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Office of Prevention, Pesticides, and Toxic Substances

United States Environmental Protection Agency

MEMORANDUM

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DATE: November 15, 2004

SUBJECT: EFED Ecological Risk Assessment for the Section 3 Registration of Abamectin for foliar uses on Plums/Prunes, Leafy Vegetables, Fruiting Vegetables, Avocado, Mint, and Basil and seed treatment for Cotton, Cucurbits, Peppers, and Tomatoes.

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THROUGH: Tom Bailey, Branch Chief 11/15/04
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TO: Meredith Laws, Branch Chief
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EXECUTIVE SUMMARY

This assessment updates the ecological risk assessment previously conducted for the foliar use of abamectin on plums/prunes, leafy vegetables, and fruiting vegetables (Memo from Syslo et al. DP Barcode 262129, 2000). In addition, proposed uses on avocado, mint, and basil have been assessed. Finally, a risk assessment is included here for the proposed seed treatment use on cotton, cucurbits, peppers, and tomatoes.

The results of this risk assessment suggest the potential for direct effects to endangered and non-endangered freshwater fish, freshwater invertebrates, and estuarine/marine fish, and estuarine/marine invertebrates, birds, and mammals. Specifically, RQ values for the following receptors exceed risk levels of concern established for the Agency for the screening-level risk assessment:

- **Freshwater fish**: RQs exceed acute endangered species LOCs for ground and aerial applications to leafy vegetables. RQs exceed acute restricted use LOCs for ground and aerial applications to fruiting vegetables. Seed treatment use on peppers exceeds the acute risk LOC and chronic LOC for endangered and non-endangered species.

- **Freshwater invertebrates**: RQs exceed acute restricted use and endangered species LOCs for ground application to leafy vegetables, stone fruits, basil, mint, and cotton (seed treatment). RQs exceed acute risk LOCs for aerial application to leafy vegetables, ground and aerial application to fruiting vegetables, and seed treatment use on cucumbers and peppers. Chronic risk LOCs are exceeded for ground and aerial applications to leafy vegetables and fruiting vegetables, application to stone fruits, basil, mint, cotton (seed treatment), cucumber (seed treatment), and peppers (seed treatment).

- **Estuarine/marine fish**: RQs exceed acute restricted use and endangered species LOCs for peppers (seed treatment). RQs exceed endangered species LOCs for fruiting vegetables (aerial application).

- **Estuarine/marine invertebrates**: RQs exceed acute high risk, restricted use, and endangered species LOCs for all uses included in this assessment, with the exception of cotton (seed treatment) and tomato (seed treatment) where restricted use and endangered species LOCs are exceeded. RQs also exceed chronic LOCs for all uses.

- **Birds**: RQs exceed chronic LOCs for leafy vegetables, fruiting vegetables, basil and mint.

- **Mammals**: Acute RQs for 15 g and 35 g mammals exceed the acute LOC (0.5) for all assessed uses. The endangered species level of concern for 15 g, 30 g, and 1000 g mammals is exceeded for all assessed uses. Chronic RQs range from 0.24 to 4.99 and exceed the level of concern for all assessed uses.

The chronic estuarine/marine invertebrate risk quotients range from 6.3 for tomato seed treatment to 654 for peppers seed treatment. Acute freshwater fish risk quotients range from 0.01 to 0.75; acute freshwater invertebrate RQs range from 0.08 to 8.0; and acute estuarine/marine invertebrate RQs range from 0.12 to 12.9. Acute estuarine/marine fish risk quotients range from <0.01 to 0.18. Chronic freshwater fish risk quotients range from 0.04 to 3.5; while chronic freshwater invertebrate risk quotients range from 0.73 to 76.3.

For birds and mammals, acute risk quotients range from <0.01 to 0.03 and <0.01 to 0.84, respectively. Chronic RQs range from 0.05 to 1.0 and 0.31 to 4.99 for birds and mammals, respectively. There were no terrestrial animal LOC exceedences for the seed treatment uses.

ENVIRONMENTAL FATE AND EFFECTS DIVISION SCIENCE CHAPTER

Ecological Risk Assessment

For

Abamectin

Environmental Fate and Effects Division Team Members
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Branch Chief Approval
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Date of Approval: 11/15/04

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I. EXECUTIVE SUMMARY

A. Predicted Environmental Exposure

1. Nature of Chemical Stressor

Abamectin is a mixture of avermectins containing about 80% avermectin B1a and 20% avermectin B1b. These two components, B1a and B1b, have very similar biological and toxicological properties. The avermectins are insecticidal/miticidal compounds derived from the soil bacterium Streptomyces avermitilis. Abamectin is a natural fermentation product of this bacterium. It acts as an insecticide by affecting the nervous system of and paralyzing insects. Abamectin is used to control insect and mite pests of citrus, pear, and nut tree crops, and it is used by homeowners for control of fire ants.

The proposed uses include plum/prune, leafy vegetables, fruiting vegetables, avocado, mint, and basil. There is also a pending use of a new seed treatment formulation for nematode control.

2. Environmental Fate

Abamectin is moderately persistent in the environment. The reported laboratory soil aerobic half-life was 115 days, and the reported field dissipation half-life was 31±6 days.

Abamectin is relatively stable to hydrolysis but may undergo direct photolysis (photolysis half-life in surface soil = 21 hours). Abamectin has low vapor pressure ($<3.7 \times 10^{-6}$ Pa), indicating that volatilization from dry soil surfaces will not be an important environmental fate process. An estimated Henry's Law constant of 2.7×10^{-8} atm-m^3/mol was derived from the vapor pressure and water solubility values provided by the registrant. This value suggests that volatilization from moist soil is not expected to be an important fate process. Abamectin adsorbs strongly to soil surfaces (reported K_{oc} values range from 2,531-12,051), indicating that abamectin will have very low mobility in soil and that leaching to groundwater will not be an important route of dissipation.

If abamectin were released to water, photolysis in sunlit surface waters would be an important environmental fate process based on an aqueous photolysis half-life of 12 hours. Volatilization from water is not expected to be an important fate process based on the estimated Henry's Law constant. The large K_{oc} values suggest that adsorption to suspended solids and sediment in the water column will occur. Bioconcentration factors (BCF) in bluegill sunfish were in the range of 19-69 (whole fish) and 6.6-33 (fillet), suggesting bioconcentration in aquatic organisms is low to moderate.

B. Potential Risk to Non-target Organisms

The results of this risk assessment suggest the potential for direct effects to endangered and non-endangered freshwater fish, freshwater invertebrates, and estuarine/marine fish, and estuarine/marine invertebrates, birds, and mammals. Specifically, RQ values for the following receptors exceed risk levels of concern established for the Agency for the screening-level risk assessment:

- **Freshwater fish**: RQs exceed acute endangered species LOCs for ground and aerial applications to leafy vegetables. RQs exceed acute restricted use LOCs for ground and aerial applications to fruiting vegetables. Seed treatment use on peppers exceeds the acute risk LOC and chronic LOC for endangered and non-endangered species.

- **Freshwater invertebrates**: RQs exceed acute restricted use and endangered species LOCs for ground application to leafy vegetables, stone fruits, basil, mint, and cotton (seed treatment). RQs exceed acute risk LOCs for aerial application to leafy vegetables, ground and aerial application to fruiting vegetables, and seed treatment use on cucumbers and peppers. Chronic risk LOCs are exceeded for ground and aerial applications to leafy vegetables and fruiting vegetables, application to stone fruits, basil, mint, cotton (seed treatment), cucumber (seed treatment), and peppers (seed treatment).

- **Estuarine/marine fish**: RQs exceed acute restricted use and endangered species LOCs for peppers (seed treatment). RQs exceed endangered species LOCs for fruiting vegetables (aerial application).

- **Estuarine/marine invertebrates**: RQs exceed acute high risk, restricted use, and endangered species LOCs for all uses included in this assessment, with the exception of cotton (seed treatment) and tomato (seed treatment) where restricted use and endangered species LOCs are exceeded. RQs also exceed chronic LOCs for all uses.

- **Birds**: RQs exceed chronic LOCs for leafy vegetables, fruiting vegetables, basil and mint.

- **Mammals**: Acute RQs for 15 g and 35 g mammals exceed the acute LOC (0.5) for all assessed uses. The endangered species level of concern for 15 g, 30 g, and 1000 g mammals is exceeded for all assessed uses. Chronic RQs range from 0.24 to 4.99 and exceed the level of concern for all assessed uses.

The chronic estuarine/marine invertebrate risk quotients range from 6.3 for tomato seed treatment to 654 for peppers seed treatment. Acute freshwater fish risk quotients range from 0.01 to 0.75; acute freshwater invertebrate RQs range from 0.08 to 8.0; and acute estuarine/marine invertebrate RQs range from 0.12 to 12.9. Acute estuarine/marine fish risk quotients range from <0.01 to 0.18. Chronic freshwater fish risk quotients range from 0.04 to 3.5; while chronic freshwater invertebrate risk quotients range from 0.73 to 76.3.

For birds and mammals, acute risk quotients range from <0.01 to 0.03 and <0.01 to 0.84, respectively. Chronic RQs range from 0.05 to 1.0 and 0.31 to 4.99 for birds and mammals, respectively. There were no terrestrial animal LOC exceedences for the seed treatment uses.

Chronic and acute exposure from multiple applications of abamectin was estimated using a 35-day foliar half-life, a default value used for terrestrial assessments in the absence of data. Although abamectin could persist in soils over a few months, according to Willis and McDowell (1987), the 35-day foliar half-life value could still result in overestimates of exposure of abamectin.

II. PROBLEM FORMULATION

A. Stressor Source and Distribution

1. Chemical and Physical Properties

Summary of Chemical and other Properties of Abamectin

Parameter	Value
Pesticide Name	Abamectin
Use sites	Cotton seed treatment
Formulation	Emulsifiable concentrate, bait
Mode of Action	Insecticide and acaricide with direct contact and stomach action
Molecular Weight	873.1
Molecular Formula	$C_{48}H_{72}O_{14}$
Chemical Name	Avermectin A_1a, 5-O-demethyl-25-de(1-methylpropyl)-25-(1-methylethyl)-,mixture with 5-O-demethylavermectin A_1a
CAS Number	71751-41-2
Chemical Classification	Nematacide
Color/Physical State/Odor	Solid
Melting Point (°C)	161.8 to 169.4 °C with thermal decomposition
Water Solubility (25 °C)	1.21 mg/L
Dissociation Constant (pK_a)	Does not dissociate at normal pH

Parameter	Value
Vapor pressure at 25 °C (Pa)	< 3.7 x 10^{-6}
Henry's Law Constant	2.7x10^{-8} atm-m^3/mol (calculated)
Octanol/Water Partition, K_{ow}	25,119
log K_{OW} (25°C)	4.4

2. Mode of Action

Ingestion of abamectin results in rapid paralysis and subsequent death of insect and mite pests. Abamectin has also a limited contact activity. Like many other insecticides it interferes with the signal transmission between nerve cells but abamectin acts at a different target site, the GABA receptor protein. This unique mode of action is effective on insect pests that are resistant to other insecticides such as organo phosphates, pyrethroids and other acaricides.

3. Use Characterization

Labeled application rates of abamectin to control Liriomyza leafminers, two-spotted spider mite, and carmine spider mite in **leafy vegetables** (celery, lettuce, amaranth, garden cress, upland cress, dandelion, endive, fennel, parsley, radicchio, rhubarb, spinach and swiss chard) is 0.011-0.021 lb ai/A (8-16 oz/A). Ground and aerial application is permitted. Aerial application is prohibited in the state of New York.

The application rate of abamectin for control of *Liriomyza* leafminers, spider mites, tomato russet mite, broad mite, *Thrips palmi*, Colorado potato beetle, and tomato pinworm in **fruiting vegetables** (tomato, eggplant, peppers, and tomatillo) is 0.011-0.021 lb ai/A (8-16 oz/A). Abamectin can be applied to fruiting vegetables by both ground and aerial equipment, with aerial application providing less control of mites. Aerial application to fruiting vegetables is not permitted in New York state.

The application rate of abamectin for control of two-spotted spider mite, Pacific spider mite, and European spider mite in **plumes/prunes** (stone fruit crop group) is 0.012-0.023 lbs ai/A (10-20 oz/A). Abamectin can be applied to plumes/prunes by ground application only.

The application rate to control thrips (*Scirtothrips perseae*) in **avocado** is 0.012-0.023 lbs ai/A (10-20 oz/A), with a maximum of 2 applications. Both aerial and ground application methods are proposed; however, the label states that aerial application is not the preferred method of application to control thrips since spray coverage and the resulting thrip control is less than that achieved using ground application.

Abamectin is proposed for use on **basil** and **mint** (herb crop subgroup) at rates of 0.011-0.021 lb ai/A (8-16 oz/A) and 0.011-0.019 lb ai/A (8-12 oz/A). A maximum of two applications per single cutting (harvest) by ground is permitted.

Abamectin is also proposed for new use as a seed treatment nematocide Avictar ® 400ES for **cotton** and Avictar ® 500ES for **cucurbit, peppers, and tomatoes**. The application rates are 0.1 - 0.15 mg per seed for cotton and 0.1 - 0.6 mg per seed for the rest of the vegetables.

B. Assessment Endpoints

Assessment endpoints are defined as "explicit expressions of the actual environmental value that is to be protected." Defining an assessment endpoint involves two steps: 1) identifying the valued attributes of the environment that are considered to be at risk, and 2) operationally defining the assessment endpoint in terms of an ecological entity (i.e., a community of fish and aquatic invertebrates) and its attributes (i.e., survival and reproduction). Therefore, selection of the assessment endpoints is based on valued entities (i.e., ecological receptors), the ecosystems potentially at risk, the migration pathways of pesticides, and the routes by which ecological receptors are exposed to pesticide-related contamination. The selection of clearly defined assessment endpoints is important because they provide direction and boundaries in the risk assessment for addressing risk management issues of concern.

1. <u>Ecosystems Potentially at Risk</u>

Ecosystems potentially at risk are expressed in terms of the selected assessment endpoints. The typical assessment endpoints for screening-level pesticide ecological risks are reduced survival, and reproductive and growth impairment for both aquatic and terrestrial animal species. Aquatic animal species of potential concern include freshwater fish and invertebrates, estuarine/marine fish and invertebrates, and amphibians. Terrestrial animal species of potential concern include birds, mammals, beneficial insects, and earthworms. For both aquatic and terrestrial animal species, direct acute and direct chronic exposures are considered. In order to protect threatened and endangered species, all assessment endpoints are measured at the individual level. Although all endpoints are measured at the individual level, they provide insight about risks at higher levels of biological organization (e.g. populations and communities). For example, pesticide effects on individual survivorship have important implications for both population rates of increase and habitat carrying capacity.

For terrestrial and semi-aquatic plants, the screening assessment endpoint is the perpetuation of populations of non-target species (crops and non-crop plant species). Existing testing requirements have the capacity to evaluate emergence of seedlings and vegetative vigor. Although it is recognized that the endpoints of seedling emergence and vegetative vigor may not address all terrestrial and semi-aquatic plant life cycle components, it is assumed that impacts at emergence and in active growth have the potential to impact individual competitive ability and reproductive success.

For aquatic plants, the assessment endpoint is the maintenance and growth of standing crop or biomass. Measurement endpoints for this assessment endpoint focus on algal and vascular plant (i.e., duckweed) growth rates and biomass measurements.

The ecological relevance of selecting the above-mentioned assessment endpoints is as follows: 1) complete exposure pathways exist for these receptors; 2) the receptors may be potentially sensitive to pesticides in affected media and in residues on plants, seeds, and insects; and 3) the receptors could potentially inhabit areas where pesticides are applied, or areas where runoff and/or spray drift may impact the sites because suitable habitat is available.

2. Ecological effects

Each assessment endpoint requires one or more "measures of ecological effect," which are defined as changes in the attributes of an assessment endpoint itself or changes in a surrogate entity or attribute in response to exposure to a pesticide. Ecological measurement endpoints for the screening level risk assessment are based on a suite of registrant-submitted toxicity studies performed on a limited number of organisms in the following broad groupings:

- Birds (mallard duck and bobwhite quail) used as surrogate species for terrestrial-phase amphibians and reptiles,
- Mammals (laboratory rat),
- Freshwater Fish (bluegill sunfish and rainbow trout) used as a surrogate for aquatic phase amphibians,
- Freshwater invertebrates (*Daphnia magna*),
- Estuarine/marine fish (sheepshead minnow),
- Estuarine/marine invertebrates (*Crassostrea virginica* and *Americamysis bahia*),
- Terrestrial plants (corn, onion, ryegrass, wheat, buckwheat, cucumber, soybean, sunflower, tomato, and turnip), and
- Algae and aquatic plants (*Lemna gibba* and *Selenastrum capricornutum*).

Within each of these very broad taxonomic groups, an acute and chronic endpoint is selected from the available test data, as the data sets allow.

A summary of the assessment and measurement endpoints selected to characterize potential ecological risks associated with exposure to abamectin is provided in **Table 2**.

Table 2. Summary of Assessment and Measurement Endpoints

Assessment Endpoint	Measurement Endpoint
1. Abundance (i.e., survival, reproduction, and growth) of individuals and populations of birds	1a. Bobwhite quail acute oral LD_{50} 1b. Bobwhite quail and mallard duck subacute dietary LD_{50} 1c. Bobwhite quail and mallard duck chronic reproduction NOAEC and LOAEC
2. Abundance (i.e., survival, reproduction, and growth) of individuals and populations of mammals	2a. Laboratory rat acute oral LD_{50} 2b. Laboratory rat developmental and chronic NOAEC and LOAEC
3. Survival and reproduction of individuals and communities of freshwater fish and invertebrates	3a. Rainbow trout and bluegill sunfish acute LC_{50} 3b. Rainbow trout chronic (early-life) NOAEC and LOAEC 3c. Water flea (and other freshwater invertebrates) acute EC_{50} 3d. Water flea chronic (life-cycle) NOAEC and LOAEC
4. Survival and reproduction of individuals and communities of estuarine/marine fish and invertebrates	4a. Sheepshead minnow acute LC_{50} 4b. Estimated chronic NOAEC and LOAEC values based on the acute-to-chronic ratio for freshwater fish 4c. Eastern oyster and mysid shrimp acute LC_{50} 4d. Mysid shrimp chronic (life-cycle) NOAEC and LOAEC 4e. Estimated NOAEC and LOAEC values for mollusks based on the acute-to-chronic ratio for mysids
5. Perpetuation of individuals and populations of non-target terrestrial and semi-aquatic species (crops and non-crop plant species)	5a. Monocot and dicot seedling emergence and vegetative vigor EC_{25} values
6. Survival of beneficial insect populations	6a. Honeybee acute contact LD_{50}
7. Abundance (i.e., survival, reproduction, and growth) of earthworm populations	7a. Acute and subchronic earthworm LC_{50} values
8. Maintenance and growth of individuals and populations of aquatic plants from standing crop or biomass	8a. Algal and vascular plant (i.e., duckweed) EC_{50} values for growth rate and biomass measurements

LD_{50} = Lethal dose to 50% of the test population.
NOAEC = No observed adverse effect level.
LOAEC = Lowest observed adverse effect level.
LC_{50} = Lethal concentration to 50% of the test population.
EC_{50}/EC_{25} = Effect concentration to 50%/25% of the test population.

C. Conceptual Model

In order for a chemical to pose an ecological risk, it must reach ecological receptors in biologically significant concentrations. An exposure pathway is the means by which a contaminant moves in the environment from a source to an ecological receptor. For an ecological exposure pathway to be complete, it must have a source, a release mechanism, an environmental transport medium, a point of exposure for ecological receptors, and a feasible route of exposure. In addition, the potential mechanisms of transformation (i.e., which degradates may form in the environment, in which media, and how much) must be known, especially for a chemical whose metabolites/degradates are of greater toxicological concern. The assessment of ecological exposure pathways, therefore, includes an examination of the source and potential migration pathways for constituents, and the determination of potential exposure routes (e.g., ingestion, inhalation, dermal absorption).

Ecological receptors that may potentially be exposed to abamectin include terrestrial and semiaquatic wildlife (i.e., mammals, birds, and reptiles), terrestrial and semi-aquatic plants, and soil invertebrates. In addition to terrestrial ecological receptors, aquatic receptors (e.g., freshwater and estuarine/marine fish and invertebrates, amphibians) may also be exposed to potential migration of pesticides from the site of application to various watersheds and other aquatic environments via runoff and spray drift.

All potential routes of exposure are considered and are presented in the conceptual site model (**Figure 1 and Figure 2**).

The source and mechanism of release of abamectin are ground and aerial application via foliar spray and treated seeds. Surface water runoff from the areas of application is assumed to follow topography. Additional release mechanisms include spray drift, and wind erosion, which may potentially transport site-related contaminants to the surrounding air. Potential emission of volatile compounds is not considered as a viable release mechanism for abamectin, since volatilization is not expected to be a significant route of dissipation for this chemical. The conceptual site models shown in **Figure 1** and **Figure 2** generically depict the potential source of abamectin, release mechanisms, abiotic receiving media, and biological receptor types.

Figure 1 - Conceptual model depicting ecological risk based on the proposed abamectin application to foliage

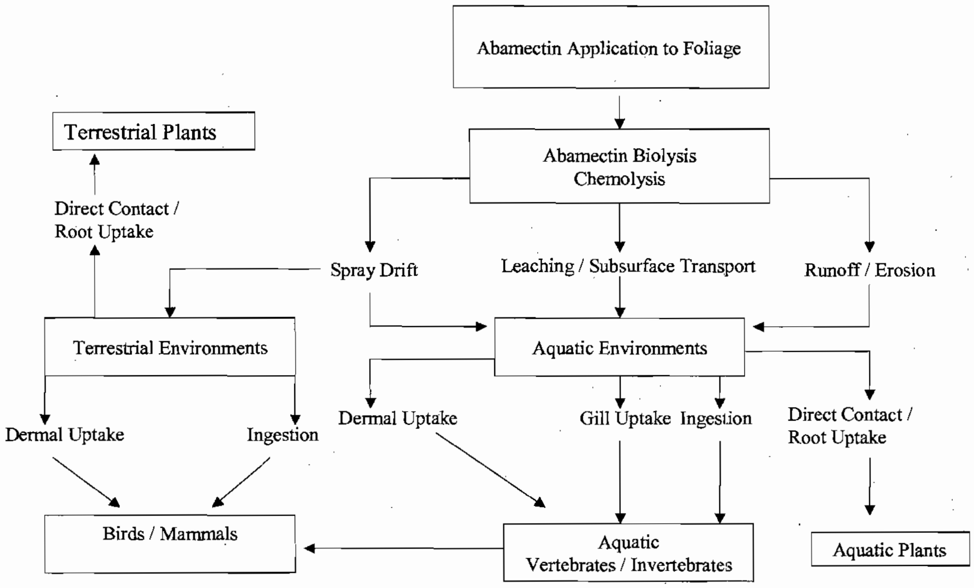
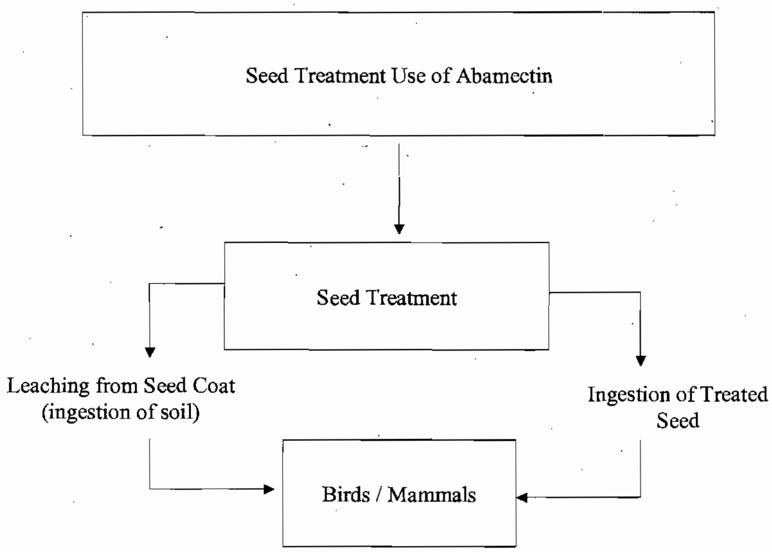


Figure 2 - Conceptual model depicting ecological risk based on the proposed abamectin application to seeds



III. ANALYSIS

A. Exposure Characterization

1. <u>Environmental Fate and Transport Characterization</u>

Abamectin is moderately persistent in the environment. The reported laboratory soil aerobic half-life was 115 days, and the reported field dissipation half-life was 31±6 days.

Abamectin is relatively stable to hydrolysis but may undergo direct photolysis (photolysis half-life in surface soil = 21 hours). Abamectin has low vapor pressure ($<3.7 \times 10^{-6}$ Pa), indicating that volatilization from dry soil surfaces will not be an important environmental fate process. An estimated Henry's Law constant of 2.7×10^{-8} atm-m^3/mol was derived from the vapor pressure and water solubility values provided by the registrant. This value suggests that volatilization from moist soil is not expected to be an important fate process. Abamectin adsorbs strongly to soil surfaces (reported K_{oc} values range from 2,531-12,051), indicating that abamectin will have very low mobility is soil and that leaching to groundwater will not be an important route of dissipation.

If abamectin were released to water, photolysis in sunlit surface waters would be an important environmental fate process based on an aqueous photolysis half-life of 12 hours. Volatilization from water is not expected to be an important fate process based on the estimated Henry's Law constant. The large K_{oc} values suggest that adsorption to suspended solids and sediment in the water column will occur. Bioconcentration factors (BCF) in bluegill sunfish were in the range of 19-69 (whole fish) and 6.6-33 (fillet), suggesting bioconcentration in aquatic organisms is low to moderate.

2. <u>Aquatic Resource Exposure Assessment</u>

General Approach

Exposure concentrations for aquatic ecosystems assessment were estimated based on EFED's aquatic models listed below in **Table 3**. The input parameters used in this assessment 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.

Table 3. Models Used to Estimate Exposure Concentrations for Aquatic Ecosystem Assessments

Exposure Estimates	Models
Surface water (Tier II)	PRZM 3.12 (dated May 7, 1998), named PRZM3.12.EXE EXAMS 2.98.04 (dated July 18, 2002), named EXAMS.EXE, Pond scenario PE4VO1.pl, dated 8/8/03

Surface Water Exposure Inputs for Abamectin		
MODEL INPUT VARIABLE	INPUT VALUE	COMMENTS
Application Rate (lbs ai/A)	0.0188 (Leafy and fruiting vegetables) 0.0234 (Plums)	Current label (EPA Reg.No. 100-898)
Maximum No. of Applications	3 (Leafy and fruiting vegetables) 2 (Plums)	Current label
Application Interval (days)	7 (Leafy and fruiting vegetables) 21 (Plums)	Current Label
K_{oc}	2,531	Lowest non-sand K_{oc} of 2,531 in Three Bridges silt loam (1.22 % OC). MRID 40856301
Aerobic Soil Metabolic Half-life (days)	115	90% upper-bound confidence limit of mean half-life
Is the pesticide wetted-in?	No	Current label
Depth of Incorporation (in.)	0	Current label
Spray Drift	5 (leafy and fruiting vegetables) 1 (leafy and fruiting vegetables, plums)	Aerial = 5%; Ground = 1%
Solubility (µg/L)	7.8	At pH 9; EFGWI3 One-Liner Database
Aerobic Aquatic Metabolic Half-life (days)	230	No acceptable aerobic aquatic metabolism data were available. Per current EFED guidance, use 2x aerobic soil metabolism half-life.
Hydrolysis (pH 7) half-life (days)	0	Stable. Maynard and Ku, 1982. Acc. # 249152. Review dated 4/18/83.
Photolysis Half-life (days)	0.5	Dark-control adjusted half-life. Ku and Jacob, 1983, Acc. # 252115, Review dated 3/28/84.

Aquatic Organism Exposure Modeling: Tier II Estimated Environmental Concentrations (EECs) for were estimated using EFED's aquatic models PRZM (Pesticide Root Zone Model) and EXAMS (EXposure Analysis Modeling System). **PRZM** is used to simulate pesticide transport as a result of runoff and erosion from an 10-ha agricultural field and **EXAMS** considers environmental fate and transport of pesticides in surface water and predicts EECs in a standard pond (10,000-m^2 pond, 2-m deep), with the assumption that the small field is cropped at 100%.

Calculations are carried out with the linkage program shell - PE4VO1.pl - which incorporates the standard scenarios developed by EFED. Additional information on these models can be found at: http://www.epa.gov/oppefed1/models/water/index.htm.

The scenarios run to represent the proposed uses for this Section 3 include:

1. Leafy Vegetables (CA Lettuce)/Aerial Application
2. Leafy Vegetables (CA Lettuce)/Ground Application
3. Fruiting Vegetables (FL Tomato)/Aerial Application
4. Fruiting Vegetables (FL Tomato)/Ground Application
5. Stone Fruits (GA Peaches)/Ground Application
6. Basil (OR Mint)/Ground Application
7. Cucumber (FL cucumber)/Ground Application
8. Pepper (FL pepper)/Ground Application
9. Tomato (FL tomato)/Ground Application

To simulate these uses, standard scenarios associated with states of the highest US planted acreage (based on the data provided in USDA National Agriculture Statistics Service, "2002 Census of Agriculture, Volume 1 Chapter 2: U.S. State Level Data" at http://www.nass.usda.gov/census/census02/volume1/us/index2.htm and the highest exposure (driven in part by the vulnerability of the soils, the climate, and the agricultural practices) were chosen for the selected crops. Maximum application rates were selected to model environmental concentrations for this screening-level deterministic (risk quotient-based) assessment. Application dates were based on reported planting dates found in the documentation section of each scenario. Results are tabulated in **Table 4.**

Table 4 - Abamectin EECs in Surface Water for Use in Ecological Risk Assessment

Crop	Use Patterns	Upper 90th Percentile Values (ppb)		
		Peak	**21 Day**	**60 Day**
Leafy Vegetables (CA lettuce)	3 x 0.019 lbs ai/A @ 7 day interval (aerial)	**0.237**	**0.206**	**0.172**
Leafy Vegetables (CA lettuce)	3 x 0.019 lbs ai/A @ 7 day interval (ground)	**0.163**	**0.141**	**0.125**
Fruiting Vegetables (FL tomato)	3 x 0.019 lbs ai/A @ 7 day interval (aerial)	**0.676**	**0.539**	**0.396**
Fruiting Vegetables (FL tomato)	3 x 0.019 lbs ai/A @ 7 day interval (ground)	**0.599**	**0.470**	**0.344**
Stone Fruits (GA peaches)	2 x 0.023 lbs ai/A @ 21 day interval (ground)	**0.115**	**0.088**	**0.068**
Basil (OR mint)	3 x 0.019 lbs ai/A @ 7 day interval (ground)	**0.108**	**0.089**	**0.081**
Cotton seed treatment (MS cotton)	1 x 0.07 lbs ai/A	**0.045**	**0.034**	**0.024**
Cucumber seed treatment (FL cucumber)	1 x 0.06 lbs ai/A	**0.173**	**0.138**	**0.104**
Pepper seed treatment (FL pepper)	1 x 0.386 lbs ai/A	**2.71**	**2.29**	**1.84**
Tomato seed treatment (FL tomato)	1 x 0.005 lbs ai/A	**0.026**	**0.022**	**0.019**

3. <u>Terrestrial Organism Exposure Modeling</u>

Terrestrial wildlife exposure estimates are typically calculated for bird and mammals, emphasizing a dietary exposure route for uptake of pesticide active ingredients. These exposures are considered as surrogates for terrestrial-phase amphibians as well as reptiles. For exposure to terrestrial organisms, such as birds and small mammals, pesticide residues on food items are estimated, based on the assumption that organisms are exposed to a single pesticide residue in a given exposure scenario. For this terrestrial exposure assessment, spray applications and seed treatment applications are considered.

Spray Applications and Residues

For abamectin spray applications, estimation of pesticide concentrations in wildlife food items focuses on quantifying possible dietary ingestion of residues on vegetative matter and insects. The residue estimates are based on a nomogram that relates food item residues to pesticide application rate. The estimated environmental concentrations (EECs) are generated from a spreadsheet-based model (ELL-FATE) that calculates the decay of a chemical applied to foliar surfaces for single or multiple applications.

The terrestrial exposure assessment is based on the methods of Hoerger and Kenaga (1972) as modified by Fletcher *et al.* (1994). Terrestrial EECs for non granular formulations (**Table 5**) were derived using proposed application rates and intervals between applications. Uncertainties in the terrestrial EECs are primarily associated with a lack of data on interception and subsequent dissipation from foliar surfaces. When data are absent, as in this case, EFED assumes a 35-day foliar dissipation half life, based on the work of Willis and McDowell (1987).

The EECs on food items may be compared directly with dietary toxicity data or converted to an oral dose, as is the case for small mammals. The screening-level risk assessment for abamectin uses upper bound predicted residues as the measure of exposure. The predicted maximum residues of abamectin that may be expected to occur on selected avian or mammalian food items immediately following application (at the maximum annual or seasonal label rate) are presented in **Table 5.** For mammals, the residue concentration is converted to daily oral dose based on the fraction of body weight consumed daily as estimated through mammalian allometric relationships.

Table 5. Estimated environmental concentrations on avian and mammalian food items (ppm) following label specified applications of abamectin to leafy vegetables, fruiting vegetables, stone fruits, and herb subgroup.

Crop	Application Rate lbs. a.i./A (# app / interval, days)	Food Items	Predicted Maximum Residue EEC (ppm)[1]
Leafy Vegetables and Fruiting Vegetables	0.019 (3 / 7)	Short grass	12
		Tall grass	5.5
		Broadleaf plants/small insects	6.7
		Fruits, pods, seeds, and large insects	0.75
Stone Fruits and avocado	0.023 (2 / 21)	Short grass	9.2
		Tall grass	4.2
		Broadleaf plants/small insects	5.2
		Fruits, pods, seeds, and large insects	0.57
Basil and mint	0.019 (3 / 7)	Short grass	12
		Tall grass	5.5
		Broadleaf plants/small insects	6.7
		Fruits, pods, seeds, and large insects	0.75

[1] Predicted maximum residues are based on Hoerger and Kenaga (1972) as modified by Fletcher *et al.* (1994).

Seed treatment applications

Birds and mammals in the field may be exposed to seed treated with pesticides by ingesting material directly with the diet. They also may be exposed by other routes, such as incidental ingestion of contaminated soil, dermal contact with treated seed surfaces and soil during activities in the treated areas, preening activities, and ingestion of drinking water contaminated with pesticide. Only ingestion of treated seed was considered as a route of exposure in this assessment.

Terrestrial EECs and acute risk quotient values were calculated for the purposes of assessing risk from abamectin-treated seeds using the acute oral dose for toxicity (LD_{50}), and comparing it to the available concentration of pesticide on the basis of pesticide per square foot.

Table 6. Seeding Rates (Maximum rates)

Crop	Seeds per lb.	Pound seeds per A.	No. of seeds per A.	seed/ft^2 per seed
Cotton	5000	12	60000	1.4
Cucumber	18140	2.5	45350	1.04
Pepper	64000	4	256000	5.9
Tomato	160000	1	160000	3.7

No. of seeds/A = seeds/lb * pounds seeds/A ; Source: http://oregonstate.edu/dept/NWREC/vegindex.html; www.Seedsforsurvival.com ; Kotts vegetables Handbook, M. Davy personal communication

Avian Exposure

Ecological risks from seed treatments are assessed by the same method used for granular and bait products. For typical in-furrow planting or drill seeded, 1% of the seeds planted are assumed to be exposed. The number of lethal doses (LD_{50}' s) that are available within one square foot immediately after application ($LD_{50}s/ft^2$) is used as the risk quotient for seeds treated with abamectin. This calculation does not include the untreated area between rows. Birds have been reported following directly behind planting equipment to forage on worms and other invertebrates exposed by the freshly tilled soil. Therefore, it is assumed that birds will forage mostly within the planted area where the pesticide treated seed is planted. This planted area is assumed to be 1.2 inches (0.1 feet) wide for in-furrow planting (EEB Guidance Doc. E-02C. June, 1995). Risk quotients are calculated for cotton, cucumber, pepper, and tomato with the small bird, 20 g songbird) as the worst case scenario.

Mammalian Exposure

The mammalian EEC, based on pesticide exposure per square foot is also calculated. A summary of the risk quotients calculated can be found in the risk characterization section in this document.

B. Ecological Effects Characterization

1. Evaluation of Aquatic and Terrestrial Ecotoxicity Studies

In screening-level ecological risk assessments, effects characterization describes the types of effects a pesticide can produce in an organism or plant. This characterization is based on registrant-submitted studies that describe acute and chronic effects toxicity information for various aquatic and terrestrial animals and plants. In addition, other sources of information, including reviews of the open literature and the Ecological Incident Information System (EIIS), are conducted to further refine the characterization of potential ecological effects.

Toxicity testing reported in this section does not represent all species of birds, mammals, or aquatic organisms. Only a few surrogate species for both freshwater fish and birds are used to represent all freshwater fish (2000+) and bird (680+) species in the United States. For mammals, acute studies are usually limited to Norway rat or the house mouse. Estuarine/marine testing is usually limited to a crustacean, a mollusk, and a fish. Also, neither reptiles nor amphibians are tested. The risk assessment assumes that avian and reptilian toxicities are similar. The same assumption is used for fish and amphibians.

In birds, abamectin technical is practically non-toxic or highly toxic, depending on the species tested. The acute oral LD_{50} for bobwhite quail is >2,000 mg/kg (practically nontoxic), whereas the acute oral LD_{50} for mallard ducks is 87 mg/kg (highly toxic). The dietary LC_{50} values obtained in short-term toxicity tests in bobwhite Quail and mallard ducks are >3,102 and 383 ppm, respectively. The No-Observed-Effect Concentrations (NOECs) for avian reproductive toxicity are 12 and 20 ppm (the highest concentrations tested) for northern bobwhite and mallard duck, respectively.

Based on data for laboratory rats, abamectin technical is of moderate toxicity to small mammals.

The acute oral and dermal contact LD_{50} values for abamectin in the honey bee are 0.0094 µg/bee and 0.0022 µg/bee, respectively, resulting in a classification of highly toxic.

Abamectin technical is very highly toxic to rainbow trout (acute LC_{50} of 3.6 µg ai/L), bluegill sunfish (acute LC_{50} of 9.6 ai µg/L) and sheepshead minnow (acute LC_{50} of 15 µg ai/L). The freshwater fish chronic toxicity No-Observed-Effect-Level (NOEC) is 0.52 µg ai/L, with a corresponding Lowest-Observed-Effect Level (LOEC) of 0.96 µg ai/L, based on a study in rainbow trout. The toxicological endpoint that served as the basis for the chronic NOEC and LOEC is not reported. Abamectin technical is acutely toxic in aquatic invertebrates, as evident from EC_{50} or LC_{50} values of 0.34 µg ai/L (very highly toxic) in *Daphnia magna*, 0.21 µg ai/L (very highly toxic) in mysid shrimp, and 430 µg ai/L (highly toxic) in oyster. Chronic exposure studies identified NOEC and LOEC values of 0.03 and 0.093 µg ai/L in *Daphnia magna* and 0.0035 and 0.0093 µg ai/L in mysid shrimp. These data indicate that abamectin is highly to very highly toxic to a variety of aquatic organisms.

Abamectin has been tested for phytotoxicity in two aquatic plant species. The EC_{50} values (endpoints not reported) obtained in these studies are >100 ppm and 3.9 ppm for *Selenastrum capricornutum* and *Lemma gibba*, respectively.

. **Tables 7, 8, and 9** summarize the most sensitive ecological toxicity endpoints for aquatic organisms, terrestrial organisms, and aquatic and terrestrial plants, respectively.

Table 7. Summary of Acute and Chronic Aquatic Toxicity Data Using Abamectin

Species	Acute Toxicity			Chronic Toxicity	
	96-hr LC_{50} (ug/L)	48-hr EC_{50} (ug/L)	Acute Toxicity	NOAEC / LOAEC (ug/L)	Affected Endpoints
Rainbow Trout *Oncorhynchus mykiss* (TGAI)	3.6	–	very highly toxic	0.52 / 0.96	
Bluegill sunfish *Lepomis macrochirus* (TGAI)	9.6	–	very highly toxic	--	
Water flea *Daphnia magna* (TGAI)	--	0.34	very highly toxic	0.03 / 0.093	
Sheepshead minnow *Cyprinodon variegatus* (TGAI)	15	–	very highly toxic	–	
Eastern oyster *Crassostrea virginica* (TGAI)	430	–	highly toxic	–	
Mysid shrimp *Americamysis bahia* (TGAI)	0.21	–	very highly toxic	0.0035 / 0.0093	

Table 8. Summary of Acute and Chronic Toxicity Data for Terrestrial Organisms Exposed to Abamectin

Species	Acute Toxicity				Chronic Toxicity	
	LD_{50} (ppm)	Acute Oral Toxicity (MRID)	5-day LC_{50} (ppm)	Subacute Dietary Toxicity (MRID)	NOAEC (ppm)	Affected Endpoints (MRID)
Northern bobwhite quail *Colinus virginianus*	>2000	practically non-toxic	>3102	slightly toxic	12	
Mallard duck *Anas platyrhynchos*	87	highly toxic	383	highly toxic	20	
Honey bee *Apis meliferus*	0.0022 (µg/bee contact)	highly toxic				
Laboratory rat *Rattus norvegicus* (TGAI)	13.6 mg/kg				0.12 mg/kg/day	increased stillbirths, decreased pup viability, decreased lactation, and decreased pup weights

Table 9. Summary of Aquatic and Terrestrial Plant Toxicity Data for Abamectin

Species	Toxicity			
	EC_{25} / EC_{05} (lbs a.i./A)	EC_{50} (ppm)	NOAEC (ppm)	Affected Endpoint
Duckweed *Lemna gibba* (TGAI)	– / --	3.9	1.2	
Green alga *Selenastrum capricornutum* (TGAI)	– / --	>100	12	

2. <u>Use of Probit Slope Response Relationship to Provide Information on the Endangered Species Levels of Concern</u>

The Agency uses the probit dose response relationship as a tool for providing additional information on the listed animal species acute levels of concern. The acute listed species LOCs of 0.1 and 0.05 are used for terrestrial and aquatic animals, respectively. As part of the risk characterization, an interpretation of acute LOCs 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 estimated environmental concentration actually occur for a species with sensitivity to abamectin 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 measurement endpoints for each taxonomic group. The individual effects probability associated with the LOCs 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. The upper and lower bounds of the effects probability are based on available information on the 95% confidence interval of the slope. A statement regarding the confidence in the applicability of the assumed probit dose response relationship for predicting individual event probabilities is also included. Studies with good probit fit characteristics (i.e., statistically appropriate for the data set) are associated with a high degree of confidence. Conversely, a low degree of confidence is associated with data from studies that do not statistically support a probit dose response relationship. In addition, confidence in the data set may be reduced by high variance in the slope (i.e., large 95% confidence intervals), despite good probit fit characteristics.

Individual effect probabilities are calculated based on an Excel spreadsheet tool IECV1.1 (Individual Effect Chance Model Version 1.1) developed by Ed Odenkirchen of 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 LOC (0.1 for terrestrial animals and 0.05 for aquatic animals) is entered as the desired threshold.

IV. RISK CHARACTERIZATION

Risk characterization is the integration of exposure and effects characterization to determine the ecological risk from the use of abamectin and the likelihood of effects on aquatic life, wildlife, and plants based on varying pesticide-use scenarios. The risk characterization provides an estimation and a description of the risk; articulates risk assessment assumptions, limitations, and uncertainties; synthesizes an overall conclusion; and provides the risk managers with information to make regulatory decisions.

A. Risk Estimation - Integration of Exposure and Effects Data

Results of the exposure and toxicity effects data are used to evaluate the likelihood of adverse ecological effects on non-target species. For the assessment of abamectin risks, the risk quotient (RQ) method is used to compare exposure and measured toxicity values. Estimated environmental concentrations (EECs) are divided by acute and chronic toxicity values. The RQs are compared to the Agency's levels of concern (LOCs). These LOCs are the Agency's interpretive policy and are used to analyze potential risk to non-target organisms and the need to consider regulatory action. These criteria are used to indicate when a pesticide's use as directed on the label has the potential to cause adverse effects on non-target organisms.

1. Non-target Aquatic Animals and Plants

Surface water concentrations resulting from abamectin application to selected crops were predicted with the Tier II models PRZM-EXAMS. The scenarios run to represent the proposed uses for this Section 3 include:

1. Leafy Vegetables (CA Lettuce)/Aerial Application
2. Leafy Vegetables (CA Lettuce)/Ground Application
3. Fruiting Vegetables (FL Tomato)/Aerial Application
4. Fruiting Vegetables (FL Tomato)/Ground Application
5. Stone Fruits (GA Peaches)/Ground Application
6. Basil (OR Mint)/Ground Application
7. Cucumber (FL cucumber)/Ground Application
8. Pepper (FL pepper)/Ground Application
9. Tomato (FL tomato)/Ground Application

Peak EECs were then compared to acute toxicity endpoints to derive acute RQs. The 60-day EECs were compared to chronic toxicity endpoints (NOAEC values) to derive chronic RQs for freshwater organisms, and 21-day EECs were compared to chronic toxicity endpoints for estuarine/marine organisms. Acute and chronic RQs for freshwater and estuarine/marine organisms are summarized in **Tables 10 and 11**, respectively. Although benthic sediment exposure estimates are provided by PRZM/EXAMS, this risk assessment does not estimate risk through this route of exposure.

For aquatic vascular and non-vascular plants, peak EECs were compared to acute EC_{50} and NOAEC toxicity endpoints to derive acute non-endangered and endangered species RQs, respectively. Acute non-endangered and endangered species RQs for aquatic vascular and non-vascular plants are summarized in **Table 12**.

The chronic estuarine/marine invertebrate risk quotients range from 6.3 for tomato seed treatment to 654 for peppers seed treatment. Acute freshwater fish risk quotients range from 0.01 to 0.75; acute freshwater invertebrate RQs range from 0.08 to 8.0; and acute estuarine/marine invertebrate RQs range from 0.12 to 12.9. Acute estuarine/marine fish risk quotients range from <0.01 to 0.18. Chronic freshwater fish risk quotients range from 0.04 to 3.5; while chronic freshwater invertebrate risk quotients range from 0.73 to 76.3.

As shown in **Table 12**, all acute non-endangered and endangered species RQs are less than LOCs for both vascular and non-vascular plants.

Table 10. Acute and chronic risk quotients for freshwater fish and invertebrates exposed to abamectin.

Crop Application Rate (# of apps)	EECs	Acute Risk Quotients		Chronic Risk Quotients	
	Peak / 21-day Average/ 60-day Average (µg/L)	**Freshwater Fish [a] LC_{50} = 3.6 µg/L**	**Freshwater Invertebrate[b] LC_{50} = 0.34 µg/L**	**Freshwater Fish [a] NOAEC = 0.52 µg/L**	**Freshwater Invertebrate[b] NOAEC = 0.03 µg/L**
Lettuce (CA-aerial) 0.019 (3)	0.237 0.206 0.172	**0.07[f]** – --	**0.7[d]** – --	-- -- 0.33	– **6.9[g]** --
Lettuce (CA-ground) 0.019 (3)	0.163 0.141 0.125	**0.05[f]** – --	**0.48[e]** – --	-- -- 0.24	– **4.7** --
Tomato (FL-aerial) 0.019 (3)	0.676 0.539 0.396	**0.19[e]** – --	**2.0[d]** – --	-- -- 0.76	– **18** --
Tomato (FL-ground) 0.019 (3)	0.599 0.470 0.344	**0.17[e]** – --	**1.8[d]** – --	-- -- 0.66	– **15.7** --
Peaches (GA-ground) 0.023 (2)	0.115 0.088 0.068	0.03 – --	**0.34[e]** – --	– -- 0.13	– **2.9** --
Mint (OR-ground) 0.019 (3)	0.108 0.089 0.081	0.03 – --	**0.32[e]** – --	– -- 0.16	– **3.0** --
Cotton seed trt (MS-ground) 0.07	0.045 0.034 0.024	0.01 – --	**0.13[e]** – --	– -- 0.05	– **1.1** --
Cucumber seed trt (FL-ground) 0.06	0.173 0.138 0.104	**0.05[f]** – --	**0.51[d]** – --	– -- 0.2	– **4.6** --
Pepper seed trt (FL-ground) 0.386	2.71 2.29 1.84	**0.75[d]** – --	**8.0[d]** – --	– -- **3.5**	– **76.3** --
Tomato seed trt (FL-ground) 0.005	0.026 0.022 0.019	0.01 – --	**0.08[f]** – --	– -- 0.04	– 0.73 --

[a] Rainbow trout (*Oncorhynchus mykiss*)
[b] Water flea (*Daphnia magna*)
[d] exceeds acute high risk (RQ ≥ 0.5), restricted use (RQ ≥ 0.1) and endangered species level of concern (RQ ≥0.05)
[e] exceeds acute restricted use (RQ ≥ 0.1) and endangered species level of concern (RQ ≥0.05)
[f] exceeds acute endangered species level of concern (RQ ≥0.05)
[g] exceeds chronic level of concern (RQ ≥1.0)

Table 11. Acute and chronic risk quotients for estuarine/marine fish and invertebrates exposed to abamectin.

Crop Application Rate (# of apps)	EECs	Acute Risk Quotients		Chronic Risk Quotients	
	Peak / 21-day Average/ 60-day Average (μg/L)	Estuarine/ Marine Fish [a] LC_{50} = 15 μg/L	Estuarine/ Marine Invertebrate[b] LC_{50} = 0.21 μg/L	Estuarine/ Marine Fish NOAEC = (no data)	Estuarine/ Marine Invertebrate[b] NOAEC = 0.0035 μg/L
Lettuce (CA-aerial) 0.019 (3)	0.237 0.206 0.172	0.02 – --	**1.1[d]** – --		– **58.9[g]** --
Lettuce (CA-ground) 0.019 (3)	0.163 0.141 0.125	0.01 – --	**0.78[d]** – --		– **40.3[g]** --
Tomato (FL-aerial) 0.019 (3)	0.676 0.539 0.396	**0.05[f]** – --	**3.2[d]** – --		– **154[g]** --
Tomato (FL-ground) 0.019 (3)	0.599 0.470 0.344	0.04 – --	**2.9[d]** – --		– **134[g]** --
Peaches (GA-ground) 0.023 (2)	0.115 0.088 0.068	0.01 – --	**0.55[d]** – --		– **25.1[g]** --
Mint (OR-ground) 0.019 (3)	0.108 0.089 0.081	0.01 – --	**0.51[d]** – --		– **25.4[g]** --
Cotton seed trt (MS-ground) 0.07	0.045 0.034 0.024	<0.01 – --	**0.21[e]** – --		– **9.7[g]** --
Cucumber seed trt (FL-ground) 0.06	0.173 0.138 0.104	0.01 – --	**0.82[d]** – --		– **39.4[g]** --
Pepper seed trt (FL-ground) 0.386	2.71 2.29 1.84	**0.18[e]** – --	**12.9[d]** – --		– **654[g]** --
Tomato seed trt (FL-ground) 0.005	0.026 0.022 0.019	<0.01 – --	**0.12[e]** – --		– **6.3[g]** --

[a] Sheepshead minnow (Cyprinodon variegatus)
[b] Mysid shrimp (*Mysidopsis bahia*)
[d] exceeds acute high risk (RQ ≥ 0.5), restricted use (RQ ≥ 0.1) and endangered species level of concern (RQ ≥0.05)
[e] exceeds acute restricted use (RQ ≥ 0.1) and endangered species level of concern (RQ ≥0.05)
[f] exceeds acute endangered species level of concern (RQ ≥0.05)
[g] exceeds chronic level of concern (RQ ≥1.0)

Table 12. Acute non-endangered and endangered species risk quotients for aquatic vascular and non-vascular plants exposed to abamectin.

Crop Application Rate (# of apps)	EECs	Acute Non-Endangered Risk Quotients		Acute Endangered Species Risk Quotients	
	Peak (µg/L)	Vascular plant [a] EC_{50} = 3900 µg/L	Non-vascular Plant[b] EC_{50} >100,000 µg/L	Vascular plant [a] NOAEC = 1200 µg/L	Non-vascular Plant[b] NOAEC = 12,000 µg/L
Lettuce (CA-aerial) 0.019 (3)	0.237	<1	<1	<1	<1
Lettuce (CA-ground) 0.019 (3)	0.163	<1	<1	<1	<1
Tomato (FL-aerial) 0.019 (3)	0.676	<1	<1	<1	<1
Tomato (FL-ground) 0.019 (3)	0.599	<1	<1	<1	<1
Peaches (GA-ground) 0.023 (2)	0.115	<1	<1	<1	<1
Mint (OR-ground) 0.019 (3)	0.108	<1	<1	<1	<1
Cotton seed trt (MS-ground) 0.07	0.045	<1	<1	<1	<1
Cucumber seed trt (FL-ground) 0.06	0.173	<1	<1	<1	<1
Pepper seed trt (FL-ground) 0.386	2.71	<1	<1	<1	<1
Tomato seed trt (FL-ground) 0.005	0.026	<1	<1	<1	<1

[a] Duckweed (*Lemna gibba*)
[b] Green alga (*Selenastrum capricornutum*)
[c] exceeds acute high risk (RQ ≥ 1.0) and endangered species level of concern (RQ ≥ 1.0)

2. Non-target Terrestrial Animals

The EEC values for terrestrial exposure were derived from the Kenaga nomograph, as modified by Fletcher *et al.* (1994), based on a large set of actual field residue data. Risk quotients are based on the most sensitive LC_{50} and NOAEC for birds and LD_{50} for mammals (based on lab rat studies). Acute and chronic RQs for birds are summarized in **Table 13**; acute and chronic RQs for mammals are summarized in **Tables 14 and 15**, respectively.

All avian acute RQs are less than LOCs. The avian chronic LOC is exceeded for application to leafy vegetables, fruiting vegetables, and basil.

Acute RQs for 15 g and 35 g mammals exceed the acute LOC (0.5) for all assessed uses. The endangered species level of concern for 15 g, 30 g, and 1000 g mammals is exceeded for all assessed uses. Chronic RQs range from 0.24 to 4.99 and exceed the level of concern for all assessed uses.

Table 13. Avian acute and chronic risk quotients for selected uses of nongranular products of abamectin based on a mallard duck LC_{50} of 383 ppm and a bobwhite quail NOAEC of 12 ppm

Use/App. Method	Application Rate lbs. a.i./A (# app / interval, days)	Food Items	Maximum EEC (mg/kg)[a]	Acute RQ (EEC/ LC_{50})	Chronic RQ (EEC/ NOAEC)
Leafy Vegetables and Fruiting Vegetables	0.019 (3 / 7)	Short grass	12	0.03	**1.0**[e]
		Tall grass	5.5	0.01	0.46
		Broadleaf plants/small insects	6.7	0.02	0.56
		Fruits, pods, seeds, and large insects	0.75	<0.01	0.06
Stone Fruits and avocado	0.023 (2 / 21)	Short grass	9.2	0.02	0.76
		Tall grass	4.2	0.01	0.35
		Broadleaf plants/small insects	5.2	0.01	0.43
		Fruits, pods, seeds, and large insects	0.57	<0.01	0.05
Basil and mint	0.019 (3 / 7)	Short grass	12	0.03	**1.0**[e]
		Tall grass	5.5	0.01	0.46
		Broadleaf plants/small insects	6.7	0.02	0.56
		Fruits, pods, seeds, and large insects	0.75	<0.01	0.06

[a] estimated environmental concentrations predicted using 1[st]-order degradation model based on foliar dissipation.
[b] exceeds acute risk (RQ ≥ 0.5), restricted use (RQ ≥ 0.2) and endangered species level of concern (RQ ≥0.1)
[c] exceeds restricted use (RQ ≥ 0.2) and endangered species level of concern (RQ ≥0.1)
[d] exceeds acute endangered species level of concern (RQ ≥0.1)
[e] exceeds chronic risk level of concern (RQ ≥1.0)

Table 14. Acute RQ values for small (15-g), intermediate (35-g) and large (1,000-g) mammals feeding on short or tall grass, broadleaf plants/small insects, fruits/pods/large insects and seeds exposed to abamectin based on a rat LD_{50} =13.6 ppm

Use/App. Method	Application Rate lbs. a.i./A (# app / interval, days)	Body Weight g	Mammalian Acute Risk Quotients				
			Short Grass	Tall Grass	Broadleaf Plants/Small Insects	Fruits/pods/ large insects	Seeds
Leafy Vegetables and Fruiting Vegetables	0.019 (3 / 7)	15	**0.84**[a]	**0.38**[b]	**0.47**[b]	0.05	0.01
		35	**0.58**[a]	**0.27**[b]	**0.33**[b]	0.04	0.01
		1000	**0.13**[c]	0.06	0.07	0.01	<0.01
Stone Fruits and avocado	0.023 (2 / 21)	15	**0.64**[a]	**0.29**[b]	**0.36**[b]	0.04	0.01
		35	**0.44**[b]	**0.20**[b]	**0.25**[b]	0.03	0.01
		1000	**0.10**[c]	0.05	0.06	0.01	<0.01
Basil and mint	0.019 (3 / 7)	15	**0.84**[a]	**0.38**[b]	**0.47**[b]	0.05	0.01
		35	**0.58**[a]	**0.27**[b]	**0.33**[b]	0.04	0.01
		1000	**0.13**[c]	0.06	0.07	0.01	<0.01

[a] exceeds acute high risk (RQ ≥ 0.5), restricted use (RQ ≥ 0.2) and endangered species level of concern (RQ ≥0.1)
[b] exceeds acute restricted use (RQ ≥ 0.2) and endangered species level of concern (RQ ≥0.1)
[C] exceeds acute endangered species level of concern (RQ ≥0.1)

Table 15. Chronic RQ values for mammals feeding on short or tall grass, broadleaf plants/small insects, and fruits/pods/large insects exposed to abamectin following single and multiple applications based on a rat NOAEC of 0.14 mg/kg/d.

Use/App. Method	Application Rate lbs. a.i./A (# app / interval, days)	Mammalian Chronic Risk Quotients			
		Short Grass	**Tall Grass**	**Broadleaf Plants/Small Insects**	**Fruits/pods/ large insects**
Leafy Vegetables and Fruiting Vegetables	0.019 (3 / 7)	**4.99**	**2.99**	**2.81**	0.31
Stone Fruits and avocado	0.023 (2 / 21)	**3.82**	**1.75**	**2.15**	0.24
Basil and mint.	0.019 (3 / 7)	**4.99**	**2.99**	**2.81**	0.31

Bolded values exceed chronic level of concern (>1)

Seed Treatment for Cotton, Cucumber, Pepper, and Tomato

The acute risk quotients of abamectin seed treatments are listed below. Ecological risks from seed treatments are assessed by the same method used for granular and bait products. For typical in-furrow planting or drill seeded, 1% of the seeds planted are assumed to be exposed. The number of lethal doses ($LD_{50'}$s) that are available within one square foot immediately after application ($LD_{50}s/ft^2$) is used as the risk quotient for seeds treated with abamectin. Birds have been reported following directly behind planting equipment to forage on worms and other invertebrates exposed by the freshly tilled soil. Therefore, it is assumed that birds will forage mostly within the planted area where the pesticide treated seed is planted. Risk quotients are calculated for cotton, cucumber, pepper, and tomato with a small bird (20 g songbird) as the worst case scenario. To reflect sensitivity of the small bird (such as a songbird with a body weight of 20 g.), the Mallard duck LD_{50} was multiplied by the body weight of a songbird (as a fraction of kg) to obtain the songbird LD_{50} (mg/ b.w.). The rat LD_{50} (mg/b.w.) was calculated similarly. Based on seedling rates listed below, the results show that RQ values for avian LD_{50} 's/sq ft. range from 0.001 (cotton) to 0.020 (pepper) and none triggered acute endangered species levels of concern. RQ values for mammalian LD_{50} 's/sq ft. range from 0.001 (cotton) to 0.025 (pepper) and also did not trigger acute endangered species levels of concern.

Table 16 Seeding Rates (Maximum rates)

Crop	Seeds per lb.	Pound seeds per A.	No. of seeds per A.	seed/ft^2
Cotton	5000	12	60000	1.4
Cucumber	18140	2.5	45350	1.04
Pepper	64000	4	256000	5.9
Tomato	160000	1	160000	3.7

No. of seeds/A = seeds/lb * pounds seeds/A ; Source: http://oregonstate.edu/dept/NWREC/vegindex.html; www.Seedsforsurvival.com ; Kotts vegetables Handbook, M. Davy personal communication

Table 17. Avian Acute Risk Quotients for Single Applications of Abamectin Treated Seed based on toxicity to a songbird

Crop	Seed loading (mg ai/seed)	Seeding rate (seeds/A.)	Seed/sq ft	mg a.i./sq ft	1 % residual on surface	mg ai/sq ft on surface
Cotton	0.15	60000	1.377	0.207	0.01	0.002
Cucumber	0.6	45350	1.04	0.625	0.01	0.006
Pepper	0.6	256000	5.877	3.526	0.01	0.035
Tomato	0.6	160000	3.673	2.204	0.01	0.022

mg ai/sqft on surface = (Seeds/A ÷ 43560 sqft) * (mg ai/seed) * (0.01 fraction residual on surface)

Table 17. Avian Acute Risk Quotients for Single Applications of Abamectin Treated Seed based on toxicity to a songbird (cont.)

Crop	LD_{50} (mg/kg)	Body weight (kg)	Adjust LD_{50} (mg kg)	RQ (# LD_{50} /sq ft
Cotton	87	0.02	1.7	< 0.1
Cucumber	87	0.02	1.7	< 0.1
Pepper	87	0.02	1.7	< 0.1
Tomato	87	0.02	1.7	< 0.1

LD_{50} adj. = LD_{50} * Body Wt (fraction of Kg) ;
RQ LD_{50} /sqft = mgai/sqft ÷ LD_{50} adj
RQ greater or equal to 0.5 exceeds acute high, acute restricted use and acute endangered species LOCs
RQ greater or equal to 0.2 exceeds acute restricted use and acute endangered species LOCs
RQ greater or equal to 0.1 exceeds acute endangered species LOCs

Table 18. Mammal Acute Risk Quotients for Single Applications of Abamectin Treated Seed based on toxicity to a rat

Crop	Seed loading (mg ai/seed)	Seeding rate (seeds/A.)	Seed/sq ft	mg a.i./sq ft	1 % residual on surface	mg ai/sq ft on surface
Cotton	0.15	60000	1.377	0.207	0.01	0.002
Cucumber	0.6	45350	1.041	0.625	0.01	0.006
Pepper	0.6	256000	5.877	3.526	0.01	0.035
Tomato	0.6	160000	3.673	2.204	0.01	0.022

mg ai/sqft on surface = (Seeds/A ÷ 43560 sqft) * (mg ai/seed) * (0.01 fraction residual on surface)

Table 18. Mammal Acute Risk Quotients for Single Applications of Abamectin Treated Seed based on toxicity to a rat (cont.)

Crop	LD_{50} (mg/kg)	Body weight (kg)	Adjust LD_{50} (mg kg)	RQ (# LD_{50} /sq ft
Cotton	13.6	0.1	1 .36	< 0.1
Cucumber	13.6	0.1	1. 36	< 0.1
Pepper	13.6	0.1	1. 36	< 0.1
Tomato	13.6	0.1	1. 36	< 0.1

LD_{50} adj. = LD_{50} * Body Wt (fraction of Kg) ;
RQ LD_{50} /sqft = mgai/sqft ÷ LD_{50} adj
RQ greater or equal to 0.5 exceeds acute high, acute restricted use and acute endangered species LOCs
RQ greater or equal to 0.2 exceeds acute restricted use and acute endangered species LOCs
RQ greater or equal to 0.1 exceeds acute endangered species LOCs

B. Risk Description - Interpretation of Direct Effects

1. Risks to Aquatic Organisms and Plants

The results of this risk assessment suggest the potential for direct effects to endangered and non-endangered freshwater fish, freshwater invertebrates, and estuarine/marine fish, and estuarine/marine invertebrates. Specifically, RQ values for the following receptors exceed risk levels of concern established for the Agency for the screening-level risk assessment:

- **Freshwater fish**: RQs exceed acute endangered species LOCs for ground and aerial applications to leafy vegetables. RQs exceed acute restricted use LOCs for ground and aerial applications to fruiting vegetables. Seed treatment use on peppers exceeds the acute risk LOC and chronic LOC for endangered and non-endangered species.

- **Freshwater invertebrates**: RQs exceed acute restricted use and endangered species LOCs for ground application to leafy vegetables, stone fruits, basil, mint, and cotton (seed treatment). RQs exceed acute risk LOCs for aerial application to leafy vegetables, ground and aerial application to fruiting vegetables, and seed treatment use on cucumbers and peppers. Chronic risk LOCs are exceeded for ground and aerial applications to leafy vegetables and fruiting vegetables, application to stone fruits, basil, mint, cotton (seed treatment), cucumber (seed treatment), and peppers (seed treatment).

- **Estuarine/marine fish**: RQs exceed acute restricted use and endangered species LOCs for peppers (seed treatment). RQs exceed endangered species LOCs for fruiting vegetables (aerial application).

- **Estuarine/marine invertebrates**: RQs exceed acute high risk, restricted use, and endangered species LOCs for all uses included in this assessment, with the exception of cotton (seed treatment) and tomato (seed treatment) where restricted use and endangered species LOCs are exceeded. RQs also exceed chronic LOCs for all uses.

The chronic estuarine/marine invertebrate risk quotients range from 6.3 for tomato seed treatment to 654 for peppers seed treatment. Acute freshwater fish risk quotients range from 0.01 to 0.75; acute freshwater invertebrate RQs range from 0.08 to 8.0; and acute estuarine/marine invertebrate RQs range from 0.12 to 12.9. Acute estuarine/marine fish risk quotients range from <0.01 to 0.18. Chronic freshwater fish risk quotients range from 0.04 to 3.5; while chronic freshwater invertebrate risk quotients range from 0.73 to 76.3.

Based on the risk characterization for aquatic organisms and plants, the following hierarchy of sensitivity to abamectin exists for aquatic receptors: estuarine/marine invertebrates > freshwater invertebrates > freshwater fish > estuarine/marine fish. Abamectin appears to be non-toxic to aquatic plants. The risks associated with all of the aquatic organism and plant groups are discussed in greater detail below. A discussion of the probit dose response relationship is included as part of the risk description to provide additional information on the endangered species acute levels of concern.

Abamectin is extremely toxic to freshwater and estuarine invertebrates. Movement of very small amounts into an aquatic ecosystem would be harmful because it would kill the zooplankton and other small aquatic invertebrates, such as waterleaf, amphipods, and aquatic insects. Furthermore, populations of these aquatic invertebrates may not be able to recover after an acute exposure because their reproduction may be inhibited by remaining trace residues of abamectin. Life-cycle testing with the Mysid, a estuarine crustacean, showed that reproduction is significantly impaired at extremely low concentrations, as low as 35 ng/L. Extended reduction in these invertebrate populations would also adversely impact fish and other higher organisms which are dependent on the food source that these populations provide. The result would be degradation of the entire ecosystem. Therefore, it is very important to protect water bodies from exposure to abamectin from both runoff and spray drift. Fortunately, abamectin is not very mobile in soil. Vegetative filter strips should be effective at protecting water bodies by trapping soluble residues and residues attached to suspended particles.

The current label for grapes and peppers requires only a 25-ft uncultivated buffer zone, which is not the same a vegetative filter strip. A true vegetative filter strip is planted with specific types of grasses, as well as possibly other types of perennial vegetation, and must be maintained to serve as a barrier to surface water movement. An uncultivated strip of weeds may be totally inadequate for this function. Standard practices for installing and maintaining vegetative filter strips are available from the Natural Resources Conservation Service of USDA and various university extension services. If it is not practical to require vegetative filter strips that comply to these standard practices, then a wider buffer zone would be required to provide a comparable level of protection to aquatic habitats.

Much larger buffer zones would be required to protect aquatic ecosystems from spray drift. Spray drift precautions were included on the proposed label for cucurbits, fruiting and leafy vegetables, and potatoes as a group; the specified buffer zone for adjacent water bodies was 150 feet for aerial application, and the label also includes standard drift minimization language. However, even with the generic spray drift language and the 150-foot buffer zone, movement of abamectin by spray drift resulting from aerial applications could be devastating to aquatic ecosystems. Spray drift data reported in Bird et al. (Figure 9; 1996) would indicate that at a distance of 50 meters (approximately 150 feet), deposition of medium to fine sprays ranged from 2 to 8 % of the application. This amount of loading is predicted to be enough to kill aquatic invertebrates, even in a relatively deep (2 m) water body. Therefore, EFED recommends prohibiting aerial spraying of abamectin.

Another reason for prohibiting aerial applications would be to protect nontarget terrestrial insects, which are also very susceptible to abamectin. Spray drift into adjacent habitat containing flowering plants could pose a risk to beneficial pollinators like bees, butterflies, and moths. Spray drift could also pose a risk to several endangered butterfly species, such as the Karner blue butterfly. Since the larvae of these species would not be expected to occur within agricultural fields, they should not be harmed by ground spraying, but could be harmed by aerial spraying because spray drift could contaminate adjacent habitat where the larvae may feed.

The 1992 Census of Agriculture does not include information on all the crops mentioned on the label, so the impact on endangered species from use on these crops is uncertain. Use areas are likely small for each smaller use crop, so the increase in the number of crops on which abamectin would be used may not have a large national impact. However, use of the chemical could have significant impact on local freshwater and estuarine ecosystems.

Buffer zone

At the request of Registration Division to find acceptable safe buffer zone for aerial application of abamectin on avocado, EFED has conducted Tier1 AGDRIT spray drift model.

Table 20. Buffer Distance Effects of spray drift on the adjacent pond

Application Method (app. rate; lb a.i./A)	Target EEC (ppb)	Boom Position	Droplet Size (90%tile)	Buffer Distance
Aerial (0.019)	0.035	High	Fine/Very fine	472 ft, adjacent pond
Ground (0.023)	0.035	-	Fine/Very fine	551 ft, adjacent pond

LC_{50} = 0.0035 ppb (mysid)

The results show that buffer distance of 475 ft or 551 ft is required to reduce the EEC below the LC_{50} of the most sensitive species in the adjacent pond with aerial or ground application.

2. Risks to Terrestrial Organisms

Birds and Mammals

The results of the terrestrial risk characterization suggest that there are no acute risks associated with avian exposures to abamectin. However, chronic risk quotients for leafy vegetables, fruiting vegetables, basil and mint exceed the LOC for one food item (short grass). Acute RQs for 15 g and 35 g mammals exceed the acute LOC (0.5) for all assessed uses. The endangered species level of concern for 15 g, 30 g, and 1000 g mammals is exceeded for all assessed uses. Chronic RQs range from 0.24 to 4.99 and exceed the level of concern for all assessed uses. Avian and mammal RQ values based on exposure to treated seeds are below levels of concern.

Non-Target Insects

EFED currently does not estimate risk quotients for terrestrial non-target insects. However, an appropriate label statement is required to protect foraging honeybees when the LD_{50} is < 11 µg/bee. Based on the acute contact toxicity study to honeybees, the LD_{50} for abamectin is 0.0022 µg/bee. This classifies abamectin as highly toxic to honeybees.

C. Threatened and Endangered Species Concerns

1. Taxonomic Groups Potentially at Risk

The Agency's levels of concern for endangered and threatened birds, mammals, freshwater fish and invertebrates and estuarine/marine fish and invertebrates are exceeded for the use of abamectin. A list of endangered/threatened species at the state level for the taxonomic groups and crops of concern is attached to this assessment. The Agency recognizes that there are no Federally listed estuarine/marine invertebrates.. The registrant must provide information on the proximity of Federally listed birds, freshwater fish and invertebrates, and estuarine/marine fish to the abamectin use sites. This requirement may be satisfied in one of three ways: 1) having membership in the FIFRA Endangered Species Task Force (Pesticide Registration [PR] Notice 2000-2); 2) citing FIFRA Endangered Species Task Force data; or 3) independently producing these data, provided the information is of sufficient quality to meet FIFRA requirements. The information will be used by the OPP Endangered Species Protection Program to develop recommendations to avoid adverse effects to listed species.

The preliminary risk assessment for endangered species indicates that abamectin exceeds the endangered species LOCs for the following combinations of analyzed uses and species:

- Use of abamectin on the following crop scenarios indicate an exceedance of the endangered species LOC for freshwater fish: California lettuce (ground and aerial application), Florida tomatoes (ground and aerial), Florida cucumber (seed treatment), and Florida peppers (seed treatment).

- Use of abamectin on California lettuce (ground and aerial application), Florida tomatoes (ground and aerial), Georgia peaches, Oregon mint, MS cotton (seed treatment) Florida cucumber (seed treatment), Florida peppers (seed treatment) and Florida tomato indicate endangered LOC exceedances for endangered freshwater invertebrates.

- Use of abamectin on the following crop scenarios indicate an exceedance of the endangered species LOC for estuarine/marine fish: Florida tomatoes (aerial) and Florida peppers (seed treatment).

- Use of abamectin on the following crop scenarios indicate an exceedance of the endangered species LOC for birds: leafy vegetables, fruiting vegetables, basil, and mint.

- Use of abamectin on the following crop scenarios indicate and exceedence of the endangered species LOC for mammals: leafy vegetables, fruiting vegetables, stone fruits, avocado, basil, and mint.

2. 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 listed animal species acute levels of concern (LOC). The acute listed species LOCs of 0.1 and 0.05 are used for terrestrial and aquatic animals, respectively. As part of the risk characterization, an interpretation of acute LOCs 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 estimated environmental concentration actually occur for a species with sensitivity to abamectin chemicals 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 measurement endpoints for each taxonomic group. The individual effects probability associated with the LOCs 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. The upper and lower bounds of the effects probability are based on available information on the 95% confidence interval of the slope. A statement regarding the confidence in the applicability of the assumed probit dose response relationship for predicting individual event probabilities is also included. Studies with good probit fit characteristics (i.e., statistically appropriate for the data set) are associated with a high degree of confidence. Conversely, a low degree of confidence is associated with data from studies that do not statistically support a probit dose response relationship. In addition, confidence in the data set may be reduced by high variance in the slope (i.e., large 95% confidence intervals), despite good probit fit characteristics.

Individual effect probabilities are calculated based on an Excel spreadsheet tool IECV1.1 (Individual Effect Chance Model Version 1.1) developed by Ed Odenkirchen of 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 LOC (0.1 for terrestrial animals and 0.05 for aquatic animals) is entered as the desired threshold.

The following is the summary of screening assessment of endangered fish and aquatic invertebrates species Levels of concern using probit slope relationship.

Listed Endangered Sp.	Mysid	Daphnid	Blue Gill Sunfish	Rainbow Trout
Acute Tox. End Point LC_{50}	21.99 ppt	0.34 ppb	9.6 ppb	3.6 ppb
Probit X^2value	1.93e-01		1.31e-01	3.89e-01
Mean Slope	5.22	4.5*	2.37	3.66
Slope Confid. Interval	3.124 - 7.310		1.259 - 3.452	1.802 - 5.526
Effect probability p (Z)	5.74e-12	2.40e-09	1.13e-03	9.42e-07
Chance of Individual effect (1/p)	1.74 e+11	4.17e+08	8.84e+02	1.06e+06

* default value

The results show chance of individual effect is extremely remote. The effect probability p(Z) ranges from 5.74E-12 (or 5.74E-10 % chance, or 1 in 1.74E+11; for mysid) to 1.13e-03 (or 0.113% chance or 1 in 884 for blue gill sunfish).

The detail description of individual species are also listed as follows;

Estuarine/marine invertebrates (mysid)

Based on an assumption of a probit dose response relationship with a mean estimated slope of **5.217** the corresponding estimated chance of individual mortality associated with the listed species LOC of **0.05** the acute toxic endpoint for **estuarine/marine invertebrates** is **21.99 ppb**. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate **2.124 to 7.310** were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are **2.41E-5 to 1.0 E-16 (or 2.4E-3 % to 1.0E-14 % chance).**

Although the Agency has assumed a probit dose response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do not statistically support a probit dose response relationship **0.193** and so the confidence in estimated event probabilities based on this dose response relationship and the listed species LOC is relative high.

Freshwater invertebrates (daphnid)

Based on an assumption of a probit dose response relationship with a mean estimated slope of **default 4.5** , the corresponding estimated chance of individual mortality associated with the listed species LOC of **0.05** the acute toxic endpoint for **freshwater invertebrates** is **0.34 ppb** . It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate were need to calculate upper and lower estimates of the effects probability associated with the listed species LOC, but no information is available. .

Freshwater fish (Bluegill sunfish)
Based on an assumption of a probit dose response relationship with a mean estimated slope of **2.374**, the corresponding estimated chance of individual mortality associated with the listed species LOC of **0.05** the acute toxic endpoint for **Warm freshwater fish** is **9.6 ppb**. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate **1.259 to 3.452** were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are **5.07E-02 to 3.55E-06 (or 5.07 % to 3.55 E-4 % chance).**

Although the Agency has assumed a probit dose response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do not statistically support a probit dose response relationship **0.131** and so the confidence in estimated event probabilities based on this doseresponse relationship and the listed species LOC is relatively high.

Freshwater fish (Rainbow trout)
Based on an assumption of a probit dose response relationship with a mean estimated slope of **2.374**, the corresponding estimated chance of individual mortality associated with the listed G57species LOC of **0.05** the acute toxic endpoint for **cold fish** is **3.6 ppb**. It is recognized that extrapolation of very low probability events is associated with considerable uncertainty in the resulting estimates. To explore possible bounds to such estimates, the upper and lower values for the mean slope estimate **1.802 to 5.526** were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are **9.53E-03 to 3.28E-13 (or 0.953% to 3.28E-11% chance).**

Although the Agency has assumed a probit dose response relationship in establishing the listed species LOCs, the available data for the toxicity study generating RQs for this taxonomic group do not statistically support a probit dose response relationship **0.289** and so the confidence in estimated event probabilities based on this doseresponse relationship and the listed species LOC is relatively high.

Based on the above results Chi-Sq p-values range from 0.131 too 0.289. Because these values are greater than critical alpha value of 0.05, there for fitting of probit slope regression line is acceptable and the confidence in estimated event probability with these listed species LOC is relatively high.

3. Indirect Effect Analyses

The Agency acknowledges that pesticides have the potential to exert indirect effects upon the listed organisms by, for example, perturbing forage or prey availability, altering the extent of nesting habitat, creating gaps in the food chain, etc.

In conducting a screen for indirect effects, direct effect LOCs for each taxonomic group are used to make inferences concerning the potential for indirect effects upon listed species that rely upon non-endangered organisms in these taxonomic groups as resources critical to their life cycle.

Because screening-level acute RQs for freshwater fish, freshwater invertebrates, estuarine/marine invertebrates, estuarine/marine fish, and birds exceed the endangered species acute LOCs, the Agency uses the dose response relationship from the toxicity study used for calculating the RQ to estimate the probability of acute effects associated with an exposure equivalent to the EEC. This information serves as a guide to establish the need for and extent of additional analysis that may be performed using Services-provided "species profiles" as well as evaluations of the geographical and temporal nature of the exposure to ascertain if a "not likely to adversely affect" determination can be made. The degree to which additional analyses are performed is commensurate with the predicted probability of adverse effects from the comparison of the dose response information with the EECs. The greater the probability that exposures will produce effects on a taxa, the greater the concern for potential indirect effects for listed species dependent upon that taxa, and therefore, the more intensive the analysis on the potential listed species of concern, their locations relative to the use site, and information regarding the use scenario (e.g., timing, frequency, and geographical extent of pesticide application).

Indirect effects to aquatic animals may result from 1)sensitive plants that serve as food items for some species of aquatic organisms are reduced and 2) sensitive aquatic emergent plants that provide shade in the water are knocked down from the herbicide exposure and thus alter the temperature of the water where sensitive organisms inhabit, or 3) aquatic invertebrate population may be reduced from direct or chronic effects, thus limiting the amount of food items for larger aquatic animals.

Indirect effects to terrestrial animals may result from reduced food items to animals, behavior modifications from reduced or a modified habitat, and from alterations of habitats. Alterations of habitats can affect the reproductive capacity of some terrestrial animals.

4. Critical Habitats

In the evaluation of pesticide effects on designated critical habitat, consideration is given to the physical and biological features (constituent elements) of a critical habitat identified by the U.S Fish and Wildlife and National Marine Fisheries Services as essential to the conservation of a listed species and which may require special management considerations or protection. The evaluation of impacts for a screening level pesticide risk assessment focuses on the biological features that are constituent elements and is accomplished using the screening-level taxonomic analysis (risk quotients, RQs) and listed species levels of concern (LOCs) that are used to evaluate direct and indirect effects to listed organisms.

The screening-level risk assessment has identified potential concerns for indirect effects on listed species for those organisms dependant upon aquatic organisms, birds, amphibians, reptiles, and insects. In light of the potential for indirect effects, the next step for EPA and the Service(s) is to identify which listed species and critical habitat are potentially implicated. Analytically, the identification of such species and critical habitat can occur in either of two ways. First, the agencies could determine whether the action area overlaps critical habitat or the occupied range of any listed species. If so, EPA would examine whether the pesticide's potential impacts on non-endangered species would affect the listed species indirectly or directly affect a constituent element of the critical habitat. Alternatively, the agencies could determine which listed species depend on biological resources, or have constituent elements that fall into, the taxa that may be directly or indirectly impacted by the pesticide. Then EPA would determine whether use of the pesticide overlaps the critical habitat or the occupied range of those listed species. At present, the information reviewed by EPA does not permit use of either analytical approach to make a definitive identification of species that are potentially impacted indirectly or critical habitats that is potentially impacted directly by the use of the pesticide. EPA and the Service(s) are working together to conduct the necessary analysis.

This screening-level risk assessment for critical habitat provides a listing of potential biological features that, if they are constituent elements of one or more critical habitats, would be of potential concern. These correspond to the taxa identified above as being of potential concern for indirect effects and include the following aquatic organisms, birds, amphibians, reptiles, and insects. This list should serve as an initial step in problem formulation for further assessment of critical habitat impacts outlined above, should additional work be necessary

D. Description of Assumptions, Uncertainties, Strengths, and Limitations

1. Assumptions and Limitations Related to Exposure for all Taxa

This screening-level risk assessment relies on labeled statements of the maximum rate of abamectin application, the maximum number of applications, and the shortest interval between applications. Together, these assumptions constitute a maximum use scenario. The frequency at which actual uses approach these maximums is dependant on resistance to the insecticide, timing of applications, and market forces.

2. Assumptions and Limitations Related to Exposure for Aquatic Species

- For an acute risk assessment, there is no averaging time for exposure. An instantaneous peak concentration, with a 1 in 10 year return frequency, is assumed. The use of the instantaneous peak assumes that instantaneous exposure is of sufficient duration to elicit acute effects comparable to those observed over more protracted exposure periods tested in the laboratory, typically 48 to 96 hours. In the absence of data regarding time-to-toxic event analyses and latent responses to instantaneous exposure, the degree to which risk is overestimated cannot be quantified.

3. <u>Assumptions and Limitations Related to Exposure for Terrestrial Species</u>

Routes of Exposure

Screening-level risk assessments for spray applications of pesticides consider dietary exposure alone. Other routes of exposure, not considered in this assessment, are discussed below:

- Incidental soil ingestion exposure - This risk assessment does not consider incidental soil ingestion. Available data suggests that up to 15% of the diet can consist of incidentally ingested soil depending on the species and feeding strategy (Beyer et al., 1994).

- Inhalation exposure - The screening risk assessment does not consider inhalation exposure. Such exposure may occur through three potential sources: (1) spray material in droplet form at the time of application (2) vapor phase pesticide volatilizing from treated surfaces, and (3) airborne particulate (soil, vegetative material, and pesticide dusts).

- Dermal Exposure - The screening assessment does not consider dermal exposure, except as it is indirectly included in calculations of RQs based on lethal doses per unit of pesticide treated area. Dermal exposure may occur through three potential sources: (1) direct application of spray to terrestrial wildlife in the treated area or within the drift footprint, (2) incidental contact with contaminated vegetation, or (3) contact with contaminated water or soil.

- Drinking Water Exposure - Drinking water exposure to a pesticide active ingredient may be the result of consumption of surface water or consumption of the pesticide in dew or other water on the surfaces of treated vegetation. For pesticide active ingredients with a potential to dissolve in runoff, puddles on the treated field may contain the chemical.

4. Assumptions and Limitations Related to Effects Assessment

Age class and sensitivity of effects thresholds

It is generally recognized that test organism age may have a significant impact on the observed sensitivity to a toxicant. The screening risk assessment acute toxicity data for fish are collected on juvenile fish between 0.1 and 5 grams. Aquatic invertebrate acute testing is performed on recommended immature age classes (e.g., first instar for daphids, second instar for amphipods, stoneflies and mayflies, and third instar for midges). Similarly, acute dietary testing with birds is also performed on juveniles, with mallard being 5-10 days old and quail 10-14 days old.

Testing of juveniles may overestimate toxicity at older age classes for pesticidal active ingredients, such as abamectin, that act directly (without metabolic transformation) because younger age classes may not have the enzymatic systems associated with detoxifying xenobiotics. The screening risk assessment has no current provisions for a generally applied method that accounts for this uncertainty. In so far as the available toxicity data may provide ranges of sensitivity information with respect to age class, the risk assessment uses the most sensitive life-stage information as the conservative screening endpoint.

Use of the Most Sensitive Species Tested

Although the screening risk assessment relies on a selected toxicity endpoint from the most sensitive species tested, it does not necessarily mean that the selected toxicity endpoints reflect sensitivity of the most sensitive species existing in a given environment. The relative position of the most sensitive species tested in the distribution of all possible species is a function of the overall variability among species to a particular chemical. In the case of listed species, there is uncertainty regarding the relationship of the listed species' sensitivity and the most sensitive species tested.

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APPENDIX A. RQ CALCULATION AND LOC VALUES

RQ Calculations, LOCs, and Risk Presumptions for Terrestrial Animals

Risk Presumption	*RQ*	*LOC*
	Birds	
Acute High Risk	EEC[1]/LC_{50} , LD_{50}/sq ft[2] or LD_{50}/day[3]	0.5
Acute Restricted Use	EEC/LC_{50} , LD_{50}/sq ft or LD_{50}/day (or LD_{50} < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC_{50} , LD_{50}/sq ft or LD50/day	0.1
Chronic Risk	EEC/NOAEC	1
	Wild Mammals	
Acute High Risk	EEC/LC_{50} , LD_{50}/sq ft or LD_{50}/day	0.5
Acute Restricted Use	EEC/LC_{50} , LD_{50}/sq ft or LD_{50}/day (or LD_{50} < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC_{50} , LD_{50}/sq ft or LD_{50}/day	0.1
Chronic Risk	EEC/NOAEC	1

[1] abbreviation for Estimated Environmental Concentration (ppm) on avian/mammalian food items

[2] $\frac{\text{mg/ft}^2}{\text{LD50 * wt. of bird}}$

[3] $\frac{\text{mg of toxicant consumed/day}}{\text{LD50 * wt. of bird}}$

RQ Calculations, LOCs, and Risk Presumptions for Aquatic Animals

Risk Presumption	*RQ*	*LOC*
Acute High Risk	EEC/(LC_{50} or EC_{50})	0.5
Acute Restricted Use	EEC/(LC_{50} or EC_{50})	0.1
Acute Endangered Species	EEC/(LC_{50} or EC_{50})	0.05
Chronic Risk	EEC/(NOAEC)	1

RQ Calculations, LOCs, and Risk Presumptions for Aquatic Animals

Risk Presumption	*RQ*	*LOC*
Acute High Risk	EEC/(LC_{50} or EC_{50})	0.5
Acute Restricted Use	EEC/(LC_{50} or EC_{50})	0.1
Acute Endangered Species	EEC/(LC_{50} or EC_{50})	0.05
Chronic Risk	EEC/(NOAEC)	1

PRZM/EXAMS input and output files for use of abamectin of various crops.

Leafy Vegetables (CA Lettuce)/Aerial Application

stored	as	AvrCAlt2.out				
Chemical:	Avrmctn					
PRZM	environment:	calettuceC.txt	modified	Thuday,		12 August
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w23273.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.1272	0.1195	0.09703	0.07178	0.06078	0.03317
1962	0.2036	0.1949	0.1719	0.1428	0.1316	0.08795
1963	0.2132	0.2039	0.178	0.1492	0.1337	0.08653
1964	0.1727	0.1648	0.1421	0.1153	0.1023	0.073
1965	0.2508	0.2397	0.2151	0.1691	0.1486	0.09792
1966	0.1992	0.1911	0.1683	0.1409	0.127	0.09532
1967	0.2245	0.2174	0.198	0.168	0.152	0.1079
1968	0.1817	0.1735	0.1507	0.1228	0.109	0.0763
1969	0.2363	0.2268	0.2035	0.17	0.1539	0.1091
1970	0.1968	0.1881	0.1651	0.1361	0.1217	0.08872
1971	0.1995	0.1913	0.1677	0.1459	0.138	0.09651
1972	0.1736	0.1656	0.1429	0.1158	0.1029	0.07649
1973	0.2274	0.2187	0.1957	0.1661	0.1512	0.1142
1974	0.2334	0.2242	0.2009	0.1701	0.1532	0.1209
1975	0.2373	0.2289	0.2059	0.1759	0.1598	0.1171
1976	0.2022	0.1937	0.1695	0.1402	0.1252	0.1034
1977	0.2245	0.217	0.1945	0.1725	0.1606	0.1087
1978	0.2643	0.2551	0.2306	0.1955	0.1881	0.1433
1979	0.2151	0.2064	0.1834	0.1542	0.1387	0.09836
1980	0.216	0.2076	0.185	0.1563	0.1409	0.102
1981	0.215	0.2062	0.1831	0.1532	0.1391	0.09445
1982	0.2272	0.2164	0.1872	0.1493	0.1331	0.08682
1983	0.2236	0.2172	0.1981	0.168	0.1513	0.1104
1984	0.1811	0.173	0.1502	0.1221	0.1084	0.07509
1985	0.1796	0.1717	0.149	0.122	0.1086	0.07653
1986	0.2195	0.2101	0.1868	0.1523	0.1351	0.09114
1987	0.1944	0.186	0.1631	0.1349	0.1207	0.08481
1988	0.2176	0.2088	0.1924	0.1571	0.1404	0.09209
1989	0.1794	0.1714	0.1487	0.1213	0.1079	0.0705
1990	0.1671	0.1593	0.1366	0.11	0.09712	0.0592

Sorted	results					
Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.2643	0.2551	0.2306	0.1955	0.1881	0.1433

0.064516	0.2508	0.2397	0.2151	0.1759	0.1606	0.1209
0.096774	0.2373	0.2289	0.2059	0.1725	0.1598	0.1171
0.129032	0.2363	0.2268	0.2035	0.1701	0.1539	0.1142
0.16129	0.2334	0.2242	0.2009	0.17	0.1532	0.1104
0.193548	0.2274	0.2187	0.1981	0.1691	0.152	0.1091
0.225806	0.2272	0.2174	0.198	0.168	0.1513	0.1087
0.258065	0.2245	0.2172	0.1957	0.168	0.1512	0.1079
0.290323	0.2245	0.217	0.1945	0.1661	0.1486	0.1034
0.322581	0.2236	0.2164	0.1924	0.1571	0.1409	0.102
0.354839	0.2195	0.2101	0.1872	0.1563	0.1404	0.09836
0.387097	0.2176	0.2088	0.1868	0.1542	0.1391	0.09792
0.419355	0.216	0.2076	0.185	0.1532	0.1387	0.09651
0.451613	0.2151	0.2064	0.1834	0.1523	0.138	0.09532
0.483871	0.215	0.2062	0.1831	0.1493	0.1351	0.09445
0.516129	0.2132	0.2039	0.178	0.1492	0.1337	0.09209
0.548387	0.2036	0.1949	0.1719	0.1459	0.1331	0.09114
0.580645	0.2022	0.1937	0.1695	0.1428	0.1316	0.08872
0.612903	0.1995	0.1913	0.1683	0.1409	0.127	0.08795
0.645161	0.1992	0.1911	0.1677	0.1402	0.1252	0.08682
0.677419	0.1968	0.1881	0.1651	0.1361	0.1217	0.08653
0.709677	0.1944	0.186	0.1631	0.1349	0.1207	0.08481
0.741935	0.1817	0.1735	0.1507	0.1228	0.109	0.07653
0.774194	0.1811	0.173	0.1502	0.1221	0.1086	0.07649
0.806452	0.1796	0.1717	0.149	0.122	0.1084	0.0763
0.83871	0.1794	0.1714	0.1487	0.1213	0.1079	0.07509
0.870968	0.1736	0.1656	0.1429	0.1158	0.1029	0.073
0.903226	0.1727	0.1648	0.1421	0.1153	0.1023	0.0705
0.935484	0.1671	0.1593	0.1366	0.11	0.09712	0.0592
0.967742	0.1272	0.1195	0.09703	0.07178	0.06078	0.03317
0.1	0.2372	0.22869	0.20566	0.17226	0.15921	0.11681

Average of yearly averages: 0.092597

Inputs generated by pe4.pl - 8-Aug-03

Data used for this run:
Output File: AvrCAlt2
Metfile: w23273.dvf
PRZM scenario: calettuceC.txt
EXAMS environment file: pond298.exv
Chemical Name: Avrmctn

Description	Variable	Name	Value	Units	Comments
Molecular	weight	mwt	873.11	g/mol	
Henry's	Law	Const.	henry	2.20E-09	atm-m^3/mol
Vapor	Pressure	vapr	1.50E-09	torr	
Solubility	sol		78	mg/L	
Kd	Kd		50	mg/L	
Koc	Koc	mg/L			
Photolysis	half-life	kdp	0.5	days	Half-life

Aerobic	Aquatic	Metabolism	kbacw		300 days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs		0 days	Halfife
Aerobic	Soil	Metabolism	asm		150 days	Halfife
Hydrolysis :	pH		7	0 days	Half-life	
Method:	CAM		2 integer	See	PRZM	manual
Incorporation	Depth:	DEPI		0 cm		
Application	Rate:	TAPP		0.021 kg/ha		
Application	Efficiency:	APPEFF		0.95 fraction		
Spray	Drift	DRFT		0.05 fraction	of	application
Application	Date	Date		1-Apr dd/mm	or	dd/mmm
Interval		1 interval		7 days	Set	to
Interval		2 interval		7 days	Set	to
Record		17:00 FILTRA				
	IPSCND		1			
	UPTKF					
Record		18:00 PLVKRT				
	PLDKRT					
	FEXTRC		0.5			
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Leafy Vegetables (CA Lettuce)/Ground Application

stored	as	AvCAlt2G.out				
Chemical:	Avrmctn					
PRZM	environment:	calettuceC.txt	modified	Thuday,		12 August
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w23273.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.08638	0.08303	0.06961	0.04238	0.02971	0.01177
1962	0.1448	0.139	0.1264	0.1021	0.09552	0.05963
1963	0.0995	0.09624	0.08834	0.07981	0.07719	0.05429
1964	0.1096	0.1059	0.09133	0.07656	0.06012	0.03982
1965	0.1449	0.1398	0.1239	0.09822	0.08717	0.06446
1966	0.1366	0.1308	0.1127	0.08059	0.07506	0.06201
1967	0.1537	0.1479	0.1304	0.1067	0.1031	0.07473
1968	0.07688	0.07384	0.0656	0.05587	0.04966	0.04274
1969	0.1512	0.1471	0.1326	0.1216	0.1163	0.07664
1970	0.1423	0.1367	0.1088	0.07644	0.07028	0.05621

1971	0.116	0.1122	0.09972	0.08344	0.07716	0.06409
1972	0.1356	0.1291	0.1102	0.08297	0.06478	0.04362
1973	0.1584	0.1521	0.1329	0.1249	0.1177	0.08224
1974	0.1996	0.1918	0.1631	0.1158	0.1124	0.08934
1975	0.1504	0.1481	0.1363	0.1259	0.1213	0.08518
1976	0.1628	0.1575	0.137	0.1107	0.1013	0.07163
1977	0.162	0.1567	0.1414	0.116	0.1046	0.07744
1978	0.1975	0.1937	0.1743	0.1556	0.1496	0.113
1979	0.1053	0.1034	0.09999	0.09391	0.09132	0.06645
1980	0.1296	0.126	0.1141	0.1079	0.1019	0.06984
1981	0.1144	0.1114	0.1015	0.09463	0.09286	0.06221
1982	0.1135	0.1088	0.09864	0.07957	0.07209	0.05395
1983	0.1552	0.1484	0.1364	0.1184	0.1129	0.07801
1984	0.09174	0.088	0.07033	0.05463	0.0512	0.04279
1985	0.09191	0.08816	0.07823	0.05802	0.05053	0.04363
1986	0.1055	0.1019	0.09672	0.08524	0.08067	0.05857
1987	0.08281	0.08039	0.07181	0.06961	0.06527	0.0518
1988	0.1257	0.1211	0.1082	0.08803	0.07987	0.05969
1989	0.07137	0.06917	0.06191	0.05338	0.0495	0.0373
1990	0.05031	0.0486	0.04399	0.03798	0.03517	0.02587

Sorted	results					
Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.1996	0.1937	0.1743	0.1556	0.1496	0.113
0.064516	0.1975	0.1918	0.1631	0.1259	0.1213	0.08934
0.096774	0.1628	0.1575	0.1414	0.1249	0.1177	0.08518
0.129032	0.162	0.1567	0.137	0.1216	0.1163	0.08224
0.16129	0.1584	0.1521	0.1364	0.1184	0.1129	0.07801
0.193548	0.1552	0.1484	0.1363	0.116	0.1124	0.07744
0.225806	0.1537	0.1481	0.1329	0.1158	0.1046	0.07664
0.258065	0.1512	0.1479	0.1326	0.1107	0.1031	0.07473
0.290323	0.1504	0.1471	0.1304	0.1079	0.1019	0.07163
0.322581	0.1449	0.1398	0.1264	0.1067	0.1013	0.06984
0.354839	0.1448	0.139	0.1239	0.1021	0.09552	0.06645
0.387097	0.1423	0.1367	0.1141	0.09822	0.09286	0.06446
0.419355	0.1366	0.1308	0.1127	0.09463	0.09132	0.06409
0.451613	0.1356	0.1291	0.1102	0.09391	0.08717	0.06221
0.483871	0.1296	0.126	0.1088	0.08803	0.08067	0.06201
0.516129	0.1257	0.1211	0.1082	0.08524	0.07987	0.05969
0.548387	0.116	0.1122	0.1015	0.08344	0.07719	0.05963
0.580645	0.1144	0.1114	0.09999	0.08297	0.07716	0.05857
0.612903	0.1135	0.1088	0.09972	0.08059	0.07506	0.05621
0.645161	0.1096	0.1059	0.09864	0.07981	0.07209	0.05429
0.677419	0.1055	0.1034	0.09672	0.07957	0.07028	0.05395
0.709677	0.1053	0.1019	0.09133	0.07656	0.06527	0.0518
0.741935	0.0995	0.09624	0.08834	0.07644	0.06478	0.04363
0.774194	0.09191	0.08816	0.07823	0.06961	0.06012	0.04362
0.806452	0.09174	0.088	0.07181	0.05802	0.0512	0.04279
0.83871	0.08638	0.08303	0.07033	0.05587	0.05053	0.04274
0.870968	0.08281	0.08039	0.06961	0.05463	0.04966	0.03982

0.903226	0.07688	0.07384	0.0656	0.05338	0.0495	0.0373
0.935484	0.07137	0.06917	0.06191	0.04238	0.03517	0.02587
0.967742	0.05031	0.0486	0.04399	0.03798	0.02971	0.01177
0.1	0.16272	0.15742	0.14096	0.12457	0.11756	0.084886
	Average	of	yearly	averages:	0.060632	
Inputs	generated	by	pe4.pl	-	8-Aug-03	
Data	used	for	this	run:		
Output	File:	AvCAlt2G				
Metfile:	w23273.dvf					
PRZM	scenario:	calettuceC.txt				
EXAMS	environment	file:	pond298.exv			
Chemical	Name:	Avrmctn				
Description	Variable	Name	Value	Units	Comments	
Molecular	weight	mwt	873.11	g/mol		
Henry's	Law	Const.	henry	2.20E-09	atm-m^3/mol	
Vapor	Pressure	vapr	1.50E-09	torr		
Solubility	sol	78	mg/L			
Kd	Kd	50	mg/L			
Koc	Koc	mg/L				
Photolysis	half-life	kdp	0.5	days	Half-life	
Aerobic	Aquatic	Metabolism	kbacw	300	days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs	0	days	Halfife
Aerobic	Soil	Metabolism	asm	150	days	Halfife
Hydrolysis:	pH	7	0	days	Half-life	
Method:	CAM	2	integer	See	PRZM	manual
Incorporation	Depth:	DEPI	0	cm		
Application	Rate:	TAPP	0.021	kg/ha		
Application	Efficiency:	APPEFF	0.99	fraction		
Spray	Drift	DRFT	0.01	fraction	of	application
Application	Date	Date	1-Apr	dd/mm	or	dd/mmm
Interval	1	interval	7	days	Set	to
Interval	2	interval	7	days	Set	to
Record	17:00	FILTRA				
	IPSCND	1				
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC	0.5				
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Fruiting Vegetables (FL Tomato)/Aerial Application

stored	as	AvFLtom.out				
Chemical:	Avrmctn					
PRZM	environment:	FLtomatoC.txt	modified	Satday,		12 October
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w12844.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.1624	0.153	0.128	0.09382	0.0697	0.01719
1962	0.1822	0.1738	0.1514	0.1227	0.1056	0.06919
1963	0.2151	0.2029	0.1886	0.1579	0.1411	0.08659
1964	0.4305	0.4155	0.3611	0.3088	0.2555	0.1666
1965	0.5285	0.5018	0.4449	0.3409	0.279	0.1818
1966	0.3375	0.3276	0.2956	0.2654	0.2627	0.2143
1967	0.2527	0.2424	0.2187	0.1851	0.1643	0.1446
1968	0.2411	0.2317	0.2146	0.1857	0.1674	0.1372
1969	0.3929	0.3743	0.3407	0.2811	0.2334	0.1596
1970	0.2898	0.2842	0.2584	0.233	0.227	0.1774
1971	0.6976	0.6591	0.542	0.3959	0.301	0.1498
1972	0.6387	0.607	0.5045	0.3799	0.305	0.223
1973	0.2756	0.2712	0.26	0.2402	0.2272	0.1801
1974	0.2992	0.2877	0.2585	0.2089	0.1919	0.1485
1975	0.222	0.2125	0.1964	0.1647	0.1429	0.1117
1976	0.3391	0.323	0.2708	0.2132	0.1785	0.1235
1977	0.3374	0.3245	0.2922	0.2581	0.217	0.1602
1978	0.6176	0.5865	0.5113	0.3956	0.3094	0.1944
1979	0.3135	0.3075	0.2839	0.2487	0.2304	0.1974
1980	0.2327	0.2258	0.2033	0.1935	0.1834	0.1526
1981	0.4637	0.4383	0.357	0.264	0.2122	0.1316
1982	0.6797	0.656	0.5801	0.4558	0.3578	0.2367
1983	0.4167	0.4074	0.3784	0.3453	0.3277	0.2426
1984	0.845	0.8019	0.6666	0.4714	0.3626	0.2276
1985	0.3811	0.3716	0.3395	0.2957	0.279	0.2118
1986	0.4098	0.3912	0.3352	0.2712	0.2211	0.1668
1987	0.5296	0.5128	0.4415	0.3391	0.2703	0.1901
1988	0.287	0.2751	0.2377	0.2039	0.1965	0.1724
1989	0.2012	0.1921	0.169	0.1378	0.1219	0.1066
1990	0.2071	0.198	0.1748	0.1438	0.1263	0.09836

Sorted	results					
Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.845	0.8019	0.6666	0.4714	0.3626	0.2426
0.064516	0.6976	0.6591	0.5801	0.4558	0.3578	0.2367
0.096774	0.6797	0.656	0.542	0.3959	0.3277	0.2276
0.129032	0.6387	0.607	0.5113	0.3956	0.3094	0.223
0.16129	0.6176	0.5865	0.5045	0.3799	0.305	0.2143
0.193548	0.5296	0.5128	0.4449	0.3453	0.301	0.2118

0.225806	0.5285	0.5018	0.4415	0.3409	0.279	0.1974
0.258065	0.4637	0.4383	0.3784	0.3391	0.279	0.1944
0.290323	0.4305	0.4155	0.3611	0.3088	0.2703	0.1901
0.322581	0.4167	0.4074	0.357	0.2957	0.2627	0.1818
0.354839	0.4098	0.3912	0.3407	0.2811	0.2555	0.1801
0.387097	0.3929	0.3743	0.3395	0.2712	0.2334	0.1774
0.419355	0.3811	0.3716	0.3352	0.2654	0.2304	0.1724
0.451613	0.3391	0.3276	0.2956	0.264	0.2272	0.1668
0.483871	0.3375	0.3245	0.2922	0.2581	0.227	0.1666
0.516129	0.3374	0.323	0.2839	0.2487	0.2211	0.1602
0.548387	0.3135	0.3075	0.2708	0.2402	0.217	0.1596
0.580645	0.2992	0.2877	0.26	0.233	0.2122	0.1526
0.612903	0.2898	0.2842	0.2585	0.2132	0.1965	0.1498
0.645161	0.287	0.2751	0.2584	0.2089	0.1919	0.1485
0.677419	0.2756	0.2712	0.2377	0.2039	0.1834	0.1446
0.709677	0.2527	0.2424	0.2187	0.1935	0.1785	0.1372
0.741935	0.2411	0.2317	0.2146	0.1857	0.1674	0.1316
0.774194	0.2327	0.2258	0.2033	0.1851	0.1643	0.1235
0.806452	0.222	0.2125	0.1964	0.1647	0.1429	0.1117
0.83871	0.2151	0.2029	0.1886	0.1579	0.1411	0.1066
0.870968	0.2071	0.198	0.1748	0.1438	0.1263	0.09836
0.903226	0.2012	0.1921	0.169	0.1378	0.1219	0.08659
0.935484	0.1822	0.1738	0.1514	0.1227	0.1056	0.06919
0.967742	0.1624	0.153	0.128	0.09382	0.0697	0.01719
0.1	0.6756	0.6511	0.53893	0.39587	0.32587	0.22714
	Average of yearly averages:				0.159341	

Inputs generated by pe4.pl - 8-Aug-03

Data used for this run:
Output File: AvFLtom
Metfile: w12844.dvf
PRZM scenario: FLtomatoC.txt
EXAMS environment file: pond298.exv
Chemical Name: Avrmctn

Description	Variable Name		Value	Units	Comments	
Molecular weight	mwt		873.11	g/mol		
Henry's Law Const.	henry		2.20E-09	atm-m^3/mol		
Vapor Pressure	vapr		1.50E-09	torr		
Solubility	sol		78	mg/L		
Kd	Kd		50	mg/L		
Koc	Koc			mg/L		
Photolysis half-life	kdp		0.5	days	Half-life	
Aerobic Aquatic Metabolism	kbacw		300	days	Halfife	
Anaerobic Aquatic Metabolism	kbacs		0	days	Halfife	
Aerobic Soil Metabolism	asm		150	days	Halfife	
Hydrolysis:	pH	7	0	days	Half-life	

Method:	CAM		2 integer	See	PRZM	manual
Incorporati on	Depth:	DEPI		0 cm		
Applicatio n	Rate:	TAPP		0.021 kg/ha		
Applicatio n	Efficiency:	APPEFF		0.95 fraction		
Spray	Drift	DRFT		0.05 fraction	of	application
Applicatio n	Date	Date	20-10	dd/mm	or	dd/mmm
Interval		1 interval		7 days	Set	to
Interval		2 interval		7 days	Set	to
Record	17:00	FILTRA				
	IPSCND		1			
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC		0.5			
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Fruiting Vegetables (FL Tomato)/Ground Application

stored	as	AvFLtomG.out				
Chemical:	Avrmctn					
PRZM	environment:	FLtomatoC.txt	modified	Satday,		12 October
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w12844.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.0613	0.05815	0.05184	0.03772	0.0273	0.006731
1962	0.07291	0.07037	0.06589	0.05766	0.05537	0.04451
1963	0.1795	0.1208	0.1047	0.09381	0.0885	0.05738
1964	0.3714	0.3588	0.3117	0.25	0.2064	0.1388
1965	0.4427	0.4271	0.37	0.2856	0.2324	0.1552
1966	0.3174	0.3072	0.2749	0.2391	0.2382	0.1884
1967	0.1616	0.158	0.1451	0.1376	0.1351	0.1159
1968	0.1973	0.1894	0.1839	0.1623	0.148	0.108
1969	0.2962	0.2863	0.2581	0.2192	0.1832	0.1308
1970	0.2703	0.2646	0.2372	0.2125	0.2022	0.15
1971	0.6119	0.5778	0.4728	0.3429	0.2544	0.1223
1972	0.557	0.5294	0.44	0.326	0.2585	0.198
1973	0.2422	0.2383	0.2288	0.2119	0.2005	0.1527

1974	0.2718	0.26	0.2314	0.1827	0.1669	0.1209
1975	0.1343	0.1292	0.1124	0.09873	0.09197	0.08263
1976	0.2323	0.2218	0.1878	0.1513	0.1262	0.0947
1977	0.3003	0.288	0.2543	0.2	0.1674	0.1323
1978	0.5462	0.5171	0.4482	0.3436	0.2639	0.1685
1979	0.2826	0.277	0.2547	0.2218	0.2049	0.1718
1980	0.2051	0.1983	0.1762	0.1685	0.1567	0.1251
1981	0.3698	0.3495	0.2844	0.2077	0.1636	0.1037
1982	0.6033	0.5839	0.5219	0.4059	0.3147	0.2135
1983	0.3962	0.3863	0.3575	0.3234	0.3065	0.2193
1984	0.8073	0.7653	0.6326	0.4235	0.3202	0.2037
1985	0.3544	0.3452	0.3143	0.2724	0.2572	0.1882
1986	0.3699	0.3521	0.299	0.2154	0.1755	0.1413
1987	0.4382	0.4207	0.3672	0.285	0.2237	0.1652
1988	0.1984	0.1956	0.1916	0.1751	0.1696	0.1462
1989	0.1416	0.138	0.1228	0.09938	0.09256	0.07881
1990	0.1086	0.1054	0.09806	0.08881	0.08581	0.06984

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.8073	0.7653	0.6326	0.4235	0.3202	0.2193
0.064516	0.6119	0.5839	0.5219	0.4059	0.3147	0.2135
0.096774	0.6033	0.5778	0.4728	0.3436	0.3065	0.2037
0.129032	0.557	0.5294	0.4482	0.3429	0.2639	0.198
0.16129	0.5462	0.5171	0.44	0.326	0.2585	0.1884
0.193548	0.4427	0.4271	0.37	0.3234	0.2572	0.1882
0.225806	0.4382	0.4207	0.3672	0.2856	0.2544	0.1718
0.258065	0.3962	0.3863	0.3575	0.285	0.2382	0.1685
0.290323	0.3714	0.3588	0.3143	0.2724	0.2324	0.1652
0.322581	0.3699	0.3521	0.3117	0.25	0.2237	0.1552
0.354839	0.3698	0.3495	0.299	0.2391	0.2064	0.1527
0.387097	0.3544	0.3452	0.2844	0.2218	0.2049	0.15
0.419355	0.3174	0.3072	0.2749	0.2192	0.2022	0.1462
0.451613	0.3003	0.288	0.2581	0.2154	0.2005	0.1413
0.483871	0.2962	0.2863	0.2547	0.2125	0.1832	0.1388
0.516129	0.2826	0.277	0.2543	0.2119	0.1755	0.1323
0.548387	0.2718	0.2646	0.2372	0.2077	0.1696	0.1308
0.580645	0.2703	0.26	0.2314	0.2	0.1674	0.1251
0.612903	0.2422	0.2383	0.2288	0.1827	0.1669	0.1223
0.645161	0.2323	0.2218	0.1916	0.1751	0.1636	0.1209
0.677419	0.2051	0.1983	0.1878	0.1685	0.1567	0.1159
0.709677	0.1984	0.1956	0.1839	0.1623	0.148	0.108
0.741935	0.1973	0.1894	0.1762	0.1513	0.1351	0.1037
0.774194	0.1795	0.158	0.1451	0.1376	0.1262	0.0947
0.806452	0.1616	0.138	0.1228	0.09938	0.09256	0.08263
0.83871	0.1416	0.1292	0.1124	0.09873	0.09197	0.07881
0.870968	0.1343	0.1208	0.1047	0.09381	0.0885	0.06984
0.903226	0.1086	0.1054	0.09806	0.08881	0.08581	0.05738
0.935484	0.07291	0.07037	0.06589	0.05766	0.05537	0.04451
0.967742	0.0613	0.05815	0.05184	0.03772	0.0273	0.006731

0.1	0.59867	0.57296	0.47034	0.34353	0.30224	0.20313
	Average	of	yearly	averages:	0.133147	
Inputs	generated	by	pe4.pl	-	8-Aug-03	
Data	used	for	this	run:		
Output	File:	AvFLtomG				
Metfile:	w12844.dvf					
PRZM	scenario:	FLtomatoC.txt				
EXAMS	environment	file:	pond298.exv			
Chemical	Name:	Avrmctn				
Descriptio n	Variable	Name	Value	Units	Comment s	
Molecular	weight	mwt	873.11	g/mol		
Henry's	Law	Const.	henry	2.20E-09	atm-m^3/mol	
Vapor	Pressure	vapr	1.50E-09	torr		
Solubility	sol	78	mg/L			
Kd	Kd	50	mg/L			
Koc	Koc	mg/L				
Photolysis	half-life	kdp	0.5	days	Half-life	
Aerobic	Aquatic	Metabolism	kbacw	300	days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs	0	days	Halfife
Aerobic	Soil	Metabolism	asm	150	days	Halfife
Hydrolysis :	pH	7	0	days	Half-life	
Method:	CAM	2	integer	See	PRZM	manual
Incorporati on	Depth:	DEPI	0	cm		
Applicatio n	Rate:	TAPP	0.021	kg/ha		
Applicatio n	Efficiency:	APPEFF	0.99	fraction		
Spray	Drift	DRFT	0.01	fraction	of	application
Applicatio n	Date	Date	20-10	dd/mm	or	dd/mmm
Interval	1	interval	7	days	Set	to
Interval	2	interval	7	days	Set	to
Record	17:00	FILTRA				
	IPSCND	1				
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC	0.5				
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Stone Fruits (GA Peaches)/Ground Application

stored	as	AvrGApch.out				
Chemical:	Avrmctn					
PRZM	environment:	GAPeachesC.txt	modified	Satday,		12 October
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w03813.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.03853	0.03632	0.0293	0.02083	0.01815	0.008706
1962	0.06061	0.05765	0.04809	0.03642	0.03263	0.02368
1963	0.03551	0.03423	0.02971	0.02594	0.02387	0.02038
1964	0.03518	0.03409	0.03046	0.02819	0.02676	0.022
1965	0.1161	0.112	0.1009	0.09373	0.08634	0.04568
1966	0.09308	0.08878	0.07488	0.05797	0.05086	0.04156
1967	0.04862	0.04703	0.04318	0.04107	0.0391	0.03143
1968	0.03417	0.03285	0.02859	0.02531	0.02311	0.01934
1969	0.03599	0.03454	0.02982	0.02496	0.0236	0.0172
1970	0.1126	0.1067	0.0873	0.06835	0.05406	0.02905
1971	0.06731	0.06544	0.0603	0.05429	0.05063	0.0414
1972	0.05022	0.04851	0.04418	0.03715	0.03455	0.03008
1973	0.04308	0.04195	0.03844	0.03423	0.03181	0.0268
1974	0.05211	0.05004	0.04328	0.03634	0.03332	0.02231
1975	0.05078	0.04887	0.04362	0.03858	0.0355	0.02928
1976	0.04467	0.04275	0.03645	0.03058	0.02936	0.02279
1977	0.03249	0.03117	0.02694	0.02387	0.02243	0.01887
1978	0.03925	0.03766	0.03239	0.02737	0.02562	0.02025
1979	0.04565	0.04381	0.03744	0.03024	0.02775	0.02168
1980	0.05041	0.04808	0.04066	0.03195	0.03212	0.02344
1981	0.1299	0.1232	0.1056	0.08379	0.07568	0.04546
1982	0.05326	0.05222	0.04946	0.04764	0.04518	0.03568
1983	0.08131	0.07786	0.06627	0.05608	0.04986	0.03557
1984	0.07811	0.07456	0.06372	0.04997	0.04448	0.03311
1985	0.05518	0.05298	0.04591	0.03788	0.03527	0.02742
1986	0.1149	0.1086	0.08858	0.06499	0.05884	0.03133
1987	0.0553	0.0533	0.0469	0.03947	0.03746	0.03187
1988	0.03937	0.03822	0.03472	0.03243	0.02993	0.02377
1989	0.03479	0.03352	0.03095	0.02652	0.02501	0.02281
1990	0.09487	0.08954	0.0725	0.05285	0.0424	0.02541

Sorted	results					
Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.1299	0.1232	0.1056	0.09373	0.08634	0.04568
0.064516	0.1161	0.112	0.1009	0.08379	0.07568	0.04546
0.096774	0.1149	0.1086	0.08858	0.06835	0.05884	0.04156

0.129032	0.1126	0.1067	0.0873	0.06499	0.05406	0.0414
0.16129	0.09487	0.08954	0.07488	0.05797	0.05086	0.03568
0.193548	0.09308	0.08878	0.0725	0.05608	0.05063	0.03557
0.225806	0.08131	0.07786	0.06627	0.05429	0.04986	0.03311
0.258065	0.07811	0.07456	0.06372	0.05285	0.04518	0.03187
0.290323	0.06731	0.06544	0.0603	0.04997	0.04448	0.03143
0.322581	0.06061	0.05765	0.04946	0.04764	0.0424	0.03133
0.354839	0.0553	0.0533	0.04809	0.04107	0.0391	0.03008
0.387097	0.05518	0.05298	0.0469	0.03947	0.03746	0.02928
0.419355	0.05326	0.05222	0.04591	0.03858	0.0355	0.02905
0.451613	0.05211	0.05004	0.04418	0.03788	0.03527	0.02742
0.483871	0.05078	0.04887	0.04362	0.03715	0.03455	0.0268
0.516129	0.05041	0.04851	0.04328	0.03642	0.03332	0.02541
0.548387	0.05022	0.04808	0.04318	0.03634	0.03263	0.02377
0.580645	0.04862	0.04703	0.04066	0.03423	0.03212	0.02368
0.612903	0.04565	0.04381	0.03844	0.03243	0.03181	0.02344
0.645161	0.04467	0.04275	0.03744	0.03195	0.02993	0.02281
0.677419	0.04308	0.04195	0.03645	0.03058	0.02936	0.02279
0.709677	0.03937	0.03822	0.03472	0.03024	0.02775	0.02231
0.741935	0.03925	0.03766	0.03239	0.02819	0.02676	0.022
0.774194	0.03853	0.03632	0.03095	0.02737	0.02562	0.02168
0.806452	0.03599	0.03454	0.03046	0.02652	0.02501	0.02038
0.83871	0.03551	0.03423	0.02982	0.02594	0.02387	0.02025
0.870968	0.03518	0.03409	0.02971	0.02531	0.0236	0.01934
0.903226	0.03479	0.03352	0.0293	0.02496	0.02311	0.01887
0.935484	0.03417	0.03285	0.02859	0.02387	0.02243	0.0172
0.967742	0.03249	0.03117	0.02694	0.02083	0.01815	0.008706
0.1	0.11467	0.10841	0.088452	0.068014	0.058362	0.041544
	Average	of	yearly	averages:	0.027612	

Inputs	generated	by	pe4.pl	-	8-Aug-03	
Data	used	for	this	run:		
Output	File:	AvrGApch				
Metfile:	w03813.dvf					
PRZM	scenario:	GAPeachesC.txt				
EXAMS	environment	file:	pond298.exv			
Chemical	Name:	Avrmctn				
Descriptio n	Variable	Name	Value	Units	Comment s	
Molecular	weight	mwt	873.11	g/mol		
Henry's	Law	Const.	henry	2.20E-09	atm-m^3/mol	
Vapor	Pressure	vapr	1.50E-09	torr		
Solubility	sol	78	mg/L			
Kd	Kd	50	mg/L			
Koc	Koc	mg/L				
Photolysis	half-life	kdp	0.5	days	Half-life	
Aerobic	Aquatic	Metabolism	kbacw	300	days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs	0	days	Halfife

Aerobic	Soil	Metabolism	asm	150	days	Halfife
Hydrolysis :	pH		7	0 days	Half-life	
Method:	CAM		2 integer	See	PRZM	manual
Incorporati on	Depth:	DEPI		0 cm		
Applicatio n	Rate:	TAPP		0.026 kg/ha		
Applicatio n	Efficiency:	APPEFF		0.99 fraction		
Spray	Drift	DRFT		0.01 fraction	of	application
Applicatio n	Date	Date		1-Jun dd/mm	or	dd/mmm
Interval	1	interval		21 days	Set	to
Record	17:00	FILTRA				
	IPSCND		1			
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC		0.5			
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Basil (OR Mint)/Ground Application

stored	as	AvrORbsl.out				
Chemical:	Avrmctn					
PRZM	environment:	ORmintC.txt	modified	Satday,		12 October
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w24232.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.03511	0.03365	0.02476	0.01723	0.01433	0.007996
1962	0.06773	0.06523	0.05878	0.04703	0.04328	0.02714
1963	0.08192	0.07917	0.07456	0.06314	0.05766	0.04811
1964	0.1083	0.1053	0.07755	0.05835	0.05522	0.04859
1965	0.09318	0.09078	0.08188	0.07665	0.07052	0.05573
1966	0.09339	0.09195	0.08424	0.07183	0.06778	0.05564
1967	0.07577	0.07463	0.06902	0.06335	0.0604	0.05109
1968	0.08257	0.08083	0.07644	0.06896	0.06745	0.05629
1969	0.09161	0.08911	0.08634	0.07936	0.07527	0.06206
1970	0.08983	0.08859	0.08528	0.0814	0.07737	0.06338
1971	0.08697	0.0849	0.08039	0.07251	0.06842	0.06291
1972	0.09395	0.09117	0.08207	0.07161	0.06706	0.05836
1973	0.107	0.1038	0.09705	0.08343	0.0678	0.05377

1974	0.09313	0.09148	0.0849	0.07839	0.07401	0.06153
1975	0.0735	0.07154	0.06645	0.06427	0.06163	0.05356
1976	0.06686	0.06515	0.06053	0.0544	0.05319	0.04334
1977	0.07329	0.07068	0.06333	0.04672	0.03927	0.03049
1978	0.07906	0.07636	0.06815	0.05706	0.05224	0.04395
1979	0.07581	0.0739	0.06887	0.06549	0.06153	0.04709
1980	0.1107	0.1069	0.08674	0.06447	0.05956	0.05277
1981	0.09831	0.09524	0.08966	0.08126	0.07702	0.06331
1982	0.08273	0.08137	0.07791	0.07395	0.07058	0.05797
1983	0.07313	0.07193	0.06775	0.06408	0.06238	0.05508
1984	0.0801	0.07807	0.07156	0.06864	0.05938	0.05086
1985	0.08486	0.08308	0.07392	0.06372	0.05985	0.05002
1986	0.06281	0.06117	0.05659	0.0502	0.04668	0.04184
1987	0.1112	0.107	0.09693	0.06353	0.05355	0.046
1988	0.08978	0.0875	0.08224	0.07331	0.06793	0.05436
1989	0.08926	0.08608	0.07561	0.05709	0.04959	0.0456
1990	0.0745	0.07331	0.06879	0.06623	0.06254	0.05325

Sorted	results					
Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.1112	0.107	0.09705	0.08343	0.07737	0.06338
0.064516	0.1107	0.1069	0.09693	0.0814	0.07702	0.06331
0.096774	0.1083	0.1053	0.08966	0.08126	0.07527	0.06291
0.129032	0.107	0.1038	0.08674	0.07936	0.07401	0.06206
0.16129	0.09831	0.09524	0.08634	0.07839	0.07058	0.06153
0.193548	0.09395	0.09195	0.08528	0.07665	0.07052	0.05836
0.225806	0.09339	0.09148	0.0849	0.07395	0.06842	0.05797
0.258065	0.09318	0.09117	0.08424	0.07331	0.06793	0.05629
0.290323	0.09313	0.09078	0.08224	0.07251	0.0678	0.05573
0.322581	0.09161	0.08911	0.08207	0.07183	0.06778	0.05564
0.354839	0.08983	0.08859	0.08188	0.07161	0.06745	0.05508
0.387097	0.08978	0.0875	0.08039	0.06896	0.06706	0.05436
0.419355	0.08926	0.08608	0.07791	0.06864	0.06254	0.05377
0.451613	0.08697	0.0849	0.07755	0.06623	0.06238	0.05356
0.483871	0.08486	0.08308	0.07644	0.06549	0.06163	0.05325
0.516129	0.08273	0.08137	0.07561	0.06447	0.06153	0.05277
0.548387	0.08257	0.08083	0.07456	0.06427	0.0604	0.05109
0.580645	0.08192	0.07917	0.07392	0.06408	0.05985	0.05086
0.612903	0.0801	0.07807	0.07156	0.06372	0.05956	0.05002
0.645161	0.07906	0.07636	0.06902	0.06353	0.05938	0.04859
0.677419	0.07581	0.07463	0.06887	0.06335	0.05766	0.04811
0.709677	0.07577	0.0739	0.06879	0.06314	0.05522	0.04709
0.741935	0.0745	0.07331	0.06815	0.05835	0.05355	0.046
0.774194	0.0735	0.07193	0.06775	0.05709	0.05319	0.0456
0.806452	0.07329	0.07154	0.06645	0.05706	0.05224	0.04395
0.83871	0.07313	0.07068	0.06333	0.0544	0.04959	0.04334
0.870968	0.06773	0.06523	0.06053	0.0502	0.04668	0.04184
0.903226	0.06686	0.06515	0.05878	0.04703	0.04328	0.03049
0.935484	0.06281	0.06117	0.05659	0.04672	0.03927	0.02714
0.967742	0.03511	0.03365	0.02476	0.01723	0.01433	0.007996

0.1	0.10817	0.10515	0.089368	0.08107	0.075144	0.062825
	Average	of	yearly	averages:	0.05007	
Inputs	generated	by	pe4.pl	-	8-Aug-03	
Data	used	for	this	run:		
Output	File:	AvrORbsl				
Metfile:	w24232.dvf					
PRZM	scenario:	ORmintC.txt				
EXAMS	environment	file:	pond298.exv			
Chemical	Name:	Avrmctn				
Descriptio n	Variable	Name	Value	Units	Comment s	
Molecular	weight	mwt	873.11	g/mol		
Henry's	Law	Const.	henry	2.20E-09	atm-m^3/mol	
Vapor	Pressure	vapr	1.50E-09	torr		
Solubility	sol	78	mg/L			
Kd	Kd	50	mg/L			
Koc	Koc	mg/L				
Photolysis	half-life	kdp	0.5	days	Half-life	
Aerobic	Aquatic	Metabolism	kbacw	300	days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs	0	days	Halfife
Aerobic	Soil	Metabolism	asm	150	days	Halfife
Hydrolysis :	pH	7	0	days	Half-life	
Method:	CAM	2	integer	See	PRZM	manual
Incorporati on	Depth:	DEPI	0	cm		
Applicatio n	Rate:	TAPP	0.021	kg/ha		
Applicatio n	Efficiency:	APPEFF	0.99	fraction		
Spray	Drift	DRFT	0.01	fraction	of	application
Applicatio n	Date	Date	1-May	dd/mm	or	dd/mmm
Interval	1	interval	7	days	Set	to
Interval	2	interval	7	days	Set	to
Record	17:00	FILTRA				
	IPSCND	1				
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC	0.5				
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

PRZM/EXAMS input and output files for use of abamectin as a seed treatment.

Cotton (MS Cotton)/Ground Application

stored	as	avMScotn.out				
Chemical:	abmctn					
PRZM	environment:	MScottonC.txt	modified	Wedday,		22 January
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w03940.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.03994	0.03729	0.02889	0.0194	0.01594	0.006277
1962	0.04312	0.04036	0.0316	0.02178	0.01808	0.008835
1963	0.0439	0.0412	0.03261	0.02267	0.01899	0.009628
1964	0.04422	0.04153	0.03295	0.02292	0.01923	0.009945
1965	0.04443	0.04177	0.03327	0.02327	0.01954	0.01022
1966	0.04463	0.04204	0.03374	0.02369	0.01987	0.01044
1967	0.04458	0.04193	0.03344	0.0234	0.01977	0.01051
1968	0.04477	0.04213	0.03369	0.02359	0.01984	0.01047
1969	0.04467	0.04201	0.03348	0.02333	0.01958	0.01034
1970	0.04457	0.04192	0.03342	0.02339	0.01967	0.01034
1971	0.04456	0.04192	0.03346	0.02343	0.01971	0.01035
1972	0.04448	0.04183	0.03335	0.02336	0.01965	0.01025
1973	0.04459	0.04192	0.0334	0.02341	0.01966	0.0103
1974	0.04444	0.04182	0.03342	0.0234	0.01964	0.01027
1975	0.04464	0.04202	0.03361	0.0236	0.01987	0.01044
1976	0.04458	0.04199	0.03367	0.02362	0.01981	0.01035
1977	0.04446	0.04178	0.03322	0.02295	0.01926	0.01015
1978	0.04449	0.04187	0.03347	0.02329	0.01946	0.01012
1979	0.04454	0.04195	0.0336	0.02346	0.01972	0.01024
1980	0.04454	0.04193	0.03353	0.02328	0.01939	0.01005
1981	0.04429	0.0417	0.03338	0.02331	0.01947	0.01002
1982	0.04446	0.04178	0.03322	0.02323	0.01948	0.01014
1983	0.04449	0.04187	0.03349	0.02367	0.01984	0.01028
1984	0.04448	0.0418	0.03324	0.02311	0.01937	0.01016
1985	0.04444	0.04177	0.03324	0.02319	0.0195	0.01023
1986	0.04441	0.04183	0.03353	0.02344	0.01958	0.01018
1987	0.04449	0.04188	0.03353	0.02352	0.01973	0.01029
1988	0.04435	0.04161	0.03292	0.02285	0.0192	0.01006
1989	0.04452	0.04194	0.03365	0.02385	0.02015	0.01051
1990	0.04476	0.04218	0.03387	0.02361	0.0198	0.01034

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.04477	0.04218	0.03387	0.02385	0.02015	0.01051
0.064516	0.04476	0.04213	0.03374	0.02369	0.01987	0.01051
0.096774	0.04467	0.04204	0.03369	0.02367	0.01987	0.01047
0.129032	0.04464	0.04202	0.03367	0.02362	0.01984	0.01044
0.16129	0.04463	0.04201	0.03365	0.02361	0.01984	0.01044
0.193548	0.04459	0.04199	0.03361	0.0236	0.01981	0.01035
0.225806	0.04458	0.04195	0.0336	0.02359	0.0198	0.01035
0.258065	0.04458	0.04194	0.03353	0.02352	0.01977	0.01034
0.290323	0.04457	0.04193	0.03353	0.02346	0.01973	0.01034
0.322581	0.04456	0.04193	0.03353	0.02344	0.01972	0.01034
0.354839	0.04454	0.04192	0.03349	0.02343	0.01971	0.0103
0.387097	0.04454	0.04192	0.03348	0.02341	0.01967	0.01029
0.419355	0.04452	0.04192	0.03347	0.0234	0.01966	0.01028
0.451613	0.04449	0.04188	0.03346	0.0234	0.01965	0.01027
0.483871	0.04449	0.04187	0.03344	0.02339	0.01964	0.01025
0.516129	0.04449	0.04187	0.03342	0.02336	0.01958	0.01024
0.548387	0.04448	0.04183	0.03342	0.02333	0.01958	0.01023
0.580645	0.04448	0.04183	0.0334	0.02331	0.01954	0.01022
0.612903	0.04446	0.04182	0.03338	0.02329	0.0195	0.01018
0.645161	0.04446	0.0418	0.03335	0.02328	0.01948	0.01016
0.677419	0.04444	0.04178	0.03327	0.02327	0.01947	0.01015
0.709677	0.04444	0.04178	0.03324	0.02323	0.01946	0.01014
0.741935	0.04443	0.04177	0.03324	0.02319	0.01939	0.01012
0.774194	0.04441	0.04177	0.03322	0.02311	0.01937	0.01006
0.806452	0.04435	0.0417	0.03322	0.02295	0.01926	0.01005
0.83871	0.04429	0.04161	0.03295	0.02292	0.01923	0.01002
0.870968	0.04422	0.04153	0.03292	0.02285	0.0192	0.009945
0.903226	0.0439	0.0412	0.03261	0.02267	0.01899	0.009628
0.935484	0.04312	0.04036	0.0316	0.02178	0.01808	0.008835
0.967742	0.03994	0.03729	0.02889	0.0194	0.01594	0.006277
0.1	0.044667	0.042038	0.033688	0.023665	0.019867	0.010467

Average of yearly averages: 0.010058

Inputs generated by pe4.pl - 8-Aug-03

Data used for this run:
Output File: avMScotn
Metfile: w03940.dvf
PRZM scenario: MScottonC.txt
EXAMS environment file: pond298.exv
Chemical Name: abmctn

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	873	g/mol	
Henry's Law Const.	henry	2.20E-10	atm-m^3/mol	
Vapor Pressure	vapr	1.50E-09	torr	
Solubility	sol	78	mg/L	

Kd	Kd		50 mg/L			
Koc	Koc	mg/L				
Photolysis	half-life	kdp		0.5 days	Half-life	
Aerobic	Aquatic	Metabolism	kbacw		230 days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs	days	Halfife	
Aerobic	Soil	Metabolism	asm		115 days	Halfife
Hydrolysis :	pH		7	0 days	Half-life	
Method:	CAM		8 integer	See	PRZM	manual
Incorporation	Depth:	DEPI		2.54 cm		
Application	Rate:	TAPP		0.08 kg/ha		
Application	Efficiency:	APPEFF		0.99 fraction		
Spray	Drift	DRFT		0.01 fraction	of	application
Application	Date	Date	15-5	dd/mm	or	dd/mmm
Record	17:00	FILTRA				
	IPSCND		1			
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC		0.5			
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Cucumber (FL cucumber)/Ground Application

stored	as	avFLcucm.out				
Chemical:	abmctn					
PRZM	environment:	FLcucumberC.txt	modified	Satday,		12 October
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w12842.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.05984	0.0563	0.0343	0.01827	0.01801	0.005097
1962	0.05854	0.05563	0.04714	0.03572	0.03156	0.02502
1963	0.1865	0.178	0.1438	0.1002	0.07947	0.04337
1964	0.1232	0.1188	0.1047	0.09699	0.0914	0.07332
1965	0.0875	0.08371	0.07283	0.06284	0.05681	0.04848
1966	0.08659	0.08257	0.07162	0.05693	0.05013	0.04301
1967	0.1204	0.1141	0.0956	0.07529	0.06659	0.04053
1968	0.1468	0.1388	0.1134	0.09622	0.08288	0.04788
1969	0.1347	0.1293	0.1112	0.08221	0.07862	0.06206

1970	0.1019	0.099	0.09225	0.08506	0.08183	0.05718
1971	0.1524	0.1446	0.1254	0.09662	0.08523	0.05245
1972	0.1201	0.1141	0.09467	0.07944	0.07482	0.05534
1973	0.06998	0.06798	0.06195	0.05898	0.05681	0.04731
1974	0.08374	0.0797	0.06683	0.05218	0.04644	0.04026
1975	0.1575	0.1486	0.1268	0.102	0.08846	0.04615
1976	0.08328	0.07975	0.07103	0.05929	0.0535	0.04668
1977	0.05682	0.05412	0.04579	0.04195	0.03939	0.03098
1978	0.06337	0.0612	0.05375	0.0439	0.04018	0.03319
1979	0.1745	0.1672	0.1395	0.1042	0.09067	0.07033
1980	0.06747	0.06481	0.05988	0.05174	0.05064	0.0461
1981	0.09948	0.09478	0.07959	0.06258	0.05526	0.04358
1982	0.2454	0.2308	0.19	0.1375	0.1178	0.06488
1983	0.09328	0.09141	0.08557	0.08352	0.08015	0.06326
1984	0.1112	0.1052	0.08684	0.06519	0.0576	0.04688
1985	0.1541	0.1473	0.121	0.0898	0.08265	0.04468
1986	0.1023	0.09912	0.08394	0.07127	0.06667	0.05188
1987	0.1447	0.137	0.1222	0.1053	0.09469	0.06411
1988	0.1418	0.1344	0.113	0.08201	0.07146	0.05557
1989	0.0939	0.08931	0.07465	0.06727	0.06351	0.05
1990	0.09386	0.09058	0.07734	0.0642	0.0563	0.04506

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.2454	0.2308	0.19	0.1375	0.1178	0.07332
0.064516	0.1865	0.178	0.1438	0.1053	0.09469	0.07033
0.096774	0.1745	0.1672	0.1395	0.1042	0.0914	0.06488
0.129032	0.1575	0.1486	0.1268	0.102	0.09067	0.06411
0.16129	0.1541	0.1473	0.1254	0.1002	0.08846	0.06326
0.193548	0.1524	0.1446	0.1222	0.09699	0.08523	0.06206
0.225806	0.1468	0.1388	0.121	0.09662	0.08288	0.05718
0.258065	0.1447	0.137	0.1134	0.09622	0.08265	0.05557
0.290323	0.1418	0.1344	0.113	0.0898	0.08183	0.05534
0.322581	0.1347	0.1293	0.1112	0.08506	0.08015	0.05245
0.354839	0.1232	0.1188	0.1047	0.08352	0.07947	0.05188
0.387097	0.1204	0.1141	0.0956	0.08221	0.07862	0.05
0.419355	0.1201	0.1141	0.09467	0.08201	0.07482	0.04848
0.451613	0.1112	0.1052	0.09225	0.07944	0.07146	0.04788
0.483871	0.1023	0.09912	0.08684	0.07529	0.06667	0.04731
0.516129	0.1019	0.099	0.08557	0.07127	0.06659	0.04688
0.548387	0.09948	0.09478	0.08394	0.06727	0.06351	0.04668
0.580645	0.0939	0.09141	0.07959	0.06519	0.0576	0.04615
0.612903	0.09386	0.09058	0.07734	0.0642	0.05681	0.0461
0.645161	0.09328	0.08931	0.07465	0.06284	0.05681	0.04506
0.677419	0.0875	0.08371	0.07283	0.06258	0.0563	0.04468
0.709677	0.08659	0.08257	0.07162	0.05929	0.05526	0.04358
0.741935	0.08374	0.07975	0.07103	0.05898	0.0535	0.04337
0.774194	0.08328	0.0797	0.06683	0.05693	0.05064	0.04301
0.806452	0.06998	0.06798	0.06195	0.05218	0.05013	0.04053
0.83871	0.06747	0.06481	0.05988	0.05174	0.04644	0.04026

0.870968	0.06337	0.0612	0.05375	0.0439	0.04018	0.03319
0.903226	0.05984	0.0563	0.04714	0.04195	0.03939	0.03098
0.935484	0.05854	0.05563	0.04579	0.03572	0.03156	0.02502
0.967742	0.05682	0.05412	0.0343	0.01827	0.01801	0.005097
0.1	0.1728	0.16534	0.13823	0.10398	0.091327	0.064803
	Average of		yearly	averages:	0.048155	

Inputs	generated	by	pe4.pl	-	8-Aug-03	
Data	used	for	this	run:		
Output	File:	avFLcucm				
Metfile:	w12842.dvf					
PRZM	scenario:	FLcucumberC.txt				
EXAMS	environment	file:	pond298.exv			
Chemical	Name:	abmctn				
Description	Variable	Name	Value	Units	Comments	
Molecular	weight	mwt	873	g/mol		
Henry's	Law	Const.	henry	2.20E-10	atm-m^3/mol	
Vapor	Pressure	vapr	1.50E-09	torr		
Solubility	sol		78	mg/L		
Kd	Kd		50	mg/L		
Koc	Koc	mg/L				
Photolysis	half-life	kdp	0.5	days	Half-life	
Aerobic	Aquatic	Metabolism	kbacw	230	days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs	days	Halfife	
Aerobic	Soil	Metabolism	asm	115	days	Halfife
Hydrolysis:	pH		7	0	days	Half-life
Method:	CAM		8	integer	See	PRZM manual
Incorporation	Depth:	DEPI	1.27	cm		
Application	Rate:	TAPP	0.07	kg/ha		
Application	Efficiency:	APPEFF	0.99	fraction		
Spray	Drift	DRFT	0.01	fraction	of	application
Application	Date	Date	25-9	dd/mm	or	dd/mmm
Record	17:00	FILTRA				
	IPSCND		1			
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC		0.5			
Flag	for	Index	Res. calc.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Pepper (FL pepper)/Ground Application

stored	as	avFLppr.out				
Chemical:	abmctn					
PRZM	environment:	FLpeppersC.txt	modified	Satday,		12 October
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w12844.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.3645	0.3452	0.2857	0.233	0.2005	0.06938
1962	1.293	1.22	1.042	0.7636	0.6623	0.2991
1963	2.232	2.146	1.883	1.428	1.232	0.5528
1964	2.67	2.576	2.293	1.991	1.88	0.9942
1965	2.958	2.859	2.445	2.078	1.733	1.029
1966	1.608	1.544	1.46	1.335	1.265	1.022
1967	1.737	1.664	1.406	1.149	1.039	0.6965
1968	2.51	2.407	2.129	1.707	1.481	0.7695
1969	1.719	1.663	1.473	1.391	1.29	0.8347
1970	0.9554	0.9216	0.8634	0.8221	0.8081	0.6453
1971	1.597	1.515	1.266	0.9544	0.8127	0.4791
1972	1.375	1.305	1.08	0.7963	0.6576	0.5126
1973	1.038	1.002	0.9073	0.877	0.796	0.5142
1974	1.471	1.392	1.192	0.9335	0.8351	0.5271
1975	1.679	1.583	1.41	1.072	0.938	0.5313
1976	1.198	1.137	0.9623	0.8523	0.8061	0.5268
1977	2.709	2.593	2.234	1.66	1.434	0.7561
1978	1.625	1.553	1.373	1.103	0.9979	0.7204
1979	2.742	2.588	2.31	1.851	1.613	0.8575
1980	1.433	1.362	1.273	1.094	0.9856	0.7597
1981	1.475	1.407	1.181	1.01	0.9714	0.6003
1982	1.856	1.787	1.572	1.259	1.097	0.7115
1983	1.64	1.553	1.295	1.203	1.097	0.7593
1984	2.157	2.053	1.727	1.26	1.126	0.7329
1985	1.256	1.197	1.106	0.901	0.8009	0.662
1986	1.125	1.078	0.9343	0.7857	0.7179	0.5315
1987	1.672	1.62	1.417	1.341	1.231	0.6727
1988	2.681	2.52	2.008	1.463	1.293	0.7752
1989	0.6811	0.6742	0.6477	0.5976	0.5695	0.48
1990	1.547	1.474	1.348	1.035	0.8844	0.4514

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	2.958	2.859	2.445	2.078	1.88	1.029
0.064516	2.742	2.593	2.31	1.991	1.733	1.022
0.096774	2.709	2.588	2.293	1.851	1.613	0.9942
0.129032	2.681	2.576	2.234	1.707	1.481	0.8575
0.16129	2.67	2.52	2.129	1.66	1.434	0.8347
0.193548	2.51	2.407	2.008	1.463	1.293	0.7752

0.225806	2.232	2.146	1.883	1.428	1.29	0.7695
0.258065	2.157	2.053	1.727	1.391	1.265	0.7597
0.290323	1.856	1.787	1.572	1.341	1.232	0.7593
0.322581	1.737	1.664	1.473	1.335	1.231	0.7561
0.354839	1.719	1.663	1.46	1.26	1.126	0.7329
0.387097	1.679	1.62	1.417	1.259	1.097	0.7204
0.419355	1.672	1.583	1.41	1.203	1.097	0.7115
0.451613	1.64	1.553	1.406	1.149	1.039	0.6965
0.483871	1.625	1.553	1.373	1.103	0.9979	0.6727
0.516129	1.608	1.544	1.348	1.094	0.9856	0.662
0.548387	1.597	1.515	1.295	1.072	0.9714	0.6453
0.580645	1.547	1.474	1.273	1.035	0.938	0.6003
0.612903	1.475	1.407	1.266	1.01	0.8844	0.5528
0.645161	1.471	1.392	1.192	0.9544	0.8351	0.5315
0.677419	1.433	1.362	1.181	0.9335	0.8127	0.5313
0.709677	1.375	1.305	1.106	0.901	0.8081	0.5271
0.741935	1.293	1.22	1.08	0.877	0.8061	0.5268
0.774194	1.256	1.197	1.042	0.8523	0.8009	0.5142
0.806452	1.198	1.137	0.9623	0.8221	0.796	0.5126
0.83871	1.125	1.078	0.9343	0.7963	0.7179	0.48
0.870968	1.038	1.002	0.9073	0.7857	0.6623	0.4791
0.903226	0.9554	0.9216	0.8634	0.7636	0.6576	0.4514
0.935484	0.6811	0.6742	0.6477	0.5976	0.5695	0.2991
0.967742	0.3645	0.3452	0.2857	0.233	0.2005	0.06938
0.1	2.7062	2.5868	2.2871	1.8366	1.5998	0.98053

Average of yearly averages: 0.649136

Inputs generated by pe4.pl - 8-Aug-03

Data used for this run:
Output File: avFLppr
Metfile: w12844.dvf
PRZM scenario: FLpeppersC.txt
EXAMS environment file: pond298.exv
Chemical Name: abmctn

Description	Variable Name		Value	Units	Comments
Molecular weight	mwt		873	g/mol	
Henry's Law Const.	henry		2.20E-10	atm-m^3/mol	
Vapor Pressure	vapr		1.50E-09	torr	
Solubility	sol		78	mg/L	
Kd	Kd		50	mg/L	
Koc	Koc			mg/L	
Photolysis half-life	kdp		0.5	days	Half-life
Aerobic Aquatic Metabolism	kbacw		230	days	Halfife
Anaerobic Aquatic Metabolism	kbacs			days	Halfife
Aerobic Soil Metabolism	asm		115	days	Halfife
Hydrolysis:	pH	7	0	days	Half-life

Method:	CAM		8 integer	See	PRZM	manual
Incorporati on	Depth:	DEPI	1.27 cm			
Applicatio n	Rate:	TAPP	0.43 kg/ha			
Applicatio n	Efficiency:	APPEFF	0.99 fraction			
Spray	Drift	DRFT	0.01 fraction		of	application
Applicatio n	Date	Date	20-8	dd/mm	or	dd/mmm
Record	17:00	FILTRA				
	IPSCND		1			
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC		0.5			
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Tomato (FL tomato)/Ground Application

stored	as	Avtmseed.out				
Chemical:	Avrmctn					
PRZM	environment:	FLtomatoC.txt	modified	Satday,		12 October
EXAMS	environment:	pond298.exv	modified	Thuday,		29 August
Metfile:	w12844.dvf	modified	Wedday,		3 July	2002
Water	segment	concentrations	(ppb)			

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	0.005603	0.005297	0.00449	0.003599	0.003405	0.002475
1962	0.009565	0.009273	0.008669	0.007561	0.007121	0.005318
1963	0.01195	0.01147	0.009695	0.007486	0.00658	0.005369
1964	0.0164	0.01586	0.01399	0.01303	0.01243	0.008996
1965	0.01349	0.01297	0.01139	0.01	0.009329	0.007551
1966	0.02378	0.02265	0.01912	0.01528	0.01385	0.01116
1967	0.01278	0.01238	0.01136	0.01019	0.01005	0.008665
1968	0.02138	0.02044	0.01975	0.01709	0.01537	0.009632
1969	0.01717	0.01649	0.01475	0.01251	0.01183	0.009495
1970	0.02643	0.0257	0.02197	0.01914	0.01733	0.01236
1971	0.01219	0.01178	0.01092	0.009675	0.009185	0.007146
1972	0.02247	0.02134	0.0198	0.01821	0.01677	0.01031
1973	0.01072	0.01044	0.009765	0.009008	0.0087	0.007495
1974	0.02625	0.0249	0.02152	0.01602	0.01439	0.009232
1975	0.008275	0.008015	0.007523	0.007192	0.006709	0.005568
1976	0.01671	0.01593	0.01362	0.01086	0.009787	0.007351
1977	0.021	0.02036	0.01822	0.0162	0.01437	0.009882
1978	0.01618	0.01553	0.01344	0.01122	0.01032	0.008648

1979	0.02485	0.0235	0.0194	0.01577	0.01434	0.009468
1980	0.0182	0.0174	0.01539	0.01434	0.01318	0.009941
1981	0.01105	0.01065	0.009329	0.00828	0.007696	0.006937
1982	0.03368	0.03196	0.0261	0.02312	0.02144	0.01293
1983	0.0286	0.02726	0.02424	0.0217	0.01966	0.0125
1984	0.01925	0.01844	0.01601	0.0142	0.01442	0.01085
1985	0.0127	0.01231	0.01113	0.009727	0.009174	0.007874
1986	0.01308	0.01258	0.0108	0.008776	0.008674	0.00676
1987	0.01107	0.0106	0.009875	0.008987	0.008962	0.006929
1988	0.01764	0.01684	0.01442	0.0132	0.01232	0.008554
1989	0.01307	0.01263	0.01095	0.008439	0.007727	0.005874
1990	0.01152	0.01114	0.01024	0.00913	0.008667	0.005952

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258	0.03368	0.03196	0.0261	0.02312	0.02144	0.01293
0.064516	0.0286	0.02726	0.02424	0.0217	0.01966	0.0125
0.096774	0.02643	0.0257	0.02197	0.01914	0.01733	0.01236
0.129032	0.02625	0.0249	0.02152	0.01821	0.01677	0.01116
0.16129	0.02485	0.0235	0.0198	0.01709	0.01537	0.01085
0.193548	0.02378	0.02265	0.01975	0.0162	0.01442	0.01031
0.225806	0.02247	0.02134	0.0194	0.01602	0.01439	0.009941
0.258065	0.02138	0.02044	0.01912	0.01577	0.01437	0.009882
0.290323	0.021	0.02036	0.01822	0.01528	0.01434	0.009632
0.322581	0.01925	0.01844	0.01601	0.01434	0.01385	0.009495
0.354839	0.0182	0.0174	0.01539	0.0142	0.01318	0.009468
0.387097	0.01764	0.01684	0.01475	0.0132	0.01243	0.009232
0.419355	0.01717	0.01649	0.01442	0.01303	0.01232	0.008996
0.451613	0.01671	0.01593	0.01399	0.01251	0.01183	0.008665
0.483871	0.0164	0.01586	0.01362	0.01122	0.01032	0.008648
0.516129	0.01618	0.01553	0.01344	0.01086	0.01005	0.008554
0.548387	0.01349	0.01297	0.01139	0.01019	0.009787	0.007874
0.580645	0.01308	0.01263	0.01136	0.01	0.009329	0.007551
0.612903	0.01307	0.01258	0.01113	0.009727	0.009185	0.007495
0.645161	0.01278	0.01238	0.01095	0.009675	0.009174	0.007351
0.677419	0.0127	0.01231	0.01092	0.00913	0.008962	0.007146
0.709677	0.01219	0.01178	0.0108	0.009008	0.0087	0.006937
0.741935	0.01195	0.01147	0.01024	0.008987	0.008674	0.006929
0.774194	0.01152	0.01114	0.009875	0.008776	0.008667	0.00676
0.806452	0.01107	0.01065	0.009765	0.008439	0.007727	0.005952
0.83871	0.01105	0.0106	0.009695	0.00828	0.007696	0.005874
0.870968	0.01072	0.01044	0.009329	0.007561	0.007121	0.005568
0.903226	0.009565	0.009273	0.008669	0.007486	0.006709	0.005369
0.935484	0.008275	0.008015	0.007523	0.007192	0.00658	0.005318
0.967742	0.005603	0.005297	0.00449	0.003599	0.003405	0.002475
0.1	0.026412	0.02562	0.021925	0.019047	0.017274	0.01224
	Average	of	yearly	averages:	0.008374	

Inputs generated by pe4.pl - 8-Aug-03

Data	used	for	this	run:		
Output	File:	Avtmseed				
Metfile:	w12844.dvf					
PRZM	scenario:	FLtomatoC.txt				
EXAMS	environment	file:	pond298.exv			
Chemical	Name:	Avrmctn				
Description	Variable	Name	Value	Units	Comments	
Molecular	weight	mwt	873.11	g/mol		
Henry's	Law	Const.	henry	2.20E-09	atm-m^3/mol	
Vapor	Pressure	vapr	1.50E-09	torr		
Solubility	sol	78	mg/L			
Kd	Kd	50	mg/L			
Koc	Koc	mg/L				
Photolysis	half-life	kdp	0.5	days	Half-life	
Aerobic	Aquatic	Metabolism	kbacw	300	days	Halfife
Anaerobic	Aquatic	Metabolism	kbacs	0	days	Halfife
Aerobic	Soil	Metabolism	asm	150	days	Halfife
Hydrolysis:	pH	7	0	days	Half-life	
Method:	CAM	8	integer	See	PRZM	manual
Incorporation	Depth:	DEPI	1.27	cm		
Application	Rate:	TAPP	0.006	kg/ha		
Application	Efficiency:	APPEFF	0.99	fraction		
Spray	Drift	DRFT	0.01	fraction	of	application
Application	Date	Date	1-Oct	dd/mm	or	dd/mmm
Record	17:00	FILTRA				
	IPSCND	1				
	UPTKF					
Record	18:00	PLVKRT				
	PLDKRT					
	FEXTRC	0.5				
Flag	for	Index	Res.	Run	IR	Pond
Flag	for	runoff	calc.	RUNOFF	none	none,

Appendix C

Species Detail by State for Preliminary Assessment

Peaches (142), Plums and prunes (151), Vegetables, mixed (113)

Alabama (14 affected species)

BAT, GRAY	Endangered	Mammal	Critical Habitat
BAT, INDIANA	Endangered	Mammal	Critical Habitat
CAMPELOMA, SLENDER	Endangered	Snail	Critical Habitat
DARTER, BOULDER	Endangered	Fish	Critical Habitat
DARTER, SLACKWATER	Threatened	Fish	Critical Habitat
ELIMIA, LACY	Threatened	Snail	Critical Habitat
RIVERSNAIL, ANTHONY'S	Endangered	Snail	Critical Habitat
ROCKSNAIL, PAINTED	Threatened	Snail	Critical Habitat
ROCKSNAIL, PLICATE	Endangered	Snail	Critical Habitat
SHINER, CAHABA	Endangered	Fish	Critical Habitat
SNAIL, ARMORED	Endangered	Snail	Critical Habitat
SNAIL, TULOTOMA	Endangered	Snail	Critical Habitat
TREEFROG, PINE BARRENS	E/T	Amphibian	Critical Habitat
TURTLE, FLATTENED MUSK	Threatened	Reptile	Critical Habitat

Arkansas (1 affected species)

DARTER, LEOPARD	Threatened	Fish	Critical Habitat

California (46 affected species)

CHUB, MOHAVE TUI	Endangered	Fish	Critical Habitat
FOX, SAN JOAQUIN KIT	Endangered	Mammal	Critical Habitat
FOX, SAN MIGUEL ISLAND	Endangered	Mammal	Critical Habitat
FOX, SANTA CATALINA ISLAND	Endangered	Mammal	Critical Habitat
FOX, SANTA CRUZ ISLAND	Endangered	Mammal	Critical Habitat
FOX, SANTA ROSA ISLAND	Endangered	Mammal	Critical Habitat

Species Detail by State for Preliminary Assessment

Peaches (142), Plums and prunes (151), Vegetables, mixed (113)

FROG, MOUNTAIN YELLOW-LEGGED	Endangered	Amphibian	Critical Habitat
GOBY, TIDEWATER	Endangered	Fish	Critical Habitat
KANGAROO RAT, FRESNO	Endangered	Mammal	Critical Habitat
KANGAROO RAT, GIANT	Endangered	Mammal	Critical Habitat
KANGAROO RAT, TIPTON	Endangered	Mammal	Critical Habitat
LIZARD, BLUNT-NOSED LEOPARD	Endangered	Reptile	Critical Habitat
LIZARD, ISLAND NIGHT	Threatened	Reptile	Critical Habitat
MOUSE, PACIFIC POCKET	Endangered	Mammal	Critical Habitat
MOUSE, SALT MARSH HARVEST	Endangered	Mammal	Critical Habitat
RABBIT, RIPARIAN BRUSH	Endangered	Mammal	Critical Habitat
SALAMANDER, CALIFORNIA TIGER	Endangered	Amphibian	Critical Habitat
SALMON, CHINOOK (CALIFORNIA COASTAL ESU)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (CENTRAL VALLEY SPRING RUN)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (SACRAMENTO RIVER WINTER RUN)	Endangered	Fish	Critical Habitat
SALMON, COHO (CENTRAL CALIFORNIA COAST POP)	Endangered	Fish	Critical Habitat
SALMON, COHO (SOUTHERN OR/NORTHERN CA COAST)	Threatened	Fish	Critical Habitat
SEAL, GUADALUPE FUR	Threatened	Mammal	Critical Habitat
SHREW, BUENA VISTA	Endangered	Mammal	Critical Habitat
SHRIMP, CALIFORNIA FRESHWATER	Endangered	Crustacean	Critical Habitat
SHRIMP, CONSERVANCY FAIRY	Endangered	Crustacean	Critical Habitat
SHRIMP, LONGHORN FAIRY	Endangered	Crustacean	Critical Habitat
SHRIMP, RIVERSIDE FAIRY	Endangered	Crustacean	Critical Habitat
SHRIMP, VERNAL POOL FAIRY	Threatened	Crustacean	Critical Habitat
SHRIMP, VERNAL POOL TADPOLE	Endangered	Crustacean	Critical Habitat
SMELT, DELTA	Threatened	Fish	Critical Habitat
SNAKE, GIANT GARTER	Threatened	Reptile	Critical Habitat

STEELHEAD, CALIFORNIA CENTRAL VALLEY POP	Threatened	Fish	Critical Habitat
STEELHEAD, CENTRAL CALIFORNIA POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, NORTHERN CALIFORNIA POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, SOUTH-CENTRAL CALIFORNIA POP	Threatened	Fish	Critical Habitat
STEELHEAD, SOUTHERN CALIFORNIA POPULATION	Endangered	Fish	Critical Habitat
STICKLEBACK, UNARMORED THREESPINE	Endangered	Fish	Critical Habitat
SUCKER, SANTA ANA	Threatened	Fish	Critical Habitat
TOAD, ARROYO SOUTHWESTERN	Endangered	Amphibian	Critical Habitat
TORTOISE, DESERT	Threatened	Reptile	Critical Habitat
TROUT, LAHONTAN CUTTHROAT	Threatened	Fish	Critical Habitat
TROUT, LITTLE KERN GOLDEN	Threatened	Fish	Critical Habitat
TROUT, PAIUTE CUTTHROAT	Threatened	Fish	Critical Habitat
WHIPSNAKE (=striped racer), ALAMEDA	Threatened	Reptile	Critical Habitat
WOODRAT, RIPARIAN	Endangered	Mammal	Critical Habitat

Colorado

(5 affected species)

CHUB, BONYTAIL	Endangered	Fish	Critical Habitat
CHUB, HUMPBACK	Endangered	Fish	Critical Habitat
FERRET, BLACK-FOOTED	Endangered	Mammal	Critical Habitat
SQUAWFISH, COLORADO	Endangered	Fish	Critical Habitat
SUCKER, RAZORBACK	Endangered	Fish	Critical Habitat

Connecticut

(2 affected species)

STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Delaware

(2 affected species)

SQUIRREL, DELMARVA PENINSULA FOX	Endangered	Mammal	Critical Habitat
WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Florida
(1 affected species)

WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Georgia
(2 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat
SNAKE, EASTERN INDIGO	Threatened	Reptile	Critical Habitat

Idaho
(1 affected species)

TROUT, BULL	Threatened	Fish	Critical Habitat

Illinois
(3 affected species)

AMPHIPOD, ILLINOIS CAVE	Endangered	Crustacean	Critical Habitat
BAT, INDIANA	Endangered	Mammal	Critical Habitat
STURGEON, PALLID	Endangered	Fish	Critical Habitat

Kentucky
(1 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat

Maine
(1 affected species)

WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Maryland
(6 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat
DARTER, MARYLAND	Endangered	Fish	Critical Habitat
SQUIRREL, DELMARVA PENINSULA FOX	Endangered	Mammal	Critical Habitat
STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
TURTLE, BOG (NORTHERN POPULATION)	Threatened	Reptile	Critical Habitat

WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Massachusetts (1 affected species)

WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

New Jersey (4 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat
STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
TURTLE, BOG (NORTHERN POPULATION)	Threatened	Reptile	Critical Habitat
WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

New York (4 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat
STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
TURTLE, BOG (NORTHERN POPULATION)	Threatened	Reptile	Critical Habitat
WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

North Carolina (1 affected species)

WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Ohio (1 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat

Oklahoma (2 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat
SHINER, ARKANSAS RIVER	Threatened	Fish	Critical Habitat

Oregon (18 affected species)

CHUB, OREGON	Endangered	Fish	Critical Habitat
DEER, COLUMBIAN WHITE-TAILED	Endangered	Mammal	Critical Habitat

SALMON, CHINOOK (LOWER COLUMBIA RIVER)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER FALL RUN)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER SPRING/SUMMER)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (UPPER COLUMBIA RIVER SPRING)	Endangered	Fish	Critical Habitat
SALMON, CHINOOK (UPPER WILLAMETTE RIVER)	Threatened	Fish	Critical Habitat
SALMON, CHUM (COLUMBIA RIVER POPULATION)	Threatened	Fish	Critical Habitat
SALMON, COHO (OREGON COAST POPULATION)	Threatened	Fish	Critical Habitat
SALMON, COHO (SOUTHERN OR/NORTHERN CA COAST)	Threatened	Fish	Critical Habitat
SALMON, SOCKEYE (SNAKE RIVER POPULATION)	Endangered	Fish	Critical Habitat
SHRIMP, VERNAL POOL FAIRY	Threatened	Crustacean	Critical Habitat
STEELHEAD, LOWER COLUMBIA RIVER POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, MIDDLE COLUMBIA RIVER POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, SNAKE RIVER BASIN POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, UPPER COLUMBIA RIVER POPULATION	Endangered	Fish	Critical Habitat
STEELHEAD, UPPER WILLAMETTE RIVER POPULATION	Threatened	Fish	Critical Habitat
TROUT, BULL	Threatened	Fish	Critical Habitat

Pennsylvania (2 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat
TURTLE, BOG (NORTHERN POPULATION)	Threatened	Reptile	Critical Habitat

South Carolina (3 affected species)

STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
TREEFROG, PINE BARRENS	E/T	Amphibian	Critical Habitat
WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Tennessee (2 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat
STURGEON, PALLID	Endangered	Fish	Critical Habitat

Texas (3 affected species)

BEAR, LOUISIANA BLACK	Threatened	Mammal	Critical Habitat
SNAKE, CONCHO WATER	Threatened	Reptile	Critical Habitat
TOAD, HOUSTON	Endangered	Amphibian	Critical Habitat

Utah (6 affected species)

CHUB, VIRGIN RIVER	Endangered	Fish	Critical Habitat
PRAIRIE DOG, UTAH	Threatened	Mammal	Critical Habitat
SUCKER, JUNE	Endangered	Fish	Critical Habitat
TORTOISE, DESERT	Threatened	Reptile	Critical Habitat
TROUT, LAHONTAN CUTTHROAT	Threatened	Fish	Critical Habitat
WOUNDFIN	Endangered	Fish	Critical Habitat

Virginia (4 affected species)

BAT, VIRGINIA BIG-EARED	Endangered	Mammal	Critical Habitat
ISOPOD, MADISON CAVE	Threatened	Crustacean	Critical Habitat
LOGPERCH, ROANOKE	Endangered	Fish	Critical Habitat
WHALE, NORTHERN RIGHT	Endangered	Mammal	Critical Habitat

Washington (11 affected species)

BEAR, GRIZZLY	Threatened	Mammal	Critical Habitat
RABBIT, PYGMY	Endangered	Mammal	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER FALL RUN)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER SPRING/SUMMER)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (UPPER COLUMBIA RIVER SPRING)	Endangered	Fish	Critical Habitat

SALMON, SOCKEYE (SNAKE RIVER POPULATION)	Endangered	Fish	Critical Habitat
STEELHEAD, MIDDLE COLUMBIA RIVER POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, SNAKE RIVER BASIN POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, UPPER COLUMBIA RIVER POPULATION	Endangered	Fish	Critical Habitat
TROUT, BULL	Threatened	Fish	Critical Habitat
WOLF, GRAY	Threatened	Mammal	Critical Habitat

West virginia (1 affected species)

BAT, INDIANA	Endangered	Mammal	Critical Habitat

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Alabama

County		Status	County Presence	Acres
Blount				
Clam				
CLUBSHELL, OVATE	*Pleurobema perovatum*	Endangered	known	133
KIDNEYSHELL, TRIANGULAR	*Ptychobranchus greeni*	Endangered	known	133
POCKETBOOK, FINE-LINED	*Lampsilis altilis*	Threatened	known	133
Snail				
ROCKSNAIL, PLICATE	*Leptoxis plicata*	Endangered	known	133
Limestone				
Clam				
PEARLYMUSSEL, CUMBERLAND MONKEYFACE	*Quadrula intermedia*	Endangered	known	111
PEARLYMUSSEL, PINK MUCKET	*Lampsilis abrupta*	Endangered	known	111
PIGTOE, ROUGH	*Pleurobema plenum*	Endangered	possible	111
Snail				
CAMPELOMA, SLENDER	*Campeloma decampi*	Endangered	known	111
RIVERSNAIL, ANTHONY'S	*Athearnia anthonyi*	Endangered	possible	111
SNAIL, ARMORED	*Pyrgulopsis (=Marstonia) pachyta*	Endangered	known	111

California

County		Status	County Presence	Acres
Butte				
Crustacean				
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	444
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	16138
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	444
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	16138
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	16138

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Butte				
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	444
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	444
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	16138
Colusa				
Crustacean				
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	4982
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	4982
Contra Costa				
Crustacean				
SHRIMP, LONGHORN FAIRY	*Branchinecta longiantenna*	Endangered	known	1964
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	1964
Insect				
BUTTERFLY, BAY CHECKERSPOT	*Euphydryas editha bayensis*	Threatened	known	1964
BUTTERFLY, LANGE'S METALMARK	*Apodemia mormo langei*	Endangered	known	1964
El Dorado				
Crustacean				
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	819
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	819
Fresno				
Crustacean				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Fresno				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	251
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	19970
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	4533
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	19970
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	251
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	4533
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	251
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	4533
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	19970
Glenn				
Crustacean				
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	8883
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	8883
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	8883
Kern				
Crustacean				
SHRIMP, LONGHORN FAIRY	*Branchinecta longiantenna*	Endangered	possible	4717
SHRIMP, LONGHORN FAIRY	*Branchinecta longiantenna*	Endangered	possible	8747
Insect				
MOTH, KERN PRIMROSE SPHINX	*Euproserpinus euterpe*	Threatened	known	8747
MOTH, KERN PRIMROSE SPHINX	*Euproserpinus euterpe*	Threatened	known	4717

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Kings				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	2010
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	564
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	564
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	2010
Los Angeles				
Crustacean				
SHRIMP, RIVERSIDE FAIRY	*Streptocephalus woottoni*	Endangered	known	182
Insect				
BUTTERFLY, EL SEGUNDO BLUE	*Euphilotes battoides allyni*	Endangered	known	182
BUTTERFLY, PALOS VERDES BLUE	*Glaucopsyche lygdamus*	Endangered	known	182
Madera				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	2457
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	2141
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	2141
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	2457
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	2457
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	2141
Mendocino				
Insect				
BUTTERFLY, BEHREN'S SILVERSPOT known	722	*Speyeria zerene behrensii* Endangered		
BUTTERFLY, LOTIS BLUE	*Lycaeides argyrognomon lotis*	Endangered	known	722

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Mendocino				
Merced				
Crustacean				
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	1472
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	3451
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	1472
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	3451
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	1472
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	3451
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	3451
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	1472
Monterey				
Crustacean				
SHRIMP, LONGHORN FAIRY	*Branchinecta longiantenna*	Endangered	possible	183
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	183
Insect				
BUTTERFLY, SMITH'S BLUE	*Euphilotes enoptes smithi*	Endangered	known	183
Placer				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	126
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	1002
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	1002
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	126
Insect				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Placer				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	126
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	1002
Riverside				
Crustacean				
SHRIMP, RIVERSIDE FAIRY	*Streptocephalus woottoni*	Endangered	known	250
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	250
Insect				
BUTTERFLY, QUINO CHECKERSPOT	*Euphydryas editha quino (=E. e. wrighti)*	Endangered	possible	250
FLY, DELHI SANDS FLOWER-LOVING	*Rhaphiomidas terminatus abdominalis*	Endangered	known	250
Sacramento				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	254
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	254
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	254
San Benito				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	696
Insect				
FLY, DELHI SANDS FLOWER-LOVING	*Rhaphiomidas terminatus abdominalis*	Endangered	known	696
San Bernardino				
Insect				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
San Bernardino				
FLY, DELHI SANDS FLOWER-LOVING	*Rhaphiomidas terminatus abdominalis*	Endangered	known	553
San Diego				
Crustacean				
SHRIMP, RIVERSIDE FAIRY	*Streptocephalus woottoni*	Endangered	known	687
SHRIMP, SAN DIEGO FAIRY	*Branchinecta sandiegonensis*	Endangered	possible	687
Insect				
SKIPPER, LAGUNA MOUNTAIN	*Pyrgus ruralis lagunae*	Endangered	possible	687
San Joaquin				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	5138
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	143
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	5138
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	143
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	143
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	5138
San Luis Obispo				
Crustacean				
SHRIMP, LONGHORN FAIRY	*Branchinecta longiantenna*	Endangered	known	903
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	903
Snail				
SNAIL, MORRO SHOULDERBAND	*Helminthoglypta walkeriana*	Endangered	known	903
Santa Barbara				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Santa Barbara				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	554
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	138
Santa Clara				
Insect				
BUTTERFLY, BAY CHECKERSPOT	*Euphydryas editha bayensis*	Threatened	known	664
BUTTERFLY, BAY CHECKERSPOT	*Euphydryas editha bayensis*	Threatened	known	106
Santa Cruz				
Insect				
BEETLE, MOUNT HERMON JUNE	*Polyphylla barbata*	Endangered	possible	3659
BEETLE, OHLONE TIGER	*Cicindela ohlone*	Endangered	known	3659
GRASSHOPPER, ZAYANTE BAND-WINGED	*Trimerotropis infantilis*	Endangered	possible	3659
Shasta				
Crustacean				
CRAYFISH, SHASTA	*Pacifastacus fortis*	Endangered	known	130
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	130
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	130
Solano				
Crustacean				
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	129
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	2510
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	2510
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	129
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	129

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Solano				
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	2510
Insect				
BEETLE, DELTA GREEN GROUND	*Elaphrus viridis*	Threatened	known	2510
BEETLE, DELTA GREEN GROUND	*Elaphrus viridis*	Threatened	known	129
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	129
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	2510
Sonoma				
Crustacean				
SHRIMP, CALIFORNIA FRESHWATER	*Syncaris pacifica*	Endangered	known	4153
SHRIMP, CALIFORNIA FRESHWATER	*Syncaris pacifica*	Endangered	known	545
Insect				
BUTTERFLY, BEHREN'S SILVERSPOT	*Speyeria zerene behrensii*	Endangered	known	4153
BUTTERFLY, BEHREN'S SILVERSPOT	*Speyeria zerene behrensii*	Endangered	known	545
BUTTERFLY, MYRTLE'S SILVERSPOT	*Speyeria zerene myrtleae*	Endangered	known	545
BUTTERFLY, MYRTLE'S SILVERSPOT	*Speyeria zerene myrtleae*	Endangered	known	4153
Stanislaus				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	155
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	1560
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	155
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	1560
Insect				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Stanislaus				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	1560
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	155
Sutter				
Crustacean				
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	28510
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	617
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	28510
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	617
Tehama				
Crustacean				
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	11762
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	11762
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	11762
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	11762
Tulare				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	23590
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	1433
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	23590
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	1433
Ventura				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

California

County		Status	County Presence	Acres
Ventura				
Crustacean				
SHRIMP, CONSERVANCY FAIRY	*Branchinecta conservatio*	Endangered	known	400
SHRIMP, RIVERSIDE FAIRY	*Streptocephalus woottoni*	Endangered	known	400
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	400
Yolo				
Crustacean				
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	2966
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	362
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	2966
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	362
Yuba				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	13966
SHRIMP, VERNAL POOL TADPOLE	*Lepidurus packardi*	Endangered	known	13966
Insect				
BEETLE, VALLEY ELDERBERRY LONGHORN	*Desmocerus californicus dimorphus*	Threatened	known	13966

Connecticut

County		Status	County Presence	Acres
Hartford				
Clam				
MUSSEL, DWARF WEDGE	*Alasmidonta heterodon*	Endangered	known	745
Middlesex				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Connecticut

County		Status	County Presence	Acres
Middlesex				
Insect				
BEETLE, PURITAN TIGER	*Cicindela puritana*	Threatened	known	213

Georgia

County		Status	County Presence	Acres
Gilmer				
Clam				
CLUBSHELL, SOUTHERN	*Pleurobema decisum*	Endangered	possible	471
COMBSHELL, UPLAND	*Epioblasma metastriata*	Endangered	known	471
KIDNEYSHELL, TRIANGULAR	*Ptychobranchus greeni*	Endangered	possible	471

Iowa

County		Status	County Presence	Acres
Johnson				
Clam				
POCKETBOOK, FAT	*Potamilus capax*	Endangered	known	111

Illinois

County		Status	County Presence	Acres
Adams				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	possible	100
Lake				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	236
Pike				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Illinois

County		Status	County Presence	Acres
Pike				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	possible	137
POCKETBOOK, FAT	*Potamilus capax*	Endangered	known	137
Rock Island				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	known	169
St. Clair				
Crustacean				
AMPHIPOD, ILLINOIS CAVE	*Gammarus acherondytes*	Endangered	possible	264

Indiana

County		Status	County Presence	Acres
Dearborn				
Clam				
PEARLYMUSSEL, PINK MUCKET	*Lampsilis abrupta*	Endangered	known	178
Knox				
Clam				
FANSHELL	*Cyprogenia stegaria*	Endangered	known	123
MUSSEL, RING PINK (=GOLF STICK PEARLY)	*Obovaria retusa*	Endangered	known	123
PEARLYMUSSEL, TUBERCLED-BLOSSOM	*Epioblasma torulosa torulosa*	Endangered	known	123
PIGTOE, ROUGH	*Pleurobema plenum*	Endangered	known	123
POCKETBOOK, FAT	*Potamilus capax*	Endangered	known	123
La Porte				
Insect				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Indiana

County		Status	County Presence	Acres
La Porte				
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	419

Kansas

County		Status	County Presence	Acres
Doniphan				
Insect				
BEETLE, AMERICAN BURYING	*Nicrophorus americanus*	Endangered	known	105

Kentucky

County		Status	County Presence	Acres
Warren				
Clam				
PEARLYMUSSEL, ORANGE-FOOTED	*Plethobasus cooperianus*	Endangered	possible	107
PEARLYMUSSEL, PINK MUCKET	*Lampsilis abrupta*	Endangered	known	107
PEARLYMUSSEL, PURPLE CAT'S PAW	*Epioblasma obliquata obliquata*	Endangered	known	107
PIGTOE, ROUGH	*Pleurobema plenum*	Endangered	known	107
POCKETBOOK, FAT	*Potamilus capax*	Endangered	possible	107

Massachusetts

County		Status	County Presence	Acres
Hampshire				
Insect				
BEETLE, PURITAN TIGER	*Cicindela puritana*	Threatened	known	369

Maryland

County		Status	County Presence	Acres

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Maryland

County		Status	County Presence	Acres
Cecil				
Insect				
BEETLE, PURITAN TIGER	*Cicindela puritana*	Threatened	possible	389

Michigan

County		Status	County Presence	Acres
Allegan				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	2545
Berrien				
Insect				
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	210
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	8080
Cass				
Insect				
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	1241
Hillsdale				
Clam				
CLUBSHELL	*Pleurobema clava*	Endangered	known	200
Ionia				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	1473
Jackson				
Insect				
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	130

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Michigan

County		Status	County Presence	Acres
Kalamazoo				
Insect				
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	518
Mason				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	1930
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	129
Mecosta				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	143
Monroe				
Clam				
RIFFLESHELL, NORTHERN	*Epioblasma torulosa rangiana*	Endangered	known	284
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	284
Montcalm				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	933
Muskegon				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	3300
Newaygo				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	1943

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Michigan

County		Status	County Presence	Acres
Oceana				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	219
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	4462
Sanilac				
Clam				
RIFFLESHELL, NORTHERN	*Epioblasma torulosa rangiana*	Endangered	known	353
St. Joseph				
Insect				
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	203
Van Buren				
Insect				
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	217
BUTTERFLY, MITCHELL'S SATYR	*Neonympha mitchellii mitchellii*	Endangered	known	7018
Wayne				
Clam				
RIFFLESHELL, NORTHERN	*Epioblasma torulosa rangiana*	Endangered	known	164

Minnesota

County		Status	County Presence	Acres
Dakota				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	possible	181
Goodhue				
Clam				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Minnesota

County		Status	County Presence	Acres
Goodhue				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	possible	119
Houston				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	known	251
Washington				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	known	455

North Carolina

County		Status	County Presence	Acres
Haywood				
Clam				
ELKTOE, APPALACHIAN	*Alasmidonta raveneliana*	Endangered	known	216

New Hampshire

County		Status	County Presence	Acres
Cheshire				
Clam				
MUSSEL, DWARF WEDGE	*Alasmidonta heterodon*	Endangered	known	164
Merrimack				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	342
Sullivan				
Clam				
MUSSEL, DWARF WEDGE	*Alasmidonta heterodon*	Endangered	known	140

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

New Hampshire

County		Status	County Presence	Acres
Sullivan				

New York

County		Status	County Presence	Acres
Orange				
Clam				
MUSSEL, DWARF WEDGE	*Alasmidonta heterodon*	Endangered	known	1905
Saratoga				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	569

Ohio

County		Status	County Presence	Acres
Ashtabula				
Clam				
CLUBSHELL	*Pleurobema clava*	Endangered	known	485
Fairfield				
Clam				
CLUBSHELL	*Pleurobema clava*	Endangered	known	267
Greene				
Clam				
CLUBSHELL	*Pleurobema clava*	Endangered	known	138
Logan				
Insect				
DRAGONFLY, HINES EMERALD	*Somatochlora hineana*	Endangered	known	113

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Ohio

County		Status	County Presence	Acres
Lucas				
Insect				
DRAGONFLY, HINES EMERALD	*Somatochlora hineana*	Endangered	known	251

Oregon

County		Status	County Presence	Acres
Jackson				
Crustacean				
SHRIMP, VERNAL POOL FAIRY	*Branchinecta lynchi*	Threatened	known	360
Lane				
Insect				
BUTTERFLY, FENDER'S BLUE	*Icaricia icarioides fenderi*	Endangered	known	174
BUTTERFLY, OREGON SILVERSPOT	*Speyeria zerene hippolyta*	Threatened	known	174
Polk				
Insect				
BUTTERFLY, FENDER'S BLUE	*Icaricia icarioides fenderi*	Endangered	known	157
BUTTERFLY, FENDER'S BLUE	*Icaricia icarioides fenderi*	Endangered	known	595
Yamhill				
Insect				
BUTTERFLY, FENDER'S BLUE	*Icaricia icarioides fenderi*	Endangered	known	369
BUTTERFLY, FENDER'S BLUE	*Icaricia icarioides fenderi*	Endangered	known	310
BUTTERFLY, OREGON SILVERSPOT	*Speyeria zerene hippolyta*	Threatened	known	369
BUTTERFLY, OREGON SILVERSPOT	*Speyeria zerene hippolyta*	Threatened	known	310

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Pennsylvania

County		Status	County Presence	Acres
Erie				
Clam				
CLUBSHELL	*Pleurobema clava*	Endangered	known	760
RIFFLESHELL, NORTHERN	*Epioblasma torulosa rangiana*	Endangered	known	760
Mercer				
Clam				
CLUBSHELL	*Pleurobema clava*	Endangered	known	199
RIFFLESHELL, NORTHERN	*Epioblasma torulosa rangiana*	Endangered	known	199

Tennessee

County		Status	County Presence	Acres
Maury				
Clam				
PEARLYMUSSEL, BIRDWING	*Conradilla caelata*	Endangered	known	106
PEARLYMUSSEL, CUMBERLAND MONKEYFACE	*Quadrula intermedia*	Endangered	known	106
PEARLYMUSSEL, PALE LILLIPUT	*Toxolasma cylindrellus*	Endangered	known	106
RIFFLESHELL, TAN	*Epioblasma florentina walkeri (=E.*	Endangered	known	106

Virginia

County		Status	County Presence	Acres
Albemarle				
Clam				
SPINYMUSSEL, JAMES RIVER	*Pleurobema collina*	Endangered	known	1102
Amherst				
Clam				
SPINYMUSSEL, JAMES RIVER	*Pleurobema collina*	Endangered	known	344

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Virginia

County		Status	County Presence	Acres
Botetourt				
Clam				
SPINYMUSSEL, JAMES RIVER	*Pleurobema collina*	Endangered	known	471
Fauquier				
Clam				
MUSSEL, DWARF WEDGE	*Alasmidonta heterodon*	Endangered	known	106
Rockingham				
Crustacean				
ISOPOD, MADISON CAVE	*Antrolana lira*	Threatened	known	1400
Warren				
Crustacean				
ISOPOD, MADISON CAVE	*Antrolana lira*	Threatened	known	655

Vermont

County		Status	County Presence	Acres
Windsor				
Clam				
MUSSEL, DWARF WEDGE	*Alasmidonta heterodon*	Endangered	known	287

Wisconsin

County		Status	County Presence	Acres
Crawford				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	known	1123
Dane				
Clam				

Species Listing by State for Crop

Apples (5), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres

Wisconsin

County		Status	County Presence	Acres
Dane				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	known	216
Door				
Insect				
DRAGONFLY, HINES EMERALD	*Somatochlora hineana*	Endangered	known	1073
Dunn				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	193
Eau Claire				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	possible	111
Richland				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	known	358
Sauk				
Insect				
BUTTERFLY, KARNER BLUE	*Lycaeides melissa samuelis*	Endangered	known	213
Trempealeau				
Clam				
PEARLYMUSSEL, HIGGINS' EYE	*Lampsilis higginsii*	Endangered	known	427

Species Detail by State for Preliminary Assessment

Peaches (142), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres.

Alabama			(3 affected species)
DARTER, BOULDER	Endangered	Fish	Critical Habitat
DARTER, SLACKWATER	Threatened	Fish	Critical Habitat
SHINER, CAHABA	Endangered	Fish	Critical Habitat
Arkansas			(1 affected species)
DARTER, LEOPARD	Threatened	Fish	Critical Habitat
California			(18 affected species)
CHUB, MOHAVE TUI	Endangered	Fish	Critical Habitat
GOBY, TIDEWATER	Endangered	Fish	Critical Habitat
SALMON, CHINOOK (CALIFORNIA COASTAL ESU)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (CENTRAL VALLEY SPRING RUN)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (SACRAMENTO RIVER WINTER RUN)	Endangered	Fish	Critical Habitat
SALMON, COHO (CENTRAL CALIFORNIA COAST POP)	Endangered	Fish	Critical Habitat
SALMON, COHO (SOUTHERN OR/NORTHERN CA COAST)	Threatened	Fish	Critical Habitat
SMELT, DELTA	Threatened	Fish	Critical Habitat
STEELHEAD, CALIFORNIA CENTRAL VALLEY POP	Threatened	Fish	Critical Habitat
STEELHEAD, CENTRAL CALIFORNIA POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, NORTHERN CALIFORNIA POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, SOUTH-CENTRAL CALIFORNIA POP	Threatened	Fish	Critical Habitat
STEELHEAD, SOUTHERN CALIFORNIA POPULATION	Endangered	Fish	Critical Habitat
STICKLEBACK, UNARMORED THREESPINE	Endangered	Fish	Critical Habitat
SUCKER, SANTA ANA	Threatened	Fish	Critical Habitat
TROUT, LAHONTAN CUTTHROAT	Threatened	Fish	Critical Habitat
TROUT, LITTLE KERN GOLDEN	Threatened	Fish	Critical Habitat

Species Detail by State for Preliminary Assessment

Peaches (142), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres.

TROUT, PAIUTE CUTTHROAT	Threatened	Fish	Critical Habitat
Colorado			(4 affected species)
CHUB, BONYTAIL	Endangered	Fish	Critical Habitat
CHUB, HUMPBACK	Endangered	Fish	Critical Habitat
SQUAWFISH, COLORADO	Endangered	Fish	Critical Habitat
SUCKER, RAZORBACK	Endangered	Fish	Critical Habitat
Idaho			(1 affected species)
TROUT, BULL	Threatened	Fish	Critical Habitat
Illinois			(1 affected species)
STURGEON, PALLID	Endangered	Fish	Critical Habitat
Maryland			(2 affected species)
DARTER, MARYLAND	Endangered	Fish	Critical Habitat
STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
New Jersey			(1 affected species)
STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
New York			(1 affected species)
STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
Oklahoma			(1 affected species)
SHINER, ARKANSAS RIVER	Threatened	Fish	Critical Habitat
Oregon			(16 affected species)
CHUB, OREGON	Endangered	Fish	Critical Habitat
SALMON, CHINOOK (LOWER COLUMBIA RIVER)	Threatened	Fish	Critical Habitat

SALMON, CHINOOK (SNAKE RIVER FALL RUN)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER SPRING/SUMMER)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (UPPER COLUMBIA RIVER SPRING)	Endangered	Fish	Critical Habitat
SALMON, CHINOOK (UPPER WILLAMETTE RIVER)	Threatened	Fish	Critical Habitat
SALMON, CHUM (COLUMBIA RIVER POPULATION)	Threatened	Fish	Critical Habitat
SALMON, COHO (OREGON COAST POPULATION)	Threatened	Fish	Critical Habitat
SALMON, COHO (SOUTHERN OR/NORTHERN CA COAST)	Threatened	Fish	Critical Habitat
SALMON, SOCKEYE (SNAKE RIVER POPULATION)	Endangered	Fish	Critical Habitat
STEELHEAD, LOWER COLUMBIA RIVER POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, MIDDLE COLUMBIA RIVER POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, SNAKE RIVER BASIN POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, UPPER COLUMBIA RIVER POPULATION	Endangered	Fish	Critical Habitat
STEELHEAD, UPPER WILLAMETTE RIVER POPULATION	Threatened	Fish	Critical Habitat
TROUT, BULL	Threatened	Fish	Critical Habitat
South Carolina			(1 affected species)
STURGEON, SHORTNOSE	Endangered	Fish	Critical Habitat
Tennessee			(1 affected species)
STURGEON, PALLID	Endangered	Fish	Critical Habitat
Virginia			(1 affected species)
LOGPERCH, ROANOKE	Endangered	Fish	Critical Habitat
Washington			(8 affected species)
SALMON, CHINOOK (SNAKE RIVER FALL RUN)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (SNAKE RIVER SPRING/SUMMER)	Threatened	Fish	Critical Habitat
SALMON, CHINOOK (UPPER COLUMBIA RIVER SPRING)	Endangered	Fish	Critical Habitat

Species Detail by State for Preliminary Assessment

Peaches (142), Plums and prunes (151), Vegetables, mixed (113)

Minimum of 100 Acres.

SALMON, SOCKEYE (SNAKE RIVER POPULATION)	Endangered	Fish	Critical Habitat
STEELHEAD, MIDDLE COLUMBIA RIVER POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, SNAKE RIVER BASIN POPULATION	Threatened	Fish	Critical Habitat
STEELHEAD, UPPER COLUMBIA RIVER POPULATION	Endangered	Fish	Critical Habitat
TROUT, BULL	Threatened	Fish	