk Estimation	Assessed Species Potentially Affected
	Non-listed Species **(Yes)** - DDVP	Acute dose-based RQs from DDVP exposure for non-listed species are exceeded for all uses. Acute dietary-based RQs from DDVP exposure for non-listed species are not exceeded for any uses of naled. Chronic dietary-based RQs from DDVP exposure are exceeded for uses of naled ≥ 0.25 lbs ai/A (as naled, equivalent to 0.03 lbs ai/A DDVP).	Indirect Effects: CCR, SFFS & SJKF
	Listed Species **(Yes)** - Naled	Acute dose-based RQs exceed the listed species LOC for all uses of naled. Acute dietary-based RQs for listed species are exceeded for all uses ≥ 0.9 lbs ai/A of naled. Chronic dietary-based RQs exceed the chronic LOC for uses of naled ≥ 0.9 lbs ai/A (at 104 apps., at a 3-day interval only).	Direct Effects: CCR & SFGS
	Listed Species **(Yes)** - DDVP	Acute dose-based RQs from DDVP exposure exceed the listed species LOC for all uses of naled. Acute dietary-based RQs from DDVP exposure exceed the listed species LOC for uses of naled ≥ 0.9 lbs ai/A (at 104 apps., at a 3-day interval only as naled, equivalent to 0.1 lbs ai/A DDVP). Chronic dietary-based RQs from DDVP exposure, exceed the chronic LOC for uses of naled ≥ 0.25 lbs ai/A (as naled, equivalent to 0.03 lbs ai/A DDVP).	Direct Effects: CCR & SFGS
Mammals	Non-listed Species **(Yes)** - Naled	**Small mammals:** Acute dose-based RQs exceed the non-listed species LOC for all uses of naled > 0.25 lbs ai/A. Chronic dose-based RQs exceed the chronic LOC for all uses of naled. Chronic dietary-based RQs exceed the chronic LOC for uses of naled ≥ 0.9 lbs ai/A.	Indirect Effects: CCR, SFGS & SJKF
	Non-listed Species **(Yes)** - DDVP	**Small mammals:** Acute dose-based RQs from DDVP exposure do not exceed the non-listed species LOC for any	Indirect Effects: CCR, SFGS & SJKF

Taxa	LOC Exceedances (Yes/No)	Description of Results of Risk Estimation	Assessed Species Potentially Affected
		uses of naled. Chronic dose-based RQs from DDVP exposure exceed the chronic LOC for uses of naled ≥ 0.25 lbs ai/A (as naled, equivalent to 0.03 lbs ai/A DDVP). Chronic dietary-based RQs from DDVP exposure exceed the chronic LOC for uses of naled > 0.25 lbs ai/A (as naled, equivalent to 0.03 lbs ai/A DDVP).	
	Listed Species **(Yes)** - Naled	**Large mammals:** Acute dose-based RQs exceed the listed species LOC for all uses of naled > 0.25 lbs ai/A. Chronic dose-based RQs exceed the chronic LOC for all uses of naled ≥ 0.1 lbs ai/A with 2 applications at a 7 day interval. Chronic dietary-based RQs exceed the chronic LOC for uses of naled > 0.25 lbs ai/A.	Direct Effects: SJKF
	Listed Species **(Yes)** - DDVP	**Large mammals:** Acute dose-based RQs from DDVP exposure exceed the listed species LOC for uses of naled ≥ 0.9 lbs ai/A (0.1 lbs ai/A as DDVP, at 104 apps., at a 3-day interval only). Chronic dose-based and dietary-based RQs from DDVP exposure exceed the chronic LOC for uses of naled ≥ 0.9 lbs ai/A (as naled, equivalent to 0.1 lbs ai/A DDVP).	Direct Effects: SJKF
Terrestrial Invertebrates	Listed Species **(Yes)** - Naled	Acute RQs exceed the terrestrial invertebrate LOC for all uses.	Direct Effects: BCB & VELB Indirect Effects: CCR, SFGS, & SJKF
	Listed Species **(Yes)** - DDVP	Acute RQs exceed the terrestrial invertebrate LOC for all uses.	Direct Effects: BCB & VELB Indirect Effects: CCR, SFGS, & SJKF
Terrestrial Plants – Monocots	Non-listed Species	**NO DATA – Effects to terrestrial plants cannot be quantified due to the lack of data. However there are incident data available, as a result risk could not be precluded.**	Indirect Effects: BCB, VELB, CCR, SFGS, & SJKF
Terrestrial Plants – Dicots	Non-listed Species		
	Listed Species		

Table 5-19. Risk Estimation Summary for Naled – Effects to Designated Critical Habitat. (PCEs)

Taxa	LOC Exceedances (Yes/No)	Description of Results of Risk Estimation	Species Associated with a Designated Critical Habitat that May Be Modified by the Assessed Action
Terrestrial Invertebrates	Listed Species **(Yes)** - Naled	Acute RQs exceed the terrestrial invertebrate LOC for all uses.	BCB & VELB
	Listed Species **(Yes)** - DDVP	Acute RQs exceed the terrestrial invertebrate LOC for all uses.	BCB & VELB
Terrestrial Plants – Monocots	Non-listed Species[1] (**Could not be determined**)	**NO DATA – Effects to terrestrial plants cannot be quantified due to the lack of data. However there are incident data available, as a result risk could not be precluded.**	BCB & VELB
Terrestrial Plants – Dicots	Non-listed Species[2] (**Could not be determined**)		
	Listed Species (**Could not be determined**)		

1. Non-listed LOCs would be evaluated when the assessed species did not have an obligate relationship with terrestrial monocots or dicots.
2. Listed LOCs would be evaluated when the assessed species has an obligate relationship with terrestrial dicots (both the BCB and VELB have an obligate relationship with terrestrial dicots).

Following a preliminary "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 assessed species. 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 assessed species and its designated critical habitat.

The criteria used to make determinations that the effects of an action are "not likely to adversely affect" the assessed species or modify 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 assessed species and their designated critical habitat is provided in Sections 5.2.1 through 5.2.4. The effects determination section for each listed species assessed will follow a similar pattern. Each will start with a discussion of the potential for direct effects, followed by a discussion of the potential for indirect effects. These discussions do not consider the spatial analysis. For those listed species that have designated critical habitat, the section will end with a discussion on the potential for modification to the critical habitat from the use of naled. Finally, in Section 5.2.1.5, a discussion of any potential overlap between areas of concern and the species (including any designated critical habitat) is presented. If there is no overlap of the species habitat and occurrence sections with the Potential Area of LAA Effects a No Effect determination is made.

5.2.1. California Clapper Rail (CCR)

5.2.1.1. Direct Effects

Naled – Parent

Acute and chronic RQs

To determine direct effects to the CCR from exposure to naled, avian toxicity data was used. The initial screen (a bird consuming 100% of their dietary requirements) for potential direct and indirect effects to listed species was conducted using T-REX, and modeled a small bird (20g) consuming short grass. A preliminary **"may affect"** determination for direct effects to the CCR was made based on the screen assuming consuming 100% of dietary requirements as short grass.

However, CCRs consume other food items including tall grasses, spiders, worms, small birds, mammals, and seeds, none of which were found to be at 100%. Acute dose-based RQs associated with these other food items were also examined. For the small bird (20g) and adult bird (100g) consuming tall grass and broadleaf plants/small insects the acute dose-based RQs exceeded both the acute listed and non-listed species LOC (0.1 and 0.5, respectively), for all uses of naled. The acute dose-based RQs assuming 100% dietary consumption range from 15.97 to 0.83 for small birds (20g) consuming tall grass and 19.60 to 1.02 for small birds (20g) consuming broadleaf plants/small insects. The acute dose-based RQs assuming 100% dietary consumption range from 7.15 to 0.37 for adult birds (100g) consuming tall grass and 8.78 to 0.05 for adult birds (100g) consuming broadleaf plants/small insects.

For the small bird (20g) consuming fruits/pods/seeds/large insects the acute dose-based RQs exceed the acute listed species LOC (0.1) for all uses of naled, and exceed the acute non-listed species LOC (0.5) for uses > 0.25 lbs ai/A. The acute dose-based RQs assuming 100% dietary consumption range from 2.18 to 0.11 for small birds (20g) consuming fruits/pods/seeds/large insects. For an adult bird (100g) consuming fruits/pods/seeds/large insects the acute dose-based RQs exceed the acute listed species LOC (0.1) for uses ≥ 0.25 lbs ai/A, and exceed the non-listed LOC (0.5) for uses ≥ 1.4 lbs ai/A (and ≥ 0.9 lbs ai/A when applied 104 times at 3-d intervals). The acute dose-based RQs assuming 100% dietary consumption range from 0.98 to 0.05 for adult birds (100g) consuming fruits/pods/seeds/large insects. For the small bird (20g) consuming seeds (granivore) the acute dose-based RQs exceeded the acute listed species LOC (0.1) only for uses > 0.25 lbs ai/A, the non-listed species LOC (0.5) was not exceeded for any use of naled. The acute dose-based RQs assuming 100% dietary consumption range from 0.48 to 0.03 for small birds (20g) consuming seeds (granivore). For an adult bird (100g) consuming seeds (granivore) the acute dose-based RQs exceeded the acute listed species LOC (0.1) only for uses ≥ 0.9 lbs ai/A, the non-listed species LOC (0.5) was not exceeded for any use of naled. The acute dose-based RQs assuming 100% dietary consumption range from 0.22 to 0.01 for adult birds (100g) consuming seeds (granivore).

The acute dietary-based RQs exceed the listed species LOC (0.1) for all uses of naled with an application rate ≥ 0.9 lbs ai/A (regardless of interval), and the naled acute dietary-based RQs range from 0.38 to 0.02. The chronic dietary-based RQs for naled exposure exceed the chronic LOC for uses of naled with an application rate > 0.9 lbs ai/A, and equal to 0.9 lbs ai at 3 day intervals (with 104 applications). All other uses either with an application rate equal to 0.9 lbs ai/A, (at either 1 application or 52 applications) or with an application rate less than 0.9 lbs ai/A, do not exceed the chronic LOC of 1.0, for naled exposures. The chronic dietary-RQs range from 1.94 to 0.10 from naled exposures.

In addition to dietary exposure, there is the potential for inhalation exposure to birds via volitization. Naled does volatilize, and there is the potential for birds to be exposed to naled as a result. However, no further data are available to evaluate this route of exposure. As a result there is an uncertainty associated with the potential for exposure via inhalation of naled.

Sublethal effects

The acute oral LD_{50} toxicity test observed the following sublethal effects. Signs of intoxication included ataxia, goose-stepping, tachypnea, salivation, tremors, loss of righting reflex, violent wing-beat convulsions, and opisthotonos, and these signs appeared as soon as 5 minutes after test initiation. Mortalities generally occurred between 15 minutes and 3.5 hours after treatment with one pheasant dying between 2 and 3 days after treatment. Remission of survivors took up to 2 weeks. A treatment level as low as 22.2 mg/kg caused mortality in Canada geese (MRID 00160000). One key observation from this study was that naled was less toxic the smaller (weight) the bird. Two studies on the toxic effects of naled to reproduction of birds were submitted. The Northern bobwhite quail (*C. virginiaus*, MRID 44517901) endpoints were based on significant reductions in male body weights at all treatment levels. At the 130 ppm a.i. treatment level, the average weight of a male bird was 10 grams less than the control. The Mallard duck (*A. platyrhynchos*, MRID 44517902) endpoints were based on reductions in egg production (eggs laid, egg set, etc.) and in percentage of eggs set and eggs laid.

Dose Response – Probability of an Individual Effect

No slope is available for the submitted avian studies; therefore the probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). All uses of naled represent a very high probability of individual effect to small birds when considering dose-based acute naled exposure. When considering dietary-based acute naled exposure, there is a low to very low probability of individual effect to small birds for all uses of naled > 1.4 lbs ai/A (scenario 3) and > 0.9 lbs ai/A, 104 applications at 3 day intervals (scenario 6).

Refinements
Since CCRs consume other terrestrial food items including tall grasses, spiders, worms, small birds, mammals, and seeds, none of which were found to be make up 100% of the diet, a refinement was needed to make the effects determination, Likely to Adversely Affect (LAA) or Not Likely to Adversely Affect (NLAA). From available literature (Eddleman & Conway, 1998, Birds of North America), up to 15% of the diet in the winter and approximately 1% of the diet for the remainder of the year consists of plant material; cordgrass, sedges, bull rushes (which can are classified as tall grasses), pickleweed (a broadleaf plant), and seeds. Since the CCR has different dietary requirements than those modeled in T-REX, in order to model the potential exposure likely to affect the CCR from terrestrial food items a comparison of the dose and dietary based RQs was made. The comparison was made for different uses depending on timing of application, between the 100% assumption associated with T-REX, with the 15% (winter diet) and 1% (non-winter diet) maximum of plant material (tall grasses, broadleafs, and seeds (Table 5-20 and Table 5-21). The forest uses (scenarios 5 and 6) due to the potential for year round application, compared both the 15% and 1% of diet to the 100% T-REX produced RQs. All other uses compared only the 1% diet of plant material (tall grass, broadleaf plants, and seeds) as these applications are less likely to occur in the winter months when plant material is consumed more.

Table 5-20. Acute and Chronic RQs Derived Using T-REX for the CCR and Birds – Naled (1% of diet for these uses, as they are not likely to be applied during winter)

Scenario (lb ai/A)	Diet	Dose-Based RQs				Dietary-Based RQs			
		Small (20 g)		Adult (100g)		Small (20 g)/ Adult (100 g)			
		Acute RQ 100%	1%	Acute RQ 100%	1%	Acute RQ 100%	1%	Chronic RQ 100%	1%
1- Safflower (2.1 lbs ai/a, 1 app.)	Short Grass	**34.85**	**0.35**	**15.61**	**0.156**	**0.38**	0.004	**1.94**	0.019
	Tall Grass	**15.97**	**0.16**	**7.15**	0.071	**0.17**	0.002	0.89	0.009
	Broadleaf plants/ sm Insects	**19.60**	**0.20**	**8.78**	0.088	**0.21**	0.002	**1.09**	0.011
	Fruits/pods/seeds/ lg insects	**2.18**	0.02	**0.98**	0.098	0.02	0.0002	0.12	0.0012
	Seeds (granivore)	**0.48**	0.005	**0.22**	0.0022	----	----	----	----
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	Short Grass	**31.53**	**0.31**	**14.12**	**0.141**	**0.34**	0.003	**1.75**	0.017
	Tall Grass	**14.45**	**0.14**	**6.47**	0.065	**0.16**	0.002	0.80	0.008
	Broadleaf plants/ sm Insects	**17.74**	**0.18**	**7.94**	0.079	**0.19**	0.002	0.99	0.01
	Fruits/pods/seeds/ lg insects	**1.97**	0.02	**0.88**	0.0088	0.02	0.0002	0.11	0.001
	Seeds (granivore)	**0.44**	0.004	**0.20**	0.002	----	----	----	----
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	Short Grass	**23.23**	**0.23**	**10.41**	**0.10**	**0.25**	0.002	**1.29**	0.0013
	Tall Grass	**10.65**	**0.11**	**4.77**	0.048	**0.12**	0.001	0.59	0.0059
	Broadleaf plants/ sm Insects	**13.07**	**0.13**	**5.85**	0.058	**0.14**	0.001	0.73	0.0073

Scenario (lb ai/A)	Diet	Dose-Based RQs				Dietary-Based RQs			
		Small (20 g)		Adult (100g)		Small (20 g)/ Adult (100 g)			
		Acute RQ 100%	**1%**	**Acute RQ 100%**	**1%**	**Acute RQ 100%**	**1%**	**Chronic RQ 100%**	**1%**
	Fruits/pods/seeds/ lg insects	**1.45**	0.01	**0.65**	0.0065	0.02	0.0002	0.08	0.0008
	Seeds (granivore)	**0.32**	0.003	**0.14**	0.0014	----	----	----	----
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	Short Grass	**14.94**	**0.15**	**6.69**	0.067	**0.16**	0.002	0.83	0.008
	Tall Grass	**6.85**	0.07	**3.07**	0.031	0.07	0.0007	0.38	0.004
	Broadleaf plants/ sm Insects	**8.40**	0.08	**3.76**	0.038	0.09	0.0009	0.47	0.005
	Fruits/pods/seeds/ lg insects	**0.93**	0.009	**0.42**	0.004	0.01	0.0001	0.05	0.0005
	Seeds (granivore)	**0.21**	0.002	0.09	0.0009	----	----	----	----
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**4.52**	0.04	**2.02**	0.02	0.05	0.0005	0.25	0.002
	Tall Grass	**2.07**	0.02	**0.93**	0.009	0.02	0.0002	0.12	0.001
	Broadleaf plants/ sm Insects	**2.54**	0.02	**1.14**	0.011	0.03	0.0003	0.14	0.001
	Fruits/pods/seeds/ lg insects	**0.28**	0.003	**0.13**	0.0013	< 0.01	<0.0001	0.02	0.0002
	Seeds (granivore)	0.06	0.0006	0.03	0.0003	----	----	----	----
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	Short Grass	**2.83**	0.03	**1.27**	0.013	0.03	0.0003	0.16	0.002
	Tall Grass	**1.30**	0.01	**0.58**	0.006	0.01	0.0001	0.07	0.0007
	Broadleaf plants/ sm Insects	**1.59**	0.02	**0.71**	0.007	0.02	0.0002	0.09	0.0009
	Fruits/pods/seeds/ lg insects	**0.18**	0.002	0.08	0.0008	< 0.01	<0.0001	0.01	0.0001
	Seeds (granivore)	0.04	0.0004	0.02	0.0002	----	----	----	----
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**1.81**	0.02	**0.81**	0.008	0.02	0.0002	0.10	0.001
	Tall Grass	**0.83**	0.08	**0.37**	0.004	0.01	0.0001	0.05	0.0005
	Broadleaf plants/ sm Insects	**1.02**	0.01	**0.46**	0.005	0.01	0.0001	0.06	0.0006
	Fruits/pods/seeds/ lg insects	**0.11**	0.01	0.05	0.0005	< 0.01	<0.0001	0.01	0.0001
	Seeds (granivore)	0.03	0.0003	0.01	0.0001	----	----	----	----

LOC exceedances (acute RQ $\geq$ 0.1 and chronic RQ $\geq$ 1.0) are **bolded.**

[1]Based on dose-based EEC and Canada goose acute oral LD_{50} = 36.9 mg/kg-bw

[2]Based on dose-based EEC and Japanese Quail subacute dietary LC_{50} =1327 mg/kg-diet

[3]Based on dietary-based EEC and Mallard Duck NOAEC = 260 mg/kg-diet.

*Adjustments are made by multiplying the 100% RQ 0.01 to calculate the RQ assuming that 1% of the diet is composed of that particular food item (plant material).

Table 5-21. Acute and Chronic RQs Derived Using T-REX for the CCR and Birds – Naled (15% and 1% of diet, because year round application of naled is possible for these uses)

Scenario (lb ai/A)	Diet	Dose-Based RQs						Dietary-Based RQs					
		Small (20 g)			Large (100g)			Small (20 g)/Adult (100 g)					
		Acute RQ 100%	15%	1%	Acute RQ 100%	15%	1%	Acute RQ 100%	15%	1%	Chronic RQ 100%	15%	1%
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	Short Grass	**16.38**	**2.46**	**0.16**	**7.34**	**1.01**	0.073	**0.18**	0.027	0.002	0.91	0.14	0.009
	Tall Grass	**7.51**	**1.13**	0.075	**3.36**	**0.5**	0.034	0.08	0.012	0.001	0.42	0.06	0.004
	Broadleaf plants/ sm Insects	**9.22**	**1.38**	0.092	**4.13**	**0.62**	0.041	**0.10**	0.015	0.001	0.51	0.08	0.005
	Fruits/pods/seeds /lg insects	**1.02**	**0.15**	0.010	**0.46**	0.069	0.005	0.01	0.001	0.0001	0.06	0.01	0.001
	Seeds (granivore)	**0.23**	0.03	0.002	**0.10**	0.015	0.001	----	----	----	----	----	----
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 7-d interval)	Short Grass	**23.10**	**3.46**	**0.23**	**10.35**	**1.55**	0.010	**0.25**	0.037	0.002	**1.29**	0.19	0.013
	Tall Grass	**10.59**	**1.59**	**0.11**	**4.74**	**0.71**	0.047	**0.12**	0.018	0.001	0.59	0.09	0.006
	Broadleaf plants/ sm Insects	**13.00**	**1.95**	**0.13**	**5.82**	**0.87**	0.058	**0.14**	0.021	0.001	0.72	0.11	0.007
	Fruits/pods/seeds /lg insects	**1.44**	**0.22**	0.014	**0.65**	0.097	0.006	0.02	0.003	0.0002	0.08	0.01	0.001
	Seeds (granivore)	**0.32**	0.05	0.003	**0.14**	0.02	0.001	----	----	----	----	----	----

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded.**
[1]Based on dose-based EEC and Canada goose acute oral LD_{50} = 36.9 mg/kg-bw
[2]Based on dose-based EEC and Japanese Quail subacute dietary LC_{50} =1327 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 260 mg/kg-diet.
*Adjustments are made by multiplying the 100% RQ by 0.15 to calculate the RQ assuming 15% of the diet is composed of that food item (plant material), and 0.01 to calculate the RQ assuming 1% of the diet is composed of that particular food item (plant material).

This refinement provides a better understanding of the risk posed to the CCR when incorporating the actual amount of a food item the bird is likely to consume in the environment. The acute dose-based RQs for juvenile birds (20g) consuming either tall grass or broadleaf plants still exceed the listed species LOC (0.1) for uses ≥ 1.4 lbs ai/A, when assuming that 1% of the diet is composed of that food item (plant material) (Table 5-20). The acute dose-based RQs for juvenile birds consuming any of the food items of relevance (i.e., tall grass, broadleaf plants, and seeds) all exceed the acute listed species for both forest use scenarios (scenario 5 and 6) assuming 15% of the diet is from those food items (Table 5-21). The acute dose-based RQs for tall grass and broadleaf plants only exceed the listed species acute LOC (0.1) for the forest use with 104 applications at 3 day intervals assuming 1% of the diet from tall grass or broadleaf plants (Table 5-21). The acute dose-based RQs for adult birds (100g) consuming any food item when assuming that 1% of the diet is composed of that food item (plant material) does not exceed the acute listed species LOC (0.1) for any uses of naled. The acute dose-based RQs for adult birds (100g) consuming either tall grass or broadleaf plants still exceeds the acute listed species LOC (0.1) for both forest use scenarios (scenario 5 and 6) assuming 15% of the diet is from those food items (Table 5-21). The acute and chronic dietary-based RQs do not exceed the listed species LOC (0.1 and 1.0, respectively) when using the refinement method assuming 1% or 15% of the diet is from those food item for any use of naled (Table 5-20 and Table 5-21). This indicates that there is still risk potential to the CCR from application of naled when considering the food relative to the amount they consume in the environment.

One other factor to consider is that the most sensitive acute oral toxicity endpoint for naled was the Canada goose, which is a much larger bird than the CCR. When the additional acute oral toxicity endpoints were examined, smaller bird species were found to be less sensitive to naled than the larger Canadian goose. Although the weights during testing were not available, the average weights of the birds at "likely" test initiation were used to examine the differences seen in toxicity when values for the smaller, less sensitive bird were used. Average weights of the birds; sharp-tailed grouse and Canadian goose were located in the Birds of North America volumes, (Connelly et al. 1998 – sharp-tailed grouse, and Mowbray et al 2002 – Canada Goose). Only the dose-based RQs were affected by this change, when the short-tailed grouse LD_{50} value of 64.9 mg/kg-bw was used in combination with its average weight of 827g, the resulting dose-based acute RQ values were greater than 50% of the dose-based acute RQ values calculated using the Canadian goose toxicity endpoint and average weight. Comparison tables of resulting acute dose-based RQs from differing bird species toxicity endpoints and associated weights can be found in Appendix L.

DDVP – Degradate

<u>*Acute and chronic RQs*</u>

To determine direct effects to the CCR from exposure to DDVP, avian toxicity data was used. The initial screen for potential direct and indirect effects to listed species was conducted using T-REX, and modeled a small bird (20g) consuming short grass. A preliminary **"may affect"** determination was made based on the screen and assuming the CCR is consuming 100% of dietary requirements as short grass.

However, CCRs consume other food items including tall grasses, spiders, worms, small birds, mammals, and seeds, none of which were found to be at 100%. Acute dose-based RQs associated with these other food items were also examined. For the small bird (20g) and adult bird (100g) consuming tall grass and broadleaf plants/small insects the acute dose-based RQs exceeded the acute listed species LOC (0.1), for all uses of naled. The small bird (20g) consuming tall grass and broadleaf plants/small insects acute dose-based RQs exceeded the non-listed species LOC (0.5) for all uses > 0.1 lbs ai/A (naled), (0.01 lbs ai/A, DDVP except when applied at 0.01 twice at a 7-d interval). The adult birds (100g) consuming tall grass acute dose-based RQs exceeded the non-listed species LOC (0.5) for all uses > 0.25 lbs ai/A (naled), (0.03 lbs ai/A, DDVP). The adult birds (100g) consuming broadleaf plants/small insects acute dose-based RQs exceeded the non-listed species LOC (0.5) for all uses ≥ 0.25 lbs ai/A (naled), (0.03 lbs ai/A, DDVP). The acute dose-based RQs assuming 100% dietary consumption range from 7.42 to 0.34 for small birds (20g) consuming tall grass and 9.11 to 0.41 for small birds (20g) consuming broadleaf plants/small insects. The acute dose-based RQs assuming 100% dietary consumption range from 3.33 to 0.15 for adult birds (100g) consuming tall grass and 4.08 to 0.19 for adult birds (100g) consuming broadleaf plants/small insects.

For the small bird (20g) consuming fruits/pods/seeds/large insects the acute dose-based RQs exceed the acute listed species LOC (0.1) for all uses of naled ≥ 0.25 lbs ai/A (naled), (0.03 lbs ai/A, DDVP), and exceed the acute non-listed species LOC (0.5) for uses ≥ 1.4 lbs ai/A (naled), (0.16 lbs ai/A, DDVP). The acute dose-based RQs assuming 100% dietary consumption range from 1.01 to 0.05 for small birds (20g) consuming fruits/pods/seeds/large insects. For an adult bird (100g) consuming fruits/pods/seeds/large insects the acute dose-based RQs exceed the acute listed species LOC (0.1) only for uses > 0.25 lbs ai/A (naled), (0.03 lbs ai/A, DDVP). The non-listed species LOC (0.5) is not exceeded for any DDVP residues resulting from any naled use. The acute dose-based RQs assuming 100% dietary consumption range from 0.45 to 0.02 for adult birds (100g) consuming fruits/pods/seeds/large insects. For the small bird (20g) consuming seeds (granivore) the acute dose-based RQs exceeded the acute listed species LOC (0.1) only for uses > 0.9 lbs ai/A (naled), (0.1 lbs ai/A, DDVP), the non-listed species LOC (0.5) was not exceeded for any use of naled. The acute dose-based RQs assuming 100% dietary consumption range from 0.22 to 0.01 for small birds (20g) consuming seeds (granivore). For an adult bird (100g) consuming seeds (granivore) the acute dose-based RQs exceeded the acute listed species LOC (0.1) only for the maximum single application of 2.1 lbs ai/A (naled), (0.24 lbs ai/A, DDVP), the non-listed species LOC (0.5) was not exceeded for any use of naled. The acute dose-based RQs assuming 100% dietary consumption range from 0.10 to < 0.01 for adult birds (100g) consuming seeds (granivore).

The acute dietary-based RQs for DDVP exposure exceed the acute LOC (0.1) for uses of naled with an application rate > 0.1 lbs ai/A (naled), (0.01 lbs ai/A, DDVP except when applied at 0.01 twice at a 7-d interval), and the DDVP acute dietary-based RQs range from 0.19 to 0.01. The chronic dietary-based RQs for DDVP exposure exceed the chronic LOC (1.0) for uses of naled with an application rate ≥ 0.25 lbs ai/A (of naled) (equal to 0.03 lbs ai/A of DDVP), and the DDVP chronic dietary-based RQs range from 11.52 to 0.52.

In addition to dietary exposure, there is the potential for inhalation exposure to birds via volitization. Both naled and DDVP volatilize, and there is the potential for birds to be exposed to DDVP as a result of naled application. However, no further data are available to evaluate this route of exposure. As a result there is an uncertainty associated with the potential for exposure via inhalation of DDVP as a degradate of naled.

Sublethal effects

The acute oral LD_{50} toxicity test observed the following sublethal effects. Acute symptoms included goose stepping ataxia, use of wings to aid in balance, tremors, and convulsions (MRID 0160000). Two studies on the toxic effects of DDVP to reproduction of birds were submitted. The Mallard duck (*A. platyrhynchos*, MRID 44233401) endpoints were based on a reduction in eggshell thickness and a reduction in the number of eggs laid, eggs set, viable embryos and live three-week embryos. The Northern bobwhite quail (*C. virginiaus*, MRID 43981701) endpoints were based on eggs laid, viable embryos, live three-week embryos, normal hatchlings, 14-day old survivors, 14-day survivor weight, food consumption, and terminal adult male and female body weight.

Dose Response – Probability of an Individual Effect

The probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). DDVP exposure resulting from all uses of naled > 0.1 lbs ai/A (0.01 lbs ai/A, as DDVP) represent a very high probability of individual effect to small birds when considering dose-based acute DDVP exposure, and uses of naled ≤ 0.1 lbs ai/A (0.01 lbs ai/A, as DDVP) represent a medium to low probability of individual effect to small birds when considering dose-based acute DDVP exposure. When considering dietary-based acute DDVP exposure resulting from naled use, there is a very low probability of individual effect to small birds for any use of naled.

<u>Refinements</u>
Since CCRs consume other terrestrial food items including tall grasses, spiders, worms, small birds, mammals, and seeds, none of which were found to be make up 100% of the diet, a refinement was needed to make the effects determination, Likely to Adversely Affect (LAA) or Not Likely to Adversely Affect (NLAA). From available literature (Eddleman & Conway, 1998, Birds of North America), up to 15% of the diet in the winter and approximately 1% of the summer diet consists of plant material; cordgrass, sedges, bull rushes (which can are classified as tall grasses), pickleweed (broadleaf), and seeds. Since the CCR has different dietary requirements than those modeled in T-REX, in order to model the potential exposure likely to affect the CCR from terrestrial food items a comparison of the dose and dietary based RQs was made. The comparison was made for different uses depending on timing of application, between the 100% assumption associated with T-REX, with the 15% (winter diet) and 1% (summer diet) maximum of plant material (tall grasses, broadleafs, and seeds) (Table 5-22 and Table 5-23). The forest uses (scenarios 5 and 6) due to the potential for year round application, compared both the 15% and 1% of diet to the 100% T-REX produced RQs. All other uses compared only the 1% diet of plant material (tall grass, broadleaf plants, and seeds) as these applications are less likely to occur in the winter months when plant material is consumed more.

Table 5-22. Acute and Chronic RQs Derived Using T-REX for the CCR and Birds – DDVP (1% of diet for these uses of naled, as they are not likely to be applied during winter)

Scenario (lb ai/A)	Diet	Dose-Based RQs				Dietary-Based RQs			
		Small (20 g)		Adult (100g)		Small (20 g)/ Adult (100 g)			
		Acute RQ 100%	1%	Acute RQ 100%	1%	Acute RQ 100%	1%	Chronic RQ 100%	1%
1- Safflower (0.24 lbs ai/a, 1 app.)	Short Grass	**16.20**	**0.162**	**7.26**	0.073	**0.19**	0.0019	**11.52**	0.1152
	Tall Grass	**7.42**	0.074	**3.33**	0.0333	0.09	0.0009	**5.28**	0.053
	Broadleaf plants/ sm Insects	**9.11**	0.091	**4.08**	0.041	**0.11**	0.0011	**6.48**	0.065
	Fruits/pods/seeds/ lg insects	**1.01**	0.010	**0.45**	0.0045	0.01	0.0001	0.72	0.0072
	Seeds (granivore)	**0.22**	0.0022	**0.10**	0.0010	----	----	**----**	----
2- Cole crops, tree nuts, citrus (0.22 lbs ai/A, 1 app.)	Short Grass	**14.85**	**0.148**	**6.65**	0.066	**0.18**	0.0018	**10.56**	0.1056
	Tall Grass	**6.81**	0.0681	**3.05**	0.0305	0.08	0.0008	**4.84**	0.048
	Broadleaf plants/ sm Insects	**8.35**	0.0835	**3.74**	0.037	**0.10**	0.0010	**5.94**	0.059
	Fruits/pods/seeds/ lg insects	**0.93**	0.0093	**0.42**	0.0042	0.01	0.0001	0.66	0.0066
	Seeds (granivore)	**0.21**	0.0021	0.09	0.0009	----	----	**----**	----
3- Alfalfa, row crops, cotton (0.16 lbs ai/A, 1 app.)	Short Grass	**10.80**	**0.108**	**4.84**	0.048	**0.13**	0.0013	**7.68**	0.077
	Tall Grass	**4.95**	0.0495	**2.22**	0.022	0.06	0.0006	**3.52**	0.0352
	Broadleaf plants/ sm Insects	**6.07**	0.0607	**2.72**	0.0272	0.07	0.0007	**4.32**	0.0432
	Fruits/pods/seeds/ lg insects	**0.67**	0.0067	**0.30**	0.0030	0.01	0.0001	0.48	0.0048

Scenario (lb ai/A)	Diet	Dose-Based RQs				Dietary-Based RQs			
		Small (20 g)		Adult (100g)		Small (20 g)/ Adult (100 g)			
		Acute RQ 100%	1%	Acute RQ 100%	1%	Acute RQ 100%	1%	Chronic RQ 100%	1%
	Seeds (granivore)	**0.15**	0.0015	0.07	0.0007	----	----	----	----
4- Melons, misc food and non-food plants (0.1 lbs ai/A, 1 app.)	Short Grass	**6.75**	0.0675	**3.02**	0.0302	0.08	0.0008	**4.80**	0.0480
	Tall Grass	**3.09**	0.0309	**1.39**	0.014	0.04	0.0004	**2.20**	0.0220
	Broadleaf plants/ sm Insects	**3.80**	0.038	**1.70**	0.017	0.05	0.0005	**2.70**	0.0270
	Fruits/pods/seeds/ lg insects	**0.42**	0.0042	**0.19**	0.002	0.01	0.0001	0.30	0.0030
	Seeds (granivore)	0.09	0.0009	0.04	0.0004	----	----	----	----
7- Insect pests-animal and human health concerns (0.03 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**2.20**	0.022	**0.99**	0.001	0.03	0.0003	**1.57**	0.0157
	Tall Grass	**1.01**	0.010	**0.45**	0.0045	0.01	0.0001	0.72	0.0072
	Broadleaf plants/ sm Insects	**1.24**	0.0124	**0.56**	0.0056	0.01	0.0001	0.88	0.0088
	Fruits/pods/seeds/ lg insects	**0.14**	0.0014	0.06	0.0006	< 0.01	<0.0001	0.10	0.0010
	Seeds (granivore)	0.03	0.0003	0.01	0.0001	----	----	----	----
8- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 1-d interval)	Short Grass	1.15	0.0115	**0.52**	0.0052	0.01	0.0001	0.82	0.0082
	Tall Grass	0.53	0.0053	**0.24**	0.0024	0.01	0.0001	0.38	0.0038
	Broadleaf plants/ sm Insects	0.65	0.0065	**0.29**	0.003	0.01	0.0001	0.46	0.0046
	Fruits/pods/seeds/ lg insects	0.07	0.0007	0.03	0.0003	< 0.01	<0.0001	0.05	0.0005
	Seeds (granivore)	0.02	0.0002	0.01	0.0001	----	----	----	----
9- Insect pests-animal and human health concerns (0.01 lbs ai/A, 2 apps., 7-d interval)	Short Grass	**0.73**	0.0073	**0.33**	0.0033	0.01	0.0001	0.52	0.0052
	Tall Grass	**0.34**	0.0034	**0.15**	0.0015	< 0.01	<0.0001	0.24	0.0024
	Broadleaf plants/ sm Insects	**0.41**	0.0041	**0.19**	0.002	< 0.01	<0.0001	0.29	0.0029
	Fruits/pods/seeds/ lg insects	0.05	0.0005	0.02	0.0002	< 0.01	<0.0001	0.03	0.0003
	Seeds (granivore)	0.01	0.0001	< 0.01	<0.0001	----	----	----	----

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.

[1]Based on dose-based EEC and Mallard Duck acute oral LD_{50} = 7.8 mg/kg-bw

[2]Based on dose-based EEC and Japanese quail subacute dietary LC_{50} =298 mg/kg-diet

[3]Based on dietary-based EEC and Mallard Duck NOAEC = 5 mg/kg-diet.

*Adjustments are made by multiplying the 100% RQ 0.01 to calculate the RQ assuming that 1% of the diet is composed of that particular food item (plant material).

Table 5-23. Acute and Chronic RQs Derived Using T-REX for the CCR and Birds – DDVP (15% and 1% of diet, because year round application of naled is possible for these uses)

Use (lb ai/A)	Diet	Dose-Based RQs						Dietary-Based RQs					
		Small (20 g)			Large (100g)			Small (20 g)/Adult (100 g)					
		Acute RQ 100%	15%	1%	Acute RQ 100%	15%	1%	Acute RQ 100%	15%	1%	Chronic RQ 100%	15%	1%
5- Forest and Non-food plants (0.1 lbs ai/A, 52 apps., 7-d interval)	Short Grass	**7.40**	**1.11**	**0.074**	**3.32**	**0.498**	0.0332	0.09	0.013	0.0009	**5.27**	0.790	0.053
	Tall Grass	**3.39**	**0.51**	0.034	**1.52**	**0.228**	0.0152	0.04	0.006	0.0004	**2.41**	0.361	0.024
	Broadleaf plants/ sm Insects	**4.16**	**0.624**	0.042	**1.87**	**0.280**	0.0187	0.05	0.007	0.0005	**2.96**	0.444	0.029
	Fruits/pods/seeds/ lg insects	**0.46**	0.069	0.046	**0.21**	0.031	0.0021	0.01	0.001	0.0001	0.33	0.049	0.003
	Seeds (granivore)	**0.10**	0.015	0.001	0.05	0.007	0.0005	----	----	----	----	----	----
6- Forest and Non-food plants (0.1 lbs ai/A, 104 apps., 7-d interval)	Short Grass	**10.44**	**1.57**	**0.104**	**4.68**	**0.702**	0.0468	**0.12**	0.018	0.0012	**7.43**	1.11	0.074
	Tall Grass	**4.79**	**0.72**	**0.048**	**2.14**	**0.321**	0.0214	0.06	0.009	0.0006	**3.40**	0.51	0.034
	Broadleaf plants/ sm Insects	**5.87**	**0.88**	**0.059**	**2.63**	**0.394**	0.0263	0.07	0.01	0.0007	**4.18**	0.627	0.042
	Fruits/pods/seeds/ lg insects	**0.65**	0.097	0.006	**0.29**	0.043	0.003	0.01	0.001	0.0001	0.46	0.069	0.005
	Seeds (granivore)	**0.15**	0.022	0.001	0.06	0.009	0.0006	----	----	----	----	----	----

LOC exceedances (acute RQ ≥ 0.1 and chronic RQ ≥ 1.0) are **bolded**.
[1]Based on dose-based EEC and Mallard Duck acute oral LD_{50} = 7.8 mg/kg-bw
[2]Based on dose-based EEC and Japanese quail subacute dietary LC_{50} =298 mg/kg-diet
[3]Based on dietary-based EEC and Mallard Duck NOAEC = 5 mg/kg-diet.
*Adjustments are made by multiplying the 100% RQ by 0.15 to calculate the RQ assuming 15% of the diet is composed of that food item (plant material), and 0.01 to calculate the RQ assuming 1% of the diet is composed of that particular food item (plant material).

From the refinement of acute and chronic RQs, according to the percentage of the diet that is composed of plant material (tall grasses, broadleaf plants (i.e., pickleweed), and seeds); 15% and 1% for forest uses, and 1% for all other uses of naled, and associated residues of DDVP. This refinement provides a better understanding of the risk posed to the CCR when incorporating the actual amount of a food item the bird is likely to consume in the environment. The acute dose-based RQs for juvenile (20g) and adult (100g) birds consuming either tall grass or broadleaf plants still exceed the listed species LOC (0.1) for the forest uses (both the 52 and 104 applications at 7-d and 3-d intervals, respectively), when assuming that 15% of the diet is composed of that food item (plant material) (Table 5-23). The acute dose-based RQs for juvenile and adult birds consuming any of the food items of relevance (i.e., tall grass, broadleaf plants, and seeds) do not exceed the acute listed species LOC (0.1) for any uses of naled, when looking at the DDVP residues that remain assuming 1% of the diet is composed of that food item (plant material) (Table 5-22 and Table 5-23). The acute and chronic dietary-based RQs do not exceed the listed species LOC (0.1 and 1.0, respectively) when using the refinement method assuming 1% or 15% of the diet is from any of the food items for any use of naled, when using at the DDVP residues that remain (Table 5-22 and Table 5-23). This indicates that there is still some risk potential to the CCR from DDVP residues that remain after the application of naled when considering the food relative to the amount they consume in the environment.

5.2.1.2. Indirect Effects (*via reductions in Prey Base*)

Potential aquatic based food items of the CCR include fish (dead), frogs, aquatic freshwater and marine invertebrates, and plant material. Potential terrestrial based food items of the CCR include seeds, worms, spiders, occasionally small mammals and birds, and up to 15% plant material – part of winter diet (i.e., tall grasses, broadleaf plants). Frogs can be eaten if available; however other taxa can fulfill dietary needs.

5.2.1.2.1. Freshwater Fish and Aquatic-phase Amphibians

For most of the acute freshwater fish, half of the chronic freshwater fish, all of the acute freshwater invertebrates, all of the chronic freshwater invertebrates, and the acute and chronic estuarine/marine fish and invertebrates, there are RQ exceedances. These exceedances represent a potential loss in aquatic prey taxa resulting in loss of food items for the CCR.

Since there is insufficient monitoring data for comparison to the modeled exposure concentrations, a comparison cannot be made at this time.

Based on the results, naled may indirectly impact the CCR through acute and chronic effects to the freshwater and estuarine/marine fish prey base resulting from naled exposure.

5.2.1.2.2. Freshwater and Estuarine/Marine Invertebrates

The description of the RQs for the effects for all potential aquatic prey taxa are the same for the CCR. Since most of the acute freshwater fish, half of the chronic freshwater fish, all of the acute freshwater invertebrates, all of the chronic freshwater invertebrates, and the acute and chronic estuarine/marine fish and invertebrates, have RQ exceedances, it is believed that naled will decrease food items.

There is insufficient monitoring data for naled and it's degradate DDVP; therefore, comparison to the modeled exposure concentrations cannot be made at this time.

Based on the results, naled may indirectly impact the CCR through acute and chronic effects to the freshwater and estuarine/marine invertebrate prey base resulting from naled exposure.

5.2.1.2.3. Terrestrial Vertebrates

The diet of the CCR may occasionally consist of small birds and mammals, therefore RQ values representing exposures of naled and/or DDVP to small birds and mammals were used to evaluate indirect risk to the CCR.

Naled

Refer to section 5.1.2.1, Exposures in the Terrestrial Habitat – Birds, for a summary of the acute and chronic avian RQs, and the probability of individual effects summary.

Refer to section 5.1.2.2, Exposures in the Terrestrial Habitat – Mammals, for a summary of acute and chronic mammalian RQs, and the probability of individual effects summary.

Based on these results, naled may indirectly impact the CCR through acute and chronic effects to the avian and mammalian prey base resulting from naled exposure.

DDVP
Refer to section 5.1.2.1, Exposures in the Terrestrial Habitat – Birds, for a summary of the acute and chronic avian RQs, and the probability of individual effects summary.

Refer to section 5.1.2.2, Exposures in the Terrestrial Habitat – Mammals, for a summary of acute and chronic mammalian RQs, and the probability of individual effects summary.

Based on these results, DDVP may indirectly impact the CCR through acute effects of to the avian prey base resulting from DDVP exposure, and chronic effects to the mammalian prey base resulting from DDVP exposure.

5.2.1.2.4. Terrestrial Invertebrates

The CCR diet also consists of worms and spiders, therefore indirect effects to the CCR from reductions in available terrestrial invertebrate prey items was also examined. In order to assess the risks of naled exposure to terrestrial invertebrates, T-REX and the most sensitive toxicity data available for terrestrial invertebrates (acute contact LD_{50} = 3.75 µg a.i./g of bee, from LD_{50} value of 0.48 µg a.i./bee MRID 00036935 for naled and acute contact LD_{50} = 3.87 µg a.i./g of bee, from LD_{50} value of 0.495 µg a.i./bee MRID 00036935 for DDVP).

Naled
Refer to section 5.1.2.3, Exposures in the Terrestrial Habitat – Terrestrial Invertebrates, for a summary of small and large insect RQs, and the probability of individual effects summary.

DDVP
Refer to section 5.1.2.3, Exposures in the Terrestrial Habitat – Terrestrial Invertebrates, for a summary of small and large insect RQs, and the probability of individual effects summary.

Based on these results, naled and DDVP may indirectly impact the CCR through the reduction of the terrestrial invertebrate prey base resulting from exposure to naled and/or DDVP.

5.2.1.3. Indirect Effects (*via Habitat Effects*)

5.2.1.3.1. Aquatic Plants (Vascular and Non-Vascular)

The habitat for the CCR may be slightly affected due to a few use-specific RQ exceedances for non-vascular plants. However, vascular plants did not show any exceedances and thus, will not result in loss of habitat.

Monitoring data for naled or the degradate DDVP has not been reported. Therefore, a comparison could not be made at this time.

5.2.1.3.2. Terrestrial Plants

Plant toxicity data was previously not required for naled; therefore there are no registrant-submitted studies available for this assessment. However, there is a study from the open literature that was reviewed for use in this assessment. In previous assessments (CRLF, 2008), in lieu of the registrant submitted data, a number of alternatives were used to assess plant toxicity. First, naled is foliarly applied to agricultural crops, and the label cautions that application under certain conditions (humidity, etc) will result in crop damage and there are reported incidents that give validity to this warning (see Section 4.5.1for terrestrial plant incident information). The effects to plants include spots and burns, but the significance of such effects are unknown. As a result, effects to terrestrial plants could not be quantified, and in combination with the reported incidents, risk to terrestrial plants could not be precluded.

5.2.1.4. Potential Modification of Habitat

There is no designated critical habitat for the CCR. Therefore, the modification of habitat is not applicable for this species.

5.2.1.5. Spatial Extent of Potential Effects

When LOCs are exceeded, typically an analysis of the spatial extent of potential LAA effects is needed to determine where effects may occur in relation to the treated site. If the potential area of usage and subsequent Potential Area of LAA Effects overlaps with CCR, SFGS, SJKF, VELB, and BCB habitat or areas of occurrence and critical habitat (for VELB and BCB), a likely to adversely affect determination is made. If the Potential Area of LAA Effects and the CCR, SFGS, SJKF, VELB, and BCB habitat and areas of occurrence and critical habitat, do not overlap, a no effect determination is made.

To determine this area, the footprint of naled's use pattern is identified, using corresponding land cover data, see Section 2.7. The land cover classes for naled include: forestry, citrus, developed high/medium/low intensity, cultivated crops, wetlands, pastures/hay, and developed open space. However, due to the vast amount of land cover areas that represent the labeled uses of naled, the initial area of concern is the entire state of California.

5.2.1.6. Spray Drift

In order to determine terrestrial and aquatic habitats of concern due to naled 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. For the flowable uses, a quantitative analysis of spray drift distances was completed using AgDRIFT (v. 2.01) using default inputs for ground applications (*i.e.*, high boom, ASAE droplet size distribution = Very Fine to Fine, 90th data percentile) and aerial applications. An aquatic and terrestrial analysis was performed using the most sensitive endpoints for aquatic and terrestrial taxa. The most sensitive aquatic endpoint was 0.114 ppb for Daphnia pulex (freshwater invertebrate), and the terrestrial endpoint was 3.75 ppm for the honey bee (*Apis mellifera*).

Table 5-24. AgDRIFT Spray Drift Estimations

Aquatic Assessment								
Tier I Ground Application								
Risk Class	Risk Description	Application Rate (lb ai/acre)	Toxicity Value Used	Initial Avg Concentration (ppt)	Nonvolatile Rate (lb/a)	Minimum Spray Volume Rate (gal/a)	Active Rate (lb ai/a)	Distance (feet)
Freshwater Invertebrates	Potential for effects to non-target, non-listed plants from exposures	2.1	LC_{50} = 0.114 ppb Daphnia pulex	114	Does not apply	Does not apply	Does not apply	>1000
Tier I Aerial Application								
Risk Class	Risk Description	Application Rate (lb ai/acre)	Toxicity Value Used	Initial Avg Concentration (ppt)	Nonvolatile Rate (lb/a)	Minimum Spray Volume Rate (gal/a)	Active Rate (lb ai/a)	Distance (feet)
Freshwater Invertebrates	Potential for effects to non-target, non-listed plants from exposures	2.1	LC_{50} = 0.114 ppb Daphnia pulex	114	Does not apply	Does not apply	Does not apply	>1000
Tier II Aerial Application								
Risk Class	Risk Description	Application Rate (lb ai/acre)	Toxicity Value Used	Initial Avg Concentration (ppt)	Nonvolatile Rate (lb/a)	Minimum Spray Volume Rate (gal/a)	Active Rate (lb ai/a)	Distance (feet)
Freshwater Invertebrates	Potential for effects to non-target, non-listed plants from exposures	2.1	LC_{50} = 0.114 ppb Daphnia pulex	114	4.03	2.5	2.1	>1000
Terrestrial Assessment								
Tier I Ground Application								
Risk Class	Risk Description	Application Rate (lb ai/acre)	Toxicity Value Used	Fraction of applied	Nonvolatile Rate (lb/a)	Minimum Spray Volume Rate (gal/a)	Active Rate (lb ai/a)	Distance (feet)
Beneficial Insects	Potential for effects to non-target, non-listed plants from exposures	2.1	LD_{50} = 3.75 ppm, Honey bee (*Apis mellifera*)	0.0007	Does not apply	Does not apply	Does not apply	> 1,000
Tier I Aerial Application								
Risk Class	Risk Description	Application Rate (lb ai/acre)	Toxicity Value Used	Fraction of applied	Nonvolatile Rate (lb/a)	Minimum Spray Volume Rate (gal/a)	Active Rate (lb ai/a)	Distance (feet)
Beneficial Insects	Potential for effects to non-target, non-listed plants from exposures	2.1	LD_{50} = 3.75 ppm, Honey bee (*Apis mellifera*)	0.0007	Does not apply	Does not apply	Does not apply	> 1,000
Tier II Aerial Application								
Risk Class	Risk Description	Application Rate (lb ai/acre)	Toxicity Value Used	Fraction of applied	Nonvolatile Rate (lb/a)	Minimum Spray Volume Rate (gal/a)	Active Rate (lb ai/a)	Distance (feet)

Beneficial Insects	Potential for effects to non-target, non-listed plants from exposures	2.1	LD_{50} = 3.75 ppm, Honey bee (*Apis mellifera*)	0.0007	4.03	2.5	2.1	>1000

For both ground and aerial applications, a buffer of greater than 1000 feet is needed in order to reduce exposure below the effects levels for the most sensitive aquatic and terrestrial species (freshwater invertebrates and honey bees, respectively).

5.2.1.7. Downstream Dilution Analysis

In order to determine the downstream extent of exposure in streams and rivers where the EEC could potentially be above levels that would exceed the most sensitive LOC, the greatest ratio of aquatic RQ to LOC would be estimated. However, due to having direct applications to water for naled, it was determined that a downstream dilution analysis is not applicable in this case since it can be applied to any location within the water body. It is not just being transported as runoff across the landscape, into non-impacted water.

5.2.2. San Francisco Garter Snale (SFGS)

5.2.2.1. Direct Effects

Naled

Acute and chronic RQs

To determine direct effects to the SFGS from exposure to naled, avian toxicity data was used. The initial screen for potential direct and indirect effects to listed species was conducted using T-REX, and modeled a small bird consuming short grass. A preliminary **"may affect"** determination was made based on the screen of a small bird (surrogate for snake) consuming short grass.

Due to the acute and chronic LOC exceedances for avian species, the T-HERPS model was used to refine the direct risk to the SFGS. Potential direct acute effects to the SFGS were evaluated by considering dose- and dietary-based EECs modeled in T-HERPS for medium snakes consuming small herbivorous mammals (Table 3-5 and Table 3-6) and acute oral and subacute dietary toxicity endpoints for avian species (Table 4-3 and Table 4-4). Potential direct chronic effects to the SFGS were evaluated by considering dietary-based EECs modeled in T-HERPS assuming the species is consuming a variety of dietary items. Chronic effects were estimated using the lowest available toxicity data for birds. Small snakes only consume insects (small and large) while medium and large snakes consume small and large insects, mammals (herbivorous and insectivorous), and amphibians. The most sensitive RQ for snakes were for medium snakes consuming small herbivore mammals. Acute and chronic RQs for the SFGS, and reptiles, derived using T-HERPS can be found Table 5-6 to Table 5-7. The percent and probability of individual effect resulting from acute exposure to naled based on the refinement can be found in Table 5-6.

For the T-HERPS a medium snake (20g) consuming an herbivore mammal was used as the most sensitive screening tool. The acute dose-based RQs exceeded both the listed and non-listed species acute LOC (0.1 and 0.5, respectively) for all uses of naled, and ranged from 29.02 to 1.50. The acute dietary-based RQs for a medium snake consuming an herbivore mammal exceeded the listed species acute LOC (0.1) only for uses of naled with an application rate ≥ 0.9 lbs ai/A, and ranged from 0.29 to 0.12. The chronic dietary-based RQs for a medium snake consuming an herbivore mammal exceeded the chronic LOC (1.0) for uses of naled with an application rate ≥ 1.9 lbs ai/A, and ranged from 1.49 to 1.34 (Table 5-6).

Because the SFGS does not only consume herbivore mammals at every life stage other dietary items were also examined using T-HERPS. This helped determine the overall risk to the SFGS at various life stages. The juvenile SFGS consumes small and large invertebrates, both of which were modeled in T-HERPS using the small (2g) reptile to determine the risk potential to juvenile SFGS from naled application. The acute dose based RQs for the juvenile (2g) snake consuming small invertebrates exceeded the acute listed species LOC (0.1) for all uses of naled, except 0.1 lbs ai/A when applied twice at a 7-d interval, and ranged from 1.35 to 0.07 (Table 5-7). Acute dose-based RQs for the juvenile (2g) snake consuming large invertebrates exceeded the acute listed species LOC (0.1) for all uses of naled with an application ≥ 1.4 lbs ai/A, and ranged from 0.15 to 0.10 (Table 5-7).

Adult SFGS were modeled in T-HERPS using both the medium (20g) and large (200g) snakes consuming small and large invertebrates, small insectivorous and herbivorous mammals, and terrestrial-phase amphibians (RQs are presented in Table 5-7). The acute dose-based RQs for medium snakes consuming small invertebrates exceed the acute listed species LOC (0.1) for uses of naled with an application rate ≥ 0.9 lbs ai/A, and exceed the non-listed species LOC (0.5) for uses of naled with an application rate ≥ 1.9 lbs ai/A. Acute dose-based RQs for medium snakes consuming small invertebrates ranged from 0.57 to 0.03. There are no acute listed species LOC exceedances for medium snakes consuming large invertebrates, RQs ranged from 0.06 to < 0.01 for medium snakes. Acute dose-based RQs for medium snakes consuming herbivorous mammals exceed the acute listed and non-listed species LOC for all uses of naled, RQs range from 29.02 to 1.50. Medium snakes consuming insectivorous mammals exceed the listed species LOC (0.1) for all uses of naled, except 0.1 lbs ai/A when applied twice at a 7-d interval, and the non-listed species LOC (0.5) for uses of naled with an application rate ≥ 0.9 lbs ai/A. Acute dose-based RQs for medium snakes consuming insectivorous mammals ranged from 1.81 to 0.09. Acute dose-based RQs for medium snakes consuming terrestrial-phase amphibians exceed the listed species LOC (0.1) for uses of naled with an application rate ≥ 0.9 lbs ai/A, and exceed the non-listed species LOC (0.5) for uses of naled with an application rate ≥ 1.9 lbs ai/A. Acute dose-based RQs for medium snakes consuming terrestrial-phase amphibians ranged from 0.67 to 0.03.

Large snakes consuming small invertebrates exceed the listed species LOC (0.1) for uses of naled with an application rate ≥ 0.9 lbs ai/A, and ranged from 0.24 to 0.01. There are no acute listed species LOC exceedances for large snakes consuming large invertebrates, RQs ranged from 0.03 to < 0.01 for large snakes. Acute dose-based RQs for large snakes consuming herbivorous mammals exceeded the acute listed and non-listed species LOC (0.1 and 0.5) for all uses of naled, except 0.1 lbs ai/A when applied twice at a 7-d interval, and ranged from 8.25 to 0.43. Acute dose-based RQs for large snakes consuming insectivorous mammals exceeded the listed species LOC (0.1) for uses of naled with an application rate ≥ 0.9 lbs ai/A, and exceeded the non-listed species LOC (0.5) the maximum single application of naled only. Acute dose-based RQs for large snakes consuming insectivorous mammals ranged from 0.52 to 0.03. Acute dose-based RQs for large snakes consuming terrestrial-phase amphibians exceeded the listed species LOC (0.1) for uses of naled with an application rate ≥ 0.9 lbs ai/A, and ranged from 0.32 to 0.02.

Acute dietary-based RQs for snakes consuming small invertebrates exceeded the listed species LOC (0.1) for uses of naled with an application rate ≥ 1.4 lbs ai/A, and ranged from 0.21 to 0.01. Acute dietary-based RQs for snakes consuming herbivorous mammals exceeded the listed species LOC for uses of naled with an application rate ≥ 0.9 lbs ai/A, and ranged from 0.29 to 0.02. The acute dietary-based RQs for snakes consuming large invertebrates, insectivorous mammals or terrestrial-phase amphibians do not exceed the listed species LOC for any uses of naled. Chronic dietary-based RQs for snakes consuming small invertebrates exceed the chronic LOC (1.0) for the maximum single application rate of naled only, the RQs ranged from 1.09 to 0.06. Chronic dietary-based RQs for snakes consuming herbivorous mammals exceeded the chronic LOC (1.0) for uses of naled with an application rate ≥ 1.9 lbs ai/A, the RQs ranged from 1.49 to 0.08. Chronic dietary-based RQs for snakes consuming large invertebrates, insectivorous mammals, or terrestrial-phase amphibians do not exceed the chronic LOC for any use of naled.

Sublethal effects
There were no registrant submitted data using reptiles as the test species. There were sublethal effects observed in avian toxicity data. In the acute oral LD_{50} toxicity test, signs of intoxication included ataxia, goose-stepping, tachypnea, salivation, tremors, loss of righting reflex, violent wing-beat convulsions, and opisthotonos. These effects appeared as soon as 5 minutes after test initiation. Mortalities generally occurred between 15 minutes and 3.5 hours after treatment; one pheasant died between 2 and 3 days after treatment. Remission of survivors took up to 2 weeks. A treatment level as low as 22.2 mg/kg caused mortality in Canada geese (MRID 00160000). One key observation from this study was that the smaller (weight) of the bird, the less toxic it was to naled. Two studies on the toxic effects of naled to reproduction of birds were submitted. The Northern bobwhite quail (*C. virginiaus*, MRID 44517901) endpoints were based on significant reductions in male body weights at all treatment levels. At this treatment level (130 ppm a.i.), the average weight of a male bird was 10 grams less than the control. The Mallard duck (*A. platyrhynchos*, MRID 44517902) endpoints were based on reductions in egg production (eggs laid, egg set, etc.) and in percentage of eggs set and eggs laid.

Dose Response – Probability of an Individual Effect
No slope is available for the submitted avian studies; therefore the probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). The probability of individual effect was calculated using the RQ values that were calculated from T-HERPS. All uses of naled represent a high to very high probability of individual effect to snakes when considering dose-based acute naled exposure. When considering dietary-based acute naled exposure, there is a low to very low probability of individual effect to snakes consuming herbivorous mammals for uses of naled ≥ 0.9 lbs ai/A (scenario 6).

DDVP – Degradate

Acute and chronic RQs

To determine direct effects to the SFGS from exposure to DDVP, resulting from the application of naled, avian toxicity data for DDVP were used. The initial screen for potential direct and indirect effects to listed species was conducted using T-REX, and modeled a small bird consuming short grass. A preliminary **"may affect"** determination for DDVP exposure was made based on the screen of a medium snake (20g) consuming an herbivorous mammal.

Due to the acute and chronic LOC exceedances for avian species, the T-HERPS model was used to refine the direct risk to the SFGS from DDVP exposure. Potential direct acute effects to the SFGS were evaluated by considering dose- and dietary-based EECs modeled in T-HERPS for medium snakes consuming small herbivorous mammals (Table 3-5 and Table 3-6) and acute oral and subacute dietary toxicity endpoints for avian species (Table 4-3 and Table 4-4). Potential direct chronic effects to the SFGS were evaluated by considering dietary-based EECs modeled in T-HERPS consuming a variety of dietary items. Chronic effects were estimated using the lowest available toxicity data for birds. Small snakes only consume insects (small and large) while medium and large snakes consume small and large insects, mammals (herbivorous and insectivorous), and amphibians. The most sensitive RQ for snakes were for medium snakes consuming small herbivore mammals. Acute and chronic RQs for the SFGS, and reptiles, derived using T-HERPS can be found in Table 5-8 and Table 5-9. The percent and probability of individual effect resulting from DDVP exposure based on the refinement can be found in Table 5-8.

For the T-HERPS a medium snake (20g) consuming an herbivore mammals was used as the most sensitive screening tool. The acute dose-based RQs exceeded both the listed and non-listed species acute LOC (0.1 and 0.5, respectively) from DDVP exposure, associated with all uses of naled, and ranged from 13.49 to 0.61. The acute dietary-based RQs for a medium snake consuming an herbivore mammal exceeded the listed species acute LOC (0.1) from DDVP exposure, associated with only the uses of naled with an application rate > 0.9 lbs ai/A (naled, 0.1 lbs ai/A DDVP, except when there are 104 applications at 3-d intervals). The acute dietary-based RQs ranged from 0.15 to 0.01. The chronic dietary-based RQs for a medium snake consuming an herbivore mammal exceeded the chronic LOC (1.0) from DDVP exposure, associated with uses of naled with an application rate ≥ 0.25 lbs ai/A (naled), (0.03 lbs ai/A, DDVP), and ranged from 8.83 to 0.40 (Table 5-8).

For further refinement, and due to the fact that the SFGS does not only consume herbivore mammals at every life stage, other dietary items were also examined using T-HERPS. This helped determine the overall risk to the SFGS at various life stages. The juvenile SFGS consumes small and large invertebrates, both of which were modeled in T-HERPS using the small (2g) reptile to determine the risk potential to juvenile SFGS from DDVP exposure resulting from naled application. The acute dose based RQs for the juvenile (2g) snake consuming small invertebrates exceeded the acute listed species LOC (0.1) from DDVP exposure, associated with uses of naled > 0.1 lbs ai/A (naled), (0.01 lbs ai/A, DDVP), and ranged from 0.63 to 0.03 (Table 5-9). Acute dose-based RQs for the juvenile (2g) snake consuming large invertebrates did not exceed the acute listed species LOC (0.1) from DDVP exposure, associated with any uses of naled (Table 5-9).

Adult SFGS were modeled in T-HERPS using both the medium (20g) and large (200g) snakes consuming small and large invertebrates, small insectivorous and herbivorous mammals, and terrestrial-phase amphibians (RQs are presented in Table 5-9). The acute dose-based RQs for medium snakes consuming small invertebrates exceed the acute listed species LOC (0.1) from DDVP exposure, associated with uses of naled with an application rate > 0.25 lbs ai/A (naled), (0.03 lbs ai/A, DDVP), and ranged from 0.26 to 0.01. There are no acute listed species LOC exceedances for medium snakes consuming large invertebrates from DDVP exposure, associated with uses of naled, the RQs ranged from 0.03 to < 0.01. Acute dose-based RQs for medium snakes consuming herbivorous mammals exceed the acute listed and non-listed species LOC from DDVP exposure, associated with all uses of naled, and the RQs range from 13.49 to 0.61. Medium snakes consuming insectivorous mammals exceed the listed species LOC (0.1) from DDVP exposure, associated with uses of naled > 0.1 lbs ai/A (naled, 0.01 lbs ai/A DDVP), and the non-listed species LOC (0.5) from DDVP exposure, associated with uses of naled with an application rate ≥ 1.4 lbs ai/A (naled, 0.16 lbs ai/A, DDVP). Acute dose-based RQs for medium snakes consuming insectivorous mammals ranged from 0.84 to 0.04. Acute dose-based RQs for medium snakes consuming terrestrial-phase amphibians exceed the listed species LOC (0.1) from DDVP exposure, associated with uses of naled with an application rate > 0.25 lbs ai/A (naled), (0.03 lbs ai/A, DDVP), and ranged from 0.31 to 0.01.

Large snakes consuming small invertebrates exceed the listed species LOC (0.1) from DDVP exposure, associated with uses of naled with an application rate ≥ 1.9 lbs ai/A (naled, 0.22 lbs ai/A, DDVP) and ranged from 0.11 to 0.01. There are no acute listed species LOC exceedances for large snakes consuming large invertebrates from DDVP exposure, associated with uses of naled, RQs ranged from 0.01 to < 0.01. Acute dose-based RQs for large snakes consuming herbivorous mammals exceeded the acute listed species LOC (0.1) from DDVP exposure, associated with all uses of naled, and exceeded the non-listed species LOC (0.5) from DDVP exposure, associated with uses of naled with an application rate ≥ 0.25 lbs ai/A, naled (0.03 lbs ai/A, DDVP). Acute dose-based RQs for large snakes consuming herbivorous mammals ranged from 3.84 to 0.17. Acute dose-based RQs for large snakes consuming insectivorous mammals exceeded the listed species LOC (0.1) from DDVP exposure, associated with uses of naled with an application rate ≥ 0.9 lbs ai/A, naled (0.1 lbs ai/A, DDVP), and ranged from 0.24 to 0.01. Acute dose-based RQs for large snakes consuming terrestrial-phase amphibians exceeded the listed species LOC (0.1) from DDVP exposure, associated with uses of naled with an application rate > 0.9 lbs ai/A (naled) (0.1 lbs ai/A, DDVP – except 104 applications at 3-d intervals), and ranged from 0.15 to 0.01.

Acute dietary-based RQs for snakes consuming small invertebrates exceeded the listed species LOC (0.1) from DDVP exposure, associated with uses of naled with an application rate ≥ 1.9 lbs ai/A, and ranged from 0.11 to <0.01. Acute dietary-based RQs for snakes consuming herbivorous mammals exceeded the listed species LOC from DDVP exposure, associated with uses of naled with an application rate > 0.9 lbs ai/A (naled) (0.1 lbs ai/A, DDVP – except 104 applications at 3-d intervals), and ranged from 0.15 to 0.01. The acute dietary-based RQs for snakes consuming large invertebrates, insectivorous mammals or terrestrial-phase amphibians do not exceed the listed species LOC from DDVP exposure, associated with any uses of naled. Chronic dietary-based RQs for snakes consuming small invertebrates exceed the chronic LOC (1.0) from DDVP exposure, associated with uses of naled with an application rate > 0.25lbs ai/A, naled (0.03 lbs ai/A, DDVP), and ranged from 6.48 to 0.29. Chronic dietary-based RQs for snakes consuming herbivorous mammals exceeded the chronic LOC (1.0) from DDVP exposure, associated with uses of naled with an application rate ≥ 0.25lbs ai/A, naled (0.03 lbs ai/A, DDVP), and ranged from 8.83 to 0.40. Chronic dietary-based RQs for snakes consuming large invertebrates, insectivorous mammals, or terrestrial-phase amphibians do not exceed the chronic LOC from DDVP exposure, associated with any use of naled.

Sublethal effects

There were no registrant submitted data using reptiles as the test species. There were sublethal effects observed in the avian toxicity data. In the acute oral LD_{50} sublethal effects were observed. Acute symptoms included goose stepping, ataxia, use of wings to aid in balance, tremors, and convulsions (MRID 0160000). Two studies on the toxic effects of DDVP to reproduction of birds were submitted. The Mallard duck (*A. platyrhynchos*, MRID 44233401) endpoints were based on a reduction in eggshell thickness and a reduction in the number of eggs laid, eggs set, viable embryos and live three-week embryos. The Northern bobwhite quail (*C. virginiaus*, MRID 43981701) endpoints were based on eggs laid, viable embryos, live three-week embryos, normal hatchlings, 14-day old survivors, 14-day survivor weight, food consumption, and terminal adult male and female body weight.

Dose Response – Probability of an Individual Effect

No slope is available for the submitted avian studies; therefore the probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). The probability of individual effect was calculated using the RQ values that were calculated from T-HERPS. DDVP exposure resulting from all uses of naled ≥ 0.25 lbs ai/A (0.03 lbs ai/A, as DDVP) represent a very high probability of individual effect to snakes when considering dose-based acute DDVP exposure, and uses < 0.25 lbs ai/A (0.03 lbs ai/A, as DDVP) represent a medium to low probability of individual effect to snakes when considering dose-based acute DDVP exposure. When considering dietary-based acute DDVP exposure resulting from naled use, there is a very low probability of individual effect to snakes for any use of naled.

5.2.2.2. Indirect Effects (*via Reductions in Prey Base*)

Newborn and juvenile SFGS prey almost exclusively on Pacific tree frogs in temporary pools during the spring and early summer to the point that the SFGS may be so dependent on their anuran prey that they are not able to switch to other available prey sources if necessary to survive. SFGS under 500 mm snout-to-vent length (SVL) require Pacific tree frogs in various stages of metamorphosis, whereas individuals over 500 mm SVL can consume Pacific tree frog, CRLF, and bullfrog tadpoles and adults.

The main diet of adult SFGS consists of CRLFs. Adult SFGSs may also feed on smaller juvenile non-native bullfrogs (*Rana catesbeiana*). Immature California newts (*Taricha torosa*), California toads (*Bufo boreas halophilus*), recently metamorphosed western toads (*Bufo boreas*), threespine stickleback (*Gasterosteus aculeatus*), and non-native mosquito fish (*Gambusia affinis*) are also known to be consumed by SFGS. Small mammals, reptiles, amphibians, possibly invertebrates, and some fish species may also be consumed by the SFGS.

5.2.2.2.1. Freshwater Fish and Aquatic-phase Amphibians

For most of the acute freshwater fish and half of the chronic freshwater fish there are RQ exceedances. These exceedances represent a potential loss in aquatic prey taxa resulting in loss of food items.

Based on the results, naled may indirectly impact the SFGS through acute and chronic effects to the freshwater fish prey base resulting from naled exposure.

5.2.2.2.2. Freshwater Invertebrates

For all of the acute freshwater invertebrates and all of the chronic freshwater invertebrates there are RQ exceedances. These exceedances represent a potential loss in aquatic prey taxa resulting in loss of food items.

Since there is insufficient monitoring data for comparison to the modeled exposure concentrations, a comparison cannot be made at this time.

Based on the results, naled may indirectly impact the SFGS through acute and chronic effects to the freshwater invertebrates prey base resulting from naled exposure.

5.2.2.2.3. Terrestrial Vertebrates – Birds (Surrogate for Reptiles and Terrestrial-phase Amphibians) and Mammals

The diet of the SFGS also includes small mammals, reptiles, and terrestrial-phase amphibians. Therefore, RQ values representing exposures of naled and/or DDVP to small birds (surrogate for reptiles and terrestrial-phase amphibians) and mammals are used to evaluate indirect risk to the SFGS.

Naled

Refer to section 5.1.2.1, Exposures in the Terrestrial Habitat – Birds, for a summary of the acute and chronic RQs, and the probability of individual effects summary.

Since there were exceedances in T-REX modeling small birds (surrogate for reptiles and terrestrial-phase amphibians) consuming short grass, T-HERPS was used as a refinement tool to model effects to reptiles and terrestrial-phase amphibians consuming different food items. Acute dose-based RQs for medium snakes consuming terrestrial-phase amphibians exceeded the non-listed species LOC (0.5) for uses of naled with an application rate ≥ 1.9 lbs ai/A. Acute and chronic dietary-based RQs for snakes consuming terrestrial-phase amphibians did not exceed the non-listed species LOC (0.5 and 1.0, respectively) for any uses of naled. Uses of naled ≥ 1.9 lbs ai/A represent a low probability of individual effect to snakes consuming terrestrial-phase amphibians when considering dose-based acute naled exposure.

Refer to section 5.1.2.2, Exposures in the Terrestrial Habitat – Mammals, for a summary of acute and chronic RQs, and the probability of individual effects summary.

Since there were exceedances in T-REX modeling small birds consuming short grass, T-HERPS was used as a refinement tool to model effects to reptiles and terrestrial-phase amphibians consuming different food items. Acute dose-based RQs for medium snakes consuming herbivorous mammals exceeded the non-listed species LOC (0.1 and 0.5, respectively) for all uses of naled. Acute dietary-based RQs for snakes consuming herbivorous mammals did not exceed the non-listed species LOC (0.5) for any uses of naled. The chronic dietary-based RQs for snakes consuming herbivorous mammals exceeded the chronic LOC (1.0) for uses of naled with an application rate ≥ 1.9 lbs ai/A. The probability of individual effect was calculated using the RQ values that were calculated from T-HERPS. All uses of naled represent a high to very high probability of individual effect to snakes when considering dose-based acute naled exposure. When considering dietary-based acute naled exposure, there is a low to very low probability of individual effect to snakes consuming herbivorous mammals for uses of naled ≥ 0.9 lbs ai/A (scenario 6).

Based on these results, naled may indirectly impact the SFGS through acute and chronic effects to the avian, terrestrial-amphibian, and mammalian prey base resulting from naled exposure**.**

DDVP

Refer to section 5.1.2.1, Exposures in the Terrestrial Habitat – Birds, for a summary of the acute and chronic small bird RQs, and the probability of individual effects summary.

Since there were exceedances in T-REX modeling small birds (surrogate for reptiles and terrestrial-phase amphibians) consuming short grass, T-HERPS was used as a refinement tool to model effects to reptiles and terrestrial-phase amphibians consuming different food items (Table 5-8). Acute dose-based RQs for medium snakes consuming terrestrial-phase amphibians did not exceed the non-listed species LOC (0.5) from DDVP exposure, associated with any use of naled. The acute and chronic dietary-based RQs for snakes consuming terrestrial-phase amphibians did not exceed the acute listed species or chronic LOC (0.5 and 1.0, respectively) from DDVP exposure, associated with any use of naled.

Refer to section 5.1.2.2, Exposures in the Terrestrial Habitat – Mammals, for a summary of acute and chronic RQs, and the probability of individual effects summary.

Since there were exceedances in T-REX modeling small birds (surrogate for reptiles and terrestrial-phase amphibians) consuming short grass, T-HERPS was used as a refinement tool to model effects to reptiles and terrestrial-phase amphibians, consuming different food items (Table 5-9). Acute dose-based RQs for medium snakes consuming herbivorous mammals exceeded the acute non-listed species LOC (0.5) from DDVP exposure, associated with all uses of naled. Acute dietary-based RQs for snakes consuming herbivorous mammals did not exceed the non-listed species LOC (0.5) from DDVP exposure, associated with any use of naled. Chronic dietary-based RQs for snakes consuming herbivorous mammals exceeded the chronic LOC (1.0) from DDVP exposure, associated with uses of naled with an application rate ≥ 0.25lbs ai/A, naled (0.03 lbs ai/A, DDVP). The probability of individual effect was calculated using the RQ values that were calculated from T-HERPS. DDVP exposure resulting from all uses of naled ≥ 0.25 lbs ai/A (0.03 lbs ai/A, as DDVP) represent a very high probability of individual effect to snakes when considering dose-based acute DDVP exposure, and uses < 0.25 lbs ai/A (0.03 lbs ai/A, as DDVP) represent a medium to low probability of individual effect to snakes when considering dose-based acute DDVP exposure. When considering dietary-based acute DDVP exposure resulting from naled use, there is a very low probability of individual effect to snakes for any use of naled.

Based on these results, DDVP may indirectly impact the SFGS through acute effects to the avian prey base resulting from DDVP exposure, and chronic effects to the mammalian prey base resulting from DDVP exposure.

5.2.2.2.4. Terrestrial Invertebrates

The SFGS diet also consists of terrestrial invertebrates, therefore indirect effects to the SFGS from reductions in available terrestrial invertebrate prey items was also examined. In order to assess the risks of naled exposure to terrestrial invertebrates, T-REX, and the most sensitive toxicity data available for terrestrial invertebrates (acute contact LD_{50} = 3.75 µg a.i./g of bee, from LD_{50} value of 0.48 µg a.i./bee MRID 00036935 for naled and acute contact LD_{50} = 3.87 µg a.i./g of bee, from LD_{50} value of 0.495 µg a.i./bee MRID 00036935 for DDVP).

Naled

Refer to section 5.1.2.3, Exposures in the Terrestrial Habitat – Terrestrial Invertebrates, for a summary of small and large insect RQs, and the probability of individual effects summary.

DDVP

Refer to section 5.1.2.3, Exposures in the Terrestrial Habitat – Terrestrial Invertebrates, for a summary of small and large insect RQs, and the probability of individual effects summary.

Based on these results, naled and DDVP may indirectly impact the SFGS through the reduction of the terrestrial invertebrate prey base resulting from exposure to naled and/or DDVP.

5.2.2.3. Indirect Effects (*via Habitat Effects*)

5.2.2.3.1. Aquatic Plants (Vascular and Non-Vascular)

Aquatic plants serve several important functions in aquatic ecosystems such as primary production (non-vascular, vascular) and refugia structure (vascular plants). Rooted plants help reduce sediment loading and provide stability to nearshore areas and lower streambanks. In addition, vascular aquatic plants are important as attachment sites for egg masses of aquatic species.

The habitat for the SFGS may be slightly affected due to a few use-specific RQ exceedances for non-vascular plants. However, vascular plants did not show any exceedances and thus, will not result in loss of habitat.

Monitoring data for naled or the degradate DDVP has not been reported. Therefore, a comparison could not be made at this time.

5.2.2.3.2. Terrestrial Plants

Plant toxicity data was previously not required for naled; therefore there are no registrant-submitted studies available for this assessment. However, there is a study from the open literature that was reviewed for use in this assessment. In previous assessments (CRLF, 2008), in lieu of the registrant submitted data, a number of alternatives were used to assess plant toxicity. First, naled is foliarly applied to agricultural crops, and the label cautions that application under certain conditions (humidity, etc) will result in crop damage and there are reported incidents that give validity to this warning (see Section 4.5.1 for terrestrial plant incident information). The effects to plants include spots and burns, but the significance of such effects are unknown. As a result, effects to terrestrial plants could not be quantified, and in combination with the reported incidents, risk to terrestrial plants could not be precluded.

5.2.2.4. Potential Modification of Habitat

There is no designated critical habitat for the SFGS. Therefore, the modification of habitat is not applicable for this species.

5.2.2.5. Spatial Extent of Potential Effects

See Section 5.2.1.5 for the description of the spatial extent of potential effects to all species analyzed in this assessment including the SFGS.

5.2.2.6. Spray Drift

See Section 5.2.1.6 for the description of the spray drift analysis for potential effects to all species analyzed in this assessment including the SFGS.

5.2.2.7. Downstream Dilution Analysis

See Section 5.2.1.7 for the description of the downstream dilution analysis for potential effects to all species analyzed in this assessment including the SFGS.

5.2.3. San Joaquin Kit Fox (SJKF)

The SJKF occupies a variety of habitats, including grasslands, scrublands (*e.g*., chenopod scrub and sub-shrub scrub), vernal pool areas, oak woodland, alkali meadows and playas, and an agricultural matrix of row crops, irrigated pastures, orchards, vineyards, and grazed annual grasslands. Kit foxes dig their own dens, modify and use those already constructed by other animals (ground squirrels, badgers, and coyotes), or use human-made structures (culverts, abandoned pipelines, or banks in sumps or roadbeds). They move to new dens within their home range often (likely to avoid predation by coyotes). The SJKF forages in California prairie and Sonoran grasslands in the vicinity of freshwater marshes and alkali sinks, where there is a dense ground cover of tall grasses and San Joaquin saltbush. Seasonal flooding in such habitats is normal. It feeds on small animals including blacktailed hares, desert cottontails, mice, kangaroo rats, squirrels, birds, lizards, insects and grass. The San Joaquin kit fox satisfies its moisture requirements from prey and does not depend on freshwater sources.

5.2.3.1. Direct Effects

Naled

Acute and chronic RQs

To determine direct effects to the SJKF from exposure to naled, mammalian toxicity data were used. The initial screen for potential direct and indirect effects to listed species was conducted using T-REX, and modeled large mammals consuming short grass. A preliminary **"may affect"** determination was made based the screen of a large mammal (1000g) consuming short grass.

Sublethal effects

A two-generation reproduction study was conducted with Sprague-Dawley-derived Charles River CD rats (MRID 00146498). Systemic effects were observed in adult male rats of both generations. Body weight gain was depressed at the 18 mg/kg-bw per day dose for F0 males and at all dose levels for F1 males. Survival of pups was reduced at 18 mg/kg-bw/day in the F1 and F2b generations. A consistent decrease in pup weight was also noted during lactation in both generations. The NOAEL and LOAEL for parental systemic effects were based on decreased body weight gain in both generations.

Dose Response – Probability of an Individual Effect

The probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). Uses of naled > 1.4 lbs ai/A (scenario 3) and > 0.9 lbs ai/A, 104 applications at 3 day intervals (scenario 6) represent a medium probability of individual effect to large mammals, and uses of naled < 0.9 lbs ai/A represent a very low probability of individual effect when considering dose-based acute naled exposure.

DDVP – Degradate

Acute and chronic RQs

To determine direct effects to the SJKF from exposure to DDVP, mammalian toxicity data were used. The initial screen for potential direct and indirect effects to listed species was conducted using T-REX, and modeled large mammals consuming short grass. A preliminary **"may affect"** determination was made based the screen of a large mammal (1000g) consuming short grass.

Sublethal effects
The reproductive rat parental/systemic NOAEL/LOAEL were based on decreased percent of females with estrous cycle and increased percent of females with abnormal cycling. The offspring NOAEL/LOAEL were based on reduced number of dams bearing litter, fertility index, pregnancy index and pup weight (MRID 42483901).

Dose Response – Probability of an Individual Effect
The probability of individual effect was calculated based on a default slope assumption of 4.5 with upper and lower 95% confidence intervals of 2 and 9 (Urban and Cook, 1986). DDVP exposure from any use of naled represents a very low probability of individual effect to large mammals when considering dose-based acute DDVP exposure.

5.2.3.2. Indirect Effects (*via Reductions in Prey Base*)

Potential forage items of the SJKF includes small mammals, ground nesting birds, plants, grasses, and terrestrial insects.

5.2.3.2.1. Mammals

The diet of the SFGS also includes small mammals; therefore, RQ values representing exposures of naled and/or DDVP to small mammals are used to evaluate indirect risk to the SJKF.

Naled
Refer to section 5.1.2.2, Exposures in the Terrestrial Habitat – Mammals, for a summary of acute and chronic RQs, and the probability of individual effects summary.

Based on these results, naled may indirectly impact the SJKF through acute and chronic effects to the mammalian prey base resulting from naled exposure.

DDVP
Refer to section 5.1.2.2, Exposures in the Terrestrial Habitat – Mammals, for a summary of acute and chronic RQs, and the probability of individual effects summary.

Based on these results, DDVP will not likely indirectly impact the SJKF through acute effects to the mammalian prey base resulting from DDVP exposure, but will likely indirectly impact the SJKF through chronic effects to the mammalian prey base resulting from DDVP exposure.

5.2.3.2.2. Birds

The diet of the SJKF also includes ground nesting birds; therefore, RQ values representing exposures of naled and/or DDVP to small birds were used to evaluate indirect risk to the SJKF.

Naled
Refer to section 5.1.2.1, Exposures in the Terrestrial Habitat – Birds, for a summary of the acute and chronic RQs, and the probability of individual effects summary.

Based on these results, naled may indirectly impact the SJKF through acute and chronic effects to the avian prey base resulting from naled exposure.

DDVP
Refer to section 5.1.2.1, Exposures in the Terrestrial Habitat – Birds, for a summary of the acute and chronic RQs, and the probability of individual effects summary.

Based on these results, DDVP may indirectly impact the SJKF through acute effects to the avian prey base resulting from DDVP exposure.

5.2.3.2.3. Terrestrial Invertebrates

The SJKF diet also consists of terrestrial insects, therefore indirect effects to the SJKF from reductions in available terrestrial invertebrate prey items was also examined. In order to assess the risks of naled exposure to terrestrial invertebrates, T-REX, and the most sensitive toxicity data available for terrestrial invertebrates (acute contact LD_{50} = 3.75 µg a.i./g of bee, from LD_{50} value of 0.48 µg a.i./bee MRID 00036935 for naled and acute contact LD_{50} = 3.87 µg a.i./g of bee, from LD_{50} value of 0.495 µg a.i./bee MRID 00036935 for DDVP).

Naled
Refer to section 5.1.2.3, Exposures in the Terrestrial Habitat – Terrestrial Invertebrates, for a summary of small and large insect RQs, and the probability of individual effects summary.

DDVP
Refer to section 5.1.2.3, Exposures in the Terrestrial Habitat – Terrestrial Invertebrates, for a summary of small and large insect RQs, and the probability of individual effects summary.

Based on these results, naled and DDVP may indirectly impact the SJKF through the reduction of the terrestrial invertebrate prey base resulting from exposure to naled and/or DDVP.

5.2.3.3. Indirect Effects (*via Habitat Effects*)

5.2.3.3.1. Terrestrial Plants

Plant toxicity data was previously not required for naled; therefore there are no registrant-submitted studies available for this assessment. However, there is a study from the open literature that was reviewed for use in this assessment. In previous assessments (CRLF, 2008), in lieu of the registrant submitted data, a number of alternatives were used to assess plant toxicity. First, naled is foliarly applied to agricultural crops, and the label cautions that application under certain conditions (humidity, etc) will result in crop damage and there are reported incidents that give validity to this warning (see Section 4.5.1 for terrestrial plant incident information). The effects to plants include spots and burns, but the significance of such effects are unknown. As a result, effects to terrestrial plants could not be quantified, and in combination with the reported incidents, risk to terrestrial plants could not be precluded.

5.2.3.4. Potential Modification of Habitat

There is no designated critical habitat for the SJKF. Therefore, the modification of habitat is not applicable for this species.

5.2.3.5. Spatial Extent of Potential Effects

See Section 5.2.1.5 for the description of the spatial extent of potential effects to all species analyzed in this assessment including the SJKF.

5.2.3.6. Spray Drift

See Section 5.2.1.6 for the description of the spray drift analysis for potential effects to all species analyzed in this assessment including the SJKF.

5.2.3.7. Downstream Dilution Analysis

See Section 5.2.1.7 for the description of the downstream dilution analysis for potential effects to all species analyzed in this assessment including the SJKF.

5.2.4. Bay Checkerspot Butterfly (BCB) and Valley Elderberry Longhorn Beetle (VELB)

It is recognized that there are differences in the primary constituent elements (PCE's) related to the critical habitat of the BCB and VELB, however, the evaluation of direct and indirect effects to these terrestrial invertebrates are the same using current modeling approaches. Therefore, the direct and indirect effects determinations for the BCB and VELB are the same, and are reported below.

5.2.4.1. Direct Effects

Naled

<u>*Acute and chronic RQs*</u>

In order to assess the risks of naled exposure to terrestrial invertebrates, 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 0.48 µg a.i./bee (naled) by 1 bee/0.128g, which is based on the weight of an adult honey bee. Dietary EECs (µg a.i./g of bee) calculated by T-REX for small insects and large insects were divided by the calculated toxicity value for terrestrial invertebrates, which is 3.75 µg a.i./g of bee for naled. Larvae for the BCB and VELB are considered 'small insects' in this assessment, while the adults of these species are considered ‘large insects.’ The acute RQs resulting from naled exposure are shown for both small and large insects in Table 5-16. The acute RQs for small and large insects exposed to naled exceed the terrestrial invertebrate LOC (0.05) for all uses of naled. Based on these results, a preliminary **“may affect”** determination was made for the BCB and the VELB based on honey bee toxicity data.

Dose Response – Probability of an Individual Effect
The probability of individual effect was calculated based on a probit slope value for the acute contact honeybee toxicity test, which was available for the naled LD_{50} value. The slope was 18.18 for naled (MRID 00036935, Atkins 1975). However, confidence intervals were not provided in the study, therefore, there is uncertainty associated with the lack of confidence intervals. All uses of naled represent a very high probability of individual effect to small insects resulting from naled exposure. All uses of naled > 0.25 lbs ai/A represent a very high probability of individual effect to large insects, uses of naled equal to 0.25 lbs ai/A represent a high probability of individual effect to large insects, and uses of naled ≤ 0.1 lbs ai/A represent a very low probability of individual effect to large insects resulting from naled exposure.

DDVP – Degradate
Acute and chronic RQs
In order to assess the risks of DDVP exposure to terrestrial invertebrates, 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 0.48 µg a.i./bee (naled) or 0.495 µg a.i./bee (DDVP) by 1 bee/0.128g, which is based on the weight of an adult honey bee. Dietary EECs (µg a.i./g of bee) calculated by T-REX for small insects and large insects were divided by the calculated toxicity value for terrestrial invertebrates, which is 3.75 µg a.i./g of bee for naled and 3.87 µg a.i./g for DDVP. Larvae for the BCB and VELB are considered ‘small insects’ in this assessment, while the adults of these species are considered ‘large insects.’ RQs resulting from naled exposure are shown for both small and large insects in Table 5-17. The acute RQs for small insects exposed to either naled or DDVP residues exceed the terrestrial invertebrate LOC (0.05) for all uses of naled. For large insects exposed to naled residues only, the acute RQs exceed the terrestrial invertebrate LOC (0.5) for all uses of naled. However, for large insects exposed to DDVP residues, all uses with an application rate ≥ 0.1 lbs ai/A (naled), equivalent to 0.01 lbs ai/A (DDVP) with 2 applications at a 7 day interval exceed the terrestrial invertebrate LOC (0.05).

Dose Response – Probability of an Individual Effect
The probability of individual effect was calculated based on a probit slope value for the acute contact honeybee toxicity test, which was available for DDVP LD_{50} value. The slope was 8.97 for DDVP (MRID 00036935, Atkins 1975). However, confidence intervals were not provided in the study, therefore, there is uncertainty associated with the lack of confidence intervals. DDVP exposure resulting from all uses of naled > 0.25 lbs ai/A (0.1 lbs ai/A, as DDVP) represent a very high probability of individual effect to small insects, DDVP exposure resulting from uses of naled equal to 0.25 lbs ai/A (0.03 lbs ai/A, as DDVP) represent a high probability of individual effect to small insects, and DDVP exposure resulting from uses of naled ≤ 0.1 lbs ai/A (0.01 lbs ai/A, as DDVP) represent a very low probability of individual effect to small insects. DDVP

exposure resulting from any use of naled represents a slight to very low probability of individual effect to large insects.

5.2.4.2. Indirect Effects (*via Reductions of Prey Base and Habitat Effects*)

5.2.4.2.1. BCB

The primary diet for the BCB larvae are dwarf plantain plants (although they may also feed on purple owl's-clover or exserted paintbrush if the dwarf plantains senesce before the larvae pupate). Adults feed on the nectar of a variety of plants found in association with serpentine grasslands [*e.g*., California goldfields, tidy-tips, desert parsley, scytheleaf (*Allium falcifolium*), sea muilla (*muilla maritime*), false babystars (*Linanthus androsaceus*), and intermediate fiddleneck (*Amsinckia intermedia*)].

In addition to serving as the primary dietary item of the BCB, terrestrial plants serve several important habitat-related functions that are described below in Section 5.2.4.3 in detail with regards to critical habitat. Therefore, the potential for indirect effects to the BCB via loss of terrestrial plant food items and impacts to habitat and/or primary production was considered.

5.2.4.2.2. VELB

The VELB feeds on at least one species of elderberry (*Sambucus*) and perhaps as many as three elderberry taxa including *S. glauca*, *S. caerulea*, and *S. mexicana* (USFWS, 1984). In addition to serving as the primary dietary item of the VELB, terrestrial plants serve several important habitat-related functions that are described below in Section 5.2.5.3 in detail with regards to critical habitat. Therefore, the potential for indirect effects to the VELB via loss of terrestrial plant food items and impacts to habitat and/or primary production was considered.

5.2.4.3. Terrestrial Plants – Obligate species

Plant toxicity data were previously not required for naled; therefore there are no registrant-submitted studies available for this assessment. However, there is a study from the open literature that was reviewed for use in this assessment. In previous assessments (CRLF, 2008), in lieu of the registrant submitted data, a number of alternatives were used to assess plant toxicity. First, naled is foliarly applied to agricultural crops, and the label cautions that application under certain conditions (humidity, etc) will result in crop damage and there are reported incidents that give validity to this warning (see Section 4.5.1 for terrestrial plant incident information). The effects to plants include spots and burns, but the significance of such effects are unknown. As a result, effects to terrestrial plants could not be quantified, and in combination with the reported incidents, risk to terrestrial plants could not be precluded.

5.2.4.4. Potential Modification of Habitat

The open literature study that was reviewed found and examined a connection between naled application and celery petiole lesion (CPL) damage (E63164, Koike, 1997). Affected plants exhibited sunken, brown to tan, dry areas or lesions on the lower portions of petioles, which is an indication of soft, rotten tissues. The study authors concluded that CPL should be designated as phytotoxicity due to naled sprays applied by ground equipment. Moisture levels (pooling and accumulation of liquid at the base of the celery petioles) in conjunction with naled exposure resulted in increased instances of petiole lesion damage seen in celery. The combination of the extra moisture and chemical naled after ground spray application results in CPL in celery, as naled is causing entrance for bacteria. Both the BCB and VELB has an obligate relationship with terrestrial plants, the BCB is obligate with the dwarf plantain (*Plantago erecta*), and the VELB is obligate with the elderberry tree (*Sambucus* sp.). However, the effects to terrestrial plants could not be quantified, and the presence of incident data indicates that risk to terrestrial plants cannot be precluded. As a result exposure to terrestrial plants may affect the BCB and VELB via habitat modification, described further below in Section 5.2.4.5.

5.2.4.5. Modification of Designated Critical Habitat

The primary constituent elements (PCEs) of the BCB include:

- The presence of annual or perennial grasslands with little to no overstory that provide north/south and east/west slopes with a tilt of more than 7 degrees for larval host plant survival during periods of atypical weather (e.g., drought).
- The presence of the primary larval host plant, dwarf plantain (*Plantago erecta*) (a dicot) and at least one of the secondary host plants, purple owl's-clover or exserted paintbrush, are required for reproduction, feeding, and larval development.
- The presence of adult nectar sources for feeding.
- Aquatic features such as wetlands, springs, seeps, streams, lakes, and ponds and their associated banks, that provide moisture during periods of spring drought; these features can be ephemeral, seasonal, or permanent.
- Soils derived from serpentinite ultramafic rock (Montara, Climara, Henneke, Hentine, and Obispo soil series) or similar soils (Inks, Candlestick, Los Gatos, Fagan, and Barnabe soil series) that provide areas with fewer aggressive, nonnative plant species for larval host plant and adult nectar plant survival and reproduction.
- The presence of stable holes and cracks in the soil, and surface rock outcrops that provide shelter for the larval stage of the bay checkerspot butterfly during summer diapause.

For the purposes of this assessment, the potential for indirect effects to the BCB as result of effects to the PCEs of its designated critical habitat is assessed by considering effects to terrestrial plants. Similar to what was noted in Section 5.2.4.2.1 above, in which the potential for indirect effects to the BCB via loss of terrestrial plant food items and impacts to habitat and/or primary production was assessed, effects to terrestrial plants cannot be quantified due to the lack of data, and there are reported incidents involving terrestrial plants. Therefore, the Agency cannot preclude risk to terrestrial plants, and as a result there is the potential for habitat modification of BCB designated critical habitat.

The primary constituent elements (PCEs) of the VELB include:

- The presence of riparian elderberry trees (*Sambucus* sp.) during its entire life cycle.

For the purposes of this assessment, the potential for indirect effects to the VELB as result of effects to the PCEs of its designated critical habitat is assessed by considering effects to terrestrial plants. Similar to what was noted in Section 5.2.4.2.2 above, in which the potential for indirect effects to the VELB via loss of terrestrial plant food items and impacts to habitat and/or primary production was assessed, although effects to terrestrial plants cannot be quantified due to the lack of data, and there are reported incidents involving terrestrial plants. Therefore, the Agency cannot preclude risk to terrestrial plants, and as a result there is the potential for habitat modification of BCB designated critical habitat.

5.2.4.6. Spatial Extent of Potential Effects

See Section 5.2.1.5 for the description of the spatial extent of potential effects to all species analyzed in this assessment including the BCB and VELB.

5.2.4.7. Spray Drift

See Section 5.2.1.6 for the description of the spray drift analysis for potential effects to all species analyzed in this assessment including the BCB and VELB.

5.2.4.8. Downstream Dilution Analysis

See Section 5.2.1.7 for the description of the downstream dilution analysis for potential effects to all species analyzed in this assessment including the BCB and VELB.

5.3. Effects Determinations

5.3.1. California Clapper Rail (CCR)

Based on the best available information the Agency makes a **"may affect, and likely to adversely affect" (LAA)** determination for the CCR based on direct acute and chronic effects and indirect effects to the CCR via effects to fish, aquatic invertebrates, birds, mammals, and terrestrial invertebrates for all uses of naled except control of insect pests related to animal and human health (i.e., scenarios 7, 8, and 9). For control of insect pests related to animal and human health (i.e., scenarios 7, 8, and 9) there are direct effects and indirect effects to the CCR via effects to fish and aquatic invertebrates. Direct effects to the CCR are insignificant for control of insect pests related to animal and human health (i.e., scenarios 7, 8, and 9). The LAA determination applies to currently registered naled uses in California as described in Table 1-3, Table 1-4, Table 7-3, and Table 7-4.

5.3.2. San Francisco Garter Snake (SFGS)

Based on the best available information the Agency makes a **"may affect, and likely to adversely affect**" **(LAA)** determination for the SFGS based on direct and indirect effects to the SFGS for safflower, cole crops, tree nuts, citrus uses (scenarios 1 and 2), and based on indirect effects to the SFGS via effects to fish, aquatic invertebrates, birds, mammals, and terrestrial invertebrates for all other uses. The LAA determination applies to currently registered naled uses in California as described in Table 1-3, Table 1-4, Table 7-3, and Table 7-4.

5.3.3. San Joaquin Kit Fox (SJKF)

Based on the best available information the Agency makes a **"may affect, but not likely to adversely affect" (NLAA)** determination for the SJKF based on no direct acute or chronic effects (or the acute affect is discountable), and insignificant indirect effects from the control of insect pests related to animal and human health uses of naled (i.e., scenarios 7, 8, and 9). Based on the best available information the Agency makes a **"may affect, and likely to adversely affect**" **(LAA)** determination for the SJKF for all other uses of naled based on the direct acute and chronic effects and indirect effects to the SJKF via effects to birds, mammals and terrestrial invertebrates. The LAA determination applies to currently registered naled uses in California as described in Table 1-3, Table 1-4, Table 7-3, and Table 7-4.

5.3.4. Bay Checkerspot Butterfly (BCB)

Based on the best available information the Agency makes a **"may affect, and likely to adversely affect**" **(LAA)** determination for the BCB for all uses of naled based on direct and indirect effects. The LAA determination applies to currently registered naled uses in California as described in Table 1-3, Table 1-4, Table 7-3, and Table 7-4. The effects to terrestrial plants could not be quantified, and the presence of incident data indicates that risk to terrestrial plants cannot be precluded; and therefore there is the potential for indirect effects to the BCB via effects to terrestrial plants, specifically the dwarf plantain to which they are an obligate to. As a result, the Agency makes a **"habitat modification"** determination for the BCB designated critical habitat as risk to terrestrial plants cannot be precluded.

5.3.5. Valley Elderberry Longhorn Beetle (VELB)

Based on the best available information the Agency makes a **"may affect, and likely to adversely affect**" **(LAA)** determination for the VELB for all uses of naled based on direct and indirect effects. The LAA determination applies to currently registered naled uses in California as described in Table 1-3, Table 1-4, Table 7-3, and Table 7-4. The effects to terrestrial plants could not be quantified, and the presence of incident data indicates that risk to terrestrial plants cannot be precluded; and therefore there is the potential for indirect effects to the VELB via effects to terrestrial plants, specifically the Elderberry to which they are an obligate to. Therefore, As a result, the Agency makes a **"habitat modification"** determination for VELB designated critical habitat as risk to terrestrial plants cannot be precluded.

5.3.6. Addressing the Risk Hypotheses

In order to conclude this risk assessment, it is necessary to address the risk hypotheses defined in Section 2.9.1. Based on the conclusions of this assessment, none of the hypotheses can be rejected, meaning that the stated hypotheses represent concerns in terms of direct and indirect effects of naled on the CCR, SFGS, SJKF, BCB, and VELB and its designated critical habitat.

The labeled uses of naled within the action area may:

- directly affect the SFGS, SJKF, BCB, and VELB by causing mortality or by adversely affecting growth or fecundity;
- indirectly affect CCR, SFGS, SJKF, BCB, and VELB and/or modify their designated critical habitat by reducing or changing the composition of food supply;
- indirectly affect CCR, SFGS, SJKF, BCB, and VELB and/or modify their designated critical habitat by reducing or changing the composition of the aquatic plant community in the species' current range, thus affecting primary productivity and/or cover;
- indirectly affect CCR, SFGS, SJKF, BCB, and VELB and/or modify their designated critical habitat by reducing or changing aquatic habitat in their current range (via modification of water quality parameters, habitat morphology, and/or sedimentation).

6. Uncertainties

Uncertainties that apply to most assessments completed for the San Francisco Bay Species Litigation are discussed in Attachment I. This section describes additional uncertainties specific to this assessment.

6.1. Exposure Assessment Uncertainties

AgDRIFT tends to be used in order to determine the buffer needed for terrestrial and aquatic species to not have adverse effects as a result from the use of naled. It is important to note that due to model limitations, it may not be possible to provide a quantitative estimate of exposure with known uncertainty, beyond the range of AgDRIFT (1,000 feet).

6.1.1. Terrestrial Exposure Assessment Uncertainties

6.1.1.1. T-REX

Organisms consume a variety of dietary items and may exist in a variety of sizes at different life stages. For foliar applications of liquid formulations, T-REX estimates exposure for the following dietary items: short grass, tall grass, broadleaf plants/small insects, fruits/pods/seeds/large insects, and seeds for granivores. Birds (used as a surrogate for reptiles), including the CCR and SFGS, and mammals, including the SJKF, consume all of these items. The size classes of birds represented in T-REX are the small (20 g), medium (100 g), and large (1000 g). The size classes for mammals are small (15 g), medium (35 g), and large (1000 g). EECs are calculated for the most sensitive dietary item and size class for birds (surrogate for reptiles) and mammals. Table 6-1 shows the percentages of the EECs and RQs of the various dietary classes for each size class as compared to the most sensitive dietary class (short grass) and size class (small mammal or bird). This information could be used to further characterize potential risk that is specific to the diet of birds and mammals. For example, if a mammal only consumes broadleaf plants and small insects and the RQ was 100 for small mammals consuming short grass, the RQ for small mammals that only consumed broadleaf plants and small insects would be 56 (100 x 0.56).

Table 6-1. Percentage of EEC or RQ for the Specified Dietary Items and Size Classes as Compared to the EEC or RQ for The Most Sensitive Dietary Items (Short Grass) and Size Class (Small Bird or Small Mammal)

Dietary Items	**Percentage of EECs or RQs for the Specified Dietary Items and Size Class as compared to the EEC or RQ for Small Birds[1] or Small Mammals Consuming Short Grass**					
Birds: Dose Based EECs and RQs						
Size Class	Small, 20 g		Mid, 100 g		Large, 1000 g	
	EEC	RQ	EEC	RQ	EEC	RQ
Short Grass	100%	100%	57%	45%	26%	14%
Tall Grass	46%	46%	26%	21%	12%	7%
Broadleaf plants/small Insects	56%	56%	32%	25%	14%	8%
Fruits/pods/seeds/large insects	6%	6%	4%	3%	2%	1%
Granivores	1%	1%	1%	1%	0.4%	0.2%
Mammals: Dose-Based EECs and RQs						
Size Class	Small, 15 g		Mid, 35 g		Large, 1000 g	
	EEC	RQ	EEC	RQ	EEC	RQ
Short Grass	100%	100%	69%	85%	16%	46%
Tall Grass	46%	46%	32%	39%	7%	21%
Broadleaf plants/small Insects	56%	56%	39%	48%	9%	26%
Fruits/pods/seeds/large insects	6%	6%	4%	5%	1%	3%
Granivores	1%	1%	1%	1%	0.2%	0.6%
Mammals and Birds: Dietary-based EECs and RQs for all Size Classes[2]						
Short Grass	100%					
Tall Grass	46%					
Broadleaf plants/sm Insects	56%					
Fruits/pods/seeds/lg insects	6%					

[1] The percents of the maximum RQ shown here for birds are based on the Agency's default avian scaling factor of 1.15.
[2] Percentages for dose-based chronic EECs and RQs for mammals are equivalent to the acute dose-based EECs and RQs.

In the risk assessment, RQs were only calculated for the most sensitive dietary class relevant to the organisms assessed. For most organisms, not enough data are available to conclude that birds or mammals may not exclusively feed on a dietary class for at least some time period. However, most birds and mammals consume a variety of dietary items and thus the RQ will overestimate risk to those organisms. For example, the CCR is estimated to consume only 15%

plant material (USFWS, 2003). Additionally, some organisms will not feed on all of the dietary classes. For example, many amphibians would only consume insects and not any plant material.

In addition to dietary exposure, there is the potential for inhalation exposure to birds via volitization. Both naled and DDVP volatilize, and there is the potential for birds to be exposed to naled and/or DDVP as the result of naled application. However, no further data are available to evaluate this route of exposure. As a result there is an uncertainty associated with the potential exposure route of avian inhalation resulting from the use of naled and the subsequent degradation to DDVP.

6.1.1.2. T-HERPS

For foliar applications of liquid formulations, T-HERPS estimates exposure for the following dietary items: broadleaf plants/small insects, fruits/pods/seeds/large insects, small herbivore mammals, small insectivore mammals, and small amphibians. Snakes and amphibians may consume all of these items. The default size classes of amphibians represented in T-HERPS are small (2 g), medium (20 g), and large (200 g). The default vertebrate prey size that the medium and large amphibians can consume is 13 g and 133 g, respectively (small amphibians are not expected to eat vertebrate prey). The default size classes for snakes are small (2 g), medium (20 g), and large (800 g). The default vertebrate prey size that medium and large snakes can consume is 25 g and 1,286 g, respectively (small snakes are not expected to eat vertebrate prey). EECs are calculated for the most sensitive dietary item and size class for amphibians and snakes. Table 6-2 shows the percentages of the EECs and RQs of the various dietary classes for each size class as compared to the most sensitive dietary class (herbivorous mammal) and size class [medium (20 g) amphibian or snake]. This information could be used to further characterize potential risk that is specific to the diet of amphibians and snakes, Section 5.2.2.

Table 6-2. Percentage of EEC or RQ for the Specified Dietary Class as Compared to the EEC or RQ for The Most Sensitive Dietary Class (Small Herbivore Mammals) and Size Class (Medium Amphibian or Snake)

<table>
<tr><th>Dietary Items</th><th colspan="4">Percentage of EECs or RQs for the Specified Dietary Items and Size Class as compared to the EEC or RQ for Medium Amphibians or Snakes Consuming Small Herbivore Mammals</th></tr>
<tr><td colspan="5">Amphibians: Acute Dose Based EECs and RQs</td></tr>
<tr><td>Size Class</td><td>Small, 2 g</td><td>Mid, 20 g</td><td colspan="2">Large, 200 g</td></tr>
<tr><td>Broadleaf plants/sm Insects</td><td>5%</td><td>3%</td><td colspan="2">2%</td></tr>
<tr><td>Fruits/pods/seeds/lg insects</td><td>0.5%</td><td>0.3%</td><td colspan="2">0.2%</td></tr>
<tr><td>Small herbivore mammals</td><td>N/A</td><td>100%</td><td colspan="2">37%</td></tr>
<tr><td>Small insectivore mammals</td><td>N/A</td><td>6%</td><td colspan="2">2%</td></tr>
<tr><td>Small amphibians</td><td>N/A</td><td>2%</td><td colspan="2">1%</td></tr>
<tr><td colspan="5">Snakes: Acute Dose-Based EECs and RQs</td></tr>
<tr><td>Size Class</td><td>Small, 2 g</td><td>Mid, 20 g</td><td>Mid, 200 g[1]</td><td>Large, 800 g</td></tr>
<tr><td>Broadleaf plants/sm Insects</td><td>3%</td><td>2%</td><td>1%</td><td>1%</td></tr>
<tr><td>Fruits/pods/seeds/lg insects</td><td>0.4%</td><td>0.2%</td><td>0.1%</td><td>0.1%</td></tr>
<tr><td>Small herbivore mammals</td><td>N/A</td><td>100%</td><td>40%</td><td>23%</td></tr>
<tr><td>Small insectivore mammals</td><td>N/A</td><td>6%</td><td>3%</td><td>1%</td></tr>
</table>

Small amphibians	N/A	2%	2%	1%
Amphibians and Snakes: Acute and Chronic Dietary-based EECs and RQs for all Size Classes				
	Amphibians		Snakes	
Broadleaf plants/sm Insects	56%		73%	
Fruits/pods/seeds/lg insects	6%		8%	
Small herbivore mammals	100%		100%	
Small insectivore mammals	6%		6%	
Small amphibians	2%		2%	

[1] To provide more information, a 200 g snake (eating a 291 g prey item) was also modeled (in addition to the default body sizes).

In the risk assessment, RQs were only calculated for the most sensitive dietary class relevant to the organisms assessed. For most organisms, not enough data are available to conclude that amphibians or snakes may not exclusively feed on a dietary class for at least some time period. However, most amphibians and snakes consume a variety of dietary items and thus the RQ will overestimate risk to those organisms. Additionally, some organisms will not feed on all of the dietary classes. For example, many amphibians would only consume insects and not any plant material.

6.1.1.3. Incorporation of Naled Degradation

To estimate and characterize the risk associated with naled exposures to terrestrial species resulting from applications of naled, the T-REX model. The T-HERPS model is used to further characterize dietary exposures of reptiles relative to screening exposure estimates based on birds in T-REX. Naled degrades rapidly to DDVP, and T-REX (and T-HERPS) do not track total toxic residues, therefore, two separate T-REX (and T-HERPS) runs were executed for each application scenario to capture the range in possible naled and DDVP residues: one run was conducted at 100% of the application rate (assuming 100% residue as naled), and one run was conducted at 20% of the application rate (representing the maximum possible DDVP residue level from naled). For each run, the resulting EECs were compared to their respective toxicity endpoints to generate estimates of risk (i.e., 100% application run was compared to naled toxicity endpoints, and the 20% application run was compared to DDVP toxicity endpoints). The RQ values that were generated from each run were not summed, but rather used to bound the range of possible RQ values resulting from naled and subsequently DDVP exposure. This allowed for further characterization of the direct and indirect risks to terrestrial organisms.

RQs calculated from the naled only runs (100% of the application of naled) maybe an overestimation of risk, due to the rapid degradation to DDVP the organisms would have to be exposed (either direct or indirect via consumption of dietary items that were exposed) within the first few days after application and the likelihood of that is low. These RQs provide the upper bounding of risk potential to terrestrial organisms. RQs calculated using 20% of the application rate (maximum DDVP residue), provides the lower bounding of risk potential to terrestrial organisms, as there is still risk associated with the presence of DDVP resulting from the application of naled. However, using only the 20% fails to account for the additional 80% of naled that is expected to be concurrent with 20% DDVP. There is currently no acceptable method by which the Agency can evaluate possible synergistic (or antagonistic) effects of simultaneous naled/DDVP exposure, but it may be assumed that there is at least an additive effect – especially as both chemicals have the same action (ChE inhibition). However, as potential additive effects cannot be adequately quantified, it should simply be noted that for cases where DDVP terrestrial exposure endpoints are used, there is less confidence that the most conservative possible determination has been made.

6.1.2. Aquatic Exposure Modeling of Naled

A specific limitation of the PRZM model for this assessment is evident in the relative effects of runoff and spray drift, as they are processed in the model. For example, in many of the California scenarios, the associated meteorological files exhibit very little rainfall during those months (June-August) when certain pest pressures are assumed to be greatest. During this period, the predicted surface water concentrations are solely determined by the spray drift function; changing the initial application date within this period (summer) results in absolutely no change in the predicted concentrations. In contrast, if the same parameters are run with only the application date changed, there can be as much as order of magnitude higher aquatic concentrations in surface water – the result of rainfall initiating runoff into the water body, combined with the spray drift inputs. Since spraying may occur during non-summer months (as California can have more than one ‘crop cycle’ – or ‘season’ – in a year), it is conservative and protective to model some of these uses in other months; provided, of course, that they still fall within the period that is appropriate for the given application.

In addition, due to not having an acceptable aerobic aquatic metabolism study, the aerobic soil metabolism half-life was used and was multiplied by 2 as instructed by the Input Parameter Guidance (2002).

For the aquatic exposure, the total toxic residue (TTR) method was used to determine the exposure of both naled and DDVP as a result of naled use. However, it is important to note, that in locations where both naled and DDVP can be used, assuming TTR can be underestimating exposure since the amount of DDVP present would be greater than if just naled was being used. Therefore, while DDVP may potentially be used simultaneously (for different purposes) within the same areas as naled, this was not addressed in this risk assessment.

6.1.3. Exposure in Estuarine/Marine Environments

PRZM-EXAMS modeled EECs are intended to represent exposure of aquatic organisms in relatively small ponds and low-order streams. Therefore it is likely that EECs generated from the PRZM-EXAMS model will over-estimate potential concentrations in larger receiving water bodies such as estuaries, embayments, and coastal marine areas because chemicals in runoff water (or spray drift, etc.) should be diluted by a much larger volume of water than would be found in the ‘typical’ EXAMS pond. However, as chemical constituents in water draining from freshwater streams encounter brackish or other near-marine-associated conditions, there is potential for important chemical transformations to occur. Many chemical compounds can undergo changes in mobility, toxicity, or persistence when changes in pH, Eh (redox potential), salinity, dissolved oxygen (DO) content, or temperature are encountered. For example, desorption and re-mobilization of some chemicals from sediments can occur with changes in salinity (Jordan *et al.*, 2008; Means, 1995; Swarzenski *et al.*, 2003), changes in pH (*e.g*., Wood and Baptista 1993; Parikh et al. 2004; Fernandez et al. 2005), Eh changes (Velde and Church, 1999; Wood and Baptista, 1993), and other factors. Thus, although chemicals in discharging rivers may be diluted by large volumes of water within receiving estuaries and embayments, the hydrochemistry of the marine-influenced water may negate some of the attenuating impact of the greater water volume; for example, the effect of dilution may be confounded by changes in chemical mobility (and/or bioavailability) in brackish water. In addition, freshwater contributions from discharging streams and rivers do not instantaneously mix with more saline water bodies. In these settings, water will commonly remain highly stratified, with fresh water lying atop denser, heavier saline water – meaning that exposure to concentrations found in discharging stream water may propagate some distance beyond the outflow point of the stream (especially near the water surface). Therefore, it is not assumed that discharging water will be rapidly diluted by the entire water volume within an estuary, embayment, or other coastal aquatic environment. PRZM-EXAMS model results should be considered consistent with concentrations that might be found near the head of an estuary unless there is specific information – such as monitoring data – to indicate otherwise. Conditions nearer to the mouth of a bay or estuary, however, may be closer to a marine-type system, and thus more subject to the notable buffering, mixing, and diluting capacities of an open marine environment. Conversely, tidal effects (pressure waves) can propagate much further upstream than the actual estuarine water, so discharging river water may become temporarily partially impounded near the mouth (discharge point) of a channel, and resistant to mixing until tidal forces are reversed.

The Agency does not currently have sufficient information regarding the hydrology and hydrochemistry of estuarine aquatic habitats to develop alternate scenarios for assessed listed species that inhabit these types of ecosystems. The Agency acknowledges that there are unique brackish and estuarine habitats that may not be accurately captured by PRZM-EXAMS modeling results, and may, therefore, under- or over-estimate exposure, depending on the aforementioned variables.

6.1.4. Modeled Versus Monitoring Concentrations

There were insufficient monitoring data with which to compare modeling results.

6.2. Effects Assessment Uncertainties

6.2.1. Data Gaps and Uncertainties

There are no registrant submitted estuarine/marine early life-stage toxicity tests for naled, and in the absence of this data, DDVP toxicity was used (total toxic residue approach, naled + DDVP) allowed for this. Although, there is still uncertainty due to the lack of data for estuarine/marine fish toxicity to naled technical, it is unlikely that estuarine/marine fish would be exposed to naled under chronic exposure basis due to the rapid degradation to DDVP. Also there is no definitive chronic toxicity value for naled for estuarine/marine invertebrates. As a result, DDVP estuarine/marine invertebrate chronic toxicity data was used to determine the risk potential associated with total toxic residue of naled + DDVP exposed to estuarine/marine invertebrates.

There were no body weights provided in the study for the avian acute oral and subacute dietary toxicity endpoints used in the assessment. Therefore, the average body weight for those species that were used (i.e., Canada goose, Japanese quail) were used in the T-REX modeling. Without the body weights of the test birds that were used, there is some uncertainty associated with the average weights that were found in outside sources as they may not be for the same size (age) of bird used in the toxicity tests.

There are no registrant submitted terrestrial plant toxicity data available for naled or DDVP, as plant toxicity data was previously not required for naled or DDVP. However, there is a study from the open literature that was reviewed for use in this assessment. The open literature study that was reviewed found and examined a connection between naled application and celery petiole lesion (CPL) damage (E63164, Koike, 1997). Affected plants exhibited sunken, brown to tan, dry areas or lesions on the lower portions of petioles, which is an indication of soft, rotten tissues. From review it does not seem probable that other native plant populations will exhibit this characteristic (CPL) since they usually do not have water intensive petioles like celery. There are also no other indications that other crop species are also affected like celery to naled exposure. Therefore it does not appear that naled will have a significant effect on native populations or on obligate species such as elderberry or the dwarf plantain. Even still, there are uncertainties associated with using open literature data, as no raw data is available to confirm the results that were documented.

6.2.2. Use of Surrogate Species Effects Data

Guideline toxicity tests and open literature data on naled are not available for reptiles therefore; birds are used as surrogate species for terrestrial-phase amphibians, reptiles and the SFGS. Endpoints based on avian ecotoxicity data are assumed to be protective of potential direct effects to snakes including the SFGS, and extrapolation of the risk conclusions from the most sensitive tested species to the SFGS 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 t 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 characterization purposes.

No open literature data was available examining sublethal effects associated with exposure to naled. To the extent to which sublethal effects are not considered in this assessment, the potential direct and indirect effects of naled on listed species may be underestimated.

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 naled to CCR, SFGS, SJKF, BCB, and VELB and their designated critical habitat (the BCB and VELB only).

Based on the best available information, the Agency makes a May Affect, Likely to Adversely determination for the CCR, SFGS, SJKF, BCB and VELB. Additionally, the Agency has determined that there is the potential for modification of the designated critical habitat for the BCB and VELB from the use of naled. Given the LAA determination for CCR, SFGS, SJKF, BCB and VELB a description of the baseline status and cumulative effects is provided in Attachment III.

A summary of the risk conclusions and effects determinations for the CCR, SFGS, SJKF, BCB and VELB and their critical habitat, given the uncertainties discussed in Section 6 and Attachment I, is presented in Table 7-1 and Table 7-2. Use specific effects determinations are provided in Table 7-3 and Table 7-4.

Table 7-1. Effects Determination Summary for Effects of Naled on the CCR, SFGS, SJKF, BCB, and VELB

Species	Effects Determination	Basis for Determination
California Clapper Rail (CCR) (*Rallus longirostris obsoletus)*	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects** ***Juveniles and Adults*** : There are direct acute and chronic effects for all uses of naled except insect pests – animal and human health concerns uses (scenarios 7, 8, and 9). Acute dose-based RQs for small birds consuming tall grass and broadleaf plants ranged from 15.97 to 0.83 and 19.60 to 1.02, respectively assuming 100% of dietary requirements are met from those materials. Acute dose-based RQs for adult birds consuming tall grass and broadleaf plants ranged from 7.15 to 0.37 and 8.78 to 1.02, respectively. When considering the realistic percentage of the diet those materials make up at time of application (1%), the acute dose-based RQs still exceed the listed species LOC (0.1) for small birds consuming either tall grass or broadleaf plants. RQs ranged from 0.16 to 0.08 for tall grass, and 0.20 to 0.01 for broadleaf plants. When considering the realistic percentage of the diet those materials make up at time of application (1%), the acute dose-based RQs did not exceed the listed species LOC (0.1) for adult birds consuming either tall grass or broadleaf plants. RQs ranged from 0.071 to 0.004 for tall grass, and 0.088 to 0.005 for broadleaf plants.

Species	Effects Determination	Basis for Determination
		Potential for Indirect Effects
		Aquatic prey items, aquatic habitat, cover and/or primary productivity There are indirect acute and chronic effects to the CCR via effects to fish, aquatic invertebrates for all uses of naled. RQs are exceeded for all freshwater invertebrates on an acute and chronic basis, most freshwater fish on an acute basis and half on a chronic basis, estuarine/marine fish and invertebrates are assumed to be exceeded on an acute and chronic basis, a few of the non-vascular plants, and none of the vascular plants. The effects to fish and aquatic invertebrates result in an indirect effect to the CCR via loss of prey items.
		Terrestrial prey items, riparian habitat There are indirect acute and chronic effects to the CCR via effects to birds, mammals, and terrestrial invertebrates, for all uses of naled except insect pests – animal and human health concerns uses (scenarios 7, 8, and 9). Acute dose-based RQs for small birds consuming short grass ranged from 34.85 to 1.81, acute dietary-based RQs for birds consuming short grass ranged from 0.38 to 0.02, and chronic dietary-based RQs for birds consuming short grass ranged from 1.52 to 0.10. Acute dose-based RQs for small mammals consuming short grass ranged from 2.38 to 0.12, chronic dose-based RQs for small mammals consuming short grass ranged from 36.44 to 1.89, and chronic dietary-based RQs for small mammals consuming short grass ranged from 4.20 to 0.22. RQs for small insects ranged from 75.60 to 3.92 and RQs for large insects ranged from 8.40 to 0.43. The effects to birds, mammals, and terrestrial invertebrates result in an indirect effect to the CCR via loss of prey items.
San Francisco Garter Snake (SFGS) (*Thamnophis sirtalis tetrataenia*)	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects**
		Juveniles and Adults: There are direct acute and chronic effects to the SFGS for safflower, cole crops, tree nuts, citrus uses only (scenarios 1 and 2). Acute dose-based RQs for a 20g snake consuming small mammals ranged from 29.02 to 1.50, acute dietary-based RQs for a 20g snake consuming small mammals ranged from 0.29 to 0.02, and chronic RQs for a 20g snake consuming small mammals ranged from 1.49 to 0.08 (using the T-HERPS refinement).
		Potential for Indirect Effects
		Aquatic prey items, aquatic habitat, cover and/or primary productivity There are indirect acute and chronic effects to the SFGS via effects to fish, aquatic invertebrates for all uses of naled. RQs are exceeded for all freshwater invertebrates on an acute and chronic basis, most freshwater fish on an acute basis and half on a chronic basis, estuarine/marine fish and invertebrates are assumed to be exceeded on an acute and chronic basis, a few of the non-vascular plants, and none of the vascular plants. The effects to fish and aquatic invertebrates results in an indirect effect to the SFGS via loss of prey items.
		Terrestrial prey items, riparian habitat There are indirect acute and chronic effects to the SFGS via effects to birds (surrogate for terrestrial-phase amphibians), mammals, and terrestrial invertebrates, for safflower, cole crops, tree nuts, citrus uses of naled only (scenarios 1 and 2). Acute dose-based RQs for small birds (surrogate for terrestrial-phase amphibians) consuming short grass ranged from 34.85 to 1.81, acute dietary-based RQs for birds (surrogate for terrestrial-phase amphibians) consuming short grass ranged from 0.38 to 0.02, and chronic dietary-based RQs for birds (surrogate for terrestrial-phase amphibians) consuming short grass ranged from 1.52 to 0.10. Acute dose-based RQs for small mammals

Species	Effects Determination	Basis for Determination
		consuming short grass ranged from 2.38 to 0.12, chronic dose-based RQs for small mammals consuming short grass ranged from 36.44 to 1.89, and chronic dietary-based RQs for small mammals consuming short grass ranged from 4.20 to 0.22. From T-HERPS refinement, using medium snakes (20g) consuming herbivore mammals, the acute dose-based RQs ranged from 29.02 to 1.50, the acute dietary-based RQs range from 0.29 to 0.02, and the chronic dietary RQs ranged from 1.49 to 0.08. RQs for small insects ranged from 75.60 to 3.92 and RQs for large insects ranged from 8.40 to 0.43. The effects to birds (surrogate for terrestrial-phase amphibians), mammals, and terrestrial invertebrates result in an indirect effect to the SFGS via loss of prey items.
San Joaquin Kit Fox (SJKF) (*Vulpes macrotis mutica*)	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects**
		Juveniles and Adults: There are direct acute and chronic effects to the SJKF for all uses (except for insect pests – animal and human health concerns uses – scenarios 7, 8, and 9). Acute dose based RQs for large mammals consuming short grass ranged from 1.09 to 0.06, chronic dose-based RQs for large mammals consuming short grass ranged from 16.68 to 0.86, and chronic dietary-based RQs for large mammals consuming short grass ranged from 4.20 to 0.22.
		Potential for Indirect Effects
		Terrestrial prey items, riparian habitat There are indirect acute and chronic effects to the SJKF for all uses (except for insect pests – animal and human health concerns uses – scenarios 7, 8, and 9), via effects to birds, mammals and terrestrial invertebrates. Acute dose-based RQs for small birds consuming short grass ranged from 34.85 to 1.81, acute dietary-based RQs for birds consuming short grass ranged from 0.38 to 0.02, and chronic dietary-based RQs for birds consuming short grass ranged from 1.52 to 0.10. Acute dose-based RQs for small mammals consuming short grass ranged from 2.38 to 0.12, chronic dose-based RQs for small mammals consuming short grass ranged from 36.44 to 1.89, and chronic dietary-based RQs for small mammals consuming short grass ranged from 4.20 to 0.22. RQs for small insects ranged from 75.60 to 3.92 and RQs for large insects ranged from 8.40 to 0.43. The effects to birds, mammals, and terrestrial invertebrates result in an indirect effect to the SJKF via loss of prey items.
Bay Checkerspot Butterfly (BCB) (*Euphydryas editha bayensis*)	**May Affect, Likely to Adversely Affect (LAA)**	**Potential for Direct Effects**
		Larvae and Adults: There are direct effects to larvae and adult BCB for all uses of naled. RQs for small insects (representing the BCB larval stage) ranged from 75.60 to 3.92 and RQs for large insects (representing the BCB adult stage) ranged from 8.40 to 0.43.
		Potential for Indirect Effects
		The effects to terrestrial plants could not be quantified, and the presence of incident data indicates that risk to terrestrial plants cannot be precluded; and therefore there is the potential for indirect effects to the BCB via effects to terrestrial plants, specifically the dwarf plantain to which they are an obligate to.
Valley Elderberry Longhorn Beetle (VELB)	**May Affect, Likely to Adversely Affect**	**Potential for Direct Effects**
		Larvae and Adults: There are direct effects to larvae and adult VELB for all uses of naled. RQs for small insects (representing the VELB larval stage) ranged from 75.60 to 3.92 and RQs for large insects (representing the VELB adult stage) ranged from 8.40 to 0.43.

Species	Effects Determination	Basis for Determination
(*Desmocerus californicus dimorphus*)	**(LAA)**	**Potential for Indirect Effects**
		The effects to terrestrial plants could not be quantified, and the presence of incident data indicate that risk to terrestrial plants could not be precluded; and therefore there is the potential for indirect effects to the VELB via effects to terrestrial plants, specifically the Elderberry to which they are an obligate to.

Table 7-2. Effects Determination Summary for the Critical Habitat Impact Analysis

Designated Critical Habitat for:	Effects Determination	Basis for Determination
Bay Checkerspot Butterfly (BCB) (*Euphydryas editha bayensis*)	**Habitat Modification**	The effects to terrestrial plants cannot be quantified, and the presence of incident data indicate that risk to terrestrial plants could not be precluded. Therefore, the Agency makes a **"Habitat Modification"** determination for the BCB designated critical habitat as risk to terrestrial plants cannot be precluded.
Valley Elderberry Longhorn Beetle (VELB) (*Desmocerus californicus dimorphus*)	**Habitat Modification**	The effects to terrestrial plants cannot be quantified, and the presence of incident data indicate that risk to terrestrial plants could not be precluded. Therefore, the agency makes a **"Habitat Modification" determination** for VELB designated critical habitat as risk to terrestrial plants cannot be precluded.

Table 7-3. Use Specific Summary of The Potential for Indirect Adverse Effects to Aquatic Taxa.

Uses	Potential for Effects to Identified Taxa Found in the Aquatic Environment:									
	Estuarine/Marine Vertebrates[1]		Freshwater Vertebrates[2]		Freshwater Invertebrates[3]		Estuarine/Marine Invertebrates[4]		Vascular Plants[5]	Non-vascular Plants[5]
	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic		
orange, lemon, grapefruit, tangerine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
cabbage, broccoli, cauliflower, collards, kale	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
cotton	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
peaches	No	No	No	No	Yes	Yes	Yes	Yes	No	No
grapes	No	No	No	No	Yes	Yes	Yes	Yes	No	No
Brussels sprouts	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Swiss chard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
eggplant, summer squash	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
cantaloupes, muskmelons, melons	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
bedding plant, foliage plants, outdoor nursery ops.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
celery	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
beans, peas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
peppers	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
strawberries	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
sugar beets	No	No	No	No	Yes	Yes	Yes	Yes	No	No
safflower	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes
hops	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No	No
forestry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
areas outside bldgs., impervious surfaces	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
residential (including lawns)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Rangeland, pasture	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
alfalfa	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No

1 A yes in this column indicates a potential for indirect effects to CCR.
2 A yes in this column indicates a potential for indirect effects to SFGS and CCR.
3 A yes in this column indicates a potential for indirect effects to SFGS and CCR.
4 A yes in this column indicates a potential for indirect effects to CCR.
5 A yes in this column indicates a potential for indirect effects to SFGS and CCR.

Table 7-4. Use Specific Summary of the Potential for Adverse Effects to Terrestrial Taxa

Scenario (lbs ai/A)	Small Mammals[1]		SJKF and Large Mammals[2]		CCR and Small Birds[3]		SFGS and Reptiles[4]		BCB, VELB, & Terrestrial Invertebrates (Acute)[5]	Dicots[6]	Monocots[6]
	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic			
1- Safflower (2.1 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes**	Yes**
2- Cole crops, tree nuts, citrus (1.9 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes**	Yes**
3- Alfalfa, row crops, cotton (1.4 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
4- Melons, misc food and non-food plants (0.9 lbs ai/A, 1 app.)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
5- Forest and Non-food plants (0.9 lbs ai/A, 52 apps., 7-d interval)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
6- Forest and Non-food plants (0.9 lbs ai/A, 104 apps., 3-d interval)	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes**	Yes**
7- Insect pests-animal and human health concerns (0.25 lbs ai/A, 2 apps., 7-d interval)	No	No	No	No	No	No	No	No	Yes	Yes**	Yes**
8- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 1-d interval)	No	No	No	No	No	No	No	No	Yes	Yes**	Yes**
9- Insect pests-animal and human health concerns (0.1 lbs ai/A, 2 apps., 7-d interval)	No	No	No	No	No	No	No	No	Yes	Yes**	Yes**

1 A yes in this column indicates a potential for indirect effects to SFGS, CCR, SJKF.
2 A yes in this column indicates a potential for direct and indirect effects to SJKF.
3 A yes in this column indicates a potential for direct effects to CCR and indirect effects to the CCR, SFGS, SJKF.
4 A yes in this column indicates the potential for direct and indirect effects to SFGS and other reptiles.
5 A yes in this column indicates a potential for direct effect to BCB and VELB and indirect effects to SFGS, CCR, SJKF.
6 A yes in this column indicates a potential for indirect effects to BCB, VELB, SFGS, CCR. For the BCB and VELB this is based on the listed species LOC because of the obligate relationship with terrestrial monocots and dicots. For other species, the LOC exceedances are evaluated based on the LOC for non-listed species.
**There is no toxicity data for terrestrial plants, and there incident data is available, therefore risk cannot be precluded for terrestrial plants

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 listed 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.

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 CCR, SFGS, SJKF, BCB, and VELB life stages within the action area and/or applicable designated critical habitat. 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 assessed species.
- Quantitative information on prey base requirements for the assessed species. While existing information provides a preliminary picture of the types of food sources utilized by the assessed species, 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 species and potential modification to critical habitat.

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9. MRID List

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MRID: 145303
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Guideline: 83-4 2-generation repro.-rat

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MRID: 74892
Kohn, F.E. (1965) Report to California Chemical Company: Three- generation Reproduction Study in Albino Rats--Dibrom: Results through Weaning of F1b Litters. (Unpublished study received on unknown date under unknown admin. no.; prepared by Industrial Bio-Test Laboratories, Inc., submitted by Chevron Chemical Co., Richmond, Calif.; CDL:102864-A)

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Guideline: 121-1 Phytotoxicity

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MRID: 136456
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MRID: 136458
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MRID: 140182
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MRID: 140183
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MRID: 140187
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MRID: 140911
Chevron Chemical Co. (1968) ?Efficacy of Dibrom-BTB 2-2 Dust|. (Compilation; unpublished study received Jan 31, 1969 under 239- 2344; CDL:001542-A)

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Guideline: 122-2   Aquatic plant growth

MRID: 42529601
Hoberg, J. (1992) Naled Technical: Toxicity to the Duckweed, Lemna gibba: Lab Project Number: 12709.0292.6111.410. Unpublished study prepared by Springborn Labs, Inc. 59 p.

MRID: 42529602
Hoberg, J. (1992) Naled Technical: Toxicity to the Marine Diatom, Skeletonema costatum: Lab Project Number: 12709.0292.6110.450. Unpublished study prepared by Springborn Labs, Inc. 64 p.

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MRID: 42529604
Hoberg, J. (1992) Naled Technical: Toxicity to the Freshwater Blue-Green Alga, Anabaena Flos-aquae: Lab Project Number: 12790.0292.6107.420. Unpublished study prepared by Springborn Labs, Inc. 66 p.

MRID: 42529605
Hoberg, J. (1992) Naled Technical: Toxicity to the Freshwater Green Alga, Selenastrum capricornutum: Lab Project Number: 12709.0292.6109.430. Unpublished study prepared by Springborn Labs, Inc. 62 p.

Guideline: 123-2   Aquatic plant growth

MRID: 42529601

Hoberg, J. (1992) Naled Technical: Toxicity to the Duckweed, Lemna gibba: Lab Project Number: 12709.0292.6111.410. Unpublished study prepared by Springborn Labs, Inc. 59 p.

MRID: 42529602
Hoberg, J. (1992) Naled Technical: Toxicity to the Marine Diatom, Skeletonema costatum: Lab Project Number: 12709.0292.6110.450. Unpublished study prepared by Springborn Labs, Inc. 64 p.

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Guideline: 141-1 Honey bee acute contact

MRID: 142655
Atkins, E.; Anderson, L.; Kellum, D. et al. (1974) Protecting ho- ney bees from pesticides. Leaflet 2883. University of Califor- nia, Division of Agricultural Sciences. 15 p.

MRID: 142657
Womeldorf, D.; Atkins, E.; Gillies, P. (1974) Honey bee hazards associated with some mosquito abatement aerial spray applica- tions. California, Vector Views 21(9):51-55.

MRID: 142658
Caron, D. (1979) Effects of some ULV mosquito abatement insecti- cides on honey bees. Entomological Society of America 72(1): 148-151.

MRID: 144888
Colburn, R.; Langford, G. (1970) Field evaluation of some mosquito adulticides with observations on toxicity to honey bees and house flies. Mosquito News 30(4):518-522.

Guideline: 141-2 Honey bee residue on foliage

MRID: 142655
Atkins, E.; Anderson, L.; Kellum, D. et al. (1974) Protecting ho- ney bees from pesticides. Leaflet 2883. University of Califor- nia, Division of Agricultural Sciences. 15 p.

Guideline: 142-3   Simulated or Actual Field Testing

MRID: 73823
Lesser, C.R. (1977) The Effect of Naled on Selected Species of Salt Marsh Organisms. (Maryland, Dept. of Agriculture; unpublished study; CDL:232296-A)

Guideline: 154-8   Freshwater Fish Acute Toxicity

MRID: 84053
Frederick, J.J. (1974) Toxicities of Some Mosquito Adulticides to Non-target Marine Organisms. (Monroe County (Florida), Mosquito Control District; CDL:221987-Q)

Guideline: 154-22   Non-Target Plant Studies

MRID: 3616
Guthrie, F.E. (1957) Budworm Tests: To Compare Materials and Methods of Application for Budworm Control: Report No. 2114a. (Ent. Info. Note No. 118; unpublished study received Dec 21, 1959 under 3125-11; prepared by North Carolina State Univ., submitted by Mobay Chemical Corp., Agricultural Div., Kansas City, Mo.; CDL:006854-E)

MRID: 140270
Chevron Chemical Co. (1961) ?Efficacy: Dibrom|. (Compilation; unpublished study received Aug 12, 1968 under 239-2278; CDL: 001513-A)

Guideline: 850.3030 Honey bee toxicity of residues on foliage
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MRID: 47737801
Walsh, D. (2009) Pollinator Pesticide Safety Trials 2007: Flonicamid. Project Number: IB/2009/PH/002/01. Unpublished study prepared by Washington State University. 19 p.

ECOLOGICAL EFFECTS MRID NUMBERS BY GUIDELINE – DDVP

Guideline: 71-1   Avian Single Dose Oral Toxicity

MRID: 62001
Dougherty, E. (1962) Fly sprays can poison ducks. Farm Research 28(1):14. (Also In unpublished submission received Apr 24, 1969 under 9F0800; submitted by Dow Chemical U.S.A., Midland, Mich.; CDL:091380-F)

MRID: 76834
Colorado Organic Chemical Company, Incorporated (1970?) Bird Acute Toxicity. (Unpublished study received Jun 16, 1981 under 42118-23; CDL:245298-V)

MRID: 119139
Farnam Cos., Inc. (1970?) Bird Acute Toxicity: ?Technical DDVP|. (Unpublished study received Jul 19, 1976 under 270-98; CDL: 238104-D)

MRID: 119140
Farnam Cos., Inc. (1972?) Bird Dietary Study: ?DDVP|. (Unpublished study received Jul 19, 1976 under 270-98; CDL:238104-E)

MRID: 159386
Singh, V. (1965) Letter sent to L. Mitchell dated Mar 5, 1965: (Reference to the toxic effects of Vapona in relation to the mortalities in laying hens). Prepared by Bio-Toxicological Re- search Associates. 1 p.

MRID: 40818301
Grimes, J.; Jaber, M. (1988) DDVP: An Acute Oral Toxicity Study with the Bobwhite: Final Report: Project No. 246-102. Unpub- lished study prepared by Wildlife International Ltd. 21 p.

Guideline: 71-2 Avian Dietary Toxicity

MRID: 76836
Colorado Organic Chemical Company, Incorporated (1972?) Bird Dietary Study. (Unpublished study received Jun 16, 1981 under 42118-23; CDL:245298-X)

Guideline: 71-4 Avian Reproduction

MRID: 43710202
Huntingdon Research Centre Ltd. (1995) Effects of Dietary Administration of DDVP on Reproduction in the Bobwhite Quail: Status Report at Week 16: Lab Project Number: AVC 2. Unpublished study. 9 p.

MRID: 43710203
Huntingdon Research Centre Ltd. (1995) Effects of Dietary Administration of DDVP on Reproduction in the Mallard Duck: Status Report at Week 16: Lab Project Number: AVC 3. Unpublished study. 9 p.

MRID: 43981701
Cameron, D. (1996) DDVP: Bobwhite Quail Dietary Reproduction and Tolerance Studies: Lab Project Number: AVC 2: AVC 2/960139. Unpublished study prepared by Huntingdon Life Sciences Ltd. 324 p.

MRID: 43981702
Cameron, D. (1996) DDVP: Mallard Duck Dietary Reproduction and Tolerance Studies: Lab Project Number: AVC 3: AVC 3/953112. Unpublished study prepared by Huntingdon Life Sciences Ltd. 247 p.

MRID: 44233401
Redgrave, V. (1997) Mallard Duck Dietary Reproduction and Tolerance Studies: DDVP: Lab Project Number: AVC 7/961821: AVC 7. Unpublished study prepared by Huntingdon Life Sciences Ltd. 243 p.

Guideline: 71-5   Simulated or Actual Field Testing

MRID: 48239
Shell Chemical Company (1972) Evaluation of the Safety of Va- pona^(R)I Insecticide Scatter Bait to Birds. (Compilation; un- published study received Jul 19, 1972 under 201-210; CDL: 222968-A)

Guideline: 72-1   Acute Toxicity to Freshwater Fish

MRID: 74683
Kohn, G.K. (1958) Letter sent to L.R. Gardner dated Dec 1, 1958: Dibrom, phosphamidon and other commercial pesticides--toxicity to fish: File No. 721.11. (Unpublished study received Sep 20, 1966 under 7F0532; submitted by Chevron Chemical Co., Richmond, Calif.; CDL:090646-L)

MRID: 74873
Kohn, G.K. (1958) Letter sent to L.R. Gardner dated Dec 1, 1958: Dibrom, phosphamidon and other commercial toxicity to fish. (Unpublished study received Sep 27, 1965 under unknown admin. no.; submitted by Chevron Chemical Co., Richmond, Calif.; CDL: 125232-C)

MRID: 118181
Swedberg, D. (1973) Letter sent to R. Hanson dated Feb 27, 1973 ?Vapona: Static bioassays|. (Unpublished study received Dec 18, 1975 under 201-125; prepared by U.S. Fish and Wildlife Servie, Fish-Pesticide Research Laboratory, submitted by Shell Chemical Co., Washington, DC; CDL:223859-C)

MRID: 118184
U.S. Fish and Wildlife Service (1965) Effects of Pesticides on Fish and Wildlife: 1964 Research Findings of the Fish and Wildlife Service.   Washington, DC: USFWS. (Circular 226; also In unpub- lished submission received Apr 27, 1976 under 201-125; submitted by Shell Chemical Co., Washington, DC; CDL:224035-B)

MRID: 119138
Farnam Cos., Inc. (1975?) Fish Toxicity: ?Dichlorvos|. (Unpub- lished study received Jul 19, 1976 under 270-98; prepared in cooperation with U.S. Fish and Wildlife Service, Fish-Pesticide Research Laboratory; CDL:238104-C)

MRID: 5014941
Pickering, Q.H.; Henderson, C. (1966) The acute toxicity of some pesticides to fish. Ohio Journal of Science 66(5):508-513.

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Guideline: 72-3 Acute Toxicity to Estuarine/Marine Organisms

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Guideline: 72-4 Fish Early Life Stage/Aquatic Invertebrate Life Cycle Study
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Davis, J. (1995) DDVP Technical Grade: Toxicity to Embryos and Larvae of the Rainbow Trout, Oncorhynchus mykiss, Under Flow-Through Conditions: Lab Project Number: J9403007M. Unpublished study prepared by Toxikon Environmental Sciences. 77 p.

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Guideline: 81-1 Acute oral toxicity in rats

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