UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES, AND
TOXIC SUBSTANCES

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MEMORANDUM

July 27, 2005

SUBJECT: **Acetamiprid New Use (Cucurbits, Stone Fruits and Tree Nuts):**
Environmental Fate and Effects Risk Assessment

TO: Akiva Abramovitch, Product Manager
Registration Division

FROM: Brian D. Kiernan, Biologist BDK 7/28/05
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THRU: Elizabeth Behl, Branch Chief
Environmental Fate and Effects Division (7507C) for E Fite 7/28/05

The Environmental Fate and Effects Division (EFED) has completed its ecological risk assessment for the new uses of the insecticide acetamiprid. Risk quotients for aquatic invertebrates, birds and mammals indicate possible risk to these organisms. Additionally, there are exceedances of levels of concern for upland dicotyledonous plants and for endangered plants in wetlands.

United States Environmental Protection Agency

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Date: 7/27/2004

SUBJECT: Ecological Risk Assessment for Proposed Use of Acetamiprid on Cucurbit, Stone Fruit and Tree Nut Crops

TO: Akiva Abramovitch, Product Manager
Registration Division

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Executive Summary

The Environmental Fate and Effects Division (EFED) has reviewed the proposed new use of acetamiprid on stone fruit and cucurbit cops. Acetamiprid has been previously registered on a range of crops and was evaluated by EFED; see the original Section 3 Environmental Fate and Ecological Risk Characterization for details (DP Barcode D270368) on the environmental fate properties and ecological effects of acetamiprid.

Acetamiprid is mobile and is not likely to persist in surface soils; however, it can move to surface water through spray drift and through runoff if it rains soon after application. The primary route of degradation is through aerobic soil metabolism where there are four major degradates (IM-1-2, IM-1-4, IC-0 and IM-1-5).

Acetamiprid is classified as moderately toxic to terrestrial animals on an acute exposure basis. Following chronic exposure, reduced growth occurred in rats and reduced growth effects occurred in birds. While acetamiprid is practically nontoxic to freshwater and estuarine/marine fish, the chemical is very highly toxic to freshwater and estuarine/marine invertebrates on an acute exposure basis. The degradates ranged in toxicity from being slightly to practically nontoxic to both terrestrial and aquatic animals on an acute exposure basis.

At maximum proposed application rates, the proposed new uses of acetamiprid exceed the acute risk LOCs for restricted use and endangered species for sensitive aquatic invertebrates, as well as the chronic LOC for freshwater invertebrates for tree nut and cucurbit uses. However, there are neither acute or chronic exceedances for fish, though indirect effects are possible. Acute dose-based LOCs are exceeded for birds by up to almost 8-fold, although dietary-based acute LOCs are not exceeded. Avian chronic LOCs are exceeded for all proposed uses on at least one forage item. No acute risk LOCs were exceeded for mammals. However, restricted use and endangered species LOCs are exceeded for small- (15g) and intermediate-sized (35g) mammals foraging on short grasses, long grasses, broadleaf plants and small insects and for large (1000g) mammals foraging on short grass. Dietary-based chronic mammalian RQs do not exceed the LOC, but dosed-based chronic RQs exceed the LOC for small- (15g) and intermediate-sized (35g) mammals foraging on short grasses, long grasses, broadleaf plants and small insects and for large (1000g) mammals foraging on short grass. While risk to aquatic plants is likely to be low with RQ values well below LOCs, RQ values for dicotyledonous terrestrial plants exceeds acute risk LOC for spray drift following aerial application. Both monocot and dicot RQs exceed the threatened/endangered LOC for wetland habitats. Although risk quotients for non-target insects are not typically evaluated, acetamiprid is moderately toxic to honey bees and belongs to a class of chemicals that has been associated with causing adverse behavioral effects in bees.

Levels of concern for threatened and endangered (listed) species were exceeded for several types of wildlife, including aquatic invertebrates, birds (and reptiles), mammals, as well as plants. Endangered species LOCs were exceeded for freshwater and estuarine invertebrates, with potential for associated indirect effects on fish. Listed species LOCs were also exceeded for small, medium and large-sized birds foraging on short grass, tall grass or broadleaf plants/small insects for all proposed uses. Small-sized birds foraging on fruits/pods/large insects also exceed the listed species LOC for all proposed uses, as do medium-sized birds for tree nut uses. Small- and medium-sized mammals foraging on short grass, tall grass or broadleaf plants/small insects exceed the LOC for all proposed uses, as do large mammals foraging on short grass. Large mammals foraging on broadleaf plants/small insects also exceed the listed species LOC. The LOC for listed plants was exceeded in wetlands for both monocots and dicots, and for dicot plants exposed to drift alone. Exceedance of LOCs for plants indicate concern for indirect effects on listed animal species reliant on susceptible plant communities, or are solely dependent on a sensitive plant for some portion of their life cycle (obligate relationships). Refinement of this risk assessment will be required to ascertain which listed species could potentially be affected.

Conclusion

The proposed new uses of acetamiprid indicate potential risk to aquatic invertebrates, and therefore possible indirect effects to fish, although there is no indication of direct risk to fish. There are LOC exceedances for acute and chronic risk to birds and mammals, depending on size class and foraging strategy, although the true extent of the risk remains unclear. Some plants are sensitive to acetamiprid application, particularly lettuce, although endangered wetland plants appear to be at potential risk. It is not clear what potential effects may occur in reptiles or amphibians, although there are indications of risk to their surrogates, birds and mammals.

Uncertainties

Levels of concern for endangered small mammal species are exceeded, but are based on a default foliar dissipation half-life of 35 days. Foliar dissipation data on acetamiprid could reduce uncertainty regarding these exceedances as the default value may not be representative of acetamiprid.

Although the major degradates are not particularly toxic to terrestrial or aquatic animals, toxicity is evaluated on animals that were least sensitive (i.e. daphnid) to the parent compound. EFED is uncertain regarding the sensitivity of aquatic invertebrates to all of the major degradates, given that the parent compound is very highly toxic many aquatic invertebrates. However, recently submitted data indicate that one degradate, IM-1-5, is no more than slightly toxic to most organisms tested.

Additionally, as a class of pesticides, the neonicotinic compounds have been associated with behavioral effects in bees. While the registrant provided studies intended to address whether bee behavior is impacted by acetamiprid, the study design was not appropriate to address this issue; therefore, there are insufficient data to determine whether acetamiprid exposure results in behavioral effects in bees.

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Problem Formulation

The purpose of this screening-level ecological assessment is to evaluate the risk to non-target organisms from the proposed new uses of acetamiprid as an aerial or ground spray on cucurbit, stone fruit and tree nut crop. Acetamiprid has previously been evaluated for flowers and ornamentals, leafy vegetables, cole crops, fruiting vegetables, citrus, pome fruits, grapes and seeds (DP Barcode D270368) and subsequently assessed for tobacco and potatoes (DP Barcode D302025). The original risk assessment characterized acetamiprid as a mobile, generally nonpersistent compound where low application rates and a relatively rapid biotic degradation rate combined to yield estimated environmental concentrations (EECs) well below toxic levels. Thus, it concluded that the initial uses evaluated would pose low risk of acute and chronic effects to nontarget animals and plants. However, the current assessment includes data from subsequently submitted studies which lead to somewhat different conclusions.

This assessment focuses on the parent compound, but also addresses one of the degradates. The original assessment identified four major degradates (IM-1-2, IM-1-4, IC-0 and IM-1-5) formed through biotic degradation and found the degradates ranged from being slightly to practically nontoxic to aquatic (freshwater fish and invertebrates) and terrestrial animals (rat) on an acute exposure basis. However, the degradates were only evaluated for the least sensitive aquatic invertebrate (water flea). Toxicity testing of the parent compound revealed that it is very highly toxic to some aquatic invertebrates. New studies evaluating the toxicity of IM-1-5 have been submitted and preliminarily reviewed; however, the toxicity of the other degradates to aquatic invertebrates that are sensitive to the parent compound remains uncertain.

Several of the ecological effects data requirements identified in the initial assessment have subsequently been submitted by the registrant (Aventis Crop Science) and reviewed. The results of the studies are included in this current assessment and the potential impact of the newly proposed uses of acetamiprid on biological receptors is discussed relative to both the old and new data. Additionally, the initial assessment characterized acetamiprid as nonpersistent; however, it is important to emphasize that while the chemical is subject to relatively rapid biodegradation (aerobic soil metabolism $t_{½}$ = 0.3 to 8.2 days) in soils, acetamiprid is moderately persistent in water (aerobic aquatic metabolism $t_{½}$ = 45 days; anaerobic aquatic metabolism $t_{½}$ = 365 days). Acetamiprid could readily move to adjacent surface waters through spray drift, especially with aerial applications, or, because acetamiprid does not readily sorb to sediments (K_d = 0.39 to 4.1 mL g^{-1}), through runoff if applications are followed by an appreciable rain event.

Analysis Plan

The maximum label application rates for each proposed use were selected for modeling environmental concentrations for this screening-level deterministic (risk-quotient based) assessment. The most sensitive toxicity endpoints from surrogate test species are used to estimate treatment-related effects on growth, and survival assessment endpoints. EECs used in terrestrial and aquatic ecological risk assessments are based solely on acetamiprid parent compound.

A risk quotient-based approach is used in this assessment, comparing the ratio of exposure concentrations to effects endpoints with predetermined levels of concern (LOCs). The use, laboratory environmental fate, and laboratory ecological effects data which provide the basis for these risk quotients are characterized in the assessment. Although risk is often defined as the likelihood and magnitude of adverse ecological effects, the risk quotient-based approach does not provide a quantitative estimate of likelihood and/or magnitude of an adverse effect.

Conceptual Model

The conceptual model for depicting risks of acetamiprid (stressor) is based primarily on the information presented in the original assessment and is presented graphically in **Figure 1**. The model assumes that the most likely source of acetamiprid to aquatic environments is through spray drift and runoff from sites where insecticide has been recently applied. The potential adverse effects as a result of this exposure would be to: A) aquatic animals (receptors) through increased mortality response following exposure and/or diminished reproduction and growth responses and B) terrestrial animals foraging on contaminated food sources. Additionally, the uncertainty of the potential effects of acetamiprid on receptor beneficial insects (*i.e.* bees) is considered. Other neonicotinic insecticides have been implicated in impairing bee behavior; however, there are insufficient data at this point to determine whether or not acetamiprid exposure also results in this adverse response in bees.

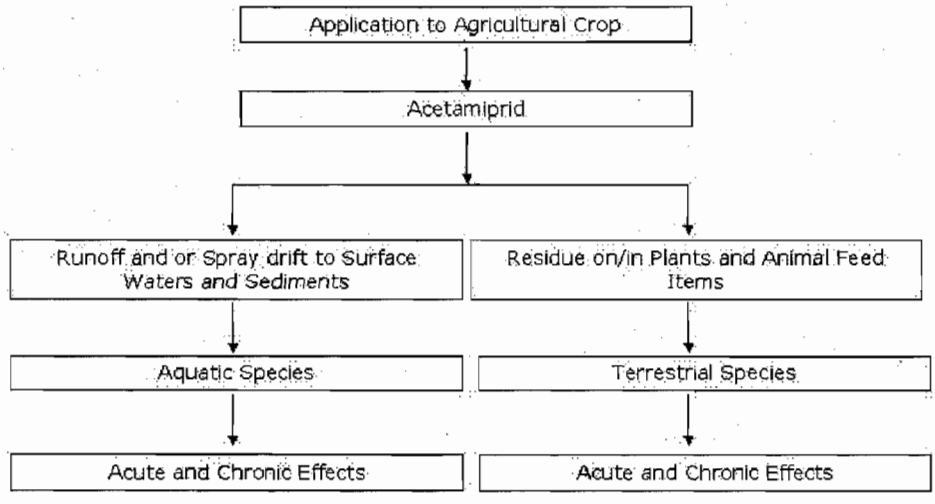

Figure 1. Conceptual Model for a Screening Level Assessment of Acetamiprid on Agricultural Crops

Introduction

Chemical family: Chloronicotinyl.

Mode of Action

As discussed in the original March, 2002 acetamiprid risk assessment (DP Barcode 270368), acetamiprid acts as an agonist of the nicotinic acetylcholine receptor (nACHR) of the postsynaptic membrane of nerve cells. The active ingredient interrupts the function of the insect nervous system. Biochemical radio-ligand binding studies show that acetamiprid interacts with high affinity at the nACHR binding site in insects, and with low infinity at the nACHR in vertebrates.

Use Characterization

The current label for agricultural uses of acetamiprid, EPA Reg. No. 8033-23 (Reg. 8033-23), includes cotton, leafy vegetable, cole crop, fruiting vegetable other than cucurbit, citrus, pome fruit, grape, tuberous and corm vegetable, and tobacco uses. The proposed label adds the following three uses: stone fruit at a maximum application rate of 0.15 lb a.i./A, no more than 4 times per season with a minimum 10-day spray interval, yielding a seasonal maximum application rate of 0.60 lb a.i./A; tree nut at a maximum application rate of 0.18 lb a.i./A, no more than 4 times per season with a minimum 7-day spray interval, yielding a seasonal maximum application rate of 0.72 lb a.i./A; and cucurbit at a maximum application rate of 0.10 lb a.i./A, no more than 5 times per season with a minimum 5-day spray interval, yielding a seasonal maximum application rate of 0.50 lb a.i./A. Multiple cucurbit seasons occur within one year. However, it is possible that cucurbit crops would be planted on the same field more than twice within one year.

Method(s) of Application: Aerial and ground spray equipment.

Environmental Fate Characterization

Acetamiprid is a moderately to highly mobile compound that degrades quickly in aerobic soil, but is moderately persistent to persistent in aquatic environments. It is stable to hydrolysis at environmental temperatures, and photodegrades relatively slowly in water. The primary degradation pathway for the compound is aerobic soil metabolism, which results in rapid biodegradation in soil. It is metabolized moderately rapidly in aerobic aquatic systems, but is only slowly metabolized in anaerobic aquatic systems. Acetamiprid is not expected to bind strongly to most soils or to aquatic sediments. Two major degradates, IM-1-4 and IC-0, were formed in most of the aerobic soil systems studied. An additional major degradate (IM-1-5) was observed only in aerobic soil systems that approached or exceeded pH 8. General properties of acetamiprid are presented in **Table 1**.

Table 1. General properties of acetamiprid.

Parameter	Value	Source
Chemical name	N^1-[(6-chloro-3-pyridyl)methyl]-N^2-cyano-N^1-methylacetamidine	MRID 44651803
Molecular Weight	222.68 g/mol	MRID 44651803
Solubility	4250 mg/L	MRID 44651811
Vapor Pressure	$<1 \times 10^{-8}$ mmHg ($<1 \times 10^{-6}$ Pa; 25°C)	MRID 44651812
Hydrolysis half life (pH 5)	stable (22°C)	MRID 44651876
Hydrolysis half life (pH 7)	stable (22°C)	MRID 44651876
Hydrolysis half life (pH 9)	stable at 22°C; half-lives of 50.8 days at 35°C and 12.8 days at 45°C	MRID 44651876
Aqueous photolysis half life	34 days (25°C)	MRID 44988509
Aerobic soil metabolism half life	0.90-5.94 days (20 or 25°C)	MRIDs 44651879, 44651881, 44699101
Aerobic aquatic metabolism half life	45 days in loamy sand sediment (25°C)	MRID 44988513
Anaerobic aquatic metabolism half life	365 days in loamy sand sediment (25°C)	MRID 44988512
Soil-water distribution coefficient (K_d)	0.39–4.1 mL/g[1]	MRID 44651883
Organic carbon partitioning coefficient (K_{oc})	157–298 mL/g[1]	MRID 44651883
Octanol-water partition coefficient (K_{ow})	6.27 (25°C)	MRID 44651814

1: Range of the average simple K_ds or K_{oc}s for four soils and one sediment.

The original acetamiprid risk assessment offers detailed information on studies submitted to the environmental fate database for use in that assessment. Studies submitted afterward focus on degradates of acetamiprid, such as IM-1-5. They are summarized in **Appendix II**, followed by a listing of maximum degradate amounts observed in acetamiprid degradation studies (**Table B**). Two recently submitted studies that focus on IM-1-5 formation (MRID 46255603, 46255604) support the hypothesis that it is a major degradate of aerobic soil metabolism studies of soils that approach or exceed pH 8, such as calcareous soils. However, two supplemental aerobic soil metabolism studies (MRID 44651880, 44699101) using soils of pH 7.6 did not detect IM-1-5. It is unknown whether or not IM-1-5 was an analyte in these studies. Major degradates IM-1-4 and IC-0 were formed in most of the degradation systems studied.

Previous acetamiprid risk assessments used aerobic soil metabolism data from four studies to produce a range of six half-life values from 0.3 to 5.9 days. One of the four studies (MRID 44651880) was conducted for 7 days to examine the reaction kinetics of degradate IM-1-2, resulting in a parent half-life value of 0.3 days. This value was not used in this assessment because the study was not conducted using Good Laboratory Practice (GLP) standards, and the study soil is identical to that of another study used (MRID 44699101). Therefore, this assessment uses aerobic soil metabolism half-lives from five soils in three studies that range from 0.90 to 5.94 days.

Environmental Exposure Characterization

Aquatic Exposure

The Tier II screening simulation models Pesticide Root Zone Model (PRZM v3.12, May 24, 2001) and Exposure Analysis Modeling System (EXAMS v2.98.04, Aug. 18, 2002) were coupled with the input shell pe4v01.pl (Aug.8, 2003) to generate estimated environmental concentrations (EECs) of acetamiprid that may occur in surface water from use on adjacent crops at maximum use rates (**Table 2**). The PRZM model simulates pesticide movement and transformation from crop application through soil residue processes. The EXAMS model simulates pesticide loading into an adjacent pond from runoff and spray drift. The coupled PRZM/EXAMS model assumes a standard pond scenario in which a 10-hectare field drains into an adjacent 1-hectare pond of 2-meter depth. For additional information on PRZM and EXAMS, see http://www.epa.gov/oppefed1/models/water/.

Table 2. Tier II surface water estimated exposure concentrations (EECs) of acetamiprid from cucurbit, stone fruit, and tree nut uses.

Use Group	Modeled Scenario	Acute (µg/L)	1-in-10-year 21-day average (µg/L)	1-in-10-year 60-day average (µg/L)
Cucurbit	FL cucumber	6.64	6.43	5.85
Stone fruit	MI cherry	5.21	5.00	4.72
	GA peach	3.74	3.52	3.26
	CA fruit	2.60	2.44	2.25
Tree nut	GA pecan	9.39	8.72	8.28
	OR filbert	5.02	4.86	4.63
	CA almond	4.57	4.34	4.05

The seven scenarios listed are those currently approved for Tier II modeling that represent the three proposed new uses for acetamiprid: cucurbit, stone fruit, and tree nut. The Florida cucumber scenario was used to model cucurbit uses. Georgia peach, California fruit (representing non-citrus fruit in California, such as stone fruit, pome fruit, and kiwi), and Michigan cherry scenarios were used to model stone fruit uses. California almond, Oregon filbert, and Georgia pecan scenarios were used to model tree nut uses. Florida cucumber, Michigan cherry, and Georgia pecan EECs were the highest per use group and are therefore used to represent cucurbit, stone fruit, and tree nut uses, respectively, in the risk estimation (**Table 3**).

Table 3. Surface water estimated exposure concentrations (EECs) per use group for use in risk estimation.

Use Group	Acute (µg/L)	1-in-10-year 21-day average (µg/L)	1-in-10-year 60-day average (µg/L)
Cucurbit	6.64	6.43	5.85
Stone fruit	5.21	5.00	4.72
Tree nut	9.39	8.72	8.28

Application methods, rates, and timing were obtained from the proposed label for new crop uses (Reg. 8033-23). Chemical property input values were chosen in observance of current input parameter guidance (EPA, 2002). Model input parameters are listed below in **Table 4** and again in **Table A, Appendix I**. Actual PRZM/EXAMS output/input files for each modeled scenario are included in **Appendix I**.

Table 4. PRZM/EXAMS input parameter values for ecological exposure assessment of acetamiprid.

Parameter	Value	Justification	Source
Application Rate in lb a.i./ac (kg a.i./ha)	Cucurbit: 0.10 (0.112) Stone fruit: 0.15 (0.168) Nut tree: 0.18 (0.202)	Label directions. (1 kg a.i./ha = 1 lb a.i./A x 0.89218)	Reg. 8033-23
Number of Applications	Cucurbit: 10 Stone fruit: 4 Nut tree: 4	Label directions.	Reg. 8033-23
Intervals Between Applications (days)	Cucurbit: 5, 5, 5, 5, 165, 5, 5, 5, 5 Stone fruit: 10, 10, 10 Nut tree: 7, 7, 7 (with exception of OR filbert: 45, 7, 7)	Minimum application intervals from the label were used with the exception of a dormant application to OR filbert.	Reg. 8033-23
Date of First Application	Fl cucumbers: Mar. 15 GA peach: May 15 CA fruit: Apr. 1 MI cherry: May 20 CA almond: Apr. 1 OR filbert: Feb. 15 GA pecan: Jul. 1	Application dates are specific to factors from all three sources.	USDA agricultural crop profiles information[1], Reg. 8033-23 label directions, and scenario parameters
Application Type; CAM input	Cucurbit: aerial spray; CAM = 2 Stone fruit: aerial spray; CAM = 2 Nut tree: aerial spray; CAM = 2	Label directions.	Reg. 8033-23
IPSCND input	Cucurbit: 1 Stone fruit: 3 Nut tree: 3	Foliar residue reverts to soil after cucurbit harvest; remains on stone fruit and nut tree foliage.	USDA agricultural crop profiles information[1]

Parameter	Value	Justification	Source
Organic Carbon Partition Coefficient (K_{oc})	227	Represents the mean K_{oc} of five soils.	MRID 44651883
Aerobic Soil Metabolism Half-life (days)	4.28	Represents the 90th percentile of the upper confidence bound on the mean non-linearly regressed half-life for five soils.	MRID 44651879, 44651881, 44699101
Spray Drift Fraction	0.05	Aerial spray drift fraction is higher than that of ground spray.	Input parameter guidance[2]
Application Efficiency	0.95	Default value for aerial spray.	Input parameter guidance[2]
Molecular Weight (g/mol)	222.68	Product chemistry data.	MRID 44651803
Vapor Pressure (Torr)	1×10^{-8}	Product chemistry data.	MRID 44651812
Solubility in Water at 25°C (ppm)	42500	Set at 10X solubility limit of 4250 ppm based on input parameter guidance.	MRID 44651811
Aerobic Aquatic Metabolism Half-life (days)	135	Input value is 3x the estimated half-life of 45 days to account for the uncertainty associated with a single value.	MRID 44988513
Anaerobic Aquatic Metabolism Half-life (days)	1095	Input value is 3x the estimated half-life of 365 days to account for the uncertainty associated with a single value.	MRID 44988512
Hydrolysis Half-life at pH 5, 7, 9 (22°C) (days)	Stable	Represents study values.	MRID 44651876
Aquatic Photolysis Half-life @ pH 7 (days)	34	Represents the single available half-life.	MRID 44988509

1. USDA Crop Profiles information is located at: http://pestdata.ncsu.edu/cropprofiles/.
2. EFED input parameter guidance is located at: http://www.epa.gov/oppefed1/models/water/input_guidance2_28_02.htm/.

The maximum application rate for each use group was obtained from the proposed label (Reg. 8033-23). The maximum number of applications and minimum number of days between applications per season and use group, as directed on the proposed label, were modeled, with exception of the Oregon filbert scenario. The proposed label recommends a delayed dormant application prior to bud break. The Oregon filbert scenario meteorological profile makes the use of such an early application more protective than the exclusive use of in-season applications, most likely due to increased precipitation in winter months, which leads to increased runoff of residue and higher modeled EECs. Therefore, an early initial application date was chosen for the Oregon filbert scenario, followed by a 45-day application interval that places the remaining applications, separated by the minimum interval, in-season. The Florida cucumber scenario was modeled with 5-day minimum application intervals and one 165-day interval to separate two modeled growing seasons.

Stone fruit and tree nut uses have one growing season per year. Therefore, the proposed maximum number of applications per season for these uses was modeled as the maximum number of applications per year. In contrast, cucurbit crops may have multiple growing seasons per year. The USDA crop profile for cucumbers in Florida (USDA, 2003) reports that field grown cucumbers are planted near late winter and late summer in northern and central Florida and anytime from September to April in southern Florida. The crop profile also reports that cucumbers are most commonly grown in a double-cropping system, following a solanaceous or other crop. It is unlikely that cucumbers would be grown for more than two seasons per year on the same field due to crop rotation practices and increasing pathogen pressure from single crop repetition. Therefore, the maximum number of applications per year on cucurbit modeled for this assessment is twice the proposed maximum number of applications per season.

Application dates were chosen based on reported planting and harvest dates found in USDA agricultural crop profiles at www.pestdata.ncsu.edu/cropprofiles/, label directions, and the emergence, maturity, and harvest dates used in the standard scenarios. The initial application date (Mar. 15th) for Florida cucumber use was chosen to simulate the first of five applications in a springtime growing season. A 165-day application interval separates those applications from five applications in late fall that are timed so that the final application date and crop maturity coincide. The USDA crop profile for cucumbers in Florida (USDA, 2003) indicates that whitefly populations peak near harvest time. Therefore, applications are likely to occur close to crop maturity in response to whitefly pressure, which is reflected by modeled application dates.

The initial application date for California almond and fruit (April 1st) simulates a likely period of application in response to pests that begin activity around March, such as peach tree borer and oriental fruit moth, and in prevention of pests that become active later, such as San Jose scale (Mosz, 2002; USDA 1999, 1999a). Oregon filbert was modeled with an early initial application date (Feb. 15th) followed by three applications commencing on the 1st of April in order to simulate an early application prior to bud break followed by in-season applications as recommended on the draft label (Reg. 8033-23).

The initial application date for Michigan cherry (May 20th) is timed to control plum curculio and cherry fruit flies, the latter of which transform to adults in late May, requiring treatment before the females mature (USDA, 2003a). The Georgia peach initial application (May 15th) coincides with scenario maturation and addresses control when pest pressures may be high and greater runoff into the standard pond is likely (USDA, 2004). The Georgia pecan initial application (Jul. 1st) is the date of heightened response to aphid pressures, as reported in the USDA crop profile for pecans in Georgia (USDA, 2001).

All use groups were modeled with aerial spray application of 95% efficiency and 5% spray drift, following the proposed label (Reg. 8033-23) and input parameter guidance. Aerial spray application was chosen over ground spray in order to maximize the effect of spray drift. IPSCND values were chosen to reflect that cucurbit crop foliage and foliar residues revert to soil after harvest versus stone fruit and tree nut orchards, which retain foliar residues above the soil while

their foliage is intact. Chemical property input values were chosen according to input parameter guidance.

Terrestrial Exposure Assessment

Animals

Terrestrial animal exposure was evaluated using EECs generated from a spreadsheet-based model (TREX v.1.1) that calculates the decay of a chemical applied to foliar surfaces for single or multiple applications. The terrestrial animal exposure assessment is based on the methods of Hoerger and Kenaga (1972) as modified by Fletcher *et al.* (1994). 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 predicted maximum residues of acetamiprid 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**. Further explanation of the model is presented in **Appendix III**.

Table 5. Estimated environmental concentrations (EECs) on avian and mammalian forage items following label-specified applications of acetamiprid determined using the TREX model.

Crop	Application Rate lb ai/A (# app / interval, days)	Food Items	EEC (ppm)[a]
Tree nuts	0.18 (4 / 7)	Short grass	142.05
		Tall grass	65.11
		Broadleaf plants/small insects	79.90
		Fruits, pods, seeds, and large insects	8.88
Stone fruits	0.15 (4 / 10)	Short grass	109.63
		Tall grass	50.25
		Broadleaf plants/small insects	61.67
		Fruits, pods, seeds, and large insects	6.85
Cucurbits	0.10 (4 / 5)	Short grass	99.41
		Tall grass	45.56
		Broadleaf plants/small insects	55.92
		Fruits, pods, seeds, and large insects	6.21

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

Plants

Estimated exposure to upland and wetland plants is estimated using the TerrPlant (v1.0) screening model. TerrPlant estimates potential exposure from a single application using default

assumptions for runoff and spray drift. Estimated environmental concentrations are presented in **Table 6.** TerrPlant model details are included in **Appendix IV**.

Table 6. Expected environmental concentrations on plants following label-specified applications of acetamiprid determined using the TerrPlant model.

Crop (Maximum Single Application Rate)	Application Method	Adjacent Upland Loading[a]	Adjacent Wetland Loading	Drift Only
Tree nuts 0.18 lbs ai/A	Ground Spray	0.0108	0.0918	0.0018
	Aerial Spray	0.0141	0.0630	0.0090
Stone Fruits 0.15 lbs ai/A	Ground Spray	0.0090	0.0765	0.0015
	Aerial Spray	0.0120	0.0525	0.0075
Cucurbits 0.10 lbs ai/A	Ground Spray	0.0060	0.0510	0.0010
	Aerial Spray	0.0080	0.0350	0.0050

[a] Loading is runoff plus drift (lbs ai/A)

Ecological Effects Characterization

Aquatic Effects

Freshwater and Estuarine/Marine Fish

The original Section 3 states that acetamiprid is practically nontoxic to fish on an acute basis ($LC_{50} \geq$ 100 mg ai/L). Chronic exposure to acetamiprid reduced fish growth in a laboratory study at 38.4 mg ai/L, with an NOEL established at 19.2 mg ai/L. No new studies have been submitted.

Freshwater Invertebrates

The original assessment found that acetamiprid is slightly toxic on an acute basis to the water flea (*Daphnia magna*; LC_{50}=49.8 mg ai/L). Additional acute studies found that acetamiprid is very highly toxic to the amphipod *Gammarus fasciatus* (LC_{50}=0.08 mg ai/L; MRID 459325-01) and a midge (*Chironomus riparius*; LC_{50}=0.02 mg ai/L; MRID 459162-01). With chronic exposure, acetamiprid reduces reproduction and growth of the freshwater water flea at 9 mg ai/L, with an NOEL established at 5 mg ai/L. The gammarid NOEL is 0.018 mg ai/L, and the chironomid NOEL is 0.006 mg ai/L. These data indicate a wide range in both acute and chronic sensitivities among freshwater invertebrates which are not limited to insects.

Estuarine/Marine Invertebrates

Acetamiprid is very highly toxic to the mysid on an acute exposure basis (LC_{50}=0.066 mg ai/L). In a chronic study, mysid male body weight is reduced at 0.0047 mg ai/L, with an NOEL at 0.0025 mg ai/L. Acetamiprid is slightly toxic to estuarine/marine mollusks (*Crassostrea virginica* EC_{50}=40.7 mg ai/L) on an acute exposure basis, but there are no chronic toxicity data available for estuarine/marine mollusks.

Aquatic Plants

Tier 1 toxicity testing with aquatic plants indicates that acetamiprid is not toxic to aquatic plants at the concentration tested. No adverse effects were observed when one species of aquatic vascular plant (duckweed) and four nonvascular plants were tested at approximately 1 mg ai/L. See the original Section 3 for additional details.

Terrestrial Effects

Avian Acute Oral, Dietary and Chronic

The available data indicate that acetamiprid is moderately toxic to avian species on an acute oral exposure basis (LD_{50}= 84.4 mg ai/kg bw) and practically nontoxic on a subacute dietary basis (LC_{50} >5000 mg ai/kg of diet). Some mortality was observed in the subacute dietary studies, though LC_{50} values could not be established. At the highest test dose (5000 mg ai/kg of diet), in the bobwhite quail and mallard studies, there were observed mortalities of 10% and 40%, respectively.

Chronic toxicity to birds was uncertain in prior assessments because of deficiencies in the avian reproduction studies with both the mallard (MRID 449884-08) and the northern bobwhite (MRID 449884-01), as described in original Section 3 document. Two new avian reproduction studies were submitted to address this uncertainty. The mallard study (MRID 463692-01) was classified Supplemental because it failed to establish a NOEC in two adult endpoints (male and female weight gain), with a LOEC of 60.2 mg ai/kg diet. At the highest dose tested, male mallards lost an average of 3% of their initial body weight, whereas all other test levels and all female mallards gained less weight relative to controls. The northern bobwhite study (MRID 465556-01) was classified as Acceptable and determined a NOEC of 89.7 mg ai/kg diet, based on reductions in hatchling weight. The previous mallard duck study provided an estimated NOEC of 125 mg ai/kg diet) based on reductions in adult female body weight. The previous bobwhite quail study showed significant reductions in hatchling body weights at all treatment concentrations and thus failed to establish a NOEC.

Mammalian Acute and Chronic

The available data indicate that acetamiprid is moderately toxic to mammals on an acute oral exposure basis (LD_{50}=146 mg ai/kg). The original Section 3 risk assessment reported an

LD_{50}=167 mg ai/kg. Although that number is derived from a combination of the male and female end points, the more conservative number used in this assessment is based on findings for female rats alone and is consistent with the value used in the Health Effects Division chapter that supported the original Section 3. The chronic NOEC is 280 mg ai/kg based on reduced growth of offspring in a two-generation rat reproduction study as described in the original Section 3.

Nontarget Insects

Acetamiprid is considered moderately toxic to honey bees, with an acute contact LD_{50} of approximately 8.1 µg ai/bee. The original Section 3 recommended that data be provided to address uncertainties regarding the potential effects of acetamiprid on bee behavior. A supplemental study (MRID 459325-05, in secondary review) was submitted, but a major rain event the night after application may have reduced the residues on foliage; therefore, the utility of this study for examining behavioral effects is uncertain. A supplemental oral toxicity study (MRID 459325-03, in secondary review) found an acute LC_{50} of 22.2 µg ai/bee of acetamiprid to bumble bees (*Bombus terrestris*) and a chronic NOEL of 10.4 µg ai/bee. The same study provided an acute contact LC_{50} of >100 µg ai/bee and a NOEL of 100 µg ai/bee. Bumble bees are not a preferred study species.

Terrestrial Plants

As reported in the original document, seedling emergence data are classified supplemental for all test species because the study did not include any measurement of plant weights. Based on the supplemental data, acetamiprid adversely affects seedling emergence and growth (shoot length) of onion, cucumber, and tomato at applications rates greater than 0.077 lb ai/A. The vegetative vigor study found relatively low toxicity when acetamiprid was applied to the foliage of most species (NOELs >0.31 lb ai/A), but much greater phytotoxicity was observed in lettuce (EC_{25} = 0.0087 lb ai/A, NOEL = 0.0046 lb ai/A). An additional study (MRID 459214-01) demonstrates the sensitivity of lettuce (Family: Asteraceae). While finding a NOEL of 0.16 lb ai/A for mortality, significant reduction in plant vigor was found, with the most sensitive parameter being shoot length (NOEL <0.0025 lb ai/A; EC_{25} = 0.0056 lb ai/A).

Degradate Effects

As reported in the original Section 3, toxicity testing with degradation products of acetamiprid indicate that the degradates are no more than slightly toxic to aquatic animals. IM-1-4 is slightly toxic to freshwater fish, freshwater invertebrates, and estuarine/marine invertebrates (LC_{50}'s and EC_{50}'s range from 19 to 48.4 mg ai/L) on an acute exposure basis. IM-1-2 and IC-0 are practically nontoxic to freshwater invertebrates (EC_{50}'s > 100 mg ai/L) on an acute exposure basis. It is important to note that the toxicity of the degradates was evaluated in some of the surrogate organisms least sensitive to the parent compound applied. Thus, it is uncertain what the toxicity of these degradates would be to more sensitive species like the mysid shrimp.

Subsequent studies on the toxicity of the degradate IM-1-5 have been submitted. As described previously in the fate section, IM-1-5 is expected to occur only in soils with pH around 8, but it was a major degradate in some of those soils, present at 12-20% of the parent applied. IM-1-5 may be persistent and is not clear what concentrations of IM-1-5 might be found in aquatic ecosystems.

A study of the acute toxicity of IM-1-5 on *Daphnia magna* resulted in an EC_{50} of 24.5 ppm, classified as slightly toxic to the daphnid. A full life-cycle test with the same species resulted in a NOEC, based on number of young per female, of 26 ppm and a NOEC based on mortality of 51 ppm. Although the dose response curve determined in the acute study was fairly steep (5.4), it is unclear how an acute EC_{50} of 24.5 ppm can be reconciled with a chronic NOEC of 26 ppm. The daphnids were less sensitive to the parent compound than the larval midge, *Chironomus riparius*. However, based on an acute IM-1-5 toxicity study of the midge, which resulted in an LC_{50} of 68 ppm, there does not appear to be an appreciable difference in toxic response to IM-1-5 between the species.

Several studies of terrestrial invertebrate toxicity to IM-1-5 were also submitted. An acute study with the earthworm, *Eisenia fetida* established an LC_{50} of greater than 1000 ppm. There is no official classification for toxicity to earthworms. A study of the toxicity of IM-1-5 on the reproduction of the earthworm resulted in a NOEC of 62.5 ppm, the highest dose tested. A soil dwelling insect of the order Collembola, *Folsomia candida*, was tested for toxic reproductive response to IM-1-5, resulting in no effect at doses down to 0.1 mg ai/kg (the lowest dose tested). Additionally, a reproductive test on the rove beetle, *Aleochara bilineata*, resulted in a NOEC of 2.5 mg ai/kg, with a 19% reduction in beetle emergence at 62.5 mg ai/kg, the highest dose tested. The rove beetle is in the order Coleoptera, members of which are targeted by acetamiprid.

ECOTOX

An official review of scientific literature available through the Agency's ECOTOX database has been requested, but was unavailable at the time of this writing. A review of publically available literature in ECOTOX (http://www.epa.gov/ecotox/) discovered no references. Publically available scientific literature available through other source was not considered for this risk assessment, as per EFED policy.

Risk Characterization

Risk Estimation

The risk assessment for the proposed agricultural use of acetamiprid on tree nuts, stone fruits and cucurbits indicates potential acute risk to endangered freshwater and estuarine/marine invertebrates and consequently potential indirect effects to endangered aquatic vertebrates. Chronic risk LOCs are also exceeded for aquatic invertebrates. In addition, calculated RQs suggest a potential for acute and chronic risk to birds, depending on size and feeding strategy. Likewise, the labeled uses of acetamiprid indicate there is a potential for acute risk to endangered

mammals, depending on size and feeding strategy, as well as chronic risk to mammals. Most plants appear unaffected by acetamiprid uses, though sensitive dicotyledonous plant species are at risk from the use of acetamiprid, and endangered wetland monocots and dicots appear at risk. **Table 7** summarizes the endpoints used in this and/or the original Section 3 analyses.

Table 7. Endpoints used in analyses.

Group (Test Species)	LC_{50}/LD_{50}	NOEC/ NOEL	MRID No.
Mallard *(Anas platyrhynchos)*	LD_{50}=84.4 mg/kg bw LC_{50}>5000 ppm	<60.2 ppm	446518-69 446518-61 463692-01
Rat (*Rattus norvegicus*)	146 mg ai/kg diet	280 ppm	446518-33 449884-30
Freshwater Fish (Rainbow trout, *Oncorhynchus mykiss*)	100 ppm	-	446518-64
Freshwater Fish (Fathead minnow, *Pimephales promelas*)	–	19.2 ppm	446518-72
Estuarine/Marine Fish (Sheepshead minnow, *Cyprinodon variegatus*)	100 ppm	–	449884-11
Freshwater Invertebrate (midge, *Chironomus riparius*)	0.02 ppm	0.006 ppm	459162-01
Estuarine/Marine Invertebrate (mysid shrimp, *Americamysis bahia*)	0.066 ppm	0.0025 ppm	446518-69
Monocot (onion seedling emergence, *Allium* spp)	0.23 lb ai/A	0.077 lb ai/A	449884-13
Lettuce (dicot, *Lactuca sativa*)	0.0056 lb ai/A	<0.0025 lb ai/A	459214-01

Nontarget Aquatic Animals

Freshwater and Estuarine/Marine Fish

Consistent with acetamiprid being practically nontoxic to fish ($LC_{50} \geq 100$ mg ai/L), RQ values were less than acute risk LOCs. The risk quotients for both freshwater and estuarine/marine fish are less than 0.01 (**Table 8**); thus the likelihood that the proposed new uses of acetamiprid will result in acute mortality to fish is expected to be low. Additionally, based on RQ values, the chronic risk LOC is not exceeded for either freshwater or estuarine/marine fish.

Table 8. Risk Quotients for aquatic vertebrates.

Crop Rate lbs ai/A # apps, interval (days)	EECs Peak 21-day ave 60 day ave (µg ai/L)	Acute Risk Quotients Freshwater Fish[a] LC_{50}> 100 mg ai/L	Acute Risk Quotients Estuarine/marine Fish[b] LC_{50}= 100 mg ai/L	Chronic Risk Quotients Freshwater Fish[c] NOEL= 19.2 mg ai/L	Chronic Risk Quotients Estuarine/marine Fish[c] NOEL= N/A
Cucurbit	6.64	<0.01	<0.01	-	-
0.10	6.43	-	-	-	-
5,5	5.85	-	-	<0.01	-
Tree nut	9.39	<0.01	<0.01	-	-
0.18	8.72	-	-	-	-
4,7	8.28	-	-	<0.01	-
Stone fruit	5.21	<0.01	<0.01	-	-
0.15	5.00	-	-	-	-
4,10	4.72	-	-	<0.01	-

[a]Rainbow trout and bluegill sunfish
[b]Sheepshead minnow
[c]Fathead minnow

Freshwater Invertebrates

Based on RQ values, the proposed application rates for all acetamiprid new uses result in exceedances of acute restricted use (RQ≥0.1) and acute risk to endangered species (RQ≥0.05) LOCs (**Table 9**). Tree nut uses result in an RQ equal to the acute risk level of concern (RQ≥0.5) The chronic risk LOC is exceeded for freshwater invertebrates for tree nut uses.

Table 9. Risk quotients for freshwater invertebrates.

Crop Rate lbs ai/A # apps, interval (days)	EECs Peak 21-day ave 60 day ave (µg ai/L)	Acute Risk Quotients Freshwater Invertebrates Chironomid LC50 = 0.021 mg ai/L	Chronic Risk Quotients Sensitive Aquatic Invertebrates Chironomid NOEL= 0.006mg ai/L
Cucurbit	6.64	0.32[a]	-
0.10	6.43	-	1.07[b]
5,5	5.85	-	-
Tree nut	9.39	0.45[a]	-
0.18	8.72	-	1.45[b]
4,7	8.28	-	-
Stone fruit	5.21	0.25[a]	-
0.15	5.00	-	0.83
4,10	4.72	-	-

[a]Exceeds acute restricted use (RQ≥0.1) and acute risk to endangered species (RQ≥0.05) levels of concern.
[b] Exceeds chronic risk level of concern (RQ≥ 1.0)

Estuarine/marine Invertebrates

All of the proposed new uses of acetamiprid at maximum label rates exceed the acute endangered species LOC (RQ≥0.05) for estuarine/marine invertebrates (**Table 10**). Additionally, both the cucurbit and tree nut uses exceed the acute restricted use LOC (RQ≥0.10). All of the proposed new uses exceed the chronic risk LOC of 1.0 by a factor of two or three.

Table 10. Risk quotients for estuarine/marine invertebrates.

		Acute Risk Quotients	Chronic Risk Quotients
Crop Rate lbs ai/A # apps, interval (days)	**EECs Peak 21-day ave 60 day ave (µg ai/L)**	**Freshwater Invertebrates Mysid LC_{50} = 0.066 mg ai/L**	**Sensitive Aquatic Invertebrates Mysid NOEL= 0.0025mg ai/L**
Cucurbit	6.64	0.10[a]	-
0.10	6.43	-	2.57[c]
5,5	5.85	-	-
Tree nut	9.39	0.14[a]	-
0.18	8.72	-	3.49[c]
4,7	8.28	-	-
Stone fruit	5.21	0.08[b]	-
0.15	5.00	-	2.00[c]
4,10	4.72	-	-

[a]Exceeds acute restricted use (RQ≥0.1) and acute risk to endangered species (RQ≥0.05) levels of concern.
[b] exceeds endangered species level of concern (RQ≥0.05
[c] Exceeds chronic risk level of concern (RQ≥ 1.0)

Terrestrial

Avian Acute

While acetamiprid is classified as practically non-toxic to mallard ducks on a sub-acute dietary basis, it is classified as moderately toxic on an acute oral basis. Since both a dose-based and dietary-based endpoints are available for birds, acute risk quotients are calculated using both a dose-based and dietary-based approach as described in **APPENDIX III**. The dose-based RQs are calculated using a body weight adjusted and consumption-weighted equivalent dose. The adjustments account for the fact that smaller-sized animals have to consume more food in terms of their body weight than larger animals and that differential amounts of food have to be consumed depending on the water content and nutritive value of the food. By expressing the Kenaga nomogram estimated residues in terms of daily equivalent dose, estimated environmental concentrations can then be compared to the dose-based LD_{50}. RQs calculated from the sub-acute dietary LC_{50} (>5000 ppm) are presented in **Table 11**. Dietary-based RQs range from <0.01 to 0.03, well below any avian LOC for all forage items.

RQs based on the acute oral LD_{50} are presented in **Table 12**. Dosed-based RQs range from 0.02 for large (1000g) birds foraging on fruit/pods/large insects to 3.83 for small birds (20g) foraging on short grass. The RQ of 3.83 is nearly an 8-fold exceedance of the acute avian LOC (0.5). The acute avian LOC is exceeded for 20g and 100g bird size classes for all uses on short grass, tall grass and broadleaf/small insect forage items, for 1000g birds on short grass for tree nut use. The restricted use and/or endangered species LOC is exceeded for 1000g birds on short grass, tall grass and broadleaf/small insect forage items as well as fruit/pod/large insect forage items for 20g and 100g birds. Only fruit/pod/large insect forage items for 1000g birds do not exceed LOCs for all uses.

Table 11. Estimated environmental concentration and avian risk quotient (RQ) values for acetamiprid used on tree nut, stone fruit and cucurbit crops based on a sub-acute dietary LC_{50}>5000 ppm (actual RQs less than reported).

	Tree nuts[1]		Stone fruit[2]		Cucurbits[3]	
	EEC (ppm)	**RQ**	**EEC (ppm)**	**RQ**	**EEC (ppm)**	**RQ**
Short grass	142.05	<0.03	109.63	<0.02	99.41	<0.02
Tall grass	65.11	<0.01	50.25	<0.01	45.56	<0.01
Broadleaf/sm insects	79.90	<0.02	61.67	<0.01	55.92	<0.01
Fruits/pods/lg insects	8.88	<0.01	6.85	<0.01	6.21	<0.01

[1] application rate 0.18 lbs ai/A, 4 apps, 7 day interval
[2] application rate 0.15 lbs ai/A, 4 apps, 10 day interval
[3] application rate 0.10 lbs ai/A, 5 apps, 5 day interval

Table 12. Estimated environmental concentration and avian risk quotient (RQ) values for acetamiprid used on tree nut, stone fruit and cucurbit crops calculated with acute dose-based LD_{50}=84.4 mg/kg bw.

		Tree nuts[1]		Stone fruit[2]		Cucurbits[3]	
		EEC mg/kg bw	**RQ**	**EEC mg/kg bw**	**RQ**	**EEC mg/kg bw**	**RQ**
20g birds	Short grass	162	3.83[4]	125	2.95[4]	113	2.68[4]
% bw consumed: 114	Tall grass	74	1.75[4]	57	1.35[4]	52	1.23[4]
Adjusted LD_{50}: 42 mg/kg bw	Broadleaf/sm insects	91	2.15[4]	70	1.66[4]	64	1.51[4]
	Fruits/pods/lg insects	10	0.24[5]	8	0.18[6]	7	0.17[6]
100g birds	Short grass	92	1.71[4]	71	1.32[4]	65	1.20[4]
% bw consumed: 65	Tall grass	42	0.79[4]	33	0.61[4]	30	0.55[4]

Adjusted LD_{50}: 54 mg/kg bw	Broadleaf/sm insects	52	0.96[4]	40	0.74[4]	36	0.67[4]
	Fruits/pods/lg insects	6	0.11[6]	4	0.08	4	0.07
1000g birds	Short grass	41	0.54[4]	32	0.42[5]	29	0.38[5]
% bw consumed: 29	Tall grass	19	0.25[5]	15	0.19[6]	13	0.17[6]
Adjusted LD_{50}: 76 mg/kg bw	Broadleaf/sm insects	23	0.30[5]	18	0.24[5]	16	0.21[5]
	Fruits/pods/lg insects	3	0.03	2	0.03	2	0.02

[1] application rate 0.18 lbs ai/A, 4 apps, 7 day interval
[2] application rate 0.15 lbs ai/A, 4 apps, 10 day interval
[3] application rate 0.10 lbs ai/A, 5 apps, 5 day interval
[4] exceeds acute LOC (RQ≥0.5)
[5] exceeds restricted use LOC (RQ≥0.2)
[6] exceeds endangered species LOC (RQ≥0.1)

Avian Chronic

Although the mallard duck reproduction study did not determine a NOEC, the LOEC from that study (60.2 mg/kg diet) is lower than the NOEC derived from the northern bobwhite study (89.7 mg/kg diet). Therefore, chronic avian RQs are calculated using the mallard LOEC, and are reported as "greater than", because the NOEC would be below 60.2 mg/kg diet. Chronic RQs, presented in **Table 13**, exceed the LOC of 1.0 for three of the four forage groups for tree nut uses. Short grass forage items result in the highest chronic RQ (>2.36) for tree nut uses, while fruit/pod/large insect forage items do not exceed the LOC, with an RQ of >0.15. For stone fruit uses, short grass (RQ>1.82) and broadleaf plants/small insects (>1.02) both exceed the chronic LOC, while tall grass forage items may exceed the LOC, when a NOEC is determined (RQ>0.83). Cucurbit uses result in exceedances for only short grass forage items (RQ>1.65), but it is possible that both tall grass (RQ>0.76) and broadleaf plants/small insects forage items (RQ>0.93) would exceed the LOC if a NOEC were established.

Table 13. Estimated environmental concentration and avian chronic risk quotient (RQ) values for acetamiprid used on tree nut, stone fruit and cucurbit crops calculated with reproductive NOEC<60.2 mg/kg diet (LOC=1.0).

	Tree nuts[1]		Stone fruit[2]		Cucurbits[3]	
	EEC (ppm)	RQ	EEC (ppm)	RQ	EEC (ppm)	RQ
Short grass	142.05	>2.36[4]	109.63	>1.82[4]	99.41	>1.65[4]
Tall grass	65.11	>1.08[4]	50.25	>0.83	45.56	>0.76
Broadleaf/sm insects	79.90	>1.33[4]	61.67	>1.02[4]	55.92	>0.93
Fruits/pods/lg insects	8.88	>0.15	6.85	>0.11	6.21	>0.10

[1] application rate 0.18 lbs ai/A, 4 apps, 7 day interval
[2] application rate 0.15 lbs ai/A, 4 apps, 10 day interval
[3] application rate 0.10 lbs ai/A, 5 apps, 5 day interval
[4] exceeds LOC = 1

Mammalian Acute

The available data indicate that acetamiprid is moderately toxic to mammalian species on an acute oral exposure basis (LD_{50}=146 mg ai/kg bw). There are no dietary acute toxicity data. Acute restricted use and endangered species LOCs are exceeded for small (15g) and intermediate-sized (35g) mammals foraging on short grass for all uses (**Table 14**). The endangered species LOC is exceeded for 1000g mammals foraging on short grass for all uses, and for small and intermediate mammals foraging on tall grass and broadleaf/small insects for all uses. Additionally, the endangered species LOC is exceeded for large mammals foraging on broadleaf/small insects for the tree nut use.

Table 14. Mammalian acute risk quotient (RQ) values for tree nut, stone fruit and cucurbit crops calculated with a dosed-based LD_{50} = 146 mg/kg bw.

		Tree nuts[1]		Stone fruit[2]		Cucurbits[3]	
		EEC[4] mg/kg bw	RQ	EEC mg/kg bw	RQ	EEC mg/kg bw	RQ
15g mammals	Short grass	135	0.42[4]	104	0.32[4]	94	0.29[4]
% bw consumed	Tall grass	62	0.19[5]	48	0.15[5]	43	0.13[5]
Herbivore/insectivore: 95 Granivore: 21	Broadleaf/sm insects	76	0.24[4]	59	0.18[5]	53	0.17[5]
Adjusted LD_{50}: 321 mg/kg bw	Fruits/pods/lg insects	8	0.03	7	0.02	6	0.02
	Seeds	2	0.01	1	<0.01	1	<0.01
35g mammals	Short grass	94	0.36[4]	72	0.28[4]	66	0.25[4]
% bw consumed	Tall grass	43	0.17[5]	33	0.13[5]	30	0.12[5]

Herbivore/insectivore: 66 Granivore: 15	Broadleaf/sm insects	53	0.20[4]	41	0.16[5]	37	0.14[5]
Adjusted LD_{50}: 250 mg/kg bw	Fruits/pods/lg insects	6	0.02	5	0.02	4	0.02
	Seeds	1	0.01	1	<0.01	1	<0.01
1000g mammals	Short grass	21	0.19[5]	16	0.15[5]	15	0.13[5]
% bw consumed	Tall grass	10	0.09	8	0.07	7	0.06
Herbivore/insectivore: 15 Granivore: 3	Broadleaf/sm insects	12	0.11[5]	9	0.08	8	0.07
Adjusted LD_{50}: 112 mg/kg bw	Fruits/pods/lg insects	1	0.01	1	0.01	1	0.01
	Seeds	<1	<0.01	<1	<0.01	<1	<0.01

[1] application rate 0.18 lbs ai/A, 4 apps, 7 day interval
[2] application rate 0.15 lbs ai/A, 4 apps, 10 day interval
[3] application rate 0.10 lbs ai/A, 5 apps, 5 day interval
[4] exceeds restricted use LOC (RQ≥0.2)
[5] exceeds endangered species LOC (RQ≥0.1)

Mammalian Chronic

Chronic risk to mammals is estimated using the NOEC (280 mg/kg diet) used in prior assessments. In addition, in accordance with the overview document, the dietary-based NOEC is converted to a dose-based NOEL using the standard USFDA laboratory rat conversion, which can be scaled to different mammalian size classes. The dose-based RQs are calculated using a body weight adjusted and consumption-weighted equivalent dose. The adjustments account for the fact that smaller-sized animals have to consume more food in terms of their body weight than larger animals and that differential amounts of food have to be consumed depending on the water content and nutritive value of the food. By expressing the Kenaga nomogram estimated residues in terms of daily equivalent dose, estimated environmental concentrations can then be compared to the dose-based NOEC. Both sets of RQs are presented in Tables 15 and 16.

Table 15. Estimated environmental concentration and mammalian chronic risk quotient (RQ) values for acetamiprid used on tree nut, stone fruit and cucurbit crops calculated with reproductive NOEC = 280 mg/kg diet (LOC=1.0).

	Tree nuts[1]		Stone fruit[2]		Cucurbits[3]	
	EEC (ppm)	RQ	EEC (ppm)	RQ	EEC (ppm)	RQ
Short grass	142.05	0.51	109.63	0.39	99.41	0.36
Tall grass	65.11	0.23	50.25	0.18	45.56	0.16
Broadleaf/sm insects	79.90	0.29	61.67	0.22	55.92	0.20
Fruits/pods/lg insects	8.88	0.03	6.85	0.02	6.21	0.02

[1] application rate 0.18 lbs ai/A, 4 apps, 7 day interval
[2] application rate 0.15 lbs ai/A, 4 apps, 10 day interval
[3] application rate 0.10 lbs ai/A, 5 apps, 5 day interval

Table 16. Mammalian chronic risk quotient (RQ) values for tree nut, stone fruit and cucurbit crops calculated with a derived dosed-based NOEL = 14 mg/kg bw.

		Tree nuts[1]		Stone fruit[2]		Cucurbits[3]	
		EEC[4] mg/kg bw	RQ	EEC mg/kg bw	RQ	EEC mg/kg bw	RQ
15g mammals	Short grass	135	4.39	104	3.38	94	3.07
% bw consumed	Tall grass	62	2.01	48	1.55	43	1.41
Herbivore/insectivore: 95 Granivore: 21	Broadleaf/sm insects	76	2.47	59	1.90	53	1.73
Adjusted LD_{50}: 321 mg/kg bw	Fruits/pods/lg insects	8	0.27	7	0.21	6	0.19
	Seeds	2	0.06	1	0.05	1	0.04
35g mammals	Short grass	94	3.77	72	2.91	66	2.64
% bw consumed	Tall grass	43	1.73	33	1.33	30	1.21
Herbivore/insectivore: 66 Granivore: 15	Broadleaf/sm insects	53	2.12	41	1.63	37	1.48
Adjusted LD_{50}: 250 mg/kg bw	Fruits/pods/lg insects	6	0.24	5	0.18	4	0.16
	Seeds	1	0.05	1	0.04	1	0.04
1000g mammals	Short grass	21	1.98	16	1.53	15	1.38
% bw consumed	Tall grass	10	0.91	8	0.70	7	0.63
Herbivore/insectivore: 15 Granivore: 3	Broadleaf/sm insects	12	1.11	9	0.86	8	0.78
Adjusted LD_{50}: 112 mg/kg bw	Fruits/pods/lg insects	1	0.12	1	0.10	1	0.09
	Seeds	<1	0.02	<1	0.02	<1	0.02

[1] application rate 0.18 lbs ai/A, 4 apps, 7 day interval
[2] application rate 0.15 lbs ai/A, 4 apps, 10 day interval
[3] application rate 0.10 lbs ai/A, 5 apps, 5 day interval
[4] exceeds chronic LOC (RQ≥ 1.0)

Nontarget Insects

The Agency currently does not calculate risk quotients for nontarget insects. The original assessment states that acetamiprid is moderately toxic to honey bees. While additional supplemental studies have been submitted reporting slightly higher LC_{50} values, these studies do negate previous studies indicating higher sensitivities. The proposed uses include crops that are reliant on pollination, and exposure could occur to bees foraging around the time of application(s).

The original assessment also suggested a potential sub-lethal behavioral change similar to that which is thought to occur due the use of other neonicotinic pesticides. While additional supplemental studies (MRIDs 459325-04, 459325-05) were submitted to evaluate this concern, there are enough uncertainties in the studies to warrant continued concern. One study found no behavioral changes,

but it looked at flight intensity as an indicator and was confined to tents for much of the study. The study design could not discern whether the bees could navigate back to the hive over any appreciable distance, which is a major uncertainty. Additionally, an appreciable rain event occurred on the night of application, which may have markedly reduced exposure. Another study determined no behavioral changes to bumble bees (*Bombus terrestris*), but it is not certain that those findings can be generalized to honey bees (*Apis melliflora).*

Nontarget Plants

The LOC (1.0) is exceeded for threatened and endangered (listed) monocots and dicots in wetlands following ground application for tree nut uses (RQ=1.19) when using the most sensitive endpoints (NOEC=0.077 lbs a.i./A for both monocot and dicot seedling emergence). The listed species RQ for drift alone exceeds the LOC by greater than 3-fold when using the most sensitive endpoint (shoot length in lettuce; NOEL = 0.0025 lb ai/A; **Table 17**). The acute LOC for dicots is exceeded for drift alone from aerial applications (RQ=1.61). All of the RQs were calculated using the maximum one-time rate for tree nuts (0.18 lbs a.i/A). RQs would be lower for the other uses considered. As described in the original Section 3 risk assessment, risk to aquatic plants appears minimal, as no LOCs are exceeded.

Table 17. Risk quotients for threatened and endangered plants.

Maximum Label Rate	Application Method	Adjacent Upland		Adjacent Wetland		Drift Only	
		Monocot	Dicot	Monocot	Dicot	Monocot	Dicot
0.18 lbs ai/A	Ground Spray	0.14	0.14	1.19[a]	1.19[a]	0.01	0.72
	Aerial Spray	0.19	>0.19	0.82	>0.82	0.03	>3.60[a]

[a] Exceeds endangered species (RQ≥1.0) level of concern

Risk Description

Based on the screening-level deterministic assessment, the proposed new uses of acetamiprid on tree nut, stone fruit and cucurbit crops exceed the acute risk LOCs for restricted use and endangered species for sensitive aquatic invertebrates, as well as the chronic LOC for tree nut uses. However, there are neither acute or chronic exceedances for fish. Acute dose-based LOCs are exceeded for birds by up to almost 8-fold, although dietary based acute LOCs are not exceeded. Avian chronic LOCs are exceeded for all proposed uses on at least one forage item. No acute risk LOCs were exceeded for mammals. However, restricted use and endangered species LOCs are exceeded for small- (15g) and intermediate-sized (35g) mammals foraging on short grasses, long grasses, broadleaf plants and small insects and for large (1000g) mammals foraging on short grass. Dietary-based chronic mammalian RQs do not exceed the LOC, but dosed-based chronic RQs exceed the LOC for small- (15g) and intermediate-sized (35g) mammals foraging on short grasses, long grasses, broadleaf plants and small insects and for large (1000g) mammals foraging on short grass. While risk to aquatic plants is likely to be low with RQ values well below LOCs, RQ values for dicotyledonous terrestrial plants exceeds acute risk LOC for direct spray drift following aerial application and both monocot and dicot RQs exceed the threatened/endangered LOC for wetland

habitats. Although risk quotients for non-target insects are not typically evaluated, acetamiprid is moderately toxic to honey bees and belongs to a class of chemicals that has been associated with causing adverse behavioral effects in bees. The potential for acetamiprid to cause similar behavioral effects is uncertain.

Tree nut, stone fruit and cucurbit crops are grown in areas where freshwater may be contaminated, and possibly estuarine areas. Screening-level assessments are based on maximum label use rates, which may not represent actual usage. The most sensitive endpoint for freshwater invertebrates is the chironomid midge, an insect. Had the assessment been conducted using the amphipod *Gammarus*, the chronic LOC would not have been exceeded, but the acute LOC would still be exceed for tree nut uses. Although acetamiprid is not expected to bioconcentrate in the aquatic food chain, the midge serves as an important member of that chain.

Acute risk quotients for small- and intermediate-sized mammals exceed restricted use and threatened/endangered LOCs. The RQs are based on maximum label rates, but typical use rates for the new uses have not been established. Reducing the number of application per year to two results in about 40% reduction in RQs for small mammals. Of course, reducing maximum application rates would also reduce the RQs. Further refinement in EECs may be obtained with reduced estimates of the foliar dissipation half-life. The EFED default of 35 days may not be representative of acetamiprid. If data were submitted that showed the foliar dissipation half-life were, for example, three days, the endangered species RQs would exceed the LOC for only small- and medium-sized mammals foraging on short grass. It is necessary to keep in mind that reported RQs are for the upper bound (95%) Kenaga values. RQs calculated with mean Kenaga values only exceed the LOC for small and medium-sized mammals foraging on short grass. It is important to note, however, that RQ values based on mean residues will likely underestimate potential risk since an appreciable number of the exposure values will be higher than the mean.

Although two methods (dietary-based and dose-based) are used to estimate chronic risk to mammals that result in considerably different RQ estimates, the dose-based calculation takes into account that different-sized animals have to consume different amounts of food and that the food itself has differing nutritional value. If the dietary-based RQ values are adjusted to account for these factors, it is possible that these RQs would be roughly similar to the dose-based RQ values. When calculated on a dietary basis, chronic risk quotients are considerably lower, not exceeding the LOC when using upper-bound residue estimates. As with mammalian acute risk estimates, chronic risk RQs calculate with mean Kenaga values exceed the LOC only for small and medium-sized mammals foraging on short grass. Again, the RQ values based on mean residues will likely underestimate potential risk since an appreciable number of the exposure values will be higher than the mean.

Avian acute risk is evaluated based on two standards (dietary-based and dose-based) calculated two ways (using the LC_{50} and the LD_{50}) that result in considerably different RQ estimates. The dose-based calculation takes into account that different-sized animals have to consume different amounts of food and the differing nutritional value of feed items. Again, if the dietary-based RQ values are adjusted to account for these factors, as well as duration and intensity of exposure, it is possible that these RQs would be roughly similar to the dose-based RQ values. However, using tree nut uses as an example, if mean Kenaga values were used to calculate the RQs, acute risk LOCs would still be exceeded for short grass, tall grass and broadleaf plant/small insect forage items for

20g birds and short grass for 100g birds. Endangered species LOCs would be exceeded all forage items for all size classes except fruits/pods/large insects for 100g and 1000g birds and tall grass forage for 1000g birds. Additionally, it is important to note that although an LC_{50} was not established in the subacute dietary study, mortality of up to 40% was noted.

Avian chronic risk, calculated only from the dietary NOEC, results in exceedances for short grass, tall grass and broadleaf plant/small insect forage items. Although at this time appropriate conversion factors are unavailable, it is likely that RQs calculated in a dose-based manner would result in higher RQs. Dietary-based RQs based on mean Kenaga values do not exceed the LOC. However, the 95% upper bound Kenaga EECs exceed the NOEC for 60 days for tree nut uses, 40 days for stone fruit uses and 34 days for cucurbit uses. In the mallard reproduction studies, birds were exposed to acetamiprid for 22 weeks. Therefore, environmental exposure may not be sufficient to induce the effects seen in studies, although it is not known whether even a single dose of sufficient intensity of exposure could cause the observed effects. The most sensitive mallard end point was reduction in adult weight gain, although the males actually lost up to 3% of their weight during the study. It is unclear that this lower weight gain would cause effects of biologic concern. The bobwhite quail study revealed reduction in hatchling body weight, which may be of greater concern because it may have a more direct impact on survival, although the endpoint is a bit higher (89.7 ppm). A point of note is that the studies used in the original Section 3 (neither of which established a valid NOEC) had the same sensitive endpoints for both the mallard and the bobwhite, respectively, as the newer studies. This emphasizes that there is some chronic effect to birds, though again, the duration and magnitude of exposure is uncertain.

Levels of concern are exceeded for acute risk dicotyledonous plants when exposed to drift from aerial application. The acute risk exceedance is based on the most sensitive endpoint for vegetative vigor, *i.e.*, shoot length on dicots. Of the 10 different families studied, only lettuce (*Lactuca sativa*) appeared to be greatly affected. It is uncertain whether this indicates a particular sensitivity on a family level (Asteraceae) or generic level. Additionally, the LOC for threatened/endangered wetland plants (monocots and dicots) from ground application (drift plus runoff).

Several toxicity studies with the degradate IM-1-5 have been submitted. This degradate appears to be only slightly toxic to the chironomid (LC_{50}=68 ppm), the most sensitive aquatic species to the parent compound. Whether this finding can be extrapolated across degradates is uncertain. However, IM-1-5 is also classified as slightly toxic to daphnids (EC_{50}=24.5 ppm), a species less sensitive to the parent compound. Similarly, a NOEC of 51 ppm was found for daphnids in a chronic study. Other studies with terrestrial invertebrates (a collembola, rove beetles and earthworms) indicate low toxicity to IM-1-5.

Uncertainties

Uncertainties in this assessment include a reliance on a default foliar dissipation half-life of 35 days for calculating residues on terrestrial animal forage items. Although no data were provided to estimate a more realistic half-life, it is likely that the default value is conservative given the mobility of acetamiprid. As previously discussed, an appreciable reduction in foliar dissipation half-life would

result in lower RQs. Also, as discussed above, the data provided thus far do not adequately address whether acetamiprid results in behavioral effects in bees.

There are a number of factors inherent to exposure modeling that can affect the accuracy and precision of analysis including the quality of the input data and the ability of the models to represent real scenarios. The fate data requirements for acetamiprid are complete. Values are input at the upper 90% confidence limit to reduce uncertainty in and increase the protectiveness of EECs. The reaction kinetics and soil to water partition coefficient of degradate IM-1-5 remain uncertain. However, degradate exposure was not modeled in this assessment.

The standard PRZM/EXAMS modeling system is used as a second-tier screen, not as an explicit predictor of typical exposure. This modeling system uses standard scenarios that should indicate which chemicals exceed levels of concern at a national and scenario-specific level, warranting a more detailed assessment. The models estimate exposure based on scenario, chemical, and use input parameters which have limitations in their ability to represent some processes and factors, such as spray drift, certain runoff factors, within-site variability, crop growth, soil water transport, and weather.

Conclusion

The proposed new uses of acetamiprid indicate potential risk to aquatic invertebrates, and therefore possible indirect effects to fish, although there is no indication of direct risk to fish. There are LOC exceedances for acute and chronic risk to birds and mammals, depending on size class and foraging strategy, although the true extent of the risk remains unclear. Some plants are sensitive to acetamiprid application, particularly lettuce. Endangered wetland plants appear to be at potential risk. It is not clear what potential effects may occur in reptiles or amphibians, although there are indications of risk to their surrogates.

Threatened and Endangered Species

Levels of concern for threatened and endangered species were exceeded for several types of wildlife, including aquatic invertebrates, birds (and reptiles), mammals and plants. Endangered species LOCs were exceeded for freshwater and estuarine invertebrates, with potential for associated indirect effects on fish. Listed species LOCs were also exceeded for small-, medium and large-sized birds foraging on short grass, tall grass or broadleaf plants/small insects for all proposed uses. Small-sized birds foraging on fruits/pods/large insects also exceed the listed species LOC for all proposed uses, as do medium-sized birds for tree nut uses. Small- and medium-sized mammals foraging on short grass, tall grass or broadleaf plants/small insects exceed the LOC for all proposed uses, as do large mammals foraging on short grass. Large mammals foraging on broadleaf plants/small insects also exceed the listed species LOC. The LOC for listed plants was exceeded in wetlands for both monocots and dicots, and for dicot plants exposed to drift alone. Exceedance of LOCs for plants indicate concern for indirect effects on listed animal species reliant on susceptible plant communities, or are solely dependent on a sensitive plant for some portion of their life cycle (obligate relationships).

The Overview of Ecological Risk Assessment Process in the Office of Pesticide Programs, U.S. Environmental Protection Agency (USEPA 2004, the 'Overview Document') discusses methods for providing the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), collectively 'the Services', with additional information regarding the listed animal species acute levels of concern (LOCs). A tool has been developed by EFED in consultation with the Services to evaluate the chance of an individual being affected given the toxicity of the chemical to the organism and the dose-response curve (see Appendix IV for more detail). For the present time, the Excel spreadsheet tool IECV1.1 will allow for such calculations by entering in the mean slope estimate and the 95 percent confidence bounds of that estimate as the slope parameter for the spreadsheet. It is important to note that the model output can go as low as 10^{-16} in estimating the event probability. This cut-off is a limit in the Excel spreadsheet environment and is not to be interpreted as an agreed upon lower bound threshold for concern for individual effects in any given listed species. The toxicity studies used in this risk assessment do not report dose-response curves, and due to resource limitations, it was not possible to determine if the data are available to calculate the curves. In cases where dose-response curves are unavailable, event probabilities are calculated for the listed species LOC based on a default slope assumption of 4.5 as per original Agency assumptions of typical slope cited in Urban and Cook (1986).

For aquatic organisms, the LOC for endangered species is 0.05. The RQ is the ratio of exposure to toxicity, so at the point where that ratio equals 0.05, there is a 1 in 417 million chance of an individual being affected. At the highest RQ for aquatic invertebrates in this assessment (freshwater; tree nut uses; RQ = 0.5), the chance of an individual being affected is 1 in 11. The uncertainty in this number lies primarily in whether the actual exposure of sensitive species is likely to equal that modeled.

For birds and mammals, the endangered species LOC is 0.1. The chance of one individual being affected at an RQ equal to the LOC is 1 in 294,000. For birds, the highest acute RQ in this assessment was 3.83, for small-sized birds foraging on short grass (tree nut uses). If birds are as sensitive to acetamiprid as the endpoint used in the model indicates, and the exposed to the concentration modeled, the chance of an individual being affected is approximately 1 in 1. Large birds foraging on broadleaf plants/small insects (tree nut use; RQ = 0.30) results in the potential for 1 in 107 chance for an individual to be affected. For small mammals foraging on short grass (tree nut uses; RQ = 0.42), the chance of an individual effect is 1 in 22, and a large mammal, same use and forage, the chance is 1 in 1710.

Because the screening level risk assessment indicates that acetamiprid uses exceed the endangered species LOC for aquatic invertebrates, birds (and reptiles), mammals (and amphibians), and plants, a 'may affect' designation can not be precluded based on this assessment. Additionally, the acute level of concern for terrestrial plants is exceeded. The Agency considers this to be indicative of a potential for adverse effects to those listed species that rely either on a specific plant species (plant species obligate) or multiple plant species (plant dependant) for some important aspect of their life cycle. Further analysis regarding the overlap of individual species with each use site is required prior to determining the likelihood of potential impact to listed species. Such a refinement is outlined in the following sections.

a. Action Area

For listed species assessment purposes, the action area is considered to be the area affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. At the initial screening-level, the risk assessment considers broadly described taxonomic groups and so conservatively assumes that listed species within those broad groups are co-located with the pesticide treatment area. This means that terrestrial plants and wildlife are assumed to be located on or adjacent to the treated site and aquatic organisms are assumed to be located in a surface water body adjacent to the treated site. The assessment also assumes that the listed species are located within an assumed area, which has the relatively highest potential exposure to the pesticide, and that exposures are likely to decrease with distance from the treatment area.

If the assumptions associated with the screening-level action area result in RQs that are below the listed species LOCs, a "no effect" determination conclusion is made with respect to listed species in that taxa, and no further refinement of the action area is necessary. Furthermore, RQs below the listed species LOCs for a given taxonomic group indicate no concern for indirect effects upon listed species that depend upon the taxonomic group covered by the RQ as a resource. However, in situations where the screening assumptions lead to RQs in excess of the listed species LOCs for a given taxonomic group, a "may affect" designation cannot be precluded and may be associated with direct effects on listed species belonging to that taxonomic group or may extend to indirect effects upon listed species that depend upon that taxonomic group as a resource. In such cases, additional information on the biology of listed species, the locations of these species, and the locations of use sites need to be considered along with available information on the fate and transport properties of the pesticide to determine the extent to which screening assumptions regarding an action area apply to a particular listed organism. These subsequent refinement steps could consider how this information would impact the action area for a particular listed organism and may potentially include areas of exposure that are downwind and downstream of the pesticide use site.

b. Taxonomic Groups Potentially at Risk

The risk quotients (RQs) calculated based on the ratio of estimated environmental concentrations (EECs) to toxicity endpoints, in this case the NOEC from animal toxicity studies and NOEL from plant toxicity studies, indicate potential risk to aquatic invertebrates, some birds mammals, reptiles and plants, as well as endangered plants exposed to acetamiprid.

Should estimated exposure levels occur in proximity to listed resources, the available screening level information suggests a potential concern for direct effects on some listed species associated with tree nut, stone fruit and cucurbit uses of acetamiprid. This Level I screening assessment is based on the initial assumption that listed species within the taxonomic groups of concern are actually present in areas for which the estimated exposure levels used for RQ calculation can be expected to occur. A specific determination of "may affect" for any RQ in excess of listed species LOCs cannot be made until a determination of the co-occurrence of the listed species with the action area has been determined. This was not done for this assessment.

c. Indirect Effects Analysis

Because plant RQs are above non-endangered species LOCs, the Agency considers this to be indicative of a potential for adverse effects to those listed species that rely either on a specific plant species (plant species obligate) or multiple plant species (plant dependant) for some important aspect of their life cycle. The extent to which the use of acetamiprid on tree nuts, stone fruits or cucurbits will indirectly effect listed animal species will require identification of listed species that co-occur in areas of acetamiprid use and an evaluation of critical habit as described below. Because of the extent of the proposed uses of acetamiprid, EFED cannot preclude the possibility of a 'may affect' designation for listed species based on this assessment.

d. Critical Habitat

The screening-level risk assessment has identified potential concerns for direct and indirect effects on listed species associated with action areas where acetamiprid is used. In light of the potential for effects on listed species, 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 acetamiprid's potential impact on listed species and whether 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 are potentially impacted directly by the use of the pesticide. EPA and the Service(s) will work together to conduct the necessary analysis.

This screening-level risk assessment for critical habitat provides a table of potential biological entities that, if they are constituent elements of one or more critical habitats, would be of potential concern (**Appendix V**). These correspond to the taxa identified above as being of potential concern for indirect effects and include birds, mammals, terrestrial-phase amphibians, reptiles, fish, aquatic invertebrates and aquatic-phase amphibians. These tables should serve as an initial step in problem formulation for further assessment of critical habitat impacts outlined above.

e. Co-occurrence Analysis

The goal of the analysis for co-location is to determine whether sites of pesticide use are geographically associated with known locations of listed species. At the screening level, this analysis is accomplished using the Agency's LOCATES database. The database uses location information for listed species at the county level and compares it to agricultural census data for crop production at the same county level of resolution. The product is a listing of federally listed species that are located within states known to produce the crop upon which the pesticide will be used. Because the Level I screening assessment considers **both** direct and indirect effects across generic taxonomic

groupings, it is not possible to exclude any taxonomic group from a LOCATES database run for a screening risk assessment.

Because acetamiprid is being registered for new crops, the extent of its use has not yet been determined. As noted previously, at the screening level, it is not possible to evaluate all the potential direct and indirect effects that could impact endangered animals. Therefore, a 'may effect' designation cannot be precluded for listed animals based on this assessment.

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Appendix I. PRZM/EXAMS model outputs.

Table A. PRZM/EXAMS input parameter values for ecological exposure assessment of acetamiprid.

Parameter	Value	Justification	Source
Application Rate in lb a.i./ac (kg a.i./ha)	Cucurbit: 0.10 (0.112) Stone fruit: 0.15 (0.168) Nut tree: 0.18 (0.202)	Label directions. (1 kg a.i./ha = 1 lb a.i./A x 0.89218)	Reg. 8033-23
Number of Applications	Cucurbit: 10 Stone fruit: 4 Nut tree: 4	Label directions.	Reg. 8033-23
Intervals Between Applications (days)	Cucurbit: 5, 5, 5, 5, 165, 5, 5, 5, 5 Stone fruit: 10, 10, 10 Nut tree: 7, 7, 7 (with exception of OR filbert: 45, 7, 7)	Minimum application intervals from the label were used with the exception of a dormant application to OR filbert.	Reg. 8033-23
Date of First Application	Fl cucumbers: Mar. 15 GA peach: May 15 CA fruit: Apr. 1 MI cherry: May 20 CA almond: Apr. 1 OR filbert: Feb. 15 GA pecan: Jul. 1	Application dates are specific to factors from all three sources.	USDA agricultural crop profiles information[1], Reg. 8033-23 label directions, and scenario parameters
Application Type; CAM input	Cucurbit: aerial spray; CAM = 2 Stone fruit: aerial spray; CAM = 2 Nut tree: aerial spray; CAM = 2	Label directions.	Reg. 8033-23
IPSCND input	Cucurbit: 1 Stone fruit: 3 Nut tree: 3	Foliar residue reverts to soil after cucurbit harvest; remains on stone fruit and nut tree foliage.	USDA agricultural crop profiles information[1]
Organic Carbon Partition Coefficient (K_{oc})	227	Represents the mean K_{oc} of five soils.	MRID 44651883
Aerobic Soil Metabolism Half-life (days)	4.28	Represents the 90th percentile of the upper confidence bound on the mean non-linearly regressed half-life for five soils.	MRID 44651879, 44651881, 44699101
Spray Drift Fraction	0.05	Aerial spray drift fraction is higher than that of ground spray.	Input parameter guidance[2]
Application Efficiency	0.95	Default value for aerial spray.	Input parameter guidance[2]
Molecular Weight (g/mol)	222.68	Product chemistry data.	MRID 44651803
Vapor Pressure (Torr)	1×10^{-8}	Product chemistry data.	MRID 44651812
Solubility in Water at 25°C (ppm)	42500	Set at 10X solubility limit of 4250 ppm based on input parameter guidance.	MRID 44651811

Parameter	Value	Justification	Source
Aerobic Aquatic Metabolism Half-life (days)	135	Input value is 3x the estimated half-life of 45 days to account for the uncertainty associated with a single value.	MRID 44988513
Anaerobic Aquatic Metabolism Half-life (days)	1095	Input value is 3x the estimated half-life of 365 days to account for the uncertainty associated with a single value.	MRID 44988512
Hydrolysis Half-life at pH 5, 7, 9 (22°C) (days)	Stable	Represents study values.	MRID 44651876
Aquatic Photolysis Half-life @ pH 7 (days)	34	Represents the single available half-life.	MRID 44988509

1. USDA Crop Profiles information is located at: http://pestdata.ncsu.edu/cropprofiles/.
2. EFED input parameter guidance is located at: http://www.epa.gov/oppefed1/models/water/input_guidance2_28_02.htm/.

California Almond Scenario
stored as CAalm.out
Chemical: Acetamiprid
PRZM environment: CAalmond0C.txt modified Thuday, 17 June 2004 at 09:13:20
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w23232.dvf modified Wedday, 3 July 2002 at 09:04:22
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	1.883	1.859	1.765	1.593	1.483	0.8067
1962	4.861	4.804	4.585	4.224	3.806	2.052
1963	5.322	5.283	5.118	4.83	4.599	3.471
1964	3.999	3.967	3.834	3.6	3.436	2.583
1965	3.741	3.709	3.575	3.337	3.179	2.299
1966	3.36	3.328	3.198	2.973	2.817	2.066
1967	3.595	3.567	3.443	3.198	3.034	2.107
1968	3.172	3.142	3.021	2.806	2.651	1.882
1969	3.515	3.483	3.357	3.104	2.942	2.004
1970	3.187	3.159	3.038	2.808	2.654	1.878
1971	3.152	3.124	3.012	2.806	2.658	1.859
1972	3.067	3.043	2.927	2.708	2.556	1.788
1973	3.044	3.014	2.889	2.66	2.502	1.739
1974	3.016	2.988	2.875	2.667	2.53	1.782
1975	3.092	3.067	2.951	2.722	2.565	1.755
1976	3.127	3.098	2.968	2.728	2.564	1.731
1977	2.997	2.966	2.861	2.667	2.523	1.762
1978	3.264	3.237	3.116	2.878	2.711	1.857
1979	3.131	3.102	2.982	2.757	2.603	1.831
1980	3.08	3.05	2.934	2.73	2.589	1.829
1981	3.137	3.108	2.988	2.772	2.613	1.828
1982	4.6	4.555	4.367	4.075	3.864	2.521
1983	4.252	4.229	4.067	3.785	3.585	2.529
1984	3.423	3.392	3.259	3.011	2.849	2.024
1985	3.105	3.074	2.953	2.741	2.584	1.825
1986	3.162	3.132	3.011	2.79	2.637	1.858
1987	3.055	3.024	2.896	2.669	2.518	1.766
1988	3.583	3.546	3.404	3.134	2.939	1.934
1989	3.12	3.088	2.961	2.743	2.593	1.929
1990	3.357	3.325	3.184	3.091	2.992	2.119

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	5.322	5.283	5.118	4.83	4.599	3.471
0.0645161290322581	4.861	4.804	4.585	4.224	3.864	2.583
0.0967741935483871	4.6	4.555	4.367	4.075	3.806	2.529
0.129032258064516	4.252	4.229	4.067	3.785	3.585	2.521

0.161290322580645	3.999	3.967	3.834	3.6	3.436	2.299
0.193548387096774	3.741	3.709	3.575	3.337	3.179	2.119
0.225806451612903	3.595	3.567	3.443	3.198	3.034	2.107
0.258064516129032	3.583	3.546	3.404	3.134	2.992	2.066
0.290322580645161	3.515	3.483	3.357	3.104	2.942	2.052
0.32258064516129	3.423	3.392	3.259	3.091	2.939	2.024
0.354838709677419	3.36	3.328	3.198	3.011	2.849	2.004
0.387096774193548	3.357	3.325	3.184	2.973	2.817	1.934
0.419354838709677	3.264	3.237	3.116	2.878	2.711	1.929
0.451612903225806	3.187	3.159	3.038	2.808	2.658	1.882
0.483870967741936	3.172	3.142	3.021	2.806	2.654	1.878
0.516129032258065	3.162	3.132	3.012	2.806	2.651	1.859
0.548387096774194	3.152	3.124	3.011	2.79	2.637	1.858
0.580645161290323	3.137	3.108	2.988	2.772	2.613	1.857
0.612903225806452	3.131	3.102	2.982	2.757	2.603	1.831
0.645161290322581	3.127	3.098	2.968	2.743	2.593	1.829
0.67741935483871	3.12	3.088	2.961	2.741	2.589	1.828
0.709677419354839	3.105	3.074	2.953	2.73	2.584	1.825
0.741935483870968	3.092	3.067	2.951	2.728	2.565	1.788
0.774193548387097	3.08	3.05	2.934	2.722	2.564	1.782
0.806451612903226	3.067	3.043	2.927	2.708	2.556	1.766
0.838709677419355	3.055	3.024	2.896	2.669	2.53	1.762
0.870967741935484	3.044	3.014	2.889	2.667	2.523	1.755
0.903225806451613	3.016	2.988	2.875	2.667	2.518	1.739
0.935483870967742	2.997	2.966	2.861	2.66	2.502	1.731
0.967741935483871	1.883	1.859	1.765	1.593	1.483	0.8067

0.1	4.5652	4.5224	4.337	4.046	3.7839	2.5282

Average of yearly averages: 1.98049

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAalm
Metfile: w23232.dvf
PRZM scenario: CAalmond0C.txt
EXAMS environment file: pond298.exv
Chemical Name: Acetamiprid

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	222.68	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	1e-8	torr	
Solubility sol	42500	mg/L		
Kd Kd		mg/L		
Koc Koc 227		mg/L		
Photolysis half-life	kdp	34	days	Half-life

Aerobic Aquatic Metabolism		kbacw	135	days	Halfife
Anaerobic Aquatic Metabolism		kbacs	1095	days	Halfife
Aerobic Soil Metabolism		asm	4.28	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life	
Hydrolysis:	pH 7	0	days	Half-life	
Hydrolysis:	pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI	0	cm		
Application Rate:	TAPP	.202	kg/ha		
Application Efficiency:		APPEFF	.95	fraction	
Spray Drift	DRFT	.05	fraction of application rate applied to pond		
Application Date	Date	01-04	dd/mm or dd/mmm or dd-mm or dd-mmm		
Interval 1	interval	7	days	Set to 0 or delete line for single app.	
Interval 2	interval	7	days	Set to 0 or delete line for single app.	
Interval 3	interval	7	days	Set to 0 or delete line for single app.	
Record 17:	FILTRA				
	IPSCND	3			
	UPTKF				
Record 18:	PLVKRT				
	PLDKRT				
	FEXTRC	0.5			
Flag for Index Res. Run		IR	Pond		
Flag for runoff calc.	RUNOFF		none	none, monthly or total(average of entire run)	

California Fruit Scenario
stored as CAfru.out
Chemical: Acetamiprid
PRZM environment: CAfruit0C.txt modified Thuday, 17 June 2004 at 09:14:02
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93193.dvf modified Wedday, 3 July 2002 at 09:04:24
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	1.52	1.5	1.421	1.275	1.179	0.6188
1962	2.007	1.984	1.892	1.733	1.617	1.017
1963	2.274	2.247	2.144	1.974	1.854	1.221
1964	2.295	2.269	2.17	2.003	1.882	1.279
1965	2.396	2.369	2.26	2.088	1.97	1.352
1966	2.363	2.334	2.219	2.039	1.916	1.305
1967	2.727	2.694	2.565	2.371	2.22	1.425
1968	2.341	2.314	2.207	2.031	1.904	1.308
1969	2.586	2.554	2.429	2.243	2.119	1.418
1970	2.431	2.4	2.281	2.096	1.969	1.343
1971	2.484	2.458	2.358	2.187	2.06	1.4
1972	2.346	2.317	2.204	2.024	1.898	1.287
1973	2.367	2.336	2.216	2.029	1.901	1.275
1974	2.286	2.258	2.148	1.971	1.846	1.226
1975	2.327	2.299	2.189	2.012	1.889	1.263
1976	2.392	2.362	2.248	2.07	1.948	1.363
1977	2.413	2.388	2.291	2.118	1.987	1.336
1978	2.421	2.391	2.273	2.089	1.961	1.293
1979	2.28	2.251	2.137	1.957	1.832	1.196
1980	2.216	2.19	2.09	1.923	1.805	1.168
1981	2.29	2.261	2.148	1.963	1.829	1.174
1982	2.236	2.209	2.1	1.929	1.812	1.228
1983	2.776	2.74	2.601	2.335	2.183	1.408
1984	2.338	2.306	2.178	1.989	1.863	1.21
1985	2.188	2.16	2.054	1.876	1.748	1.122
1986	2.151	2.122	2.012	1.834	1.709	1.115
1987	2.597	2.565	2.439	2.246	2.116	1.487
1988	2.392	2.364	2.257	2.082	1.951	1.27
1989	2.23	2.203	2.096	1.923	1.801	1.188
1990	2.226	2.199	2.095	2.029	1.933	1.261

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	2.776	2.74	2.601	2.371	2.22	1.487
0.0645161290322581	2.727	2.694	2.565	2.335	2.183	1.425
0.0967741935483871	2.597	2.565	2.439	2.246	2.119	1.418
0.129032258064516	2.586	2.554	2.429	2.243	2.116	1.408

0.161290322580645	2.484	2.458	2.358	2.187	2.06	1.4
0.193548387096774	2.431	2.4	2.291	2.118	1.987	1.363
0.225806451612903	2.421	2.391	2.281	2.096	1.97	1.352
0.258064516129032	2.413	2.388	2.273	2.089	1.969	1.343
0.290322580645161	2.396	2.369	2.26	2.088	1.961	1.336
0.32258064516129	2.392	2.364	2.257	2.082	1.951	1.308
0.354838709677419	2.392	2.362	2.248	2.07	1.948	1.305
0.387096774193548	2.367	2.336	2.219	2.039	1.933	1.293
0.419354838709677	2.363	2.334	2.216	2.031	1.916	1.287
0.451612903225806	2.346	2.317	2.207	2.029	1.904	1.279
0.483870967741936	2.341	2.314	2.204	2.029	1.901	1.275
0.516129032258065	2.338	2.306	2.189	2.024	1.898	1.27
0.548387096774194	2.327	2.299	2.178	2.012	1.889	1.263
0.580645161290323	2.295	2.269	2.17	2.003	1.882	1.261
0.612903225806452	2.29	2.261	2.148	1.989	1.863	1.228
0.645161290322581	2.286	2.258	2.148	1.974	1.854	1.226
0.67741935483871	2.28	2.251	2.144	1.971	1.846	1.221
0.709677419354839	2.274	2.247	2.137	1.963	1.832	1.21
0.741935483870968	2.236	2.209	2.1	1.957	1.829	1.196
0.774193548387097	2.23	2.203	2.096	1.929	1.812	1.188
0.806451612903226	2.226	2.199	2.095	1.923	1.805	1.174
0.838709677419355	2.216	2.19	2.09	1.923	1.801	1.168
0.870967741935484	2.188	2.16	2.054	1.876	1.748	1.122
0.903225806451613	2.151	2.122	2.012	1.834	1.709	1.115
0.935483870967742	2.007	1.984	1.892	1.733	1.617	1.017
0.967741935483871	1.52	1.5	1.421	1.275	1.179	0.6188

0.1	2.5959	2.5639	2.438	2.2457	2.1187	1.417

Average of yearly averages: 1.25189333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: CAfru
Metfile: w93193.dvf
PRZM scenario: CAfruit0C.txt
EXAMS environment file: pond298.exv
Chemical Name: Acetamiprid

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	222.68	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	1e-8	torr	
Solubility	sol	42500	mg/L	
Kd	Kd		mg/L	
Koc	Koc	227	mg/L	
Photolysis half-life	kdp	34	days	Half-life

Aerobic Aquatic Metabolism		kbacw	135	days	Halfife
Anaerobic Aquatic Metabolism		kbacs	1095	days	Halfife
Aerobic Soil Metabolism		asm	4.28	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life	
Hydrolysis:	pH 7	0	days	Half-life	
Hydrolysis:	pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI	0	cm		
Application Rate:	TAPP	.168	kg/ha		
Application Efficiency:		APPEFF	.95	fraction	
Spray Drift	DRFT	.05	fraction of application rate applied to pond		
Application Date	Date	01-04	dd/mm or dd/mmm or dd-mm or dd-mmm		
Interval 1	interval	10	days	Set to 0 or delete line for single app.	
Interval 2	interval	10	days	Set to 0 or delete line for single app.	
Interval 3	interval	10	days	Set to 0 or delete line for single app.	
Record 17:	FILTRA				
	IPSCND	3			
	UPTKF				
Record 18:	PLVKRT				
	PLDKRT				
	FEXTRC	0.5			
Flag for Index Res. Run		IR	Pond		
Flag for runoff calc.	RUNOFF		none	none, monthly or total(average of entire run)	

Florida Cucumber Scenario
stored as FLcuc2.out
Chemical: Acetamiprid
PRZM environment: FLcucumberC.txt modified Satday, 12 October 2002 at 16:40:38
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w12842.dvf modified Wedday, 3 July 2002 at 09:04:28
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	1.764	1.739	1.643	1.496	1.411	0.838
1962	4.499	4.439	4.267	3.988	3.787	2.535
1963	3.739	3.7	3.569	3.335	3.164	2.73
1964	4.852	4.788	4.623	4.202	3.89	3.014
1965	4.427	4.373	4.29	4.043	3.843	2.873
1966	4.502	4.463	4.276	3.897	3.672	3.007
1967	4.915	4.847	4.581	4.137	3.891	2.726
1968	3.91	3.87	3.741	3.499	3.322	2.774
1969	4.074	4.026	3.881	3.616	3.413	2.686
1970	4.277	4.224	4.072	3.75	3.493	2.621
1971	4.116	4.057	3.916	3.562	3.335	2.595
1972	4.426	4.363	4.181	3.785	3.555	2.764
1973	6.225	6.149	5.941	5.477	5.071	3.576
1974	4.12	4.074	3.932	3.66	3.425	2.642
1975	4.354	4.288	4.091	3.734	3.508	2.316
1976	3.692	3.657	3.517	3.264	3.089	2.635
1977	3.222	3.187	3.062	2.847	2.69	2.301
1978	3.098	3.057	2.92	2.701	2.551	2.164
1979	6.657	6.557	6.442	5.849	5.473	2.908
1980	5.028	4.978	4.879	4.56	4.329	3.473
1981	4.639	4.579	4.425	4.155	3.954	2.981
1982	6.821	6.725	6.545	5.952	5.554	3.526
1983	6.506	6.438	6.274	5.85	5.459	4.122
1984	4.058	4.016	3.847	3.555	3.361	2.907
1985	4.171	4.109	3.943	3.558	3.339	2.762
1986	5.959	5.889	5.743	5.425	5.079	3.533
1987	8.158	8.057	7.83	7.046	6.479	4.44
1988	4.692	4.647	4.506	4.252	4.041	3.504
1989	3.63	3.592	3.463	3.23	3.055	2.59
1990	3.609	3.576	3.421	3.101	2.925	2.417

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	8.158	8.057	7.83	7.046	6.479	4.44
0.0645161290322581	6.821	6.725	6.545	5.952	5.554	4.122
0.0967741935483871	6.657	6.557	6.442	5.85	5.473	3.576
0.129032258064516	6.506	6.438	6.274	5.849	5.459	3.533

0.161290322580645	6.225	6.149	5.941	5.477	5.079	3.526
0.193548387096774	5.959	5.889	5.743	5.425	5.071	3.504
0.225806451612903	5.028	4.978	4.879	4.56	4.329	3.473
0.258064516129032	4.915	4.847	4.623	4.252	4.041	3.014
0.290322580645161	4.852	4.788	4.581	4.202	3.954	3.007
0.32258064516129	4.692	4.647	4.506	4.155	3.891	2.981
0.354838709677419	4.639	4.579	4.425	4.137	3.89	2.908
0.387096774193548	4.502	4.463	4.29	4.043	3.843	2.907
0.419354838709677	4.499	4.439	4.276	3.988	3.787	2.873
0.451612903225806	4.427	4.373	4.267	3.897	3.672	2.774
0.483870967741936	4.426	4.363	4.181	3.785	3.555	2.764
0.516129032258065	4.354	4.288	4.091	3.75	3.508	2.762
0.548387096774194	4.277	4.224	4.072	3.734	3.493	2.73
0.580645161290323	4.171	4.109	3.943	3.66	3.425	2.726
0.612903225806452	4.12	4.074	3.932	3.616	3.413	2.686
0.645161290322581	4.116	4.057	3.916	3.562	3.361	2.642
0.67741935483871	4.074	4.026	3.881	3.558	3.339	2.635
0.709677419354839	4.058	4.016	3.847	3.555	3.335	2.621
0.741935483870968	3.91	3.87	3.741	3.499	3.322	2.595
0.774193548387097	3.739	3.7	3.569	3.335	3.164	2.59
0.806451612903226	3.692	3.657	3.517	3.264	3.089	2.535
0.838709677419355	3.63	3.592	3.463	3.23	3.055	2.417
0.870967741935484	3.609	3.576	3.421	3.101	2.925	2.316
0.903225806451613	3.222	3.187	3.062	2.847	2.69	2.301
0.935483870967742	3.098	3.057	2.92	2.701	2.551	2.164
0.967741935483871	1.764	1.739	1.643	1.496	1.411	0.838

0.1	6.6419	6.5451	6.4252	5.8499	5.4716	3.5717

Average of yearly averages: 2.86533333333333

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: FLcuc2
Metfile: w12842.dvf
PRZM scenario: FLcucumberC.txt
EXAMS environment file: pond298.exv
Chemical Name: Acetamiprid

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	222.68	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	1e-8	torr	
Solubility	sol	42500	mg/L	
Kd	Kd		mg/L	
Koc	Koc	227	mg/L	
Photolysis half-life	kdp	34	days	Half-life

Aerobic Aquatic Metabolism		kbacw	135	days	Halfife
Anaerobic Aquatic Metabolism			kbacs	1095	days Halfife
Aerobic Soil Metabolism			asm	4.28	days Halfife
Hydrolysis:	pH 5	0	days	Half-life	
Hydrolysis:	pH 7	0	days	Half-life	
Hydrolysis:	pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:		DEPI	0	cm	
Application Rate:		TAPP	.112	kg/ha	
Application Efficiency:			APPEFF	.95	fraction
Spray Drift	DRFT	.05	fraction of application rate applied to pond		
Application Date		Date	15-03	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	5	days	Set to 0 or delete line for single app.	
Interval 2	interval	5	days	Set to 0 or delete line for single app.	
Interval 3	interval	5	days	Set to 0 or delete line for single app.	
Interval 4	interval	5	days	Set to 0 or delete line for single app.	
Interval 5	interval	165	days	Set to 0 or delete line for single app.	
Interval 6	interval	5	days	Set to 0 or delete line for single app.	
Interval 7	interval	5	days	Set to 0 or delete line for single app.	
Interval 8	interval	5	days	Set to 0 or delete line for single app.	
Interval 9	interval	5	days	Set to 0 or delete line for single app.	
Record 17:	FILTRA				
	IPSCND	1			
	UPTKF				
Record 18:	PLVKRT				
	PLDKRT				
	FEXTRC	0.5			
Flag for Index Res. Run			IR	Pond	
Flag for runoff calc.		RUNOFF		none	none, monthly or total(average of entire run)

Georgia Peach Scenario
stored as GApeach.out
Chemical: Acetamiprid
PRZM environment: GAPeachesC.txt modified Satday, 12 October 2002 at 16:59:56
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w03813.dvf modified Wedday, 3 July 2002 at 09:04:32
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	1.91	1.877	1.749	1.532	1.407	0.6761
1962	2.706	2.663	2.495	2.278	2.094	1.262
1963	2.774	2.735	2.574	2.375	2.209	1.459
1964	2.296	2.259	2.12	1.944	1.833	1.34
1965	5.421	5.362	5.03	4.388	4.007	2.255
1966	3.184	3.146	3.045	2.815	2.661	2.139
1967	2.963	2.924	2.77	2.58	2.419	1.769
1968	3.484	3.433	3.268	3.051	2.878	1.923
1969	2.605	2.568	2.469	2.26	2.133	1.63
1970	2.35	2.317	2.187	1.992	1.872	1.349
1971	2.807	2.777	2.676	2.464	2.318	1.478
1972	2.762	2.736	2.587	2.315	2.166	1.485
1973	3.292	3.242	3.076	2.833	2.618	1.671
1974	2.757	2.719	2.572	2.373	2.229	1.564
1975	2.637	2.599	2.451	2.213	2.068	1.465
1976	2.87	2.83	2.676	2.477	2.327	1.564
1977	2.362	2.325	2.182	1.986	1.864	1.375
1978	2.199	2.165	2.072	1.926	1.806	1.255
1979	2.201	2.169	2.046	1.858	1.737	1.203
1980	2.136	2.102	1.987	1.787	1.666	1.134
1981	4.767	4.677	4.477	3.896	3.543	1.96
1982	2.794	2.756	2.607	2.41	2.27	1.786
1983	3.421	3.369	3.271	2.96	2.706	1.741
1984	3.769	3.71	3.551	3.281	3.034	1.958
1985	2.56	2.522	2.373	2.184	2.063	1.572
1986	2.24	2.204	2.064	1.862	1.735	1.238
1987	2.308	2.271	2.139	1.904	1.766	1.188
1988	2.164	2.131	2.014	1.908	1.792	1.234
1989	2.188	2.156	2.03	1.845	1.727	1.205
1990	2.124	2.09	1.957	1.768	1.65	1.13

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	5.421	5.362	5.03	4.388	4.007	2.255
0.0645161290322581	4.767	4.677	4.477	3.896	3.543	2.139
0.0967741935483871	3.769	3.71	3.551	3.281	3.034	1.96
0.129032258064516	3.484	3.433	3.271	3.051	2.878	1.958

0.161290322580645	3.421	3.369	3.268	2.96	2.706	1.923
0.193548387096774	3.292	3.242	3.076	2.833	2.661	1.786
0.225806451612903	3.184	3.146	3.045	2.815	2.618	1.769
0.258064516129032	2.963	2.924	2.77	2.58	2.419	1.741
0.290322580645161	2.87	2.83	2.676	2.477	2.327	1.671
0.32258064516129	2.807	2.777	2.676	2.464	2.318	1.63
0.354838709677419	2.794	2.756	2.607	2.41	2.27	1.572
0.387096774193548	2.774	2.736	2.587	2.375	2.229	1.564
0.419354838709677	2.762	2.735	2.574	2.373	2.209	1.564
0.451612903225806	2.757	2.719	2.572	2.315	2.166	1.485
0.483870967741936	2.706	2.663	2.495	2.278	2.133	1.478
0.516129032258065	2.637	2.599	2.469	2.26	2.094	1.465
0.548387096774194	2.605	2.568	2.451	2.213	2.068	1.459
0.580645161290323	2.56	2.522	2.373	2.184	2.063	1.375
0.612903225806452	2.362	2.325	2.187	1.992	1.872	1.349
0.645161290322581	2.35	2.317	2.182	1.986	1.864	1.34
0.67741935483871	2.308	2.271	2.139	1.944	1.833	1.262
0.709677419354839	2.296	2.259	2.12	1.926	1.806	1.255
0.741935483870968	2.24	2.204	2.072	1.908	1.792	1.238
0.774193548387097	2.201	2.169	2.064	1.904	1.766	1.234
0.806451612903226	2.199	2.165	2.046	1.862	1.737	1.205
0.838709677419355	2.188	2.156	2.03	1.858	1.735	1.203
0.870967741935484	2.164	2.131	2.014	1.845	1.727	1.188
0.903225806451613	2.136	2.102	1.987	1.787	1.666	1.134
0.935483870967742	2.124	2.09	1.957	1.768	1.65	1.13
0.967741935483871	1.91	1.877	1.749	1.532	1.407	0.6761

0.1	3.7405	3.6823	3.523	3.258	3.0184	1.9598

Average of yearly averages: 1.50027

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: GApeach
Metfile: w03813.dvf
PRZM scenario: GAPeachesC.txt
EXAMS environment file: pond298.exv
Chemical Name: Acetamiprid

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	222.68	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	1e-8	torr	
Solubility	sol	42500	mg/L	
Kd	Kd		mg/L	
Koc	Koc	227	mg/L	
Photolysis half-life	kdp	34	days	Half-life

Aerobic Aquatic Metabolism		kbacw	135	days	Halfife
Anaerobic Aquatic Metabolism		kbacs	1095	days	Halfife
Aerobic Soil Metabolism		asm	4.28	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life	
Hydrolysis:	pH 7	0	days	Half-life	
Hydrolysis:	pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:		DEPI	0	cm	
Application Rate:		TAPP	.168	kg/ha	
Application Efficiency:			APPEFF	.95	fraction
Spray Drift	DRFT	.05	fraction of application rate applied to pond		
Application Date		Date	15-05	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1	interval	10	days	Set to 0 or delete line for single app.	
Interval 2	interval	10	days	Set to 0 or delete line for single app.	
Interval 3	interval	10	days	Set to 0 or delete line for single app.	
Record 17:	FILTRA				
IPSCND		3			
UPTKF					
Record 18:	PLVKRT				
PLDKRT					
FEXTRC		0.5			
Flag for Index Res. Run			IR	Pond	
Flag for runoff calc.		RUNOFF	none	none, monthly or total(average of entire run)	

Georgia Pecan Scenario
stored as GApecan.out
Chemical: Acetamiprid
PRZM environment: GAPecansC.txt modified Tueday, 22 April 2003 at 07:57:20
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w93805.dvf modified Wedday, 3 July 2002 at 09:04:32
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	2.861	2.809	2.646	2.317	2.121	0.8673
1962	2.72	2.674	2.585	2.372	2.209	1.482
1963	5.946	5.838	5.424	4.689	4.293	2.368
1964	13.59	13.36	12.74	11.3	10.36	5.483
1965	8.355	8.233	8.023	7.346	6.802	5.579
1966	5.397	5.316	5.082	4.692	4.369	3.719
1967	4.858	4.787	4.555	4.17	3.934	2.904
1968	3.306	3.257	3.112	2.825	2.65	2.224
1969	7.812	7.675	7.293	6.477	5.956	3.179
1970	18.99	18.65	17.34	15	13.69	7.03
1971	8.762	8.733	8.611	8.337	8.122	6.712
1972	5.114	5.044	4.828	4.487	4.329	3.737
1973	3.317	3.269	3.201	2.94	2.761	2.321
1974	5.001	4.927	4.649	4.102	3.777	2.306
1975	6.141	6.043	5.686	5.087	4.742	3.046
1976	4.201	4.139	4.027	3.744	3.535	2.843
1977	4.045	3.984	3.75	3.351	3.146	2.381
1978	6.824	6.709	6.377	5.748	5.286	3.101
1979	9.456	9.299	8.729	7.81	7.269	4.423
1980	8.729	8.577	8.007	6.981	6.4	4.651
1981	4.294	4.266	4.224	4.109	4.001	3.307
1982	5.099	5.017	4.858	4.39	4.063	2.699
1983	3.242	3.192	2.998	2.73	2.561	2.176
1984	4.055	3.992	3.797	3.46	3.237	2.089
1985	3.979	3.933	3.778	3.401	3.175	2.176
1986	7.507	7.369	6.871	6.001	5.532	3.111
1987	4.499	4.432	4.211	3.87	3.647	3.023
1988	3.58	3.526	3.392	3.059	2.856	2.272
1989	3.669	3.63	3.418	3.133	2.924	2.031
1990	3.058	3.022	2.842	2.664	2.496	1.841

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	18.99	18.65	17.34	15	13.69	7.03
0.0645161290322581	13.59	13.36	12.74	11.3	10.36	6.712
0.0967741935483871	9.456	9.299	8.729	8.337	8.122	5.579
0.129032258064516	8.762	8.733	8.611	7.81	7.269	5.483

0.161290322580645	8.729	8.577	8.023	7.346	6.802	4.651
0.193548387096774	8.355	8.233	8.007	6.981	6.4	4.423
0.225806451612903	7.812	7.675	7.293	6.477	5.956	3.737
0.258064516129032	7.507	7.369	6.871	6.001	5.532	3.719
0.290322580645161	6.824	6.709	6.377	5.748	5.286	3.307
0.32258064516129	6.141	6.043	5.686	5.087	4.742	3.179
0.354838709677419	5.946	5.838	5.424	4.692	4.369	3.111
0.387096774193548	5.397	5.316	5.082	4.689	4.329	3.101
0.419354838709677	5.114	5.044	4.858	4.487	4.293	3.046
0.451612903225806	5.099	5.017	4.828	4.39	4.063	3.023
0.483870967741936	5.001	4.927	4.649	4.17	4.001	2.904
0.516129032258065	4.858	4.787	4.555	4.109	3.934	2.843
0.548387096774194	4.499	4.432	4.224	4.102	3.777	2.699
0.580645161290323	4.294	4.266	4.211	3.87	3.647	2.381
0.612903225806452	4.201	4.139	4.027	3.744	3.535	2.368
0.645161290322581	4.055	3.992	3.797	3.46	3.237	2.321
0.67741935483871	4.045	3.984	3.778	3.401	3.175	2.306
0.709677419354839	3.979	3.933	3.75	3.351	3.146	2.272
0.741935483870968	3.669	3.63	3.418	3.133	2.924	2.224
0.774193548387097	3.58	3.526	3.392	3.059	2.856	2.176
0.806451612903226	3.317	3.269	3.201	2.94	2.761	2.176
0.838709677419355	3.306	3.257	3.112	2.825	2.65	2.089
0.870967741935484	3.242	3.192	2.998	2.73	2.561	2.031
0.903225806451613	3.058	3.022	2.842	2.664	2.496	1.841
0.935483870967742	2.861	2.809	2.646	2.372	2.209	1.482
0.967741935483871	2.72	2.674	2.585	2.317	2.121	0.8673

0.1	9.3866	9.2424	8.7172	8.2843	8.0367	5.5694

Average of yearly averages: 3.16937666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: GApecan
Metfile: w93805.dvf
PRZM scenario: GAPecansC.txt
EXAMS environment file: pond298.exv
Chemical Name: Acetamiprid

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	222.68	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	1e-8	torr	
Solubility	sol	42500	mg/L	
Kd	Kd		mg/L	
Koc	Koc	227	mg/L	
Photolysis half-life	kdp	34	days	Half-life

Aerobic Aquatic Metabolism		kbacw	135	days	Halfife
Anaerobic Aquatic Metabolism		kbacs	1095	days	Halfife
Aerobic Soil Metabolism		asm	4.28	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life	
Hydrolysis:	pH 7	0	days	Half-life	
Hydrolysis:	pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI	0	cm		
Application Rate:	TAPP	.202	kg/ha		
Application Efficiency:		APPEFF	.95	fraction	
Spray Drift	DRFT	.05	fraction of application rate applied to pond		
Application Date	Date	01-07	dd/mm or dd/mmm or dd-mm or dd-mmm		
Interval 1	interval	7	days	Set to 0 or delete line for single app.	
Interval 2	interval	7	days	Set to 0 or delete line for single app.	
Interval 3	interval	7	days	Set to 0 or delete line for single app.	
Record 17:	FILTRA				
	IPSCND	3			
	UPTKF				
Record 18:	PLVKRT				
	PLDKRT				
	FEXTRC	0.5			
Flag for Index Res. Run		IR	Pond		
Flag for runoff calc.	RUNOFF		none	none, monthly or total(average of entire run)	

Michigan Cherry Scenario
stored as MIche.out
Chemical: Acetamiprid
PRZM environment: MICherriesC.txtmodified Satday, 27 March 2004 at 14:39:38
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w14850.dvf modified Wedday, 3 July 2002 at 09:05:40
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	1.528	1.508	1.43	1.292	1.221	0.6171
1962	2.545	2.517	2.405	2.197	2.076	1.389
1963	2.739	2.711	2.599	2.419	2.306	1.773
1964	2.917	2.887	2.77	2.687	2.605	2.028
1965	3.244	3.216	3.127	2.936	2.815	2.258
1966	3.238	3.205	3.073	2.892	2.786	2.281
1967	3.403	3.37	3.238	3.038	2.903	2.332
1968	3.327	3.3	3.222	3.03	2.901	2.338
1969	5.369	5.321	5.148	4.752	4.509	3.102
1970	4.162	4.125	3.981	3.791	3.64	3.135
1971	3.639	3.602	3.457	3.268	3.143	2.632
1972	3.422	3.393	3.275	3.11	2.983	2.43
1973	3.323	3.296	3.247	3.059	2.924	2.363
1974	4.202	4.163	4.04	3.823	3.624	2.677
1975	3.807	3.772	3.629	3.425	3.278	2.711
1976	3.448	3.415	3.281	3.085	2.973	2.469
1977	3.383	3.353	3.231	3.023	2.891	2.361
1978	3.356	3.326	3.202	3.015	2.884	2.324
1979	3.617	3.585	3.462	3.22	3.084	2.443
1980	3.994	3.96	3.819	3.504	3.333	2.629
1981	4.198	4.162	4.042	3.755	3.579	2.834
1982	4.005	3.979	3.83	3.641	3.559	2.962
1983	4.02	3.98	3.877	3.681	3.534	2.933
1984	3.751	3.717	3.581	3.37	3.232	2.689
1985	4.065	4.026	3.878	3.605	3.465	2.814
1986	7.145	7.077	6.898	6.317	5.971	4.141
1987	5.237	5.19	5.022	4.774	4.612	4.11
1988	4.254	4.215	4.054	3.87	3.719	3.231
1989	4.765	4.723	4.552	4.244	4.051	3.134
1990	4.939	4.895	4.759	4.404	4.187	3.333

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	7.145	7.077	6.898	6.317	5.971	4.141
0.0645161290322581	5.369	5.321	5.148	4.774	4.612	4.11
0.0967741935483871	5.237	5.19	5.022	4.752	4.509	3.333
0.129032258064516	4.939	4.895	4.759	4.404	4.187	3.231

0.161290322580645	4.765	4.723	4.552	4.244	4.051	3.135
0.193548387096774	4.254	4.215	4.054	3.87	3.719	3.134
0.225806451612903	4.202	4.163	4.042	3.823	3.64	3.102
0.258064516129032	4.198	4.162	4.04	3.791	3.624	2.962
0.290322580645161	4.162	4.125	3.981	3.755	3.579	2.933
0.32258064516129	4.065	4.026	3.878	3.681	3.559	2.834
0.354838709677419	4.02	3.98	3.877	3.641	3.534	2.814
0.387096774193548	4.005	3.979	3.83	3.605	3.465	2.711
0.419354838709677	3.994	3.96	3.819	3.504	3.333	2.689
0.451612903225806	3.807	3.772	3.629	3.425	3.278	2.677
0.483870967741936	3.751	3.717	3.581	3.37	3.232	2.632
0.516129032258065	3.639	3.602	3.462	3.268	3.143	2.629
0.548387096774194	3.617	3.585	3.457	3.22	3.084	2.469
0.580645161290323	3.448	3.415	3.281	3.11	2.983	2.443
0.612903225806452	3.422	3.393	3.275	3.085	2.973	2.43
0.645161290322581	3.403	3.37	3.247	3.059	2.924	2.363
0.67741935483871	3.383	3.353	3.238	3.038	2.903	2.361
0.709677419354839	3.356	3.326	3.231	3.03	2.901	2.338
0.741935483870968	3.327	3.3	3.222	3.023	2.891	2.332
0.774193548387097	3.323	3.296	3.202	3.015	2.884	2.324
0.806451612903226	3.244	3.216	3.127	2.936	2.815	2.281
0.838709677419355	3.238	3.205	3.073	2.892	2.786	2.258
0.870967741935484	2.917	2.887	2.77	2.687	2.605	2.028
0.903225806451613	2.739	2.711	2.599	2.419	2.306	1.773
0.935483870967742	2.545	2.517	2.405	2.197	2.076	1.389
0.967741935483871	1.528	1.508	1.43	1.292	1.221	0.6171

0.1	5.2072	5.1605	4.9957	4.7172	4.4768	3.3228

Average of yearly averages: 2.61577

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: MIche
Metfile: w14850.dvf
PRZM scenario: MICherriesC.txt
EXAMS environment file: pond298.exv
Chemical Name: Acetamiprid

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	222.68	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	1e-8	torr	
Solubility	sol	42500	mg/L	
Kd	Kd		mg/L	
Koc	Koc	227	mg/L	
Photolysis half-life	kdp	34	days	Half-life

Aerobic Aquatic Metabolism		kbacw	135	days	Halfife
Anaerobic Aquatic Metabolism		kbacs	1095	days	Halfife
Aerobic Soil Metabolism		asm	4.28	days	Halfife
Hydrolysis:	pH 5	0	days	Half-life	
Hydrolysis:	pH 7	0	days	Half-life	
Hydrolysis:	pH 9	0	days	Half-life	
Method:	CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI	0	cm		
Application Rate:	TAPP	.168	kg/ha		
Application Efficiency:		APPEFF	.95	fraction	
Spray Drift	DRFT	.05	fraction of application rate applied to pond		
Application Date	Date	20-05	dd/mm or dd/mmm or dd-mm or dd-mmm		
Interval 1	interval	10	days	Set to 0 or delete line for single app.	
Interval 2	interval	10	days	Set to 0 or delete line for single app.	
Interval 3	interval	10	days	Set to 0 or delete line for single app.	
Record 17:	FILTRA				
	IPSCND	3			
	UPTKF				
Record 18:	PLVKRT				
	PLDKRT				
	FEXTRC	0.5			
Flag for Index Res. Run		IR	Pond		
Flag for runoff calc.	RUNOFF		none	none, monthly or total(average of entire run)	

Oregon Filbert Scenario
stored as ORfil.out
Chemical: Acetamiprid
PRZM environment: ORfilbertsC.txt modified Satday, 12 October 2002 at 17:18:04
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 16:33:30
Metfile: w24232.dvf modified Wedday, 3 July 2002 at 09:06:10
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	1.887	1.867	1.836	1.714	1.622	1.005
1962	2.909	2.886	2.795	2.66	2.55	1.824
1963	3.49	3.463	3.365	3.251	3.139	2.352
1964	3.594	3.57	3.474	3.285	3.16	2.447
1965	3.693	3.676	3.593	3.404	3.28	2.509
1966	3.653	3.627	3.525	3.332	3.2	2.469
1967	3.593	3.57	3.48	3.291	3.158	2.391
1968	4.276	4.247	4.133	3.921	3.772	2.892
1969	3.928	3.902	3.8	3.59	3.439	2.709
1970	5.02	4.988	4.862	4.621	4.447	3.421
1971	6.07	6.024	5.847	5.546	5.311	3.877
1972	4.992	4.963	4.848	4.628	4.458	3.537
1973	4.321	4.297	4.194	3.982	3.831	3.056
1974	4.237	4.21	4.102	3.9	3.752	2.934
1975	4.093	4.068	3.977	3.787	3.649	2.852
1976	4.147	4.12	4.014	3.811	3.674	2.883
1977	3.902	3.875	3.77	3.588	3.455	2.704
1978	3.709	3.684	3.608	3.435	3.302	2.542
1979	3.816	3.789	3.686	3.498	3.358	2.587
1980	4.056	4.026	3.945	3.732	3.59	2.715
1981	4.072	4.043	3.927	3.708	3.567	2.74
1982	4.336	4.307	4.193	3.957	3.792	2.905
1983	4.795	4.762	4.632	4.396	4.23	3.277
1984	4.67	4.638	4.549	4.366	4.209	3.222
1985	4.18	4.153	4.043	3.841	3.723	2.956
1986	5.054	5.021	4.905	4.682	4.509	3.496
1987	4.457	4.426	4.311	4.068	3.905	3.069
1988	4.028	4.008	3.938	3.739	3.604	2.8
1989	3.952	3.922	3.806	3.602	3.455	2.696
1990	3.875	3.847	3.744	3.549	3.41	2.622

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
0.032258064516129	6.07	6.024	5.847	5.546	5.311	3.877
0.0645161290322581	5.054	5.021	4.905	4.682	4.509	3.537
0.0967741935483871	5.02	4.988	4.862	4.628	4.458	3.496
0.129032258064516	4.992	4.963	4.848	4.621	4.447	3.421

0.161290322580645	4.795	4.762	4.632	4.396	4.23	3.277
0.193548387096774	4.67	4.638	4.549	4.366	4.209	3.222
0.225806451612903	4.457	4.426	4.311	4.068	3.905	3.069
0.258064516129032	4.336	4.307	4.194	3.982	3.831	3.056
0.290322580645161	4.321	4.297	4.193	3.957	3.792	2.956
0.32258064516129	4.276	4.247	4.133	3.921	3.772	2.934
0.354838709677419	4.237	4.21	4.102	3.9	3.752	2.905
0.387096774193548	4.18	4.153	4.043	3.841	3.723	2.892
0.419354838709677	4.147	4.12	4.014	3.811	3.674	2.883
0.451612903225806	4.093	4.068	3.977	3.787	3.649	2.852
0.483870967741936	4.072	4.043	3.945	3.739	3.604	2.8
0.516129032258065	4.056	4.026	3.938	3.732	3.59	2.74
0.548387096774194	4.028	4.008	3.927	3.708	3.567	2.715
0.580645161290323	3.952	3.922	3.806	3.602	3.455	2.709
0.612903225806452	3.928	3.902	3.8	3.59	3.455	2.704
0.645161290322581	3.902	3.875	3.77	3.588	3.439	2.696
0.67741935483871	3.875	3.847	3.744	3.549	3.41	2.622
0.709677419354839	3.816	3.789	3.686	3.498	3.358	2.587
0.741935483870968	3.709	3.684	3.608	3.435	3.302	2.542
0.774193548387097	3.693	3.676	3.593	3.404	3.28	2.509
0.806451612903226	3.653	3.627	3.525	3.332	3.2	2.469
0.838709677419355	3.594	3.57	3.48	3.291	3.16	2.447
0.870967741935484	3.593	3.57	3.474	3.285	3.158	2.391
0.903225806451613	3.49	3.463	3.365	3.251	3.139	2.352
0.935483870967742	2.909	2.886	2.795	2.66	2.55	1.824
0.967741935483871	1.887	1.867	1.836	1.714	1.622	1.005

0.1	5.0172	4.9855	4.8606	4.6273	4.4569	3.4885

Average of yearly averages: 2.78296666666667

Inputs generated by pe4.pl - 8-August-2003

Data used for this run:
Output File: ORfil
Metfile: w24232.dvf
PRZM scenario: ORfilbertsC.txt
EXAMS environment file: pond298.exv
Chemical Name: Acetamiprid

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	222.68	g/mol	
Henry's Law Const.	henry		atm-m^3/mol	
Vapor Pressure	vapr	1e-8	torr	
Solubility	sol	42500	mg/L	
Kd	Kd		mg/L	
Koc	Koc	227	mg/L	
Photolysis half-life	kdp	34	days	Half-life

Aerobic Aquatic Metabolism	kbacw	135	days	Halfife	
Anaerobic Aquatic Metabolism	kbacs	1095	days	Halfife	
Aerobic Soil Metabolism	asm	4.28	days	Halfife	
Hydrolysis: pH 5	0	days	Half-life		
Hydrolysis: pH 7	0	days	Half-life		
Hydrolysis: pH 9	0	days	Half-life		
Method: CAM	2	integer	See PRZM manual		
Incorporation Depth: DEPI	0	cm			
Application Rate: TAPP	.202	kg/ha			
Application Efficiency:	APPEFF	.95	fraction		
Spray Drift DRFT	.05	fraction of application rate applied to pond			
Application Date Date	15-02	dd/mm or dd/mmm or dd-mm or dd-mmm			
Interval 1 interval	45	days	Set to 0 or delete line for single app.		
Interval 2 interval	7	days	Set to 0 or delete line for single app.		
Interval 3 interval	7	days	Set to 0 or delete line for single app.		
Record 17: FILTRA					
IPSCND	3				
UPTKF					
Record 18: PLVKRT					
PLDKRT					
FEXTRC	0.5				
Flag for Index Res. Run	IR	Pond			
Flag for runoff calc. RUNOFF		none	none, monthly or total(average of entire run)		

Appendix II. Acetamiprid Degradation

Three product chemistry and environmental fate studies were submitted in the interim since the release of the original acetamiprid risk assessment (DP Barcode 270368). They include studies of the dissociation constant of IM-1-5 (MRID 46255602), the aerobic soil metabolism of acetamiprid and IM-1-5 on calcareous soils (MRID 46255603), and the mobility of acetamiprid and IM-1-5 on calcareous soils (MRID 46255604). These studies were conducted under Good Laboratory Practice (GLP) standards, however the aerobic soil metabolism and mobility studies offer supplemental information. The dissociation constant study of IM-1-5 placed the degradate's pKa at 11.55 (20°C). The aerobic soil metabolism study provided reaction kinetics for acetamiprid, but not for IM-1-5. The mobility study reported an average K_{OC} for IM-1-5 of about 500 mL/g, which suggests low to medium mobility. However, the study description and data were not sufficient to place certainty in the calculated soil-water distribution coefficient value.

Three position statements were submitted concerning IM-1-5, IB-1-1, and IM-1-4 (MRID 46255605, 46255606, 46255607). "Position Statement on Persistence and Mobility of IM-1-5 in Soil" claims that IM-1-5 does not move to groundwater, binds to soil, is found only in calcareous soils, and has similar toxicity to acetamiprid. "Position Statement on IB-1-1" claims that IB-1-1 has no pesticidal activity, low mammalian toxicity, and low ecotoxicity. "Position Paper: IM-1-4, Persistence in Sediment" claims that IM-1-4 is transient, does not accumulate in aqueous environments, has low mammalian toxicity, and has low ecotoxicity. These papers reference studies not conducted under Good Laboratory Practice (GLP) standards. Such studies and the position statement conclusions drawn from them are unacceptable for risk assessment purposes.

Table B. Maximum degradate amounts as a percentage of the parent applied in laboratory degradation studies of acetamiprid.

Study (soil; pH; temperature)	MRID	Degradate (percent of initial parent concentration, in parent equivalents)								
		IC-0	IM-1-2	IM-1-3	IM-1-4	IM-1-5	IB-1-1	IM-0	CO_2	Unextracted
§161-1 (pH 4, 5, 7; 22°C)	44651876			<1 (35 d)	<1 (35 d)					
§161-1 (pH 9; 22°C)	44651876			5.0 (35 d)	1.4 (35 d)					
§161-2 (pH 7; 25°C)	44988509						35.3 (30 d)			
§162-1 (Domestic loamy sand; pH 6.9; 25°C)	44651879	4.7 (62 d)		2.5 (62 d)	73.3 (121 d)				19.1 (274 d)	20.4 (363 d)
§162-1 (Foreign loamy sand; pH 7.6; 25°C)	44651880	11.3 (2 d)	54.9 (1 d)		16.1 (7 d)				44.3 (7 d)	13.9 (7 d)
§162-1 (Foreign loam; pH 7.4; 20°C)	44651881	10.5 (120 d)		3.0 (28 d)	53.9 (14 d)				9.8 (182 d)	38.2 (182 d)
§162-1 (Foreign sandy loam; pH 5.6; 20°C)	44651881	3.6 (120 d)		3.1 (7 d)	71.8 (14 d)				22.7 (182 d)	26.3 (182 d)
§162-1 (Foreign clay loam; pH 8; 20°C)	44651881	10.4 (7 d)		1.6 (7 d)	65.3 (3 d)	20.0 (13 d)			56.6 (120 d)	20.03 (28 d)
§162-1 (Foreign loamy sand; pH 7.6; 20°C)	44699101	9.0 (4 d)	6.6 (4 d)	2.9 (4 d)	59.6 (7 d)				55.2 (112 d)	16.8 (28 d)
§162-1 (Foreign sandy loam; pH 8.0; 20°C)	46255603	5.2 (7 d)	36.0 (1 d)	1.9 (3 d)	21.2 (7 d)	16.5 (187 d)		1.3 (7 d)	50.3 (187 d)	26.2 (118 d)
§162-1 (Foreign clay loam; pH 7.7; 20°C)	46255603	7.2 (7 d)	29.1 (3 d)	2.6 (3 d)	20.7 (7 d)	11.9 (187 d)		2.5 (14 d)	54.3 (91 d)	31.3 (28 d)
§162-1 (Foreign clay loam; pH 7.9; 20°C)	46255603	10.2 (7 d)	28.1 (1 d)	2.4 (7 d)	18.2 (7 d)	12.9 (7 d)		1.0 (14 d)	57.1 (118 d)	31.4 (91 d)
§162-3 (Loamy sand sediment; pH 6-7, 25°C)	44988512		1.4 (274 d)	7.9 (182 d)	27.3 (274 d)				<1 (363 d)	17.3 (274 d)
§162-4 (Sandy loam sediment; pH 6-7; 25°C)	44988513	17.7 (6 mo)	10.5 (1 mo)	<1 (4 mo)	64.3 (6 mo)				5.3 (10 mo)	
§163-1 (Foreign sandy loam; pH 8.4; 20°C)	46255604	33.5 (28 d)	27.3 (7 d)	2.8 (21 d)	11.7 (14 d)	8.8 (64 d)		4.1 (14 d)	28.5 (64 d)	31.2 (50 d)
§163-1 (Sandy loam; pH 8.7; 20°C)	46255604	33.9 (50 d)	38.5 (7 d)	1.6 (14 d)	24.7 (21 d)	4.12 (7 d)		3.5 (14 d)	26.4 (64 d)	29.7 (64 d)

Appendix III. TREX Model Explanation and Sample Output

Points to Consider in Development of Risk Description for Birds and Mammals

Acute and Reproduction Dietary Discussions

The risk assessment includes numerous calculations of dietary exposure for multiple weight classes of animals. However, there are energetic considerations that suggest that some weight class/food item combinations are not likely to naturally occur. For example, there are not likely to be many 15 g mammals or 20 g birds that exclusively feed on vegetation. The risk assessor is urged to consult such texts as the Widlife Exposure Factors Handbook (USEPA 1993), which provides more comprehensive approaches to consider energy requirments and energy availability to estimate dietary exposure. In addition, age of individuals may also play an important role in the types and relative amounts of food items selected. This should also be taken into account when describing dietary risks.

Acute Toxicity RQ Approaches

Dose-based and dietary-based acute RQs should be provided to risk managers whenever effects data allow. There are limitations to each approach. The dose-based approach considers that the uptake and absorption kinetics of a gavage toxicity study to approximate exposure associated with uptake from a dietary matrix. Toxic response is a function of duration and intensity of exposure. For many compounds a gavage dose represents a very short-term high intensity exposure, where dietary exposure may be of a more prolonged nature. The dietary-based approach assumes that animals in the field are consuming food at a rate similar to that of confined laboratory animals. Energy content in food items differs between the field and the laboratory as does the energy requirements of wild and captive animals. The Wildlife Exposure Factors Handbook can provide insights into energy requirements of animals in the wild as well as energy content of their diets

Reproduction RQ Approach

The typical 21-week avian reproduction study does not address the exposure duration needed to elicit the observed responses. The study protocol was designed to establish a steady-state tissue concentration for bioaccumulative compounds. For other pesticides it is entirely possible that steady-state tissue concentrations are achieved earlier than the 21-week expopsure period. Moreover, pesticides may exert effects at critical periods of the reproduction cycle and so long term exposure may not be necessary to elicit the effect observed in the 21-week protocol. The EFED risk assessment uses the single-day maximum estimated EEC as a conservative approach. The degree to which this exposure is conservative cannot be determined by the existing reproduction study. However, risk assessment discussions should be accompanied by the graphics from T-REX model regarding the number of days dietary exposure is above the NOAEC. The greater number of days EECs exceed the NOAEC, the greater the confidence in predictions of reproductive risk concerns.

TREX MODEL INPUTS

These values will be used in the calculation of exposure estimates for foliar, granular, liquid and/or seed applications of pesticides.

Chemical Name:	acetamiprid	
Use:	tree nuts	
Product name and form:		
% A.I.:	100	
Application Rate:	0.18	
Half-life:	35	
Application Interval:	7	
Maximum # Apps./Year:	4	
Length of Simulation:	1	year
Concentration of Concern:	60	(ppm)
Choose label:	Avian chronic NOAEC	

Endpoints

Avian

		Indicate test species below
LD50 (mg/kg-bw)	84.4	Mallard duck
LC50 (mg/kg-diet)	5000	Mallard duck
NOAEL (mg/kg-bw)		Mallard duck
NOAEC (mg/kg-diet)	60.2	Mallard duck

Mammals

LD50 (mg/kg-bw)	146	
LC50 (mg/kg-diet)		
Reported Chronic endpoint	280	mg/kg-diet
Dose or Diet Rat Calculated Endpoint	14	mg/kg-bw based on standard FDA lab rat conversion

Would you like to calculate an LD50 ft-2 for this use? no

2

Upper Bound Kenaga Residues For RQ Calculation

Acute and Chronic RQs are based on the Upper Bound Kenaga Residues.

The maximum single day residue estimation is used for both the acute and reproduction RQs.

Chemical Name:	acetamiprid	
Use:	tree nuts	
Formulation:	0	
Application Rate:	0.18	lbs a.i./acre
Half-life:	35	days
Application Interval:	7	days
Maximum # Apps./Year:	4	
Length of Simulation:	1	year
Concentration of Concern:	60.20	(ppm)
Name of Concentration of Concern:	Avian chronic NOAEC	

Endpoints

Avian	Mallard duck LD50 (mg/kg-bw)	64.4
	Mallard duck LC50 (mg/kg-diet)	5000
	Mallard duck NOAEL (mg/kg-bw)	0
	Mallard duck NOAEC (mg/kg-diet)	60.2
Mammals	LD50 (mg/kg-bw)	146
	LC50 (mg/kg-diet)	0
	NOAEL (mg/kg-bw)	14
	NOAEC (mg/kg-diet)	280

Note: To provide risk management with the maximum possible information, it is recommended that both the dose-based and concentration-based RQs be calculated when data are available

Note: To provide risk management with the maximum possible information, it is recommended that both the dose-based and concentration-based RQs be calculated when data are available

EECs (ppm)	Kenaga Values
Short Grass	142.05
Tall Grass	65.11
Broadleaf plants/sm Insects	79.90
Fruits/pods/seeds/lg Insects	8.88

Avian Results

Avian Class	Body Weight	% body wgt consumed	Adjusted LD50
Small	20	114	42
Mid	100	66	64
Large	1000	28	76

EEC equivalent dose (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	162	92	41
Tall Grass	74	42	19
Broadleaf plants/sm Insects	91	52	23
Fruits/pods/lg insects	10	6	3

Dose-based RQs (daily dose/LD50)	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	3.83	1.71	0.54
Tall Grass	1.75	0.79	0.25
Broadleaf plants/sm Insects	2.15	0.96	0.30
Fruits/pods/lg insects	0.24	0.11	0.03

Dietary-based RQs (EEC/LC50 or NOAEC)	RQs	
	Acute	Chronic
Short Grass	0.03	2.36
Tall Grass	0.01	1.08
Broadleaf plants/sm Insects	0.02	1.33
Fruits/pods/lg insects	0.00	0.15

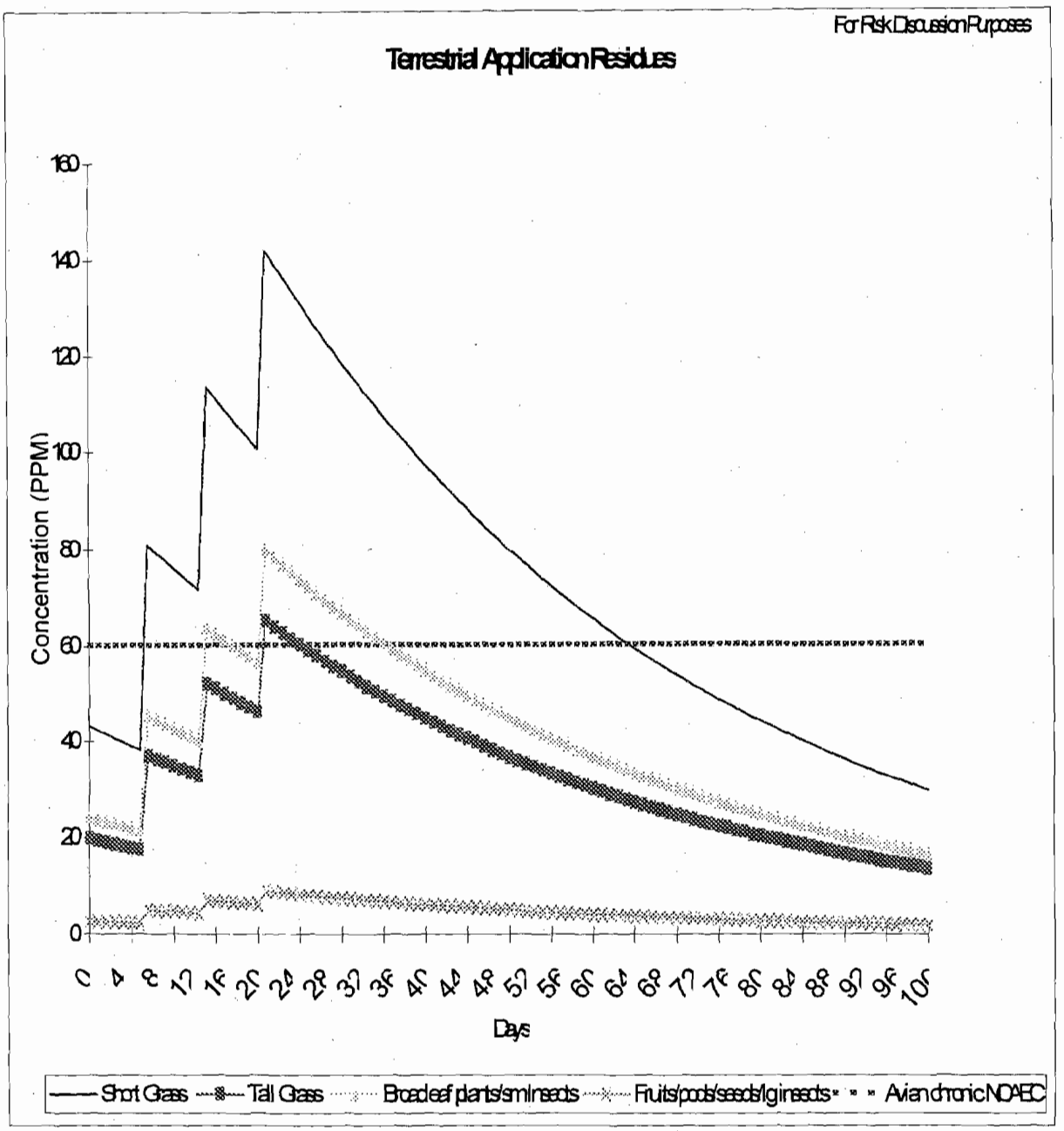
Mammalian Results

Mammalian Class	Body Weight	%body wgt consumed	Adjusted LD50	Adjusted NOAEL
Herbivores/ insectivores	15	95	321	31
	35	66	280	25
	1000	15	112	11
Grainvores	15	21	321	31
	35	15	280	25
	1000	3	112	11

EEC equivalent dose (mg/kg bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15g	35g	1000g	15g	35g	1000g
Short Grass	135	94	21			
Tall Grass	62	43	10			
Broadleaf plants/sm insects	76	53	12			
Fruits/pods/seeds/lg insects	8	6	1	2	1	0

Dose-based RQs (daily dose/LD50 or NOAEL)	15g mammal		35g mammal		1000g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	0.42	4.39	0.35	3.77	0.19	1.98
Tall Grass	0.19	2.01	0.17	1.73	0.09	0.91
Broadleaf plants/sm insects	0.24	2.47	0.20	2.12	0.11	1.11
Fruits/pods/lg insects	0.03	0.27	0.02	0.24	0.01	0.12
Seeds (granivore)	0.01	0.06	0.01	0.05	0.00	0.02

Dietary-based RQs (EEC/LC50 or NOAEC)	Mammal RQs					
	Acute	Chronic				
Short Grass	#DIV/0!	0.51				
Tall Grass	#DIV/0!	0.23				
Broadleaf plants/sm insects	#DIV/0!	0.29				
Fruits/pods/seeds/lg insects	#DIV/0!	0.03				


For Risk Discussion Purposes
Terrestrial Application Residues
Concentration (PPM)
160
140
120
100
80
60
40
20
0
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
84
88
92
96
100
Days
Short Grass
Tall Grass
Broadleaf plants/sm insects
Fruits/pods/seeds/lg insects
Avian chronic NOAEC

Appendix IV. TerrPlant Model

Exposure to Terrestrial Plants including Wetlands (August 8, 2001; version 1.0)

Terrestrial plants inhabiting dry and semi-aquatic (wetland) areas may be exposed to pesticides from runoff and/or spray drift. Semi-aquatic areas are low-lying wet areas that may dry up at times throughout the year.

EFED's runoff scenario is (1) based on a pesticide's water solubility and the amount ot pesticide present on the soil surface and its top one inch, (2) characterized as "sheet runoff" (one treated acre to an adjacent acre) for dry areas, (3) characterized as "channel runoff" (10 acres to a distant low-lying acre) for semi-aquatic or wetland areas, and (4) based on percent runoff values of 0.01, 0.02, and 0.05 for water solubilities of <10, 10-100, and >100 ppm, respectively.

EFED's Spray Drift scenario is assumed as (1) 1% for ground application, and (2) 5% for aerial, airblast, forced air, and spray chemigation applications. The spray drift ratio used here is in agreement with the policy procedures at the time the worksheet was designed.

Currently, 1) this worksheet is designed to derive the plant exposure concentrations from a single, maximum application rate only. 2) For pesticide applications with incorporation of depth of less than 1 inch, the total loading EECs derived for the incorporation method will be same as the unincorporated method.

To calculate RQ values for Non-Endangered Terrestrial Plants:

Terrestrial Plants Inhabiting Areas Adjacent to Treatment Site:

Emergence RQ = Total Loading to Adjacent Area or EEC/Seedling Emergence EC25
Drift RQ = Drift EEC/Vegetative Vigor EC25

Terrestrial Plants Inhabiting Semi-aquatic Areas Adjacent to Treatment Site:

Emergence RQ = Total Loading to Semi-aquatic Area or EEC/Seedling Emergence EC25
Drift RQ = Drift EEC/Vegetative Vigor EC25

To calculate RQ values for Endangered Terrestrial Plants:

Endangered Terrestrial Plants Inhabiting Areas Adjacent to Treatment Site:

Emergence RQ = Total Loading to Adjacent Area or EEC/Seedling Emergence EC05
Drift RQ = Drift EEC/Vegetative Vigor EC05 or NOAEC

Endangered Terrestrial Plants Inhabiting Semiaquatic Areas Near Treatment Site:

Emergence RQ = Total Loading to Semiaquatic Area or EEC/Seedling Emergence EC05

Drift RQ = Drift EEC/Vegetative Vigor EC05 or NOAEC

Formulas used to calculate EEC values (8/08/01; version 1.0)

To calculate EECs for terrestrial plants inhabiting in areas adjacent to treatment sites

Un-incorporated Ground Application (Non-granular):

Sheet Runoff = Application Rate (lb ai/A) x Runoff Value
Drift = Application Rate (lb ai/A) x 0.01
Total Loading = EEC = Sheet Runoff + Drift

Incorporated Ground Application with Drift (Non-granular):

Sheet Runoff = [Application Rate (lb ai/A)/Incorporation Depth (inch)] x Runoff Value
Drift = Application Rate (lb ai/A) x 0.01
Total Loading = EEC = Sheet Runoff + Drift

Un-incorporated Ground Application (Granular):

Sheet Runoff = EEC = Application Rate (lb ai/A) x Runoff Value

Incorporated Ground Application without Drift (Granular):

Sheet Runoff = EEC = [Application Rate (lb ai/A)/Incorportion Depth (inch)]
x Runoff Value

Aerial/Airblast/Spray Chemigation Applications:

Sheet Runoff = Application Rate (lb ai/A) x Runoff Value x Application Efficiency of 0.6

Drift = Application Rate (lb ai/A) x 0.05
Total Loading = EEC = Sheet Runoff + Drift

Runoff Value = 0.01, 0.02, or 0.05 when the solubility of the chemical is <10 ppm, 10-100 ppm, or>100 ppm, respectively

Incorporation Depth: Use the minimum incorporation depth reported on the label.

Terrestrial Plant EECs and Acute Endangered RQs
(8/8/01; version 1.0)

Chemical:

Input Values

Application Rate (lb	0.18
Runoff Value (0.01, 0.02,	0.05
Minimum Incorporation Depth (inches)	1
Seed Emerg Monocot	0.077
Seed Emerg Dicot EC05	0.077
Veg Vigor Monocot	0.31
Veg Vigor Dicot EC05	0.0025

Estimated Environmental Concentrations (EECs) for NON-

Application Method	Total Loading to Adjacent Areas	Total Loading to Semi-aquatic	DRIFT EEC (for ground: applicat
Ground Unincorp.	0.0108	0.0918	0.0018
Ground Incorp	0.0108	0.0918	0.0018
Aerial, Airblast,	0.0144	0.0630	0.0090

Risk Quotients (RQs) for NON-GRANULAR formulation applications

Emergence RQs, Adjacent Areas		Emergence RQs, Semi-aquatic areas		Drift RQs RQ = EEC/Vegetative	
Monocot	Dicot	Monocot	Dicot	Monocot	Dicot
0.14	0.14	1.19	1.19	0.01	0.72
0.14	0.14	1.19	1.19	0.01	0.72
0.19	0.19	0.82	0.82	0.03	3.60

EECs for GRANULAR formulation applications

RQs for GRANULAR formulation applications

Appendix V. Individual Effect Chance Model

IECV1.1 - Individual Effect Chance Model Version 1.1

Predictor of chance of individual effect using probit dose-response curve slope and median lethal estimate

Enter LC_{50} or LD_{50}	84.4		
Enter desired threshold	0.1		
Enter slope of dose-response	4.5	**Is this a default slope estimate? Yes or No**	y
z score result	-4.5	z is the standard normal deviate	
Probability associated with z	3.40E-06	Uses Excel NORMDIST function to estimate P with lower reporting limit of 1.0 E-16	
Chance of individual effect, ~1 in . .	2.94E+05	Calculated as 1/P	

This is based on the formula $\log LC_k = \log LC_{50} + (z/b)$

where: z is the standard normal deviate and b equals slope

Works for dose-response models based on a probit assumption (i.e. log normal distribution of individual sensitivity)

Note: Excel cannot calculate probabilities for extremes in z scores beyond -8.2
Probability is defaulted to 10^{-16}, which is the limit of Excel reporting.

Reset Model

Ed Odenkirchen, June 22, 2004 EFED/OPP/USEPA

Use of the Probit Dose Response Relationship to Provide Information on the Endangered Species Levels of Concern

Introduction

The document entitled Overview of Ecological Risk Assessment Process in the Office of Pesticide Programs, U.S. Environmental Protection Agency (USEPA 2004, the Overview Document) discusses methods for providing the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) with additional information regarding the listed animal species acute levels of concern (LOCs). This document provides (1) the background information on how agreements were reached between the services and USEPA for methods to provide additional LOC information, and (2) a discussion of issues concerning those methods and their resolution. Risk Assessors within the Environmental Fate and Effects Division (EFED) should use the Overview Document as well as the following information as guidance for using the probit dose response relationship as a tool for providing additional information on the listed species LOCs

Effective immediately, all screening-level risk assessments (REDS, Section 3's, Section 18's, etc.) using risk quotient (RQ) methods will incorporate this analysis, regardless of whether listed species LOCs are exceeded or not.

Background on Discussion of LOCs with USFWS and NMFS

Over the course of negotiations with the USFWS and NMFS, one topic of discussion centered on the risk quotient values established as screening thresholds for consideration of direct toxic effects on listed species (i.e., the acute listed species LOCs of 0.1 and 0.05 used for terrestrial and aquatic animals, respectively). The Agency provided the Services with the mathematical interpretations of these LOC values, which was

documented in the background information supplied to the Services and is included in the Overview Document CD distributed to all employees in EFED. In short, the interpretation of the LOCs was discussed in terms of best estimates of the chance of an individual event (mortality or immobilization) should exposure at the estimated environmental concentration actually occur for a species with sensitivity to the pesticide on par with the toxicity endpoint selected for RQ calculation.

The mathematics were based on a long-held assumption of a probit dose-response relationship for acute toxicity endpoints. The listed species LOCs or the fraction (0.05 or 0.1) of the dose estimated to produce 50% mortality were used to interpolate from a probit dose response curve to estimate the associated ECx, LDx, or LCx. These values were then used to estimate the chance of an individual event.

Two issues were identified over the course of discussions with the Services in regard to the Agency's presentations of the math and the interpretation of the LOCs. First was the issue that the chance of individual event was highly dependant upon the assumed shape and slope of the dose-response relationship. Second was that the Services were unwilling to present a generic threshold of the chance of an individual event, below which the Services would not have a concern for listed species impacts The services indicated that the baseline conditions of a species and it's biology would dictate species-specific concerns for tolerated effects. Further discussion on the confidence of extreme value extrapolations for probit dose response did not achieve an agreement between all parties on what the lower limit of cutoff in reporting extreme events should be for interpretation of listed species acute LOCs. Even consideration of using the most intolerant listed species within taxonomic groups as a screening basis for other more tolerant listed species was not accepted as a viable strategy for establishing generic effects thresholds for listed species.

Consequently, it was accepted by all parties that the Agency would provide in its risk assessments an interpretation of the listed species LOCs in terms of the chance of an individual effect should organisms be exposed to a media concentration or dose corresponding to 1/10 or 1/20 of the LC_{50}, LD_{50}, or EC_{50} used as the acute toxicity measurement endpoint for a particular animal taxonomic group. To accomplish this interpretation, the Agency would use (1) the slope of the dose response relationship available from the toxicity study used to establish the acute toxicity measurement endpoints for each animal taxonomic group; (2) an assumption of a probit dose response relationship; (3) a mean estimate of slope consistent with current Agency statistical procedures; and (4) a lower limit to the estimate of individual effect chance based on what could be calculated by Excel spreadsheet "Normdist" function.

Issues with the LOC Interpretation Method and Their Resolution

Discussion within the Agency has identified three issues with regard to the calculation of the chance of individual event corresponding to the listed species acute LOCs. The largest issue is the extrapolation to extremely low probability events, referring to the very large confidence intervals surrounding such estimates. A secondary issue, but still very important, is the extent to which probit dose response slopes can be calculated for existing studies (i.e., the fitting of a probit dose response relationship to available data). The third issue is how to proceed when information is unavailable to estimate a slope. The following guidance information will address these issues:

Extrapolation to Extremely Low Probability Events

The nature of this issue centers on the fact that slope estimates are accompanied by a corresponding variance in the slope term. This variance in the slope term and to some extent the variance in the median lethal dose estimate, can result in wide variations of effects probabilities at the upper and lower tails of the dose range. While the Agency has agreed to present the effects probability associated with the LOCs based on the mean

estimate of slope, it is evident that expression of this single estimate of the corresponding effects probability would suggest that the Agency has inordinately high confidence in this estimate, when in fact there is likely considerable variability in the estimate. Consequently, for the short term, it is recommended that both the estimate of effects probability be calculated for the mean slope estimate and listed species LOC and available information on the 95% confidence interval of the slope estimate be used to calculate an upper and lower estimate of the effects probability. It is important to note that interpretation of these results is not required under agreement with the Services. The Services have requested that the results be made available in the screening assessment reports. It is recommended that reporting minimally include the following discussion:

> " Based on an assumption of a probit dose response relationship with a mean estimated slope of **(enter slope here)**, the corresponding estimated chance of individual mortality associated with the listed species LOC of (0.1 or 0.05) the acute toxic endpoint for **(enter appropriate animal taxonomic group)** is **(enter value)**. 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 **(enter the 95 percent confidence interval for the slope)** were used to calculate upper and lower estimates of the effects probability associated with the listed species LOC. These values are **(enter the upper and lower estimates)**."

For the present time, the Excel spreadsheet tool IECV1.1 will allow for such calculations by entering in the mean slope estimate and the 95 percent confidence bounds of that estimate as the slope parameter for the spreadsheet. It is important to note that the model output can go as low as 10 E-16 in estimating the event probability. This cut-off is a limit in the Excel spreadsheet environment and is not to be interpreted as an agreed upon lower bound threshold for concern for individual effects in any given listed species.

EFED will continue to work on establishing subsequent approaches to account for both the variance in the slope and the median lethal dose estimate when establishing this upper and lower estimates of effects estimates associated with the listed species LOCs.

Probit Slopes for Existing Studies

Slope information may or may not be estimated for a given study upon which RQs were calculated. When the available data evaluation records (DERs) or study reports provide the slope information (i.e., mean slope estimate, p-value of estimate, and 95% confidence interval of the estimate) , it should be used as reported once these reported values have been carefully reviewed to ensure their accuracy. However, there are likely to be situations where slope information is not provided in the DERs. For such situations, the raw data from the study must be entered into and analyzed by the EFED current statistical package for acute effects studies. See the EFED Statistical Workgroup for assistance with accessing these software. Probit slope information will be used from these analyses. However, there a re two distinctions that must be made in the reporting of these results for listed species evaluation. First, studies with good probit fit characteristics can be used as reported accompanied with a statement that the probit dose response relationship was statistically appropriate for the data set. Alternatively, if the assumption of a probit dose response was shown to be statistically unsupported, the slope estimates are still used in the listed species LOC interpretation (remember we have in our policy assumed probit dose response when LOCs were established), but the statistical rejection criteria must be presented along with a statement :

> "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 **(enter the p-value from**

the statistical package) and so the confidence in estimated event probabilities based on this dose response relationship and the listed species LOC is low."

EFED will continue to work on the development of statistical tools to explore alternative dose response relationships in situations where the assumption of probit dose response relationship is not upheld by available data.

How to Proceed When Information is Unavailable to Estimate a Slope

State in the assessment that information is unavailable to estimate a slope from the available toxicity study and the reason why re-analysis of raw data is not possible. Then state that a event probability was calculated for the listed species LOC based on a default slope assumption of 4.5 as per original Agency assumptions of typical slope cited in Urban and Cook (1986).

References

United States Environmental Protection Agency (USEPA). 2004. Overview of Ecological Risk Assessment Process in the Office of Pesticide Programs, U.S. Environmental Protection Agency. Office of Prevention, Pesticides and Toxic Substances, Office of Pesticide Programs, Washington, DC.

Urban D.J. and N.J. Cook. 1986. Hazard Evaluation Division Standard Evaluation Procedure Ecological Risk Assessment. EPA 540/9-85-001. U.S. Environmental Protection Agency, Office of Pesticide Programs, Washington, DC.

Appendix VI Endangered Species by Crops from the LOCATES Database

Cucurbit Uses

Unique Taxa Count by State for Selected Crops

No species exclusions.

Minimum of 1 Acre

CANTALOUPS, CUCUMBERS AND PICKLES, HONEYDEW MELONS, PUMPKINS, SQUASH, WATERMELONS

CANTALOUPS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	15	4	2	1	5			17	10	30
Arizona	8	17	8	2		2			14	1	
Arkansas	3	2	2		1			1	3	1	5
California	15	18	22	6	8	8		20	163	1	
Colorado	3	5	2						6		
Connecticut	3	1	1					1	2		1
Delaware	2	1	1						2		
Florida	9	3	5	1	1	6			19		6
Georgia	5	7	3	1		2			16		15
Hawaii	21		2			2		1	154	1	
Idaho	1	4	2						3	5	
Illinois	3	1	2		1			2	5	1	5
Indiana	3		2			1		2	1		10
Iowa	3	2	1						6	1	2
Kansas	4	4	2					1	2		
Kentucky	3	3	3		1				8		19
Louisiana	4	2	1			2			2		2
Maine	3	2	1						1		
Maryland	2	2	2					2	6		1
Massachusetts	3	1	1			1		3	3		
Michigan	3		1			1		3	6		1
Minnesota	2	1	1						4		2

Mississippi	3	3	1			4			1		3
Missouri	3	4	2					1	6		4
Montana	4	2	2						1		
Nebraska	4	2	1						2		
Nevada	2	18				1		2	8		
New Hampshire	1		1					1	2		1
New Jersey	3	1	1						5		
New Mexico	5	12	5	1		1			13		
New York	3	1	1					1	6	1	1
North Carolina	5	4	5			1	1	1	26		5
North Dakota	4	1							1		
Ohio	2	1	1			2		1	4		6
Oklahoma	6	2	3					1	1		2
Oregon	5	9	1		1			2	9		
Pennsylvania	2		2						2		2
Rhode Island	1	1	1					1	2		
South Carolina	4	1	2	1		2			18		1
South Dakota	4	2	1					1	1		
Tennessee	3	13	4		1				13	2	25
Texas	12	7	5	4	1	3	10	8	26		
Utah	2	8	2			1			20		
Vermont	1		1						2		1
Virginia	3	5	5	1	1	1		1	12	1	18
Washington	3	5	4						2		
West Virginia	1		2						4		4
Wisconsin	3		1					2	6		2
Wyoming	1		3						1		
Affected Counties:	991	421	736	72	46	178	5	119	585	24	262
Affected States:	49	40	47	9	10	19	2	23	49	11	27
Affected Species:	56	100	55	15	16	26	11	41	508	23	66

CUCUMBERS AND PICKLES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	13	4	2	1	5			17	10	30
Arizona	8	16	7	2		2			13	1	

Arkansas	3	2	2		1			1	3	1	4
California	15	15	22	6	8	8		21	166	1	
Colorado	3	5	2					1	4		
Connecticut	3	1	1					1	2		1
Delaware	2	1	1						2		
Florida	9	4	8	1	1	10		1	44		6
Georgia	5	10	3	1		2		1	14		15
Hawaii	32		2		1	2	1	1	268	2	
Idaho	1	3	1						1	6	
Illinois	3	1	2		1			2	6	1	6
Indiana	1		2			1		2	1		8
Iowa	3	2	1						5	1	2

CUCUMBERS AND PICKLES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Kansas	4	4	2					1	2		
Kentucky	3	2	3		1				10		20
Louisiana	4	2	1			3			1		1
Maine	3	2	1						3		
Maryland	2	2	2					2	6		1
Massachusetts	3	1	1			1		3	3		
Michigan	3		2			1		3	6		1
Minnesota	2	1	1						4		2
Mississippi	6	2	1	1		4			1		
Missouri	3	4	2					1	6		3
Montana	1	3	3						2		
Nebraska	4	2	1						1		
Nevada	2	13				1		1	7		
New Hampshire	1		1					1	2		1
New Jersey	3	1	1						5		
New Mexico	5	5	1	1					9		
New York	3	1	1					1	6	1	1
North Carolina	5	4	5			1	1	1	26		5
North Dakota	4	1							1		
Ohio	2	1	1			2		1	4		6

Oklahoma	6	3	1					1	1		2
Oregon	5	9	1		1			2	10		
Pennsylvania	2		2						2		2
Rhode Island	1	1	1					1	2		
South Carolina	4	1	2	1		2			19		1

CUCUMBERS AND PICKLES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
South Dakota	4	2	1					1	1		
Tennessee	3	12	4		1		1		11		23
Texas	11	2	4	3	1	3	8	7	12		
Utah	2	8	2			1			10		
Vermont	1		1						2		1
Virginia	3	5	5	1	2	1		1	13		18
Washington	3	5	4						4		
West Virginia	1		4	1					5	1	2
Wisconsin	3		1					2	6		2
Wyoming	1		4						1		
Affected Counties:	946	404	739	75	50	186	7	123	590	25	251
Affected States:	49	40	47	11	11	18	4	26	49	10	26
Affected Species:	68	85	56	16	18	28	10	41	622	24	66

HONEYDEW MELONS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	8	9	6	2		1			8		
California	15	16	21	6	7	7		14	134		
Delaware	2		1						1		
Hawaii	21		2			2		1	171	1	
Illinois	1		1						1		
Indiana	1		1					1			7
Maine	3		1						3		
Maryland	1		2						3		1
Massachusetts	1		1								

HONEYDEW MELONS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Michigan	1		1			1		2	2		2
Nebraska	3	1									
Nevada	1										
New Hampshire	1		1						1		
New Jersey	2	1	1						2		
New Mexico	4	2	1						4		
New York	3	1	1					1	3	1	
Ohio	1	1	1					1	1		2
Oregon	5	7	1		1			2	7		
Pennsylvania	2		2						2		2
Texas	7	2	3						10		
Utah	1	1									
Vermont	1		1						1		
Washington	2	4	2								
Wisconsin	1							1	3		1
Affected Counties:	108	59	87	22	27	27		35	80	2	12
Affected States:	24	11	20	2	2	4	0	8	18	2	6
Affected Species:	47	32	36	8	7	11		20	348	2	11

PUMPKINS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	14	4	2	1	4			14	9	26
Arizona	7	17	8	2		2			13	1	
Arkansas	3	1	3		1				3		6
California	15	19	22	6	8	8		22	169	1	

PUMPKINS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Colorado	3	5	2					2	4		
Connecticut	3	1	1					1	2		1
Delaware	2	1	1						2		

Florida	9	2	2	1	1	6		1	11		
Georgia	3	6	2			1			11		13
Hawaii	32		2		1	2	1	1	268	2	
Idaho	1	5	3						3	6	
Illinois	3	1	2		1			2	6	1	6
Indiana	2		2			1		2	2		9
Iowa	3	2	1						6	1	2
Kansas	4	4	2					1	2		
Kentucky	3	3	3		1				10		20
Louisiana	3	2	1			2			1		2
Maine	3	2	1						3		
Maryland	2	2	2					2	6		1
Massachusetts	3	1	1			1		3	3		
Michigan	3		2			1		3	7		2
Minnesota	2	1	1						4		2
Mississippi	5	3	1			5			1		3
Missouri	3	7	2					1	8		5
Montana	4	3	3						2		
Nebraska	4	2	1						2		
Nevada	2	13				1		1	1		
New Hampshire	1		1					1	2		1
New Jersey	3	1	1						5		

PUMPKINS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
New Mexico	5	11	5	1		1			11		
New York	3	1	1					1	6	1	1
North Carolina	3	4	4			1	1	1	25		5
North Dakota	4	1							1		
Ohio	2	1	1			2		1	4		6
Oklahoma	6	4	3					1			2
Oregon	5	9	1		1			2	9		
Pennsylvania	2		2						2		2
Rhode Island	1	1	1					1	2		
South Carolina	4	1	2	1		1			15		1
South Dakota	4	2	1					1	1		
Tennessee	3	14	4		1		1		15		27
Texas	8	1	5			1			10		
Utah	2	6	2			1			16		
Vermont	1		1						2		1
Virginia	3	5	5	1	1	1		1	12	1	18
Washington	5	5	4					1	4		
West Virginia	1		3	1					5	1	3
Wisconsin	3		1					2	6		2
Wyoming	1		3						1		
Affected Counties:	969	414	910	51	50	90	3	136	624	25	276
Affected States:	49	40	47	8	10	19	3	24	48	10	26
Affected Species:	67	92	55	12	16	24	2	35	593	23	65

SQUASH

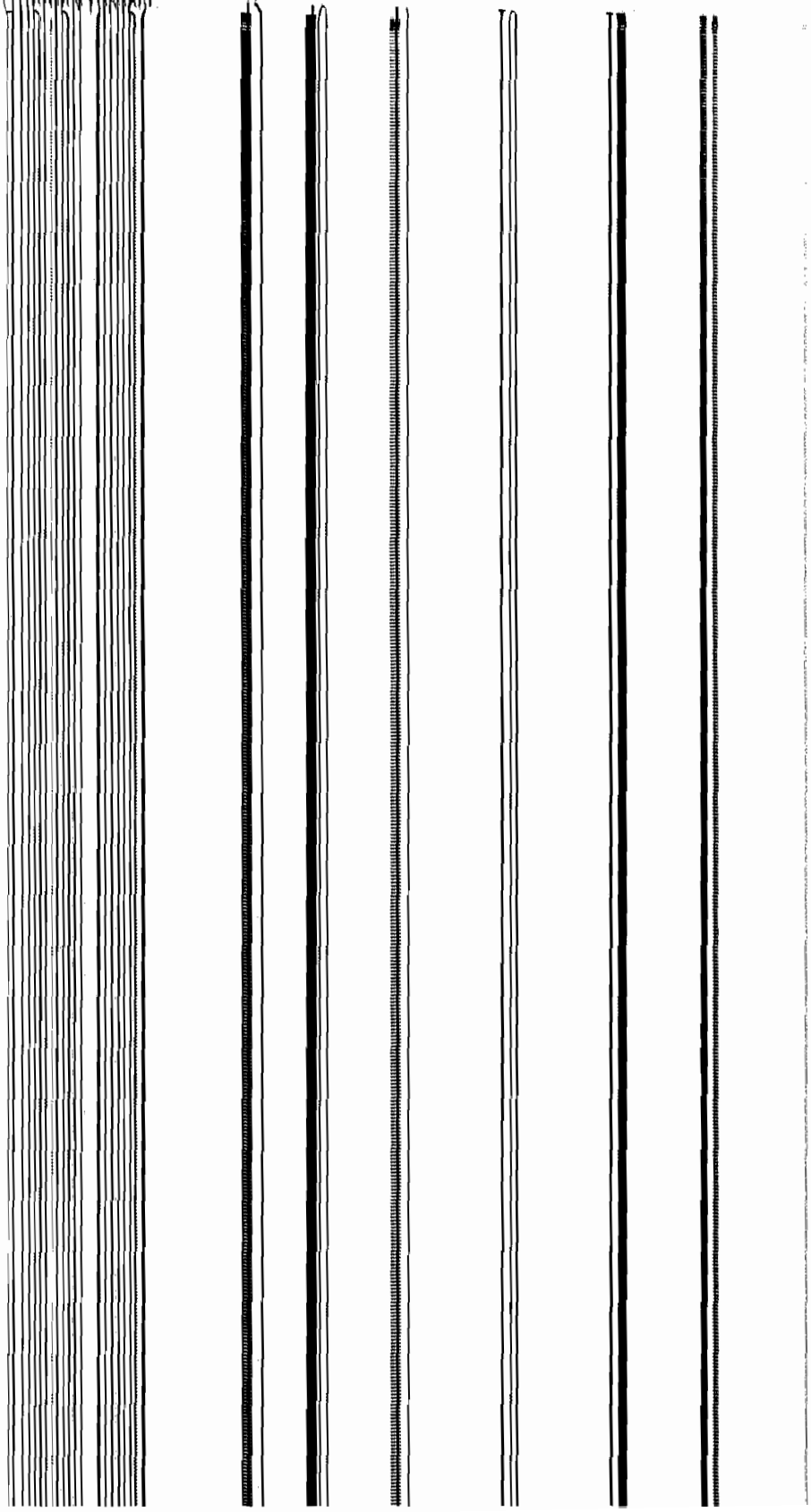
	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	13	4	2	1	5			14	10	28
Arizona	8	16	8	2		2			18	1	
Arkansas	3	2	2		1			1	3	1	5
California	15	18	22	6	8	8		21	169	1	
Colorado	3	6	2					2	6		
Connecticut	3	1	1					1	2		1
Delaware	2	1	1						2		
Florida	9	4	9	1	1	10		1	47		7
Georgia	5	7	3	1		2			15		14
Hawaii	32		2		1	2	1	1	268	2	
Idaho	1	4	3						3	6	
Illinois	3	1	2		1			2	7	1	4
Indiana	1		2			1		2	1		9
Iowa	3	2	1						6	1	2
Kansas	4	3	1					1	2		
Kentucky	3	2	3		1				7		18
Louisiana	4	2	1			1			1		1
Maine	3	2	1						3		
Maryland	2	2	2					2	6		1
Massachusetts	3	1	1			1		3	3		
Michigan	3		2			1		3	7		2
Minnesota	2	1	1						4		2
Mississippi	5	3	1			5			1		2
Missouri	3	4	2					1	7		2
Montana	4	3	3						2		

SQUASH

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Nebraska	4	2	1						2		
Nevada	2	15				1		2	8		
New Hampshire	1		1					1	2		1
New Jersey	3	1	1						5		
New Mexico	6	11	2	1	1				12	2	
New York	3	1	1					1	6	1	1
North Carolina	4	4	4			1		1	25		5
North Dakota	4	1							1		
Ohio	2	1	1			2		1	4		6
Oklahoma	6	3	3					1	1		1
Oregon	5	9	1		1			2	10		
Pennsylvania	2		2						2		2
Rhode Island	1	1	1					1	2		
South Carolina	4	1	2	1		2			18		1
South Dakota	4	2	1					1	1		
Tennessee	3	8	4		1				10		19
Texas	11	4	5	4	1	3	10	8	19		
Utah	2	8	2			1			17		
Vermont	1		1						2		1
Virginia	3	5	5	1	1	1		1	11		18
Washington	5	5	4						6		
West Virginia	1		3	1					5	1	5
Wisconsin	3		1					2	6		2
Wyoming	1		3								

SQUASH

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Affected Counties:	1016	418	749	74	49	194	4	135	594	28	220
Affected States:	49	40	47	10	12	18	2	25	48	11	27



SQUASH

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Affected Counties:	1016	418	749	74	49	194	4	135	594	28	220
Affected States:	49	40	47	10	12	18	2	25	48	11	27
Affected Species:	68	92	59	16	18	28	11	44	646	26	67

WATERMELONS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	15	4	2	1	5			17	10	30
Arizona	7	16	8	2		2			15	1	
Arkansas	3	3	3		2			1	4	1	6
California	15	16	22	6	8	8		17	152	1	
Colorado	3	5	2					1	4		
Connecticut	3	1	1					1	2		1
Delaware	2	1	1						2		
Florida	9	4	9	1	1	9			45		7
Georgia	5	8	3	1		2			18		16
Hawaii	32		2		1	2	1	1	268	2	
Idaho	1	4	2						2	5	
Illinois	3	1	2		1			2	5	1	4
Indiana	3		2			1		2	1		10
Iowa	3	2	1						5	1	2
Kansas	4	4	2					1	2		
Kentucky	3	3	3		1				8		19
Louisiana	4	2	1			3			2		2
Maine	3	2	1						3		
Maryland	2	2	2					2	6		1

WATERMELONS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Massachusetts	3	1	1			1		1	2		
Michigan	3		2			1		3	6		2
Minnesota	1	1	1						4		2
Mississippi	6	3	1	1		5			2		3
Missouri	3	6	2					1	7	1	5
Montana	4	2	3						1		
Nebraska	4	2	1						2		
Nevada	2	10				1					
New Hampshire	1		1					1	2		1
New Jersey	3	1	1						5		
New Mexico	5	11	5	1		1			13		
New York	3	1	1					1	6	1	1
North Carolina	5	4	5			1	1	1	26		5
North Dakota	4	1									
Ohio	2	1	1			2		1	4		6
Oklahoma	7	4	3					1	2		2
Oregon	5	7	1		1			2	7		
Pennsylvania	2		2						2		2
Rhode Island	1	1						1	1		
South Carolina	4	1	2	1		2			19		1
South Dakota	4	2	1					1	1		
Tennessee	3	13	4		1		1		17	2	25
Texas	12	7	5	4	1	3	10	8	26		
Utah	2	8	2			1			20		
Vermont	1		1						1		1

WATERMELONS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Virginia	3	5	5	1	2	1		1	11		18
Washington	3	5	4						4		
West Virginia	1		1						3		4
Wisconsin	3		1					2	6		2
Wyoming	1		1								
Affected Counties:	1126	473	807	76	46	254	6	119	605	27	311
Affected States:	49	40	46	10	11	19	4	23	46	11	27
Affected Species:	67	88	58	16	19	28	12	37	627	24	70

Grand Summary

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Total Counties:	152	631	118	90	55	271	8	154	840	35	391
Total States:	49	40	47	11	12	19	4	27	49	14	27
Unique Species Totals:	68	103	59	17	20	28	12	44	667	29	70

Stone Fruit Uses

Unique Taxa Count by State for Selected Crops

No species exclusions.

Minimum of 1 Acre

APRICOTS, CHERRIES, SWEET (SEE TEXT), CHERRIES, TART (SEE TEXT), NECTARINES, PEACHES, ALL, PEACHES, CLINGSTONE (AZ & CA only), PEACHES, FREESTONE (AZ & CA only), PLUMS (AZ & CA only), PLUMS AND PRUNES, PRUNES (AZ & CA only)

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

APRICOTS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	1	1							2	2	6
Arizona	7	16	8	2		2			18	1	

Arkansas	3	1								3
California	16	21	21	6	8	8	18	165	1	
Colorado	2	6	2				2	6		
Connecticut	3	1	1					1		1
Georgia	2		2					2		
Idaho	2	4	2					3	5	
Illinois	2	1	2					3		2
Indiana	1		1				1			5
Iowa	3	2	1					4	1	2
Kansas	4	4	1				1	2		
Kentucky	1		2							
Maine	2	1						1		
Maryland	1	2	2				1	3		
Massachusetts	3	1					1	1		
Michigan	3		2				2	6		
Minnesota	1		1							1

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

APRICOTS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Mississippi	3	1	1			5					
Missouri	1	2	2					1	4		4
Montana	4	2	2						2		
Nebraska	4	1	1						1		
Nevada	2	15				1		2	8		
New Jersey	2	1	1						3		
New Mexico	5	11	2	1					10		
New York	3	1	1						4		
North Carolina	4	2	1			1			3		
Ohio	2		1			1			4		2
Oklahoma	5	2	1								
Oregon	5	7	1		1			2	8		

Pennsylvania	2		2						2		2
Rhode Island	1	1	1						1		
South Carolina	3	1		1		2			3		1
South Dakota	2								1		
Tennessee			1								
Texas	11	5	2	3	1	2	8	7	12		
Utah	2	8	2			1			22		
Vermont	1		1						1		1
Virginia	2	1	3	1		1		1	3	1	2
Washington	3	5	4						4		
West Virginia			1						2		1
Wisconsin	3		1					1	4		1
Wyoming	1		1								

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

APRICOTS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Affected Counties:	360	192	238	44	38	44	2	59	206	10	25
Affected States:	41	30	36	6	3	10	1	13	35	6	15
Affected Species:	31	68	42	13	9	16	8	35	275	11	19

CHERRIES, SWEET (SEE TEXT)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	2	7	2			1			6	8	14
Arizona	5	11	6	2		1			4		
Arkansas	2	1	1		1						
California	16	20	22	6	8	8		20	173	1	
Colorado	2	6	2					1	6		
Connecticut	2	1	1					1	2		1
Georgia	2	3	2						3		
Idaho	2	5	4						3	6	
Illinois	2	1	2		1			1	5		4
Indiana	1		1					1			8
Iowa	3	1	1						5	1	2
Kansas	4	4	2					1	1		
Kentucky	1	2	2		1				4		9
Louisiana	3	2	1			2			1		
Maine	3	2	1						1		
Maryland	2	2	2					1	5		1
Massachusetts	3	1	1					1	3		
Michigan	3		2			1		3	6		2
Minnesota	2	1	1						2		2

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

CHERRIES, SWEET (SEE TEXT)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Missouri	1	4	2					1	6		4
Montana	1	2	2						2		
Nebraska	4	1							1		
Nevada	2	15				1		2	8		
New Hampshire	1		1					1	1		1
New Jersey	3	1	1						5		
New Mexico	5	10	2	1					9		
New York	3	1	1					1	6	1	1
North Carolina	3	1	3			1			15		3
North Dakota	1								1		
Ohio	2	1	1			1			4		3
Oklahoma	4	1							1		
Oregon	5	7	1		1			2	11		
Pennsylvania	2		2						2		2
Rhode Island	1	1						1	1		
South Carolina	3	1		1		2			6		
South Dakota	1	1							1		
Tennessee	1	2	2						6		6
Texas	6		1			1	2	2			
Utah	2	8	2			1			20		
Vermont	1		1						2		1
Virginia	1	2	4	1	1				8	1	10
Washington	5	5	4						6		
West Virginia	1		3	1					5	1	5
Wisconsin	2		1					2	5		1

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

CHERRIES, SWEET (SEE TEXT)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Affected Counties:	444	236	400	35	43	45	1	79	300	14	76
Affected States:	44	35	37	6	6	11	1	17	41	7	20
Affected Species:	29	74	45	11	12	17	2	32	281	19	36

CHERRIES, TART (SEE TEXT)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	1	4	2			1			7	6	14
Arizona	3	5	1			1			4	1	
California	15	18	14	5	6	6		10	80		
Colorado	2	6	2					2	6		
Connecticut	2	1	1					1	1		
Delaware	1	1							2		
Georgia	2		2						5		3
Idaho	2	4	4						2	4	
Illinois	2	1	1		1				2	1	1
Indiana	1		2			1		2	1		8
Iowa	3	2	1						3	1	2
Kansas	4	4	2					1	2		
Kentucky	2	2	3						6		10
Maine	3	2	1						3		
Maryland	2	2	2					1	4		1
Massachusetts	3	1				1		1	1		
Michigan	3		2			1		3	6		2
Minnesota	2		1						3		2
Mississippi	1										

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

CHERRIES, TART (SEE TEXT)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Missouri	2	4	2					1	6		2
Montana	4	2	3						2		
Nebraska	4	2							1		
Nevada	1	10				1		1	7		
New Hampshire	1		1					1	1		1
New Jersey	3	1	1						5		
New Mexico	4	9	2	1					9		
New York	2	1	1					1	4		1
North Carolina	2	1	3						6		
North Dakota	2								1		
Ohio	2	1	1			1		1	3		4
Oklahoma	5	1	3					1			
Oregon	5	7	1		1			2	9		
Pennsylvania	2		2						2		2
Rhode Island	1	1						1	1		
South Carolina	2								3		
South Dakota	3	2							1		
Tennessee	1	2	2						4		2
Texas	5		1				2	2			
Utah	2	8	2			1			20		
Vermont	1		1						1		1
Virginia	1	1	2	1	1	1		1	7		2
Washington	5	5	4						5		
West Virginia	1		4	1					5	1	3
Wisconsin	2		1					2	6		2

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

CHERRIES, TART (SEE TEXT)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Wyoming	1		1								
Affected Counties:	413	177	376	16	16	21	1	59	252	10	76
Affected States:	45	31	36	4	4	10	1	19	41	6	19
Affected Species:	26	62	34	8	8	11	2	24	185	13	35

NECTARINES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	1	1				1			2	1	3
Arizona	6	10	6	2		1			6		
Arkansas	3	1	1		1						1
California	15	17	21	6	8	7		14	154	1	
Colorado	2	4	1						4		
Connecticut	3	1	1					1	2		1
Delaware	2	1	1						1		
Florida	8	3	5	1	1	7		1	15		5
Georgia	3	1	2			1			7		5
Idaho	1	1								5	
Illinois	2	1	2		1				5		4
Indiana	1		1								8
Iowa	1		1						4		
Kansas	1	2	1								
Kentucky	1	1	2						1		5
Louisiana	2	1	1								1
Maine	2								1		
Maryland	1	2	2					1	5		1

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

NECTARINES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Massachusetts	3	1	1						2		
Michigan	3		1			1		2	6		
Mississippi	1										
Missouri	1	2	2					1	6		4
Nebraska	3	1							1		
New Hampshire	1		1						1		
New Jersey	2	1	1						5		
New Mexico	3	4	1	1					8		
New York	3	1	1						3		1
North Carolina	2	1	2			1			6		2
Ohio	2		1			1			4		3
Oklahoma	5	3	1					1			1
Oregon	5	7	1		1			2	9		
Pennsylvania	2		2						1		2
Rhode Island	1	1	1					1	2		
South Carolina	3	1		1		2			12		1
Tennessee			2						1		2
Texas	9	3	2	3	1		6	5	9		
Utah	2	8	2			1			9		
Vermont	1								1		
Virginia	1	1	1	1	1				3		2
Washington	3	4	3						4		
West Virginia	1		1						2		1
Wisconsin									1		

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

NECTARINES

	Bird	Fish	Mammal	Amphibian	Crustaccan	Reptile	Arachnids	Insects	Plant	Snails	Clam
Affected Counties:	271	151	202	35	39	47	1	49	177	4	33
Affected States:	40	30	34	7	7	10	1	10	35	3	20
Affected Species:	32	49	41	13	13	18	6	26	262	7	30

PEACHES, ALL

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	15	4	2	1	5			17	10	30
Arizona	8	16	8	2		2			18	1	
Arkansas	3	3	3		2			1	4		6
California	16	20	22	6	8	8		19	171	1	
Colorado	3	5	2					2	7		
Connecticut	3	1	1					1	2		1
Delaware	2	1	1						2		
Florida	9	3	6	1	1	9		1	28		6
Georgia	5	8	3	1		2		1	15		14
Idaho	2	4	4						3	5	
Illinois	3	1	2		1			2	7	1	6
Indiana	2		2			1		2	2		10
Iowa	3	2	1						5	1	2
Kansas	4	4	2					1	2		
Kentucky	3	4	3		1				10		21
Louisiana	5	2	1			2			2		2
Maine	3	2							1		
Maryland	2	2	2					2	6		1
Massachusetts	3	1	1			1		3	3		

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

PEACHES, ALL

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Michigan	3		2			1		3	6		2
Minnesota	1	1	1						3		1
Mississippi	6	3	1	1		5			2		3
Missouri	2	6	2					1	7	1	5
Montana	1	1	2						2		
Nebraska	4	1	1						1		
Nevada	2	15				1		2	8		
New Hampshire	1		1					1	1		1
New Jersey	3	1	1						5		
New Mexico	6	12	2	1	1				11	2	
New York	3	1	1					1	6	1	1
North Carolina	5	3	5			1	1	1	26		4
Ohio	2	1	1			1		1	4		5
Oklahoma	7	4	3					1	2		2
Oregon	5	7	1		1			2	11		
Pennsylvania	2		2						2		2
Rhode Island	1	1	1					1	2		
South Carolina	4	1	2	1		2			19		1
South Dakota	3	1	1								
Tennessee	3	12	4		1		1		15		23
Texas	12	6	5	4	1	3	10	8	18		
Utah	2	8	2			1			24		
Vermont	1		1						2		1
Virginia	3	5	5	1	1	1		1	13	1	18
Washington	5	5	4						6		

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

PEACHES, ALL

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
West Virginia	1		5	1					5	1	5
Wisconsin	2		1					2	5		1
Wyoming	1		3								
Affected Counties:	1097	490	911	80	53	183	6	118	641	29	301
Affected States:	47	39	45	11	11	17	3	24	45	11	27
Affected Species:	37	96	54	17	18	27	11	41	362	24	69

PEACHES, CLINGSTONE (AZ & CA only)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	8	16	8	2		2			17	1	
California	15	17	22	6	8	7		15	152	1	
Affected Counties:	48	46	31	30	32	26		28	44	3	
Affected States:	2	2	2	2	1	2	0	1	2	2	0
Affected Species:	19	29	30	8	8	8		15	169	2	

PEACHES, FREESTONE (AZ & CA only)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	7	16	8	2		2			18	1	
California	16	20	22	6	8	8		19	171	1	
Affected Counties:	58	57	35	35	35	30		30	54	3	
Affected States:	2	2	2	2	1	2	0	1	2	2	0
Affected Species:	20	32	30	8	8	9		19	189	2	

PLUMS (AZ & CA only)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	6	16	8	2		2			14	1	

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

PLUMS (AZ & CA only)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
California	15	18	22	6	8	8		21	168	1	
Affected Counties:	57	54	33	34	36	30		33	53	3	
Affected States:	2	2	2	2	1	2	0	1	2	2	0
Affected Species:	18	30	30	8	8	9		21	182	2	

PLUMS AND PRUNES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	13	4	2	1	5			17	9	26
Arizona	6	16	8	2		2			14	1	
Arkansas	3	1	2		1				2		5
California	15	20	22	6	8	8		21	169	1	
Colorado	3	6	2					2	7		
Connecticut	3	1	1					1	2		1
Delaware	1	1							2		
Florida	9	4	5	1	1	6		1	14		7
Georgia	5	4	3			2			10		14
Hawaii	21		2			2		1	133		
Idaho	2	5	4						2	5	
Illinois	2	1	2		1				6	1	4
Indiana	1		2					2	1		9
Iowa	3	2	1						5	1	2
Kansas	4	4	2					1	2		
Kentucky	3	3	3		1				7		12
Louisiana	5	2	1			2			1		2
Maine	3	2	1						3		

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

PLUMS AND PRUNES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Maryland	1	2	2					1	4		1
Massachusetts	3	1	1			1		1	3		
Michigan	3		2			1		2	6		2
Minnesota	2	1	1						4		2
Mississippi	6	3	1	1		5			1		3
Missouri	2	5	2					1	6		5
Montana	1	3	3						2		
Nebraska	4	1							1		
Nevada	2	13				1		1	7		
New Hampshire	1		1						1		1
New Jersey	2	1	1						5		
New Mexico	5	4	1	1					10		
New York	3	1	1					1	6	1	1
North Carolina	4	3	4			1			18		4
North Dakota	2								1		
Ohio	2	1	1			1		1	4		5
Oklahoma	7	4	3					1	2		2
Oregon	5	10	1		1			2	11		
Pennsylvania	2		2						2		2
Rhode Island	1	1	1					1	2		
South Carolina	4	1	2	1		2			18		1
South Dakota	4	2	1						1		
Tennessee	3	9	4		1				11		16
Texas	11	3	3	3	1	2	8	7	14		
Utah	2	8	2			1			17		

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

PLUMS AND PRUNES

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Vermont	1		1						1		
Virginia	2	1	3	1	1	1		1	9	1	2
Washington	5	5	4						6		
West Virginia	1		2	1					5		3
Wisconsin	3		1					2	6		2
Wyoming	1		3								
Affected Counties:	791	372	608	59	48	119	2	100	466	21	180
Affected States:	49	39	45	10	10	17	1	20	48	8	26
Affected Species:	56	90	55	16	16	24	8	40	465	19	64

PRUNES (AZ & CA only)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	3	6	5	1					1		
California	15	18	17	6	6	7		13	115	1	
Affected Counties:	35	34	21	19	28	21		25	32	1	
Affected States:	2	2	2	2	1	1	0	1	2	1	0
Affected Species:	17	22	22	7	6	7		13	116	1	

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

Grand Summary

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Total Counties:	126	551	101	83	54	193	6	137	714	31	320
Total States:	49	39	47	11	11	18	3	25	48	11	27
Unique Species Totals:	58	101	57	17	18	27	11	44	504	25	70

Tree Nut Uses

Unique Taxa Count by State for Selected Crops

No species exclusions.

Minimum of 1 Acre

ALMONDS, HAZELNUTS (FILBERTS), MACADAMIA NUTS, OTHER NUTS, PECANS, PISTACHIOS, WALNUTS, ENGLISH

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

ALMONDS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	6	15	7	2		2			14	1	
California	15	15	21	6	8	7		15	154	1	
Georgia	2										
Illinois	1		1						1		
Indiana	1		2								2
Kansas	2	1									
Kentucky			2								1
Missouri		1									
Nevada	1	8				1		1	7		
New Mexico	4	1	1						4		
Oklahoma	4	1	2					1			
Oregon	2	6							1		
South Carolina	2								2		

Texas	7	2	2				7	
Utah	2	5	1		1		8	
Virginia		2	2	1			1	12
Washington	5	3	2				2	

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

ALMONDS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Affected Counties:	70	59	43	30	35	29		30	55	3	3
Affected States:	14	12	11	2	2	4	0	3	11	2	3
Affected Species:	24	42	36	8	9	8		17	197	2	14

HAZELNUTS (FILBERTS)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
California	6	7	7	2	4	2		3	35		
Connecticut	2										
Idaho	2	5	3						2		
Illinois	1		1								
Indiana	1		2								2
Iowa	1								2	1	
Kansas	1	1						1			
Maine	2								1		
Massachusetts	3	1							2		
Michigan	3							2	4		
Minnesota	1								4		
Missouri		1	1						3		
Montana	1	2	3						1		
Nebraska	3	1							1		
New Hampshire	1								1		
New Jersey		1	1						1		
New York	1		1								
Ohio	1	1	1						1		4
Oregon	5	7	1		1			2	9		

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

HAZELNUTS (FILBERTS)

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Pennsylvania	1		1						1		
South Carolina	1										
South Dakota	2		1								
Vermont	1		1						2		1
Virginia	1	3	2	1	1				2		13
Washington	5	5	4						6		
West Virginia			1						1		
Affected Counties:	90	66	63	6	10	4		14	59	1	6
Affected States:	23	12	16	2	3	1	0	4	19	1	4
Affected Species:	12	18	15	3	5	2		8	66	1	19

MACADAMIA NUTS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
California	14	11	12	4	4	5		5	68		
Hawaii	32		2		1	2	1	1	268	2	
Affected Counties:	10	6	9	5	6	10	1	5	10	2	
Affected States:	2	1	2	1	2	2	1	2	2	1	0
Affected Species:	46	11	14	4	5	7	1	6	336	2	

OTHER NUTS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	5	10	7	1		1			7	1	
Arkansas	3	1	3						2		3
California	15	16	22	5	8	7		14	145	1	
Florida	9	3	6	1	1	9		1	42		7
Hawaii	32		2		1	2	1	1	268	2	

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

OTHER NUTS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Louisiana	2	2	1			1					
Mississippi	5	2	1	1		5					3
Missouri	2	7	2					1	8		4
New Mexico	3	1	1								
Oklahoma	6	4	3					1	1		1
Texas	9	3	1	1			6	3	6		
Affected Counties:	142	117	108	31	30	61	2	40	96	4	25
Affected States:	11	10	11	5	3	6	2	6	8	3	5
Affected Species:	64	38	40	9	10	19	7	20	477	4	15

PECANS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama	4	15	4	2	1	5			17	10	30
Arizona	8	16	8	2		2			16	1	
Arkansas	3	3	3		2			1	4	1	6
California	15	15	21	5	8	7		12	133	1	
Colorado	1		1					1	1		
Florida	9	4	7	1	1	10		1	47		7
Georgia	5	7	4	1		2		1	18		16
Illinois	2	1	2					1	6		6
Indiana	2		2					2	1		7
Iowa	2	2	1						4		2
Kansas	4	4	2					1	2		
Kentucky	3	4	3						6		15
Louisiana	6	2	2			3			2		2

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PECANS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Maryland	1							2			
Mississippi	6	3	1	1		5			2		3
Missouri	2	7	2					1	8		4
Nebraska	4	1							1		
Nevada	2	17				1		1	8		
New Mexico	5	10	5	1		1			8		
New York			1								
North Carolina	5	3	4			1		1	20		3
Ohio	1		1						2		4
Oklahoma	7	4	3					1	2		2
Pennsylvania	1		1						1		
South Carolina	4	1	2	1		2			19		1
Tennessee	2	1	2						6		5
Texas	12	9	5	4	1	3	10	8	25		
Utah	2	6	1			1			10		
Virginia	3	4	4	1	1	1		1	8	1	15
West Virginia			1						1		1
Affected Counties:	832	384	449	77	35	238	3	59	384	17	201
Affected States:	28	23	27	10	6	14	1	15	28	5	18
Affected Species:	36	87	49	15	14	24	10	30	303	14	63

PISTACHIOS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Arizona	7	15	8	2		2			11	1	
California	15	15	22	5	8	7		13	129	1	

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PISTACHIOS

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Nevada	2	13				1		1	7		
New Mexico	5	5	5	1		1			6		
Texas	3	2		1					2		
Utah	2	2	1			1			4		
Affected Counties:	53	46	36	30	30	30		27	47	2	
Affected States:	6	6	4	4	1	5	0	2	6	2	0
Affected Species:	21	37	33	8	8	8		14	155	2	

WALNUTS, ENGLISH

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Alabama						1					3
Arizona	6	10	6	2		1			6		
California	16	19	22	6	8	8		20	175	1	
Connecticut	1	1	1						1		1
Idaho	1	4	3						1		
Illinois	1		2					1	4	1	2
Indiana	1		1								1
Iowa	2	2	1						6	1	1
Kansas	4	1									
Kentucky			2								1
Maine	3	2							1		
Maryland	1	2	1						1		
Massachusetts	3	1							1		
Michigan	2		1			1		2	2		1
Minnesota	1								1		1

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

WALNUTS, ENGLISH

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Mississippi		2	1			1					
Nebraska	4	1							1		
New Hampshire	1								1		
New Jersey	1	1	1						2		
New York	1		1						2		
Ohio	1		1					1	1		1
Oregon	5	7	1		1			2	11		
Pennsylvania	1		1						1		
Tennessee	1	1	1						4		2
Texas	1										
Utah	2	4	2			1			10		
Vermont	1		1								
Virginia	1			1	1				6		
Washington	4	5	4						6		
West Virginia			1								
Affected Counties:	167	117	114	31	38	35		41	120	6	18
Affected States:	26	16	21	3	3	6	0	5	22	3	10
Affected Species:	25	43	37	9	9	12		25	227	2	12

Alabama, Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana,

Grand Summary

	Bird	Fish	Mammal	Amphibian	Crustacean	Reptile	Arachnids	Insects	Plant	Snails	Clam
Total Counties:	101	489	588	85	46	260	4	84	500	24	221
Total States:	43	33	38	10	8	16	2	19	43	8	22
Unique Species Totals:	69	99	56	16	16	26	11	41	642	17	66