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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

Date: 23 February 2006
Chemical Code: 044309
DP Barcodes: 326569, 326640, 326590, 326583

MEMORANDUM

SUBJECT: Section 18 Request for Use of Clothianidin on Sugar Beet Seed to Control the Beat Leafhopper (Vector of Beet Curly Top Virus).

FROM: Jennifer Leyhe, M.S., Biologist 23 Feb 06
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THROUGH: Jean Holmes, Acting Branch Chief Jean Holmes 2/23/06
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TO: Stacie Groce, Risk Manager Reviewer
Dan Rosenblatt, Risk Manager
Emergency Exemption Section 1
Registration Division

The Environmental Fate and Effects Division (EFED) have completed its review of a Section 18 Emergency Exemption request (DP Barcode 326590) for the treatment of clothianidin to sugar beet seed in treatment facilities in Colorado, North Dakota, Oregon, and Wyoming from 15 January 2006 to 31 July 2006. These seeds would then be planted to control leaf hoppers (vector of beet curly top virus) in Colorado, Idaho, Montana, Oregon, Washington, and Wyoming. The State Departments of Agriculture in Colorado, North Dakota, Oregon, and Wyoming are requesting the commercial application of 60g a.i. per ~100,000 seeds (~1 kg by weight of raw seeds). A maximum of 1 treatment may be made to sugar beet seed prior to shipping. They suggest this would amount to 30 g a.i. clothianidin/Acre (1.6 oz a.i./Acre or 0.07 lb/Acre).

Based on available effects data and treatment concentration, estimated risk quotient (RQ) values exceed the endangered species level of concern for acute risk (RQ≥0.1) to birds and acute and chronic risk to birds and mammals. Eleven species of birds and mammals are listed

as endangered or threatened in one or all of the states proposed to plant the treated seeds. However, given that clothianidin is a seed treatment, the potential risk to these species is believed to be low.

Clothianidin's major risk concern from sugar beet treatment is to non-target insects that feed on sugar beet plants because it is highly toxic to honeybees on both contact and oral basis. However pollinating insects will not be at risk because sugar beet plants that are grown for sugar are not allowed to flower. No federally listed threatened or endangered insects are listed in the states proposed to plant the treated seeds.

ENVIRONMENTAL FATE CHARACTERIZATION

Clothianidin appears to be a persistent compound under most field conditions. Based on analysis of the laboratory studies alone, the major route of dissipation for clothianidin would appear to be photolysis if exposure to sunlight occurs (e.g., the measured aqueous photolysis half-life was <1 day and aerobic half-lives were 148 to 1155 days). Although photolysis appears to be much more rapid than other avenues of degradation/dissipation of clothianidin in the laboratory studies, the very slow rate of dissipation that was observed in field studies suggests that photolysis probably is not significant under most actual-use conditions. Photolysis may be quite important in surface waters if residues have reached clear bodies of water and are in solution rather than bound to sediment. Clothianidin is stable to hydrolysis at environmental pHs and temperatures. Degradation is also relatively rapid under anaerobic aquatic conditions (overall half-life of 27 days); however, metabolic degradation occurs very slowly in aerobic soil. Clothianidin is mobile to highly mobile in the laboratory [soil organic carbon partition coefficients (Koc) values were 84 to 129 for all test soils except for a sandy loam soil which had a Koc value of 345], although only a modest amount of leaching was observed in the submitted field studies. Previous studies have confirmed that compounds with a similar combination of mobility and persistence characteristics have a potential to leach to ground water at some use sites. Volatilization is not expected to be a significant dissipation process.

EFFECTS CHARACTERIZATION

Terrestrial Animals

According to registrant submitted studies clothianidin is practically non-toxic to moderately to birds and mammals and highly toxic to honeybees. Species toxicity values are listed in **Table 1**. The most sensitive terrestrial species are Japanese quail (*Coturnix coturnix japonica,* LD_{50} = 423 mg/L), mouse (*Mus musculus,* LD_{50} = 389-465 mg/kg/day), and honeybee (*Apis mellifera,* LD_{50} = 0.0037 μg ai/bee).

Table 1. Acute effect (mortality) concentrations (LD_{50}/ LC_{50}) for terrestrial animals following exposure to clothianidin. Source: EFED Science Chapter

Species	Measurement Endpoint	Time	LD_{50}/LC_{50}	MRID
Birds				
Northern bobwhite quail *Colinus virginianus*	Oral Toxicity	14 day	LD_{50} > 2,000 mg/kg	45422417
Japanese Quail *Coturnix coturnix japonica*	Oral Toxicity	14 day	LD_{50} = 423 mg/kg	45422418
Northern bobwhite quail *Colinus virginianus*	Subacute Dietary	8 day	LC_{50} > 5,230 mg/L	45422419
Mallard duck *Anas platyrhynchos*	Subacute Dietary	8 day	LC_{50} > 5,040 mg/L	45422420
Mammals				
Rat *Rattus norvegicus*	Oral Toxicity		LD_{50} =5,000 mg/kg/day	45422621
Mouse *Mus musculus*	Oral Toxicity		LD_{50} = 389-465 mg/kg/day	45422622
Insects				
Honey bee *Apis mellifera*	Acute Contact	48 hour	LD_{50} = 0.0439 μg ai/bee	45422426
Honey bee *Apis mellifera*	Acute Oral	48 hour	LD_{50} = 0.0037 μg ai/bee	45422426

Chronic toxicity data are available for birds, mammals, and beetles (**Table 2**). Northern bobwhite quail showed adverse effects to eggshell thickness. Rats had decreased body weight gains and delayed sexual maturation (males only); decreased absolute thymus weight in F1 pups (both sexes), increased stillbirths (F1 and F2 litters); and decreased sperm mobility and increased number of sperm with detached heads (F1 and F2 litters). Effects to rabbits included premature deliveries, decreased gravid uterine weights, and increased litter incidence of missing lobe of the lung per fetus. Rove beetles had decreased number of progeny in the reproductive study.

Table 2. Chronic effect concentrations (NOAEC/LOAEC) for terrestrial animals following exposure to clothianidin. Source: EFED Science Chapter

Species	Measurement Endpoint	Study	NOAEC/ LOAEC	MRID
Birds				
Northern bobwhite quail *Colinus virginianus*	Eggshell thickness	Reproduction	205/525 mg/L	45422421
Mallard duck *Anas platyrhynchos*	No effect on reproduction	Reproduction	525/>525	45422422
Mammals				
Rat *Rattus norvegicus*	Offspring systemic[1]	2-Generation Reproduction	NOAEL (M/F) = 9.8/11.5 mg/kg/day (150/500 ppm)[5] LOAEL (M/F) = 31.2/36.8 mg/kg/day (500/500 ppm)[5]	452271416 and 4542282526
	Reproduction[2]		NOAEL (M) = 31.2 mg/kg/day (500 ppm0)[5] LOAEL (M)= 163.4 mg/kg/day (2500 ppm)[5]	
Rabbit *Sylvilagus sp.*	Development[3]	Developmental	NOAEL/LOAEL = 25/75 mg/kg/day (825/2,475 ppm)[4]	45422712 and 45422713
Insects				
Rove Beetles *Aleochara bilineata*	Reproductive performance was affected	Life Cycle	LOAEL = 200 μg a.i./kg soil	45422524

[1] Decreased body weight gains and delayed sexual maturation (males only); decreased absolute thymus weight in F1 pups (both sexes), and increased stillbirths (F1 and F2 litters).
[2] Decreased sperm mobility and increased number of sperm with detached heads (F1 and F2 litters).
[3] Premature deliveries, decreased gravid uterine weights, and increased litter incidence of missing lobe of the lung per fetus.
[4] ppm conversion based on:
1 mg/kg/day = 20 ppm in adult rats, 10 ppm in younger rats, 7 ppm in mice and 33 ppm in rabbits. (Nelson, 1975)
[5] ppm value determined from study.

Aquatic Animals

Table 3 lists acute effects concentrations of the most sensitive aquatic species. Benthic invertebrate (*Chironomus riparius*, 48-hr EC_{50}=0.022 mg/L) and mysid shrimp (*Americamysis bahia*, 96-hr LC_{50}=0.051 mg/L) are the most sensitive aquatic invertebrates listed while rainbow trout (*Oncorhynchus mykiss* , 96-hr LC50 > 105 mg/Land sheepshead minnow (*Cyprinodon variegatus* 96-hr EC_{50} > 93.6 mg/L) are the most sensitive fish. Based on these data, clothianidin is classified as practically nontoxic to very highly toxic to aquatic invertebrates and practically non-toxic to slightly toxic to fish on an acute exposure basis.

Table 3. Acute effect concentrations (LC_{50}/EC_{50}) for aquatic animals and plants following exposure to clothianidin. Source: EFED Science Chapter

Species	Measurement Endpoint	Time	LC_{50}/EC_{50} (mg/L)	MRID
Freshwater				
Rainbow Trout *Oncorhynchus mykiss*	Mortality	96 hour	LC_{50} >105	45422409
Bluegill sunfish *Lepomis macrochirus*	Mortality	96 hour	LC_{50} >117	45422407
Benthic Invertebrate *Chironomus riparius*	Mortality	48 hour	EC_{50} = 0.022	45422414
Waterflea *Daphnia magna*	Mortality	48 hour	LC_{50} >119	45422338
Estuarine/Marine				
Sheepshead minnow *Cyprinodon variegatus*	Mortality	96 hour	LC_{50} >93.6 (nominal)	45422411
Eastern oyster *Crassostrea virginica*	Mortality	96 hour	EC_{50}>129.1	45422404
Mysid *Americamysis bahia*	Mortality	96 hour	LC_{50}=0.051	45422403
Aquatic Plants				
Duckweed *Lemna gibba*	Necrotic fronds	14 days	EC_{50}/NOAEC = >121/59	45422503
Green Algae *Selenastrum capricornutum*	Biomass	5 days	EC_{50}/NOAEC = 64/3.5	45422504

Chronic Toxicity data are available for freshwater fish and invertebrates and estuarine/marine invertebrates (**Table 4**). No chronic data were submitted for estuarine/marine fish. A chronic early life stage study conducted on the fathead minnow showed that exposure has the potential to affect length and dry weight of freshwater fish. Exposure to daphnids resulted in reproductive effects, including the reduced number of juveniles produced per adult. The data submitted for mysid shrimp indicate that clothianidin reduced the number of young per reproductive day.

Table 4. Chronic effect concentrations (NOAEC/LOAEC) for aquatic animals following exposure to clothianidin. Source: EFED Science Chapter

Species	Measurement Endpoint	NOAEC/LOAEC (mg/L)	MRID
Freshwater			
Fathead Minnow *Pimephales promelas*	Length and dry weight	9.7/20	45422413
Waterflea *Daphnia magna* Static Renewal	Reproduction	0.042/0.12	45422412
Estuarine/Marine			
Mysid *Mysidopis bahia*	Reproduction	5.1/9.7	45422405

Plants

Terrestrial

The studies that were submitted for terrestrial plants tested formulated products of clothianidin (49.3% TI-435 50% WDG). The results of these studies showed that exposure elicited no effect (that is, ≥ 25%) on non-target terrestrial plants.

Aquatic

Studies submitted for aquatic plants (duckweed and green alga) showed that exposure to clothianidin reduced biomass of aquatic non-vascular plants and increased the incidence of necrotic fronds in aquatic vascular plants (**Table 5**).

Table 5. Effect concentrations (EC_{50}/NOAEC) for aquatic plants following exposure to clothianidin. Source: EFED Science Chapter

Species	Measurement Endpoint	EC_{50}/NOAEC (mg/L)	MRID
Duckweed *Lemna gibba*	Necrotic fronds	EC_{50}/NOAEC = >121/59	45422503
Green Algae *Selenastrum capricornutum*	Biomass	EC_{50}/NOAEC = 64/3.5	45422504

RISK CHARACTERIZATION

Risk Estimation

To evaluate the potential risk to non-target organisms from the proposed use of clothianidin, risk quotients (RQs) are calculated from the ratio of estimated environmental concentrations (EECs) to toxicity values. RQs are then compared to levels of concern (LOCs) used by the Office of Pesticide Programs to indicate potential risk to non-target organisms and the need to consider regulatory action.

Terrestrial Animals

The EFED terrestrial exposure model T-REX (T-REX, Version 1.2.3; **Appendix A**) is used to estimate exposures and risks to avian and mammalian species. The model provides estimates of exposure concentrations and risk quotients (RQs). The acute RQs for birds and mammals are 0.24 and 0.01, respectively. The chronic RQs for birds and mammals are 1.55 and 1.62, respectively. The avian acute RQ exceeds the LOC (0.01) for endangered species. The acute RQ for mammals did not exceed any LOCs. However, both the bird and mammal RQs exceed the chronic risk to non-target organisms.

Aquatic Animals

To assess risk of clothianidin to non-target aquatic animals (i.e., fish and invertebrates) and plants (i.e., macrophytes and algae), surface water EECs were obtained from the PRZM/EXAMS model (**Appendix B**). Input parameters are shown in **Table 6.**

Table 6. Environmental fate input parameters for clothianidin used in PRZM/EXAMS for calculating surface water EECs.

Parameter	Value	Source	Comments
Molecular weight ($gMole^{-1}$)	249.7	MRID 45422317	
Vapor Pressure (Torr)	$4.27x10^{-10}$	MRID 45422317	
Solubility (mg/L)	300	MRID 45422317	
Hydrolysis (days)	Stable	MRID 45422317	
Aquatic photolysis half-life (days)	1.1 to 34	MRID 45422323 (soil); 45422318, 45422322, 45422319, 45422321 (water)	Longest half-life of 34 days used instead of aqueous photolysis half-life because of demonstrated persistence in water and on soil surface exposed to sunlight. Lower value of 1.1 days from natural water photolysis study was not used in the modeling for this assessment.
Organic carbon partition coefficient (KOC)	188	MRID 45422311	Mean Value
Soil aerobic metabolic half-life (days)	744*	MRIDs 45422325; 45422326	90% upper confidence bound on 9 values
Aquatic metabolic half-life (days)	1,488	MRID 45422324	2X aerobic soil half-life used since there was no acceptable aerobic aquatic study
Anaerobic Aquatic metabolic half-life (days)	27x3	MRID 45422320	Selected input parameters were multiplied by 3 according to Guidance for selecting input parameters in modeling for environmental fate and transport of pesticides. Version II. February, 2002
Crop name	Sugar beet seed	Proposed label	
Maximum application rate (lb/acre)	seed=0.07	Proposed label	
Number of applications	seed treatment=1	Proposed label	
Method of application	seed treatment	Proposed label	
Incorporation depth (inches)	seed=0.75	Emergency Request from states	

* Calculated per guidance for n=9. Fugay soil not included in calculation because too little degradation occurred to accurately calculate half-life.

Table 7 lists acute risk quotients for the most sensitive species of aquatic vertebrates and invertebrates. All RQs are equal to zero because the concentration in the environment is estimated to be very low. Therefore, no RQ exceeds any LOCs.

Table 7. Acute and chronic RQs for aquatic animals and plants.

Species	Toxicity (mg/L)	EEC(mg/L)	RQ
Acute Animal			
Freshwater Fish (Rainbow Trout *Oncorhynchus mykiss*)	$LC_{50} > 105$	0.000096	0
Freshwater Invertebrate (Waterflea *Daphnia magna*)	$LC_{50} > 119$	0.000096	0
Freshwater Benthic Invertebrate (*Chironomus riparius*)	$EC_{50} = 0.022$	0.000096	0
Estuarine/Marine Fish (Sheepshead minnow *Cyprinodon variegates*)	$LC_{50} > 93.6$	0.000096	0
Estuarine/Marine Invertebrate (Mysid *Americamysis bahia*)	$LC_{50} = 0.051$	0.000096	0
Chronic Animal			
Freshwater Fish (Fathead Minnow *Pimephales promelas*)	NOEAC = 9.7	0.000070	0
Freshwater Invertebrate (Waterflea *Daphnia magna*)	NOAEC = 0.042	0.000070	0
Estuarine/Marine Invertebrate (Mysid *Mysidopis bahia*)	NOAEC = 5.1	0.000070	0
Plants			
Duckweed *Lemna gibba*	EC_{50}/NOAEC = >121/59	0.000096	0
Green Algae *Selenastrum capricornutum*	EC_{50}/NOAEC = 64/3.5	0.000096	0

Risk Discussion

Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), all pesticides sold or distributed in the United States must be registered with EPA. Clothianidin is currently registered with the U.S. EPA for use as an insecticide for seed treatment use on corn, rapeseed, and canola. Sugar beet seed treatment is not currently registered.

Clothianidin's major risk concern from sugar beet treatment is to non-target insects because of its systemic nature. Acute toxicity studies to honey bees show that clothianidin is highly toxic on both contact and oral basis. Any non-target insects that feed on sugar beet plants would be at risk; however, insects that are pollinators would not be at risk because sugar beet plants that are grown for sugar are not allowed to flower.

Based on proposed use, acute risks to small birds and mammals are unlikely, except for endangered birds should exposure actually occur. If these organisms are exposed to clothianidin on a chronic basis there may be risk to both birds and mammals; however, considering the mode of agricultural practice of incorporating seeds during planting, EFED believes that clothianidin seed treatment should result in minimal risk.

A Tier II assessment for aquatic species (using the PRZM/EXAMS model) indicates that no level of concern was exceeded for aquatic animals. Clothianidin is not expected to move to the aquatic environment from the seeds; therefore risk is low to aquatic organisms.

Clothianidin does not appear to present risk to terrestrial plants (there were no significant effects in the studies submitted). In addition, it does not appear to present risk to aquatic vascular or nonvascular plants.

Endangered Species

At the proposed treatment rate evaluated for clothianidin, acute risk to endangered species LOCs are exceeded for birds and chronic LOCs are exceeded for both birds and mammals. EFED does not calculate RQs for insects; however, based on toxicity values, risk to non-target insects that feed on sugar beet plants may be high. Pollinating insects, on the other hand, will not be at a great risk because sugar beet plants grown for sugar are not allowed to flower. Based on the LOCATES software (Version 2.9.11) output (**Appendix C**), 11 species of birds and mammals are listed as endangered or threatened in one or all of the states proposed to plant the seeds. However, no Federally listed threatened or endangered insects are listed in those same states. Given that clothianidin is a seed treatment, the potential risk to these species is believed to be low.

Appendix A. T-REX Inputs and RQs.

Data inputs are in blue

Chemical:	Clothianidin		
Name of seed treatment formulation:	Poncho 600		
Percent AI in formulation:	48%	0	Density of product (lbs/gal): 5
Endpoints	**Reported**	**Tested Body Weight (g)**	**Adjusted LD50**
Avian LD50:	423.00	102	331.29
Avian repro. NOAEC:	205.00		
Mammalian LD50:	5000.00	350	10989.15
Mammalian NOAEC:	196.00		

Crop	Maximum Seeding Rate (lbs/acre)	Reference		Application Rate (fl oz/cwt)	Application Rate (lbs. AI/cwt)
Barley	100	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
beans	160	http://www.ext.nodak.edu/extpubs/plantsci/rowcrops/a1133-1.htm#Planting		0	0.0000
dried beans	160	http://www.ext.nodak.edu/extpubs/plantsci/rowcrops/a1133-1.htm#Planting		0	0.0000
lima beans (succulent)	100	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
snap beans	100	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Canola	8	http://pestdata.ncsu.edu/cropprofiles/docs/mncanola.html		0	0.0000
Corn	25	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Cotton	18	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Oats	128	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Onion	15	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
cowpeas/blackeyed peas	50	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Pea	180	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
lupine	170	http://www.hort.purdue.edu/newcrop/afcm/lupine.html		0	0.0000
grain lupine	170	http://www.hort.purdue.edu/newcrop/afcm/lupine.html		0	0.0000
field peas	225	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Peanuts	135	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Rice	160	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Rye	150	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Safflower	100	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Sorghum	8	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000
Soybeans	100	http://www.nsrl.uiuc.edu/aboutsoy/production02.html		0	0.0000
soybeans, edible	100	http://www.nsrl.uiuc.edu/aboutsoy/production02.html		0	0.0000
Sugar beets	1	label		0	0.0000
Triticale	90	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		1.69	0.0317
Wheat	135	http://pestdata.ncsu.edu/cropprofiles/cplist.cfm?org=crop		0	0.0000

Crop	Maximum Application Rate (lbs ai/A)	Maximum Seed Application Rate (mg ai/kg seed)	Avian Nagy Dose (mg ai/kg-bw/day)	Mammalian Nagy Dose (mg ai/kg-bw/day)	Available AI (mg ai ft-2)
Barley	0.00	0.00	0.00	0.00	0.00
beans	0.00	0.00	0.00	0.00	0.00
dried beans	0.00	0.00	0.00	0.00	0.00
lima beans (succulent)	0.00	0.00	0.00	0.00	0.00
snap beans	0.00	0.00	0.00	0.00	0.00
Canola	0.00	0.00	0.00	0.00	0.00
Corn	0.00	0.00	0.00	0.00	0.00
Cotton	0.00	0.00	0.00	0.00	0.00
Oats	0.00	0.00	0.00	0.00	0.00
Onion	0.00	0.00	0.00	0.00	0.00
cowpeas/blackeyed peas	0.00	0.00	0.00	0.00	0.00
Pea	0.00	0.00	0.00	0.00	0.00
lupine	0.00	0.00	0.00	0.00	0.00
grain lupine	0.00	0.00	0.00	0.00	0.00
field peas	0.00	0.00	0.00	0.00	0.00
Peanuts	0.00	0.00	0.00	0.00	0.00
Rice	0.00	0.00	0.00	0.00	0.00
Rye	0.00	0.00	0.00	0.00	0.00
Safflower	0.00	0.00	0.00	0.00	0.00
Sorghum	0.00	0.00	0.00	0.00	0.00
Soybeans	0.00	0.00	0.00	0.00	0.00
soybeans, edible	0.00	0.00	0.00	0.00	0.00
Sugar beets	0.00	316.88	80.20	67.14	0.00
Triticale	0.00	0.00	0.00	0.00	0.00
Wheat	0.00	0.00	0.00	0.00	0.00

Animal	Nagy Allometry Food Ingestion value g/day
20 g Bird	5.061777181
15 g Mammal	3.178078065

Crop	Risk Quotients†					
	Avian (20 g)			Mammalian (15 g)		
	Acute (# 1)	Acute (# 2)	Chronic	Acute (# 1)	Acute (# 2)	Chronic
Barley	0.00	0.00	0.00	0.00	0.00	0.00
beans	0.00	0.00	0.00	0.00	0.00	0.00
dried beans	0.00	0.00	0.00	0.00	0.00	0.00
lima beans (succulent)	0.00	0.00	0.00	0.00	0.00	0.00
snap beans	0.00	0.00	0.00	0.00	0.00	0.00
Canola	0.00	0.00	0.00	0.00	0.00	0.00
Corn	0.00	0.00	0.00	0.00	0.00	0.00
Cotton	0.00	0.00	0.00	0.00	0.00	0.00
Oats	0.00	0.00	0.00	0.00	0.00	0.00
Onion	0.00	0.00	0.00	0.00	0.00	0.00
cowpeas/ blackeyed peas	0.00	0.00	0.00	0.00	0.00	0.00
Pea	0.00	0.00	0.00	0.00	0.00	0.00
lupine	0.00	0.00	0.00	0.00	0.00	0.00
grain lupine	0.00	0.00	0.00	0.00	0.00	0.00
field peas	0.00	0.00	0.00	0.00	0.00	0.00
Peanuts	0.00	0.00	0.00	0.00	0.00	0.00
Rice	0.00	0.00	0.00	0.00	0.00	0.00
Rye	0.00	0.00	0.00	0.00	0.00	0.00
Safflower	0.00	0.00	0.00	0.00	0.00	0.00
Sorghum	0.00	0.00	0.00	0.00	0.00	0.00
Soybeans	0.00	0.00	0.00	0.00	0.00	0.00
soybeans, edible	0.00	0.00	0.00	0.00	0.00	0.00
Sugar beets	0.24	0.00	1.55	0.01	0.00	1.62
Triticale	0.00	0.00	0.00	0.00	0.00	0.00
Wheat	0.00	0.00	0.00	0.00	0.00	0.00

† Acute RQ #1 = (mg ai /kg-bw/day) / LD50
Acute RQ #2 = mg ai ft-2 /(LD50*bw)
Chronic RQ = mg kg-1 seed / NOEC

Appendix B. PRZM/EXAMS Inputs and EECs

stored as MNSugSP.out
Chemical: Clothianidin
PRZM environment: MNsugarbeetC.txt modified Satday, 12 October 2002 at 16:05:10
EXAMS environment: pond298.exv modified Thuday, 29 August 2002 at 15:33:30
Metfile: w14914.dvf modified Wedday, 3 July 2002 at 08:05:52
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly	
1961	0.04288		0.04257	0.04137	0.03916	0.03791	0.02209
1962	0.0381		0.03799	0.03763	0.03668	0.03591	0.03119
1963	0.06468		0.06435	0.06314	0.06079	0.05909	0.04348
1964	0.06771		0.06741	0.0662	0.0637	0.06211	0.05206
1965	0.05564		0.05552	0.05511	0.054	0.05304	0.04984
1966	0.04488		0.04477	0.04433	0.04374	0.04343	0.04107
1967	0.04474		0.0446	0.04404	0.04282	0.04193	0.03766
1968	0.03571		0.03566	0.03543	0.03505	0.03468	0.03278
1969	0.05237		0.0522	0.05134	0.05015	0.04909	0.03871
1970	0.04217		0.04208	0.04173	0.0409	0.0401	0.03802
1971	0.06914		0.06879	0.06768	0.06522	0.06352	0.04803
1972	0.09736		0.09689	0.09525	0.09171	0.08937	0.06977
1973	0.07182		0.07174	0.07141	0.07071	0.07015	0.06449
1974	0.1015		0.1011	0.0999	0.09666	0.09423	0.07433
1975	0.0778		0.07759	0.07682	0.07468	0.07414	0.07058
1976	0.06291		0.06284	0.06255	0.06193	0.06148	0.05472
1977	0.04661		0.04648	0.04595	0.04511	0.0448	0.04228
1978	0.03839		0.03829	0.03784	0.03681	0.03637	0.03466
1979	0.03081		0.03073	0.03058	0.03027	0.03005	0.02851
1980	0.02531		0.02529	0.02517	0.02492	0.02474	0.02257
1981	0.1156		0.1148	0.1118	0.1066	0.1032	0.06436
1982	0.08148		0.08139	0.08101	0.08019	0.0796	0.07401
1983	0.06598		0.06585	0.06531	0.06402	0.06295	0.05938
1984	0.06604		0.0658	0.06484	0.06282	0.06133	0.05381
1985	0.08187		0.08153	0.08033	0.07806	0.07635	0.06271
1986	0.0718		0.07158	0.07067	0.06883	0.0682	0.06278
1987	0.08866		0.08829	0.08768	0.08483	0.08269	0.06811
1988	0.06669		0.06662	0.06632	0.06566	0.06519	0.05802
1989	0.06863		0.06838	0.06737	0.06577	0.06429	0.0543
1990	0.06237		0.06217	0.06135	0.05961	0.05829	0.05245

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly	
0.032258064516129	0.1156		0.1148	0.1118	0.1066	0.1032	0.07433
0.0645161290322581	0.1015		0.1011	0.0999	0.09666	0.09423	0.07401
0.0967741935483871	0.09736		0.09689	0.09525	0.09171	0.08937	0.07058
0.129032258064516	0.08866		0.08829	0.08768	0.08483	0.08269	0.06977
0.161290322580645	0.08187		0.08153	0.08101	0.08019	0.0796	0.06811
0.193548387096774	0.08148		0.08139	0.08033	0.07806	0.07635	0.06449

0.225806451612903 0.0778 0.07759 0.07682 0.07468 0.07414
0.06436
0.258064516129032 0.07182 0.07174 0.07141 0.07071 0.07015
0.06278
0.290322580645161 0.0718 0.07158 0.07067 0.06883 0.0682
0.06271
0.32258064516129 0.06914 0.06879 0.06768 0.06577 0.06519
0.05938
0.354838709677419 0.06863 0.06838 0.06737 0.06566 0.06429
0.05802
0.387096774193548 0.06771 0.06741 0.06632 0.06522 0.06352
0.05472
0.419354838709677 0.06669 0.06662 0.0662 0.06402 0.06295
0.0543
0.451612903225806 0.06604 0.06585 0.06531 0.0637 0.06211
0.05381
0.483870967741936 0.06598 0.0658 0.06484 0.06282 0.06148
0.05245
0.516129032258065 0.06468 0.06435 0.06314 0.06193 0.06133
0.05206
0.548387096774194 0.06291 0.06284 0.06255 0.06079 0.05909
0.04984
0.580645161290323 0.06237 0.06217 0.06135 0.05961 0.05829
0.04803
0.612903225806452 0.05564 0.05552 0.05511 0.054 0.05304
0.04348
0.645161290322581 0.05237 0.0522 0.05134 0.05015 0.04909
0.04228
0.67741935483871 0.04661 0.04648 0.04595 0.04511 0.0448
0.04107
0.709677419354839 0.04488 0.04477 0.04433 0.04374 0.04343
0.03871
0.741935483870968 0.04474 0.0446 0.04404 0.04282 0.04193
0.03802
0.774193548387097 0.04288 0.04257 0.04173 0.0409 0.0401
0.03766
0.806451612903226 0.04217 0.04208 0.04137 0.03916 0.03791
0.03466
0.838709677419355 0.03839 0.03829 0.03784 0.03681 0.03637
0.03278
0.870967741935484 0.0381 0.03799 0.03763 0.03668 0.03591
0.03119
0.903225806451613 0.03571 0.03566 0.03543 0.03505 0.03468
0.02851
0.935483870967742 0.03081 0.03073 0.03058 0.03027 0.03005
0.02257
0.967741935483871 0.02531 0.02529 0.02517 0.02492 0.02474
0.02209

0.1 0.09649 0.09603 0.094493 0.091022 0.088702 0.070499

Average of yearly averages:

0.0502256666666667

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

Data used for this run:
Output File: MNSugSP

Metfile: w14914.dvf
PRZM scenario: MNsugarbeetC.txt
EXAMS environment file: pond298.exv
Chemical Name: Clothianidin

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	249.7	g/mol	
Henry's Law Const.	henry	2.85e-16	atm-m^3/mol	
Vapor Pressure	vapr	4.27e-10	torr	
Solubility	sol	300	mg/L	
Kd	Kd		mg/L	
Koc	Koc	188	mg/L	
Photolysis half-life	kdp	34	days	Half-life
Aerobic Aquatic Metabolism	kbacw	1488	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	81	days	Halfife
Aerobic Soil Metabolism	asm	744	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	8	integer	See PRZM manual
Incorporation Depth:	DEPI	1.91	cm	
Application Rate:	TAPP	0.0786	kg/ha	
Application Efficiency:	APPEFF		1.00	fraction
Spray Drift	DRFT	0.0	fraction of application rate applied to pond	
Application Date	Date	06-05	dd/mm or dd/mmm or dd-mm or dd-mmm	

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)

Appendix C. LOCATES (Version 2.9.11) Endangered Species Output

Species Listing by State

sugarbeets for sugar

No species were excluded

Minimum of 1 Acre.

Colorado	(5) species affected		**Taxa**	Critical Habitat
Crane, Whooping *(Grus americana)*		Endangered	Bird	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*		Threatened	Bird	No
Owl, Mexican Spotted *(Strix occidentalis lucida)*		Threatened	Bird	Yes
Ferret, Black-footed *(Mustela nigripes)*		Endangered	Mammal	No
Mouse, Preble'S Meadow Jumping *(Zapus hudsonius preblei)*		Threatened	Mammal	Yes

Idaho	(1) species affected		**Taxa**	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*		Threatened	Bird	No

Montana	(7) species affected		**Taxa**	Critical Habitat
Crane, Whooping *(Grus americana)*		Endangered	Bird	Yes
Eagle, Bald *(Haliaeetus leucocephalus)*		Threatened	Bird	No
Plover, Piping *(Charadrius melodus)*		Endangered	Bird	Yes
Tern, Interior (population) Least *(Sterna antillarum)*		Endangered	Bird	No
Bear, Grizzly *(Ursus arctos horribilis)*		Threatened	Mammal	No
Ferret, Black-footed *(Mustela nigripes)*		Endangered	Mammal	No
Wolf, Gray *(Canis lupus)*		Endangered	Mammal	Yes

Oregon	(1) species affected		**Taxa**	Critical Habitat

Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird	No

Washington (2) species affected

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird	No
Rabbit, Pygmy *(Brachylagus idahoensis)*	Endangered	Mammal	No

Wyoming (5) species affected

		Taxa	Critical Habitat
Eagle, Bald *(Haliaeetus leucocephalus)*	Threatened	Bird	No
Bear, Grizzly *(Ursus arctos horribilis)*	Threatened	Mammal	No
Ferret, Black-footed *(Mustela nigripes)*	Endangered	Mammal	No
Mouse, Preble'S Meadow Jumping *(Zapus hudsonius preblei)*	Threatened	Mammal	Yes
Wolf, Gray *(Canis lupus)*	Endangered	Mammal	Yes

No species were excluded.