17 / OPP#34211

55PP

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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

PC Code: 083601

DP Barcode: D250262

Filename: TPTH cover memo- final draft

MEMORANDUM

June 8, 1999

Subject: TPTH RED Chapter

To: R. McNally, Chemical Review Manager (PM 60)
A. Chiri, PM Team Reviewer
Special Review and Reregistration Division (7508C)

From: N.E. Federoff, Wildlife Biologist
Ecological Effects Reviewer

D. Young, PhD., Environmental Engineer
Environmental Fate Reviewer

J. Cowles, PhD., Chemist
Environmental Fate and Effects Division (7507C)

6/15/99

Through: Mah T. Shamim, Ph.D., Chief
Environmental Risk Branch IV
Environmental Fate and Effects Division

This memo summarizes the EFED environmental risk assessment for TPTH reregistration on potatoes, pecans and sugarbeets. Based on our analysis of the environmental fate, ecotoxicity, and proposed uses of TPTH, the maximum application rate may cause terrestrial and aquatic chronic levels of concern (LOC) to be exceeded. Chronic Levels of concern (LOC) are exceeded for terrestrial and aquatic organisms (chronic RQs from multiple applications were up to 300 for avian species and up to 102 for freshwater fish). RQs calculated from estimated residues on seed food items treated at the maximum application rate for potatoes and sugar beets did not exceed chronic LOCs for mammals from single applications. However, chronic LOCs were exceeded for all terrestrial organisms from multiple applications. Acute LOCs for endangered species, restricted use and high risk categories are exceeded for terrestrial (various food items) and aquatic organisms for various use patterns. The pecan use exhibited the highest risk due to a higher application rate. Because of the potential high toxicity of TPTH to fish and aquatic invertebrates, (TPTH is categorized as *very highly toxic* to all aquatic species tested) exposure via drift and runoff to aquatic habitats is a concern. Although, predicted surface water concentrations are quite low (13.7 mg/L for pecans), chronic LOCs were exceeded for all freshwater fish and invertebrates and are especially high for freshwater fish at the maximum application rate for pecans (chronic RQ=102).

1855

Uncertainties

Since TPTH will partition to the sediment (Koc 5,700 and 30,000 mL/g) there is uncertainty as to its persistence in this medium and the possible toxicity to benthic organisms (i.e aquatic invertebrates). This uncertainty is compounded by a lack of appropriate data (i.e. aerobic and anaerobic aquatic metabolism studies). In addition field dissipation studies are needed to address fate and transport of TPTH under actual use conditions and may indicate dissipation pathways not apparent from laboratory data.

One of the registered formulations for TPTH, PRO-TEX™, contains 4.72% TPTH and 32.63% Maneb. Maneb is a registered product and is more acutely toxic to freshwater fish (Rainbow trout 96hr LC50=0.042 ppb) than TPTH (Fathead minnow 96hr LC50=20 ppb). It is uncertain the magnitude of any additive or synergistic effects these two chemicals may have on each other.

Outstanding Data Requirements Needed to Assess Uncertainties

Environmental Fate:

- Although not required for the proposed uses, the registrant has not submitted an aerobic or anaerobic aquatic metabolism study. Submission of these studies would enable EFED to more accurately assess the environmental fate of TPTH in aquatic systems and determine if sediment toxicity testing would be required.

- The registrant has not submitted an acceptable study on field dissipation. EFED requires a minimum of two field studies and suggests conducting studies for pecan and sugarbeet use patterns.

- Although TPTH is unlikely to leach, a more accurate assessment of this compounds ultimate fate could be made if acceptable batch equilibrium studies were conducted.

Ecological Effects:

- EFED feels that chronic testing with the mysid shrimp and sheepshead minnow should be required (72-4 invertebrate life cycle with the mysid and 72-3 fish full life cycle with the sheepshead minnow).

- Pending completion of aerobic and anaerobic aquatic metabolism studies sediment toxicity testing may be required because TPTH is shown to bioaccumulate and has a high K_{oc} (5,700 and 30,000 mL/g). Sediment toxicity studies provide information on the combined cumulative effects to benthic organisms resulting from dissolved and sediment bound chemical.

- Aquatic plant testing is required for any fungicide that has outdoor non-residential terrestrial uses and that may move off-site by runoff, and/or by drift (aerial or irrigation). Since TPTH is a fungicide and is aerially applied, the following species should be tested at Tier I : Kirchneria subcapitata and Lemna gibba. Currently, the guideline (122-2) has not been fulfilled.

Labeling Requirements

EFED recommends the following language be included on the appropriate labels.

Label statements for toxicity to nontarget organisms:

Manufacturing Use Products

> This pesticide is toxic to wildlife and very highly toxic to aquatic organisms (fish and invertebrates). Birds feeding in treated areas may be killed. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

End Use Products

Non-Granular

> This pesticide is toxic to wildlife and very highly toxic to aquatic organisms (fish and invertebrates). Cover or disc all spill areas. Birds feeding in treated areas may be killed. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high-water mark. Drift and runoff may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwater or rinsate.

Label statements for spray drift management:

> Avoiding spray drift at the application site is the responsibility of the applicator. The interaction of many equipment-and-weather-related factors determine the potential for spray drift. The applicator is responsible for considering all these factors when making decisions. Where states have more stringent regulations, they should be observed.

Surface water advisory:

> TPTH may pose (acute, chronic) risks to (fish, aquatic invertebrates, aquatic non-target plants). TPTH has the potential for bioaccumulation in aquatic organisms from water and possibly biomagnification up the food chain. TPTH may pose (acute, chronic) risks to humans consuming surface water source contaminated drinking water. Therefore, the following surface water advisory is applicable:
>
> TPTH can contaminate surface water through spray drift.
> Under some conditions, TPTH may also have a high potential for runoff into surface water (via both dissolution in runoff water and adsorption to eroding soil), for several weeks post-application. These include poorly draining or wet soils with readily visible slopes toward adjacent surface waters, frequently flooded areas, areas over-laying extremely shallow ground water, areas with in-field canals or ditches that drain to surface water, areas not separated from adjacent surface waters with vegetated filter strips, and highly erodible soils cultivated using poor agricultural practices such as conventional tillage and down the slope plowing.

TPTH RED Chapter: Environmental Fate and Ecological Risk Assessment:
Pecans, Potatoes, and Sugarbeets

Environmental Fate and Ecological Risk Assessment

Prepared by:

N.E. Federoff
Dirk Young, Ph.D.
Jim Cowles, Ph.D.

Reviewed by:

Dana Spatz
Mah Shamim, Ph.D

United States Environmental Protection Agency
Office of Pesticide Programs
Environmental Fate and Effects Division
Environmental Risk Branch IV
401 M Street, SW
Mail Code 7507C
Washington, DC 20460

4855

TPTH RED Chapter for Pecan, Potato and Sugarbeet

TPTH RED Chapter for Pecan, Potato and Sugarbeet

Environmental Risk Characterization

Summary

- Chronic Levels of concern (LOC) are exceeded for terrestrial and aquatic organisms (chronic RQs up to 300 for avian species and up to 102 for freshwater fish). RQs calculated from estimated residues on seed food items treated at the maximum application rate for potatoes and sugar beets did not exceed chronic LOCs for mammals from single applications. However, chronic LOCs were exceeded for all terrestrial organisms from multiple applications.
- Acute LOCs for endangered species, restricted use and high risk categories are exceeded for terrestrial (various food items) and aquatic organisms for various use patterns. The pecan use generally exhibited the highest risk due to a higher application rate.
- Exposure to aquatic habitats is possible and is a concern given the toxicity of TPTH to aquatic organisms (TPTH is categorized as *very highly toxic* to all aquatic species tested).
- Data gaps exist for assessing environmental fate in aquatic environments, chronic exposure to marine/estuarine fish and invertebrates, and toxicity to aquatic plants.

The Triphenyltin Hydroxide (TPTH) Task Force, consisting of Griffin Corp., Elf-Atochem Corp., and American Hoechst, is supporting reregistration of TPTH for pecans, potatoes, and sugarbeets in the US as a flowable and wettable powder. TPTH is a non-systemic fungicide used to control pecan scab, potato late blight, and sugarbeet leaf spot which interferes with mitochondrial respiration and inhibits metabolism. The maximum application rate for all proposed uses is specified in Table 1. This fungicide may be applied as ground or aerial spray, or via chemigation for potatoes and airblast for pecans. TPTH is predominately used in the south on pecans and in the midwest on sugarbeets. There are approximately 1.4 million acres of potatoes and sugarbeets and 0.5 million acres of pecans grown nationally.

Table 1. TPTH use patterns

Crop	Maximum application rate lbs a.i./A	Maximum Application per year lbs a.i./A/yr	Number of Applications	Minimum Application Interval
Potato	0.188	0.75	4	7
Sugarbeet	0.25	0.75	3	10
Pecan	0.375	3.75	10	14

Based on submitted studies, aerobic and anaerobic soil half lives of TPTH are 21 and 36 days respectively. Thus TPTH is slightly persistent based on classification system of Goring *et al.*[1] It is expected TPTH will partition and strongly sorb to soil based on the relatively high K_{oc} values (5,700 and 30,000 mL/g) estimated from supplemental studies and therefore should pose minimal risk to ground water. Although TPTH is unlikely to leach, a more accurate assessment of this compounds ultimate fate could be made if acceptable batch equilibrium studies were conducted. Also, it should be noted that the 21-day half life reported in MRID 00156004 is lower than some literature-reported values. For example, Kannan and Lee[10] reported 87 to 90 % of TPTH remained in soil after 14 days of degradation. Other literature cited in Kannan and Lee[10] reported half-lives ranging from 47 to 140 days. Although. a DT50 of 21 days was used in the PRIZM/EXAMS simulations, there is significant uncertainty with regard representativeness of this value for the aerobic soil metabolic half life.

Transport to surface water would most likely be in association with eroded soil particles during rain or irrigation events or via spray drift during application. Given that TPTH is resistant to hydrolysis and aqueous photolysis, it should be more persistent and partition to the sediment in aquatic systems. However, there is much uncertainty regarding the fate of TPTH in aquatic systems because neither an aerobic nor an anaerobic aquatic metabolism study has been submitted to the agency. There is also uncertainty regarding the fate and transport of TPTH under actual use conditions because there has not been an acceptable field study submitted for review.

Acute LOCs for TPTH were exceeded for terrestrial organisms. For example, multiple applications of TPTH caused avian acute high levels of concern to be exceeded for short range grass at the maximum allowable application rate for all uses (RQ range 0.71 - 3.6) and in pecans for all feed items except seeds (RQ range 1.6 -3.6). Risk to probing birds may be high because TPTH that reaches the ground will reside in the top few centimeters due to the tendency of triphenyl tins to strongly sorb to soil. Submitted toxicity studies indicate TPTH is more acutely toxic to bobwhite quail than to mallard ducks. However, should TPTH enter aquatic habitats, ducklings could be affected due to alterations in the food chain. Swanson *et al.*[2] and Reinecke[3] have suggested that macroinvertebrates may represent a very high percentage of the diet of waterfowl species, especially their young. The importance of aquatic invertebrates for the young of several species of dabbling (Anatini) and diving (Aythyini) ducks has been established[4, 5]. If ducklings are present, competition for limited invertebrate food items may occur, thus reducing growth rates and increasing energy expenditures while searching for food[6,7] which may also increase the chance for predation.

In mammals, submitted studies showed moderate toxicity (rat LD50=156-165mg/Kg) for acute effects. However, acute restricted use and endangered species levels of concern are exceeded for multiple applications at the pecan application rate (RQ range 0.13 -0.30). Also it has been shown in the rat that TPTH exposure suppressed cell-mediated immunity but did not compromise humoral immunity or the mononuclear phagocyte system[8]. TPTH was also assessed through an *in vivo* clastogenicity test in rat bone marrow cells which demonstrated that there was a significant induction of chromosomal aberrations.

TPTH is very highly toxic to freshwater and estuarine/marine fish and invertebrates. High acute risk RQs were exceeded for all aquatic organisms at the maximum application rate for pecans (RQs ranged from $0.54_{estuarine/marine\ fish}$ to $47.1_{estuarine/marine\ invertebrates}$). Other organotin compounds have been shown to cause adverse effects to aquatic organisms. Cimaa *et. al.*[9] found that triphenyltin derivatives, including TPTH, can cause severe immunotoxicity in tunicates (an estuarine and marine invertebrate). Generally, filter-feeding bivalves bioconcentrate organotin compounds to a greater extent than fish[10]. Bioaccumualation in aquatic environments is a concern given the submitted fish bioaccumulation study showed bioaccumulation factors of 2900, 4900, and 3700X for edible tissue, nonedible tissue and whole fish respectively. Also, a single application of TPTH has been shown to kill aquatic fauna and delay reestablishment of organisms through its residual toxicity[11]. Should TPTH enter aquatic habitats, a decline in fish populations may result due to a decline of their food base (invertebrates) as well as to direct toxicity of TPTH to fish.

All terrestrial and aquatic chronic levels of concern (LOC) are exceeded for TPTH with the exception of seed food items treated at the maximum application rate for sugarbeets and potatoes. Chronic RQs for avian and mammalian species were as high as 300 and 180 respectively for simulated multiple applications of TPTH. In particular there is concern for avian species exposed during the breeding season. Submitted avian reproduction studies show decreased food consumption, number of live embryos, and reduction of eggshell thickness. Reproductive effects in mammals resulted in decreased liver/spleen weights and litter size (NOEC=5 ppm). Chronic RQs for freshwater fish ranged from 9.2 to 102 and 1.2 to 10.8 for freshwater invertebrates. Exposure to aquatic organisms is of concern since aerial applications will be permitted and drift to aquatic habitats could occur. The submitted data is inadequate to assess chronic risk to estuarine/marine fish and invertebrates which is of particular concern for potatoes and pecans which may be grown near estuarine/marine habitats. The application of TPTH on pecans generally produced the highest risk scenario for aquatic organisms, which is of concern because 82% of the domestic TPTH use is on pecans.

TPTH is practically non-toxic to beneficial insects (honey bee LD50=114.8 ug/bee). However, a single application of TPTH drastically affected mosquito predators and residual toxicity delayed the reestablishment of these organisms, enhancing resurgence of the pest population[11]. Also, there is evidence that TPTH adversely affects reproduction in terrestrial invertebrates. Grisolia and Bicalho-Valadares[12] found that TPTH significantly decreased the production of eggs per egg mass, the number of egg masses per snail and the percentage of viable embryos per egg mass in *B. tenagophila*. The frequency of inviable embryos per egg mass, however, was not affected.

EFED is unable to assess the effects TPTH may have on aquatic plants due to spray drift or runoff. Aquatic plant testing is required for any fungicide that has outdoor non-residential terrestrial uses.

Finally, EFED is concerned that PRO-TEX™ which contains 4.72% TPTH and 32.63% Maneb may cause synergistic or additive toxic effects in the environment. Maneb is a registered product and is more acutely toxic to freshwater fish (Rainbow trout 96hr LC50=0.042 ppb) than TPTH (Fathead minnow 96hr LC50=20 ppb).

Environmental Fate Assessment

Chemical Identity and Physicochemical Properties

Table 2. Chemical Identity.

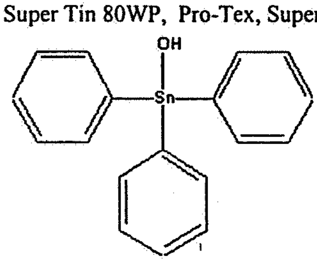
CAS	hydroxytriphenylstannane
CAS Registry No.	76-87-9
PC Code	083601
Empirical Formula	$C_{18}H_{16}OSn$
Molecular Weight	367.03
Synonyms	fentin hydroxide, TPTH
Formulated Products	Super Tin 80WP, Pro-Tex, Super Tin 4L
Structure	

Table 3. Physicochemical properties for TPTH.

physicochemical property	measured value
Solubility	1 - 8 mg/L
vapor pressure	<1 x 10^{-7} torr at 25°C
log K_{ow}	3.1

Summary

Triphenyltin hydroxide is hydrophobic (log K_{ow} = 3.1), and although there is some uncertainty with regard to measured values of K_{oc} values, indications are that TPTH partitions very strongly to soils, with K_{oc} possibly ranging from 1900 mL/g to greater than 54000 mL/g. According to submitted reports, TPTH is resistant to photodegradation and hydrolysis. Submitted reports also indicate that TPTH degrades in aerobic soil with a half life of 21 days, although open literature indicates that the half life may be as high as 140 days. TPTH half life under anaerobic soil conditions is 36 days, according to submitted reports. Based on its high K_{oc} and comparatively short soil half life (from submitted data), TPTH is not expected to reach groundwater. However, if the half-life of TPTH is closer to reported literature values, TPTH could be expected to reach groundwater. TPTH that reaches the ground after field application will be strongly sorbed; thus the major transport mechanism to surface water bodies will be by spraydrift and soil erosion. Once in surface water bodies, submitted studies indicate that TPTH will accumulate in tissues of fish by factors of 2900, 4900, 3700X for the edible tissue, nonedible tissue, and in the whole fish, respectively.

The following studies have been accepted by past reviewers as fulfilling the respective requirements:

Hydrolysis (MRID 0093875 and 0093874)
Photodegradation in water (MRID 42049502)
Photodegradation in soil (MRID 42119801)
Aerobic soil metabolism (MRID 00156004)
Anaerobic soil metabolism (MRID00156005 and 00143246)
Leaching and adsorption/desorption (MRID 0156006)
Bioaccumulation in fish (MRID 42995601)

As discussed in the text that follows some of these studies, namely the adsorption/desorption study and the aerobic soil degradation study, are deficient in the quality of the results presently required by EFED to perform meaningful environmental fate assessments. Furthermore, the registrant has not submitted an acceptable field dissipation study

Persistence and Degradation in Laboratory Studies

Aqueous Solutions

Accepted submitted reports indicate that TPTH is stable to hydrolysis and relatively stable to photodegradation. Hydrolysis studies were conducted for 30 days at 21°C at pHs of 4.6, 7, and 10 (MRID 00093875 and 00093874). Measured concentrations of TPTH fluctuated between 0.38 and 0.43 mg/L throughout the test, indicating TPTH is stable. Photolysis studies of ^{14}C-phenyl labeled TPTH (MRID 42049502) were conducted in a pH 7 sterile aqueous buffer under a filtered xenon lamp for up to 197 hours (equivalent to 26 days and 35 days constant sunlight for the two apparatuses used). The degradation half-lives were 111 days and 93 days (converted to 12 hours light/12 hours dark) for the irradiated samples and 155 days for the dark control. This indicates photolysis is not a significant factor in the degradation of TPTH. The primary degradates formed in the irradiated samples were monophenyltin (up to 17 percent of applied), diphenyltin (2 to3%), benzene (5-6 %), and CO_2 (1-2 %).

Soil

The submitted data (MRID 42119801) indicate that TPTH is stable to soil photolysis. In the submitted study, ^{14}C-phenyl-labeled TPTH was applied to stainless steel plates covered with 2 grams of biologically active silt loam. The plates were irradiated for 32 days (12/12 hours light/dark cycle) with a filtered xenon lamp at 25°C. Degradation half lives for the dark control and irradiated sample were both 30 days, indicating that soil photolysis did not play a role in the degradation of TPTH.

Aerobic soil degradation studies were conducted on a silt loam and a silty clay at 22°C (MRID 00156004). The degradation rate was determined from a first-order degradation model fit to data representing the extractable fraction of the applied mass of TPTH. The dissipation half life (DT50) for TPTH was 21 days for both soils. The DT50 includes effects of irreversible sorption, and thus does not necessarily represent the biodegradation half life. In MRID 00156004, the 21-day half-life was based on extractable TPTH. However, significant portions (up to 40%) of the applied radioactivity were not extractable. This non-extractable portion was quantified by combustion of the soil. If the non-extractable portion were assumed to be TPTH, then the aerobic soil metabolic half life could be calculated to be around 60 days; however MRID 00156004 claims that the non-extractables were not likely to be tin compounds, although the non-extractables were not identified. Note that the 21-day half life reported in MRID 00156004 is lower than some literature-reported values. For example, Kannan and Lee[10] reported 87 to 90 % of TPTH remained in soil after 14 days of degradation. Other literature cited in Kannan and Lee[10] reported half-lives ranging from 47 to 140 days. Although, a DT50 of 21 days was used in the PRIZM/EXAMS simulations, there is significant uncertainty with regard representativeness of this value for the aerobic soil metabolic half life. Degradates other than CO_2 were not characterized. The total evolved CO_2 accounted for about 30 % of the applied radioactivity.

Submitted studies (MRID 00156005) indicate the anaerobic soil half life for TPTH is 36 days at 22°C. TPTH was applied to a silty clay and incubated for 26 days at which time anaerobic conditions were established and the experiment continued for 67 additional days. During the anaerobic phase, TPTH mass declined from 29.4% to 7.9% of the initial mass measured. Approximately 31% of the applied radioactivity evolved as CO_2 during the anaerobic period. Monophenyltin and diphenyltin degradates were found at less than 1% of the applied mass.

Sediment/Water Systems

The registrant has not submitted an aerobic or anaerobic aquatic metabolism study. However, it is expected that TPTH will partition to the sediment in aquatic systems given the high K_{oc} values that are reported (K_{oc} >1900 mL/g).

Mobility

The previously accepted sorption/leaching study (MRID 0156006, accepted in 1987) was a thin layer chromatography study and did not give partitioning coefficients. A review of the TPTH file, however, uncovered one previous submitted batch study originally conducted in 1978 (MRID 0009378). In MRID 0009378, single-concentration batch studies were conducted on four soils. Final aqueous concentrations for two of the batch studies were below the analytical limit of quantification (10 μg/L). Thus only two of the soils could be used for estimation of partitioning coefficients (Table 4). Furthermore, information on losses was not reported, and a complete mass balance without including losses was apparently assumed. An assumption of a complete mass will overestimate the partitioning coefficient. Thus, EFED recalculated the sorption coefficients in MRID 0009378 with an assumption of a 15% loss (e.g., losses due to sorption to laboratory apparatuses and to incorrect estimates of applied mass). The 15% value represents a conservative estimate with respect to reported losses ranging from 3 to 11 percent for batch studies conducted using meticulously precise techniques (see, for example, Ball and Roberts, 1991, *Environ. Sci Techno*l.25, 1223-1227). With this correction for losses, the K_{oc}s from MRID 0009378 are 5700 mL/g (determined at an aqueous concentration of 56 μg/L) for a sandy clay loam and 30,000 mL/g (determined at an aqueous concentration of 13 μg/L) for a loamy sand. For the two soils for which the final concentration was below the detection limit, the K_{oc}s were greater than 1900 mL/g (for a clay) and greater than 54000 mL/g (for an organic soil). For the PRIZM /EXAMS simulations, a K_{oc} of 5700 mL/g was used (i.e., the value for the loamy sand).

Table 4. Physicochemical characteristics and the adsorption parameters of the soils used in the adsorption/desorption study

Soil Name in MRID 0009378	Hanford	Panoche
textural class	loamy sand	sandy clay loam
clay (%)	3.11	21.71
pH (water)	6.3	7.8
% organic carbon	0.214	0.231
c.e.c (meq/100g)	6.80	15.66

Field Dissipation

The registrant has not submitted an acceptable study on field dissipation.

Bioaccumulation

Submitted studies (MRID 42995601) indicate that bioaccumulation factors were 2900X in edible tissues (fillet), 4900X in nonedible tissues (viscera and carcass), and 3700X in whole fish. Exposure took place over a 170-day period at a nominal concentration of 0.50 mg/L ^{14}C-TPTH. Maximum mean concentrations of total [^{14}C] residues were 1.5 mg/kg in the edible tissues, 2.5 mg/kg in the nonedible tissues, and 1.9 mg/kg in whole fish. Greater than 90% of the accumulated residues in the fish were extractable, and all of the extracted radioactivity was identified as TPTH. Depuration was slow, with approximately 50% of the accumulated [^{14}C] residues being eliminated from the fish tissues after 56 days of depuration.

Water Resource Assessment

The submitted environmental fate studies indicate that TPTH will partition strongly to soils and will dissipate relatively rapidly (DT50 = 21 days); however significant uncertainty exists with respect to actual environmental fate parameters, as described previously. Due primarily to its high partitioning coefficient, TPTH is expected to be present only at low concentrations in surface and ground water. Model simulations support this, as described below; however actual monitoring data are not available, and thus a confirmation cannot be made.

Aquatic Exposure Assessment

Aquatic EECs are estimated using PRIZM/EXAMS with standard input scenarios. The general scenario is for a 20,000-m^3 pond adjacent to a 10 ha field. Pesticide is applied to the field at the maximum label rate and at the shortest allowable interval. The field's location, hydrologic, and meteorologic characteristics are crop dependent and are contained in an EFED database. Pesticide enters the pond by runoff, sediment erosion, and spray drift. Degradation and sorption occur both in the field and in the pond. Specific parameters for PRZM and EXAMS inputs are described in the Appendix I.

Table 5 list the maximum concentrations that were simulated for the three scenarios. Based on the standard scenarios, the surface water concentrations near pecan orchards are expected to be much higher than for beets or potatoes. This is expected, based upon the much higher allowable application rate for pecans. Although, surface water concentrations are quite low, chronic LOCs were exceeded for all freshwater fish and invertebrates and are especially high for freshwater fish at the maximum application rate for pecans (RQ=101.5). Acute high risk LOCs were exceeded at all maximum application rates for estuarine/marine invertebrates and for freshwater and marine fish and freshwater invertebrates at the maximum application rate for pecans. Endangered species LOCs for freshwater and marine fish and restricted use LOCs for freshwater invertebrates were exceeded for the potato and sugarbeet maximum application rates.

Table 5. One-in-ten-year maximum concentrations (µg/L) from PRZM/EXAMS.

Crop	Peak	4-day average	21-day average	60-day average	90-day average	yearly average
pecan	13.7	11.7	8.3	6.6	6.4	4.7
beets	1.6	1.4	1.0	0.7	0.6	0.3
potato	1.4	1.1	0.9	0.6	0.5	0.3

Drinking Water Assessment

Estimated Environmental Concentrations in Surface Water

The assessment of drinking water derived from surface waters is based on the same analysis used above for aquatic exposure. Likewise, EECs are the same as for aquatic exposure and are presented in Table 5. The worst-case scenario is for pecans, for which the peak EEC is 13.7 µg/L and the yearly average EEC is 4.7 µg/L. The same uncertainity exists for the environmental fate input parameters used to generate these EECs as described above for the water resource assessment.

Estimated Environmental Concentrations in Ground Water

Ground water assessments were performed with SCIGROW, which is an empirical model that provides a groundwater concentration for use in determining the potential risk to human health from drinking groundwater contaminated with pesticides. SCIGROW estimates ground water concentrations for pesticides applied at the maximum allowable rate in areas where ground water is vulnerable to contamination. Actual concentrations observed in groundwater may be higher or lower than those derived using SCIGROW, and actual monitoring data should be used to estimate environmental concentrations when possible. EFED assumes that in a majority of cases ground water will be less vulnerable to contamination than the areas used to derive the empirical formula used in SCIGROW. SCIGROW requires input values for the sorption coefficient (K_{oc}), the soil half life, and the maximum yearly application. It should be noted that the K_{oc} for TPTH (K_{oc}: 5700 ml/g) is out of the range of K_{oc}s (K_{oc}s: 32-180) used to develop SCIGROW. The input value for the half life is 21 days. The 21-day half life may not represent the actual degradation half life, as described previously; thus there is considerable uncertainity with regard to its applicability in the SCIGROW evaluation. The soil application rate was taken as the maximum rate allowable for pecans (0.375 lb/acre 10 times per year).

The input values for SCIGROW are listed in Table 6. All parameters came from the discussions given above. Table 7 contains the estimated concentrations for the worst-case use of TPTH. The application rate is for the crop with the highest allowed application rate (pecans). The ground water screening concentration is 0.03 ppb. This value represents an upper-bound estimate of the concentrations that might be found in ground water due to the use of TPTH on pecans. The actual SCIGROW modeling output is presented in Appendix II.

Table 6. SCIGROW modeling parameters for TPTH

PC Code	083601
Solubility	8 ppm
Aerobic Soil Metabolism	$t_{1/2}$ = 21days
Soil-Water Partitioning (K_{oc})	5700 ml/g

Table 7. Ground water EECs for TPTH, based on the application rate for pecans

App Method	App Rate (lbs ai/acre)	No. of Apps.	App. Int. (days)	SCIGROW conc. (ppb)
aerial spray	0.375	10	14	0.03

Terrestrial Exposure Assessment

Nongranular Applications

The terrestrial exposure assessment is based on the methods of Hoerger and Kenaga[13] as modified by Fletcher *et al.*[14] Terrestrial estimated environmental concentrations (EECs) for nongranular formulations were based on the maximum application rate of TPTH. Normalized estimated environmental concentrations (NEECs) are EECs that are based on a single application of 1 lb a.i./A and are shown in Table 8. Actual EECs are equal to NEECs times the maximum application rate and are presented in Appendix IV. Uncertainties in the terrestrial EECs are primarily associated with a lack of data on interception and subsequent dissipation from foliar surfaces. EFED assumes the foliar dissipation rate is based on a number of routes which include photolysis, hydrolysis and volatilization. It could also include uptake in plants as well as wash off if those data were available. Literature data suggest that foliar dissipation rates are generally less than 20 days[15].

Table 8. Normalized Estimated Environmental Concentrations (based on 1 lb. ai/A single application) for Avian and Mammalian Food Items. Values are from Hoerger and Kenaga, as modified by Fletcher *et al.*.

Food Items	EEC (ppm) Predicted Maximum Residue	EEC (ppm) Predicted Mean Residue
Short grass	240	85
Tall grass	110	36
Broadleaf plants and small insects	135	45
Fruits, pods, seeds, and large insects	15	7

Ecological Effects Hazard Assessment

Introduction

Toxicity testing reported in this section does not represent all species of birds, fish, or mammals. For birds and freshwater fish, only two surrogate species each are used to represent all freshwater fish (2000+) and bird (680+) species in the United States. For mammals, acute studies are usually limited to the Norway rat or the house mouse. Estuarine/marine testing is usually limited to a crustacean, a mollusk, and a fish. Furthermore, neither reptiles nor amphibians are tested. Reptiles are assumed to be subject to similar toxicological effects as birds, and amphibian toxicological effects are assumed to be similar to fish.

Toxicity to Terrestrial Animals

Avian Acute Oral, Subacute Dietary and Chronic

TPTH is moderately toxic to avian species based on acute oral studies ($LD_{50\ mallard\ duck}$=378 mg/kg; MRID Touotro 1980) and is highly toxic on a subacute dietary bases ($LC_{50\ bobwhite\ quail}$ = 253 ppm; MRID Touotro 1980). The registrant also submitted acute oral and subacute dietary tests using formulated product. The acute oral data using formulated product show that TPTH is moderately toxic to avian species (LD_{50} 76 $_{bobwhite\ quail}$ and 399 $_{mallard\ duck}$ mg/kg; MRID Touotro 1980). Subacute dietary testing using formulated product was classified as moderately to very highly toxic for avian species (LC50 533

$_{mallard\ duck}$ and 39 $_{bobwhite\ quail}$ ppm; MRID 00142758 and 00086486). The submitted data indicates the bobwhite quail is more susceptible to the deleterious effects of TPTH than the mallard duck via acute oral or dietary exposure. The requirements for acute oral (Guideline 71-1) have been fulfilled. The subacute dietary guideline (71-2) is partially fulfilled, however, no new information would be added by conducting additional studies.

Avian reproduction studies show that exposure to TPTH caused decreases in 14-day survivors, food consumption, number of live embryos, and egg shell thickness as well as regressed ovaries and egg peritonitis. The NOEC $_{mallard\ duck}$ was 3 ppm, and the LOEC $_{mallard\ duck}$ was 30 ppm. The avian reproduction guideline (71-4) is fulfilled.

Mammals Acute and Chronic

TPTH is moderately toxic to small mammals on an acute oral basis (LD_{50}=165 $_{males}$ and 156 $_{females}$ mg/Kg; MRID/Acc#'s 071364/252512). Results from a chronic study indicate reproductive/systemic effects, such as decreased liver and spleen weights and litter size, at an LOEC of 18.5 ppm (*HED data requirement* MRID/Acc #'s 264667-264676).

Insects

TPTH is practically non-toxic to bees on an acute contact basis (LD50 115 μg/bee). The guideline (141-1) is fulfilled (MRID# 00018842).

Toxicity to Freshwater Aquatic Organisms

Freshwater Fish Acute and Chronic

TPTH is very highly toxic to cold and warmwater fish (LC50 7.1-62 ppb; MRID 400980-01, 258233). For chronic effects the data indicate TPTH significantly affects growth of the parental generation at concentrations of 0.065 ppb and above. The guideline (72-4) is fulfilled (Acc# 434901-01 and TOUOTR06).

Freshwater Invertebrates Acute and Chronic

The LC50/EC50 of TPTH is considered to be very highly toxic to freshwater aquatic invertebrates on an acute basis because the TGAI is between 10.0 and 66.0 ppb. The guideline (72-2) is fulfilled (MRID# 400980-01 and TOUOTR04).

The studies submitted show TPTH significantly affected chronic parameters for daphnids. The NOEC was < 0.2 ppb for behavioral abnormalities and daphnid survival was significantly affected at concentrations as low as 1.5 ppb. There was no observed effect on offspring survival up to 0.77 ppb. The guideline (72-4) is fulfilled (Acc# TOUOTR05).

Toxicity to Estuarine/Marine Fish Acute

Estuarine/Marine Fish Acute

TPTH is considered to be very highly toxic to estuarine/marine fish on an acute basis (LC50= 26-46 ppb). The guideline (72-3a) is fulfilled (MRID# 432127-02).

Estuarine/Marine Invertebrate Acute

TPTH is considered very highly toxic to estuarine/marine invertebrates on an acute basis (LC50/EC50: 0.29-64.0 ppb) . The guideline (72-3a) is fulfilled (MRID# 402284-01, 432117-03, 440239-01 and 432127-03). However, the LC50/EC50 for the formulated product ranges from 55,700 to 464,900 ppb, and is considered slightly toxic to practically non-toxic to estuarine/marine invertebrates on an acute basis.

Toxicity to Aquatic Plants

No data submitted.

Environmental Risk Assessment

In order to evaluate the potential risk to aquatic and terrestrial organisms from the use of TPTH, risk quotients (RQs) are calculated from the ratio of estimated environmental concentrations (EECs) to ecotoxicity values (Appendix IV). EECs are based on the maximum application rates for TPTH. These RQs are then compared to the levels of concern (LOC) criteria used by OPP for determining potential risk to nontarget organisms and the subsequent need for possible regulatory action.

Risk to Nontarget Terrestrial Organisms

TPTH is moderately toxic to avian and mammalian species and exceeds acute and chronic LOCs. For a single application of TPTH, acute avian RQs were exceeded for endangered species for all crops except tall grass food items treated at the maximum application rate for potatoes and seed-based food items for potatoes, pecans and beets (RQ range 0.01 - 0.40). In addition, the restricted use LOC is exceeded for pecans (short range grass and broadleaf plant/insect feed items) and beets (short range grass) (RQ range 0.20 - 0.40). The avian chronic level of concern is exceeded at all registered maximum application rates (RQ range 1.3 - 30).

For multiple applications avian acute high levels of concern are exceeded for short range grass at the maximum allowable application rate for all uses (RQ range 0.71 - 3.60) and in pecans for all feed items except seeds (RQ range 1.6 - 3.6). Restricted use and endangered species levels of concern are exceeded for all maximum application rates except seeds in the sugarbeet and potato use patterns (RQ range 0.22 - 0.40). Avian chronic LOCs are exceeded for all food items at all registered maximum application rates (RQ range 3.75 - 300).

There are no acute mammalian risks from a single application of TPTH at maximum application rates. However, mammalian chronic levels of concern are exceeded for all uses and food groups (RQ range 1.2 - 18), with the exception of seeds for potato and sugarbeet uses. For multiple broadcast applications of nongranular products, mammalian acute levels of concern are not exceeded at maximum application rates for the sugarbeet and potato uses. However, acute restricted use and endangered species levels of concern are exceeded for the pecan application rate (RQ range 0.13 - 0.30). In addition, the mammalian chronic LOC is exceeded at all registered maximum application rates for all food categories (RQ range 2.25 -180).

Exposure and Risk to Nontarget Freshwater and Marine Aquatic Organisms

TPTH is very highly toxic to freshwater and marine/estuarine organisms. Exposure assessments were conducted using Tier II level modeling with PRZM/EXAMS. The RQs calculated from the modeling results show that acute and chronic LOCs for freshwater fish are exceeded (RQs range 0.07 - 0.7_{acute} and 9.2 - $102_{chronic}$).

High acute and chronic LOCs for freshwater invertebrates are exceeded for the pecan use pattern (RQs 1.4_{acute} and 10.8 $_{chronic}$). Also, acute restricted use, endangered species (RQs 0.14 - 0.20) and chronic (RQs 1.2 and 1.3) LOCs for freshwater invertebrates were exceeded for the potato and beet use patterns.

High acute risk LOCs for estuarine/marine fish are exceeded for the pecan use pattern (RQ 0.54). Also, endangered species LOCs for estuarine/marine fish were exceeded for the potato and beet use patterns (RQs 0.05 - 0.06). No data was submitted to assess chronic risk. Also high acute, restricted use and endangered species LOCs for estuarine/marine invertebrates are exceeded for all use patterns (RQs range 4.8 - 47.2). No data was submitted to assess chronic risk.

Exposure and Risk to Endangered Species

Endangered and threatened avian species may be at acute and chronic risk from applications of TPTH. There were no acute risks to endangered and threatened mammalian species associated with single applications of TPTH but risks from multiple applications were associated with the pecan use. Endangered and threatened mammalian species may be at chronic risk from most single and all multiple applications of TPTH. Endangered and threatened freshwater fish, freshwater invertebrates, estuarine/marine fish and especially mollusks may be at acute risk from TPTH. Also, endangered and threatened freshwater fish and invertebrates may be at chronic risk from TPTH. Chronic risk to endangered and threatened estuarine/marine fish and invertebrates is unknown due to a lack of data, although risk would likely be present due to high toxicity of the compound to aquatic organisms in general and extrapolation from freshwater data.

The Agency has developed a program (the "Endangered Species Protection Program") to identify pesticides whose use may cause adverse impacts on endangered and threatened species, and to implement mitigation measures that will eliminate the adverse impacts. At present, the program is being implemented on an interim basis as described in a Federal Register notice (54 FR 27984-28008, July 3, 1989), and is providing information to pesticide users to help them protect these species on a voluntary basis. As currently planned, the final program will call for label modifications referring to required limitations on pesticide uses, typically as depicted in county-specific bulletins or by other site-specific mechanisms as specified by state partners. A final program, which may be altered from the interim program, will be described in a future Federal Register notice. The Agency is not imposing label modifications at this time. Rather, any requirements for product use modifications will occur in the future under the Endangered Species Protection Program.

Limitations in the use of TPTH may be required to protect endangered and threatened species, but these limitations have not been defined and may be formulation specific. EPA anticipates that a consultation with the Fish and Wildlife Service will be conducted in accordance with the species-based priority approach described in the Program. After completion of consultation, registrants will be informed if any required label modifications are necessary. Such modifications would most likely consist of the generic label statement referring pesticide users to use limitations contained in county Bulletins.

APPENDIX I: Parameter Inputs for PRZM

Pecans

Pecan Orchard Description

The field used to grow pecans is located in the southern piedmont of Georgia. The soil is a Williston loamy sand--a fine, mixed, hyperthermic, Typic Hapludalfs in MLRA 138. The Williston loamy sand is moderately deep, well drained, moderately low permeability soil formed in moderately thick beds of clayey marine sediments overlying soft limestone. Located on nearly level to sloping upland landscapes in the Coastal Plain, water runs off the surface moderately rapidly. Slopes are predominantly less than 5 %, but ranges up to 8 % on hills. The soil is characterized as a Hydrologic Group C soil.

PRZM Parameter Inputs for Pecan Orchard

The following list the parameter inputs used in the PRZM simulations. Inputs are grouped by the record in which they appear in PRZM

PRZM 3 Input: Record 3

Parameter	Description	Value	Units	Source
PFAC	pan factor	0.740	–	PIC*
SFAC	snowmelt factor	0.150	cm/°C	PIC
IPIEND	pan factor flag	0	–	
ANETD	min. depth of evaporation	20.	cm	PIC
INICRP	initial crop flag	1	–	
ISCOND	surface condition of initial crop	2	–	

* PIC=PRZM Input Collator (Allen et al., 1991)

PRZM3 Input: Record 6

Parameter	Description	Value	Units	Source
ERFLAG	erosion flag	4		

PRZM 3 Input: Record 7

Parameter	Description	Value	Units	Source
USLEK	USLE soil erodibility (K)	0.1	–	PIC
USLELS	USLE topographic factor (LS)	1.0	–	PIC
USLEP	USLE practice factor (P)	1.0	–	
AFIELD	field area	10.	ha	std.
IREG	location of NRCS 24-hr hyteograph	3	–	
SLP	land slope	6.	%	
HL	hydraulic length	354.	m	

PRZM 3 Input: Record 8

Parameter	Description	Value	Units	Source
NDC	number of crops	1		

PRZM 3 Input: Record 9

Parameter	Description	Value	Units	Source
ICNCN	crop identification number	1	–	
CINTCP	max. interception storage	0.10	m	PIC
AMXDR	max. rooting depth	45.	cm	PIC
COVMAX	max. canopy coverage	80	%	PIC
ICNAH	surface condition of crop after harvest	2	–	
CN	runoff curve numbers: fallow cropping residue	 91 85 88		PRZM manual
WFMAX	max. dry wt. of crop at full canopy (only for CAM=3)	0.0	kg/m2	N/A
HTMAX	max. canopy ht.	900	cm	

PRZM 3 Input: Record 9A, 9B, 9C, 9D

Parameter	Description	Value	Units	Source
CROPNO	crop identification number	1	–	
NUSLEC	number of USLEC factors	3	–	
GDUSLEC & GMUSLEC	day & month for USLEC and Manning's N	1-Jan 1-May 1-Sep	–	
USLEC	soil loss cover management factor: 1-Jan to 1-May 1-May to 1-Sep 1-Sep to 1-Jan	 0.50 0.50 0.50	–	PIC
MNGN	Manning's N 1-Jan to 1-May 1-May to 1-Sep 1-Sep to 1-Jan	 0.015 0.015 0.015	–	PRZM manual

PRZM 3 Input: Record 10,11

Parameter	Description	Value	Units	Source
NCPDS	number of cropping periods	36	–	std.
EMD-EMM	day-month of crop emergence	5-Apr*	–	*
MAD-MAM	day—month of crop maturation	21-Apr*	–	*
HAD-HAM	day—month of crop harvest	6-Oct	–	
IYREM IYRAT IYRHAR	year of crop emergence, maturation, harvest	1948-1983	–	std.
NDC	crop number	1	–	

*set arbitrarily at dates before pesticide application so that there is full foliage during application schedule

PRZM 3 Input: Record 13

arameter	Description	Value	Units	Source
NAPS	total number of pesticide applications	360	–	
NCHEM	number of pesticides	1	–	
FRMFLG	soil moisture flag	0	–	
DKFLAG2	bi-phase half-life flag	0	–	

PRZM 3 Input: Record 16

Parameter	Description	Value	Units	Source
APD-APM	day-month of application	5-May 19-May 2-Jun 16-Jun 30-Jun 14-Jul 28-Jul 11-Aug 25-Aug 8-Sep	–	*
IAPYR	years of application	1948-1983	–	std.
WINDAY	number of days to check for soil moisture	0	–	N/A
CAM	chemical application method	2	–	label
DEPI	depth of pesticide application	0.0	cm	N/A
TAPP	target application rate	0.42	kg/ha	label
APPEFF	application efficiency	0.95	–	
DRFT	spay drift fraction	0.05	–	std.

*information on dates was supplied by Mitchell County agriculture extension agent (912) 336-2066, along with TPTH label information.

PRZM 3 Input: Record 17

Parameter	Description	Value	Units	Source
FILTRA	filtration parameter	0.0	–	
IPSCND	disposition of pesticide after harvest	3	–	
UPTKF	plant uptake factor	0	–	

PRZM 3 Input: Record 18

Parameter	Description	Value	Units	Source
PLVRKT	volatilization rate on foliage	0	day-1	N/A
PLDKRT	decay rate of foliage	0	day-1	N/A
FEXTRC	foliar extraction coeff.	0.5	cm-1	std.

PRZM 3 Input: Record 20

Parameter	Description	Value	Units	Source
CORED	total depth of soil core	100	cm	PIC
BDFLAG	bulk density flag	0	–	std.
THFLAG	field cap. /wilting flag	0	–	std.
KDFLAG	adsorption coeff. Flag	0	–	std.
HSWZT	drainage flag	0	–	std.
MOC	MOC flag	0	–	std.
IRFLAG	irrigation flag	0	–	std.
ITFLAG	soil temp. flag	0	–	std.
IDFLAG	thermal flag	0	–	std.
BIOFLAG	biodegradation flag	0	–	std.

PRZM 3 Input: Record 26

Parameter	Description	Value	Units	Source
DAIR	diffusion coefficient for pesticide in air	0.0	cm2/day	N/A
HENRYK	Henry's constant	0.0	cm3/cm3	N/A
ENPY	enthalpy of vaporization	0.0	kcal/mol	N/A

PRZM 3 Input: Record 33, 34

Parameter	Description	Value	Units	Source
NHORIZ	horizon number	3	–	
HORIZN: THKNS	horzn. number: thickness	1: 30 2: 16 3: 54	cm	PIC
BD	horzn. number: bulk density	1: 1.45 2: 1.7 3: 1.7	g/cm3	PIC
THETO	horzn. number: initial water content	1: 0.149 2: 0.245 3: 0.332	cm3/cm3	PIC
AD	soil drainage parameter	1: 0.0 2: 0.0 3: 0.0	day-1	PIC
DISP	dispersion coeff.	1: 0.0 2: 0.0 3: 0.0	cm2/day	std.
ADL	lateral soil drainage parameter	1: 0.0 2: 0.0 3: 0.0	day-2	std.

PRZM 3 Input: Record 36

Parameter	Description	Value	Units	Source
DWRATE	dissolved-phase decay rate	0.033	day-1	registrant*
DSRATE	sorbed-phase decay rate	0.033	day-1	registrant*
DGRATE	vapor-phase decay rate	0.0	day-1	N/A

*aerobic soil decay MRID:001560005

PRZM 3 Input: Record 37

Parameter	Description	Value	Units	Source
DPN	horzn. number: horizon discretization size	1: 0.1 2: 0.5 3: 1.0	cm	std.
THEFC	horzn. number: field capacity	1: 0.149 2: 0.245 3: 0.332	cm3/cm3	PIC
THEWP	horzn. number: wilting point	1: 0.069 2: 0.125 3: 0.192	cm3/cm3	PIC
OC	horzn. number: organic carbon content	1: 1.16 2: 0.174 3: 0.116	%	PIC
KD	partitioning coeff.	1: 66.1 2: 9.92 3: 6.61	cm3/g	registrant*

* KD = Koc*OC; Koc supplied by registrant

PRZM 3 Input: Record 40

Parameter	Description	Value	Units	Source
ILP	initial pesticide level flag	0	–	N/A

PRZM 3 Input: Record 43,44

Parameter	Description	Value	Units	Source
EXMFLG	exams flag	1	–	
EXMCHM	EXAMS chem. cat. no.	--	–	
CASSNO	CASS number	--	–	
NPROC	EXAMS transformation #	--	–	

Potatoes

Potato Field Description

The field used to grow potatoes is located in Aroostook County, Maine. The soil is a Conant silt loam—a fine-loamy, mixed, frigid Aquic Haplorthods in MLRA 143. The Conant silt loam is a very deep, moderately well-drained to somewhat poorly drained soil formed in glacial till. The soil is moderately permeable. The field is located on uplands where slopes range from 0-15 percent.

PRZM Parameter Inputs for Potato Field

PRZM Parameter Inputs for Potatoes

The following list the parameter inputs used in the PRZM simulations. Inputs are grouped by the record in which they appear in PRZM

PRZM 3 Input: Record 3

Parameter	Description	Value	Units	Source
PFAC	pan factor	0.770	–	PIC
SFAC	snowmelt factor	0.150	cm/°C	PIC
IPIEND	pan factor flag	0	–	
ANETD	min. depth of evaporation	12.5	cm	PIC
INICRP	initial crop flag	1	–	
ISCOND	surface condition of initial crop	3	–	

PRZM3 Input: Record 6

Parameter	Description	Value	Units	Source
ERFLAG	erosion flag	4		

PRZM 3 Input: Record 7

Parameter	Description	Value	Units	Source
USLEK	USLE soil erodibility (K)	0.28	–	PIC
USLELS	USLE topographic factor (LS)	0.44	–	PIC
USLEP	USLE practice factor (P)	1.0	–	
AFIELD	field area	10.	ha	std.
IREG	location of NRCS 24-hr hyteograph	3	–	
SLP	land slope	4.	%	
HL	hydraulic length	354.	m	

PRZM 3 Input: Record 8

Parameter	Description	Value	Units	Source
NDC	number of crops	1		

PRZM 3 Input: Record 9

Parameter	Description	Value	Units	Source
ICNCN	crop identification number	1	–	
CINTCP	max. interception storage	0.10	m	PIC
AMXDR	max. rooting depth	30.	cm	PIC
COVMAX	max. canopy coverage	90	%	PIC
ICNAH	surface condition of crop after harvest	3	–	
CN	runoff curve numbers: fallow cropping residue	 91 85 88		PRZM manual
WFMAX	max. dry wt. of crop at full canopy (only for CAM=3)	0.0	kg/m2	N/A
HTMAX	max. canopy ht.	40	cm	

PRZM 3 Input: Record 9A, 9B, 9C, 9D

Parameter	Description	Value	Units	Source
CROPNO	crop identification number	1	–	
NUSLEC	number of USLEC factors	3	–	
GDUSLEC & GMUSLEC	day & month for USLEC and Manning's N	1-Jan 1-May 1-Sep	–	
USLEC	soil loss cover management factor: 1-Jan to 1-May 1-May to 1-Sep 1-Sep to 1-Jan	 0.43 0.27 0.43	–	PIC
MNGN	Manning's N 1-Jan to 1-May 1-May to 1-Sep 1-Sep to 1-Jan	 0.018 0.018 0.018	–	PRZM manual

PRZM 3 Input: Record 10,11

Parameter	Description	Value	Units	Source
NCPDS	number of cropping periods	36	–	std.
EMD-EMM	day-month of crop emergence	5-May	–	*
MAD-MAM	day—month of crop maturation	8-Sep	–	*
HAD-HAM	day—month of crop harvest	18-Sep	–	
IYREM IYRAT IYRHAR	year of crop emergence, maturation, harvest	1948-1983	–	std.
NDC	crop number	1	–	

PRZM 3 Input: Record 13

Parameter	Description	Value	Units	Source
NAPS	total number of pesticide applications	144	–	
NCHEM	number of pesticides	1	–	
FRMFLG	soil moisture flag	0	–	
DKFLAG2	bi-phase half-life flag	0	–	

PRZM 3 Input: Record 16

Parameter	Description	Value	Units	Source
APD-APM	day-month of application	5-Jun 12-Jun 19-Jun 26-Jun	–	*
IAPYR	years of application	1948- 1983	–	std.
WINDAY	number of days to check for soil moisture	0	–	N/A
CAM	chemical application method	2	–	label
DEPI	depth of pesticide application	0.0	cm	N/A
TAPP	target application rate	0.21	kg/ha	
APPEFF	application efficiency	0.95	–	
DRFT	spay drift fraction	0.05	–	std.

*dates are based on information supplied by Arrostook County (ME) agricultural extension service: (207) 764-3361.

PRZM 3 Input: Record 17

Parameter	Description	Value	Units	Source
FILTRA	filtration parameter	0.0	–	
IPSCND	disposition of pesticide after harvest	1	–	
UPTKF	plant uptake factor	0	–	

PRZM 3 Input: Record 18

Parameter	Description	Value	Units	Source
PLVRKT	volatilization rate on foliage	0	day-1	N/A
PLDKRT	decay rate of foliage	0	day-1	N/A
FEXTRC	foliar extraction coeff.	0.5	cm-1	std.

PRZM 3 Input: Record 20

Parameter	Description	Value	Units	Source
CORED	total depth of soil core	100	cm	PIC
BDFLAG	bulk density flag	0	–	std.
THFLAG	field cap. /wilting flag	0	–	std.
KDFLAG	adsorption coeff. Flag	0	–	std.
HSWZT	drainage flag	0	–	std.
MOC	MOC flag	0	–	std.
IRFLAG	irrigation flag	0	–	std.
ITFLAG	soil temp. flag	0	–	std.
IDFLAG	thermal flag	0	–	std.
BIOFLAG	biodegradation flag	0	–	std.

PRZM 3 Input: Record 26

Parameter	Description	Value	Units	Source
DAIR	diffusion coefficient for pesticide in air	0.0	cm2/day	N/A
HENRYK	Henry's constant	0.0	cm3/cm3	N/A
ENPY	enthalpy of vaporization	0.0	kcal/mol	N/A

PRZM 3 Input: Record 33, 34

Parameter	Description	Value	Units	Source
NHORIZ	horizon number	4	–	
HORIZN: THKNS	horzn. number: thickness	1: 10 2: 16 3: 64 4: 10	cm	PIC
BD	horzn. number: bulk density	1: 1.25 2: 1.25 3: 1.40 4: 1.60	g/cm3	PIC
THETO	horzn. number: initial water content	1: 0.341 2: 0.341 3: 0.266 4: 0.261	cm3/cm3	PIC
AD	soil drainage parameter	1: 0.0 2: 0.0 3: 0.0 4: 0.0	day-1	PIC
DISP	dispersion coeff.	1: 0.0 2: 0.0 3: 0.0 4: 0.0	cm2/day	std.
ADL	lateral soil drainage parameter	1: 0.0 2: 0.0 3: 0.0 4: 0.0	day-2	std.

PRZM 3 Input: Record 36

Parameter	Description	Value	Units	Source
DWRATE	dissolved-phase decay rate	0.033	day-1	registrant*
DSRATE	sorbed-phase decay rate	0.033	day-1	registrant*
DGRATE	vapor-phase decay rate	0.0	day-1	registrant*

*aerobic soil decay MRID: 00156005

PRZM 3 Input: Record 37

Parameter	Description	Value	Units	Source
DPN	horzn. number: horizon discretization size	1: 0.1 2: 1.0 3: 1.0 4: 1.0	cm	std.
THEFC	horzn. number: field capacity	1: 0.1 2: 1.0	cm3/cm3	PIC

Parameter	Description	Value	Units	Source
		3: 1.0 4: 1.0		
THEWP	horzn. number: wilting point	1: 0.341 2: 0.341 3: 0.266 4: 0.261	cm3/cm3	PIC
OC	horzn. number: organic carbon content	1: 4.64 2: 4.64 3: 0.174 4: 0.116	%	PIC
KD	partitioning coeff.	1: 264 2: 264 3: 9.92 4: 6.61	cm3/g	registrant *

PRZM 3 Input: Record 40

Parameter	Description	Value	Units	Source
ILP	initial pesticide level flag	0	–	N/A

PRZM 3 Input: Record 43,44

Parameter	Description	Value	Units	Source
EXMFLG	exams flag	1	–	
EXMCHM	EXAMS chem. cat. no.	--	–	
CASSNO	CASS number	--	–	
NPROC	EXAMS transformation #	--	–	

Beets

Beet Field Description

The field used to simulate TPTH application on sugar beets is located in Polk County, Minnesota. The soil is Bearden silty clay loam, located in MLRA F-56.

PRZM Inputs for Beets

PRZM 3 Input: Record 3

Parameter	Description	Value	Units	Source
PFAC	pan factor	0.760	–	PIC
SFAC	snowmelt factor	0.50	cm/°C	PIC
IPIEND	pan factor flag	0	–	PIC
ANETD	min. depth of evaporation	12.	cm	PIC
INICRP	initial crop flag	1	–	
ISCOND	surface condition of initial crop	3	–	

PRZM3 Input: Record 6

Parameter	Description	Value	Units	Source
ERFLAG	erosion flag	4		

PRZM 3 Input: Record 7

Parameter	Description	Value	Units	Source
USLEK	USLE soil erodibility (K)	0.28	–	PIC
USLELS	USLE topographic factor (LS)	0.12	–	PIC
USLEP	USLE practice factor (P)	0.5	–	
AFIELD	field area	10.	ha	std.
IREG	location of NRCS 24-hr hyteograph	3	–	
SLP	land slope	6.	%	
HL	hydraulic length	354.	m	std.

PRZM 3 Input: Record 8

Parameter	Description	Value	Units	Source
NDC	number of crops	1		

PRZM 3 Input: Record 9

Parameter	Description	Value	Units	Source
ICNCN	crop identification number	1	–	
CINTCP	max. interception storage	0.10	m	PIC
AMXDR	max. rooting depth	20.	cm	PIC
COVMAX	max. canopy coverage	80	%	PIC
ICNAH	surface condition of crop after harvest	3	–	
CN	runoff curve numbers: fallow cropping residue	 91 82 91		PRZM manual
WFMAX	max. dry wt. of crop at full canopy (only for CAM=3)	0.0	kg/m2	N/A
HTMAX	max. canopy ht.	900	cm	

PRZM 3 Input: Record 9A, 9B, 9C, 9D

Parameter	Description	Value	Units	Source
CROPNO	crop identification number	1	–	
NUSLEC	number of USLEC factors	3	–	
GDUSLEC & GMUSLEC	day & month for USLEC and Manning's N	1-Jan 1-May 1-Sep	–	
USLEC	soil loss cover management factor: 1-Jan to 1-May 1-May to 1-Sep 1-Sep to 1-Jan	 0.43 0.18 0.43	–	PIC

Parameter	Description	Value	Units	Source
MNGN	Manning's N 1-Jan to 1-May 1-May to 1-Sep 1-Sep to 1-Jan	 0.018 0.018 0.018	–	PRZM manual

PRZM 3 Input: Record 10,11

Parameter	Description	Value	Units	Source
NCPDS	number of cropping periods	36	–	std.
EMD-EMM	day-month of crop emergence	16-May	–	
MAD-MAM	day—month of crop maturation	6-Oct	–	
HAD-HAM	day—month of crop harvest	23-Oct	–	
IYREM IYRAT IYRHAR	year of crop emergence, maturation, harvest	1948-1983	–	std.
NDC	crop number	1	–	

PRZM 3 Input: Record 13

Parameter	Description	Value	Units	Source
NAPS	total number of pesticide applications	108	–	
NCHEM	number of pesticides	1	–	
FRMFLG	soil moisture flag	0	–	
DKFLAG2	bi-phase half-life flag	0	–	

PRZM 3 Input: Record 16

Parameter	Description	Value	Units	Source
APD-APM	day-month of application	28-May 7-Jun 17-Jun	–	*
IAPYR	years of application	1948-1983	–	std.
WINDAY	number of days to check for soil moisture	0	–	N/A
CAM	chemical application method	2	–	label
DEPI	depth of pesticide application	0.0	cm	N/A
TAPP	target application rate	0.28	kg/ha	label
APPEFF	application efficiency	0.95	–	**
DRFT	spay drift fraction	0.05	–	std.

*dates are based on information supplied by Polk County Agricultural Extension Office and by the product label.

**APPEF = 1- DRFTPRZM 3 Input: Record 17

Parameter	Description	Value	Units	Source
FILTRA	filtration parameter	0.0	–	.
IPSCND	disposition of pesticide after harvest	1	–	
UPTKF	plant uptake factor	0	–	

PRZM 3 Input: Record 18

Parameter	Description	Value	Units	Source
PLVRKT	volatilization rate on foliage	0	day-1	N/A
PLDKRT	decay rate of foliage	0	day-1	N/A
FEXTRC	foliar extraction coeff.	0.5	cm-1	std.

PRZM 3 Input: Record 20

Parameter	Description	Value	Units	Source
CORED	total depth of soil core	100	cm	PIC
BDFLAG	bulk density flag	0	–	std.
THFLAG	field cap. /wilting flag	0	–	std.
KDFLAG	adsorption coeff. Flag	0	–	std.
HSWZT	drainage flag	0	–	std.
MOC	MOC flag	0	–	std.
IRFLAG	irrigation flag	0	–	std.
ITFLAG	soil temp. flag	0	–	std.
IDFLAG	thermal flag	0	–	std.
BIOFLAG	biodegradation flag	0	–	std.

PRZM 3 Input: Record 26

Parameter	Description	Value	Units	Source
DAIR	diffusion coefficient for pesticide in air	0.0	cm2/day	N/A
HENRYK	Henry's constant	0.0	cm3/cm3	N/A
ENPY	enthalpy of vaporization	0.0	kcal/mol	N/A

PRZM 3 Input: Record 33, 34

Parameter	Description	Value	Units	Source
NHORIZ	horizon number	4	–	
HORIZN: THKNS	horzn. number: thickness	1: 10 2: 8 3: 54 4: 28	cm	PIC
BD	horzn. number: bulk density	1: 1.4 2: 1.4 3: 1.5 4: 1.8	g/cm3	PIC
THETO	horzn. number: initial water content	1: 0.377 2: 0.377	cm3/cm3	PIC

Parameter	Description	Value	Units	Source
		3: 0.292 4: 0.285		
AD	soil drainage parameter	1: 0.0 2: 0.0 3: 0.0 4: 0.0	day-1	PIC
DISP	dispersion coeff.	1: 0.0 2: 0.0 3: 0.0 4: 0.0	cm2/day	std.
ADL	lateral soil drainage parameter	1: 0.0 2: 0.0 3: 0.0 4: 0.0	day-2	std.

PRZM 3 Input: Record 36

Parameter	Description	Value	Units	Source
DWRATE	dissolved-phase decay rate	0.033	day^{-1}	registrant*
DSRATE	sorbed-phase decay rate	0.033	day^{-1}	registrant*
DGRATE	vapor-phase decay rate	0.0	day^{-1}	N/A

*aerobic soil decayMRID: 001560005

PRZM 3 Input: Record 37

Parameter	Description	Value	Units	Source
DPN	horzn. number: horizon discretization size	1: 0.1 2: 1.0 3: 1.0 4: 1.0	cm	std.
THEFC	horzn. number: field capacity	1: 0.377 2: 0.37 3: 0.292 4: 0.285	cm3/cm3	PIC
THEWP	horzn. number: wilting point	1: 0.207 2: 0.207 3: 0.132 4: 0.125	cm3/cm3	PIC
OC	horzn. number: organic carbon content	1: 1.16 2: 1.16 3: 1.16 4: 0.174	%	PIC
KD	partitioning coeff.	1: 66.12 2: 66.12 3: 66.12 4: 9.92	cm3/g	registrant*

*KD = Koc x OC; Koc supplied by registrant

PRZM 3 Input: Record 40

Parameter	Description	Value	Units	Source
ILP	initial pesticide level flag	0	–	N/A

PRZM 3 Input: Record 43,44

Parameter	Description	Value	Units	Source
EXMFLG	exams flag	1	–	
EXMCHM	EXAMS chem. cat. no.	--	–	
CASSNO	CASS number	--	–	
NPROC	EXAMS transformation #	--	–	

Parameter Inputs for EXAMS

Parameter inputs for EXAMS are identical for all scenarios. EFED uses the MS pond supplied with EXAMS as a standard pond description. This is a two compartment model, with one littoral region and one benthic region considered. The processes modeled in EXAMS are dispersion into the sediment layer and biodegradation. The most salient input parameters are presented in the following tables. Mass inputs of pesticide to the pond are taken from the PRZM output.

EXAMS Chemical Input Parameters (triphenyltin hydroxide)

Parameter	Description	Value	Units	Source
MWT(*)	molecular wt	367.02		registrant
VAPR(*)	vapor pressure	3.53E-7		registrant
KOC(*)	Koc	5700	ml/g	registrant
SOL(*,*)	solubility	8	mg/l	
KPDOC(1,1)	Koc of DOC	5700	mg/l	registrant
KBACW(*,1,1)	water column byolysis rate constant	6.875E-4	(cfu/ml)-1hr-1	registrant*
KBACS(*,1,1)	benthic layer byolysis rate	1.33 E-4	(cfu/ml)-1hr-1	registrant**
QTBAS(*,1,1)	temp. factor	2	--	std.
QTBAW(*,1,1)	temp factor	2	--	std.

*estimated to be one half of the registrant-supplied value of the aerobic soil degradation rate.
** estimated to be one sixth of the registrant-supplied value of the anaerobic soil degradation rate. The one sixth factor comprises a 1/2 factor due to EFED's std., and by a 1/3 factor due to EFED's std. for dealing with a degradation derived from a single experiment.

EXAMS environmental inputs

Parameter	Description	Value	Units	Source
DEPTH(1)	littoral depth	2	m	std.
DEPTH(2)	benthic depth	0.05	m	std.
LENG(*)	pond length	100	m	std.
WIDTH(*)	pond width	100	m	std.
XSTUR	area available for dispersion to benthic layer	10000	m2	std.
CHARL	characteristic length of dispersion between littoral and benthic regions	1.02	m	std.
DSP	dispersion coefficient for littoral-	3 x 10-5	m2/hr	std.

Parameter	Description	Value	Units	Source
	benthic transport			
PCTWA	water content of benthic layer	137	%	std.
FROC(*)	fraction organic carbon	0.04	--	std.
SUSED	suspended sediment	30	mg/L	std.
BULKD	benthic bulk density	1.85	g/cm3	std.
DOC(*)	dissolved organic carbon	5	mg/L	std.
BACPL(1,*)	plankton population		cfu/mL	std.
BNBAC(2,*)	benthic bacteria population		cfu/100 g	std.

References

Allen, B.A., Barber, M.C., Bird, S.L., Burns, L.A., Cheplick, J.M., Hartel, D.R., Kittner, C.A., Mayer, F.L., Suarez, L.A., Wooten, S.E., Piranha, Environmental Research Laboratory, Office of Research and Development, U.S. EPA, Athens, GA.

Kannan, K. and Lee, R.F., 1996. "Triphenyltin and Its Degradation Products in Foliage and Soils from Sprayed Pecan Orchards and in Fish from Adjacent ponds" Environmental Toxicology and Chemistry, 15(9), 1492-1499.

Soderquist, C.J., 1978. The Environmental Chemistry of Triphenyltin Hydroxide. Ph.D. dissertation, University of California, Davis)

Appendix II: SCIGROW modeling Results

SCIGROW Output

```
RUN No.    1 FOR TPTH                   INPUT VALUES

--------------------------------------------------------------------------
APPL (#/AC)     APPL. URATE SOIL     SOIL  AEROBIC
RATE            NO.   (#/AC/YR)  KOC   METABOLISM (DAYS)

--------------------------------------------------------------------------
 0 .375          10          3.750      5700.0            21.0

 GROUND-WATER SCREENING CONCENTRATIONS IN PPB
 -----------------------------------------------------------
                      .032514
 -----------------------------------------------------------
A=     16.000  B=  5705.000  C=      1.204  D=      3.756  RILP= .293
F=     -2.062  G=       .009  URATE=     3.750  GWSC=          .032514
```

Appendix III: Ecological Effects Assessment

ECOLOGICAL EFFECTS HAZARD ASSESSMENT

Ecological Effects Characterization

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

Toxicity to Terrestrial Animals

Avian, Acute and Subacute

An acute oral toxicity study using the technical grade of the active ingredient (TGAI) is required to establish the toxicity of TPTH to birds. The preferred test species is either mallard duck (a waterfowl) or bobwhite quail (an upland gamebird). Results of this test are tabulated below.

Avian Acute Oral Toxicity- Technical

Species	% ai	LD50 (mg/kg)	Toxicity Category	MRID No. /Year	Study Classification[1]
Mallard duck (*Anas platyrhynchos*)	tech	377.6	Moderately toxic	TOUOTRO /1980	Core

[1]Core (study satisfies guideline). Supplemental (study is scientifically sound, but does not satisfy guideline)

Since the LD50 is 377.6 mg/kg, TPTH is moderately toxic to avian species on an acute oral basis. The guideline (71-1) is fulfilled (Acc# TOUOTRO/1980). Avian acute testing with formulated products is not required. However, two studies were conducted and are summarized in the following table.

Avian Acute Oral Toxicity- Formulated Product

Species	% ai	LD50* (mg/kg)	Toxicity Category	MRID No. Author/Year	Study Classification[1]
Bobwhite quail (*Colinus virginianus*)	47	76.1	Moderately toxic	TOUOTRO/ 1980	Supplemental
Mallard duck (*Anas platyrhynchos*)	47	398.5	Moderately toxic	TOUOTRO/ 1980	Core

*Not adjusted for % ai.

[1]Core (study satisfies guideline). Supplemental (study is scientifically sound, but does not satisfy guideline)

Although not required, the available data indicate that 47% TPTH is moderately toxic to birds.

Two subacute dietary studies using the TGAI are required to establish the toxicity of TPTH to birds. The preferred test species are mallard duck and bobwhite quail. Results of these tests are tabulated below.

Avian Subacute Dietary Toxicity- Technical

Species	% ai	5-Day LC50 (ppm)[1]	Toxicity Category	MRID No. Author/Year	Study Classification
Northern bobwhite quail (*Colinus virginianus*)	97	253	Highly toxic	00142758, 1985	Core
Mallard duck (*Anas platyrhynchos*)	tech	>10,000	Prac. Non-toxic	00099092, 1972	Supplemental

[1]Test organisms observed an additional three days while on untreated feed.

Since the LC50 falls in the range of 253 to >10,000 ppm, TPTH is highly to practically non-toxic to avian species on a subacute dietary basis. The guideline (71-2) is partially fulfilled (MRID 00142758).

Avian dietary testing with formulated products is not required. However, three studies were conducted and are summarized in the following table.

Species	% ai	5-Day LC50 (ppm)[1]	Toxicity Category	MRID No. Author/Year	Study Classification
Northern bobwhite quail (*Colinus virginianus*)	47	38.5	Very highly toxic	00086486; 1966	Supplemental
Mallard duck (*Anas platyrhynchos*)	40	533	Moderately toxic	00142758; 1985	Core
Mallard duck (*Anas platyrhynchos*)	40	421	Highly toxic	4017300; 1986	Core

[1]Not adjusted for percent ai.

Avian, Chronic

Avian reproduction studies using the TGAI are required for TPTH because the following conditions are met: (1) birds may be subject to repeated exposure to the pesticide, especially preceding or during the breeding season, and (2) information derived from mammalian reproduction studies indicates reproduction in terrestrial vertebrates may be adversely affected by the anticipated use of the product. The preferred test species are mallard duck and bobwhite quail. Results of these tests are tabulated below.

Avian Reproduction

Species/ Study Duration	% ai	NOEC/LOEC (ppm)	LOEC Endpoints	MRID No. /Year	Study Classification
Northern bobwhite quail (*Colinus virginianus*)	97.1	10/>10(30)	14 day surv.	263954; 1986	Supplemental
Northern bobwhite quail (*Colinus virginianus*)	97.9	3/30	Day 14 surv. of set, norm hatch of day 18 live embryos, day 14 surv. of norm hatch (%), and food consump/pen	431785-01; 1994	Core
Mallard duck (*Anas platyrhynchos*)	97.9	3/30	Live embryos, norm hatchlings, 14 day surv, and eggshell thickness	431785-02; 1994	Core
Mallard duck (*Anas platyrhynchos*)	97.1	3/>3	Regressed ovaries and egg yolk peritonitis	263954; 1986	Supplemental

The guideline (71-4) is fulfilled (MRID# 431785-01 and 431785-02). The NOEC of 3 ppm will be used as the reproductive toxicity endpoint in the risk assessment.

Mammals, Acute and Chronic

Wild mammal testing is required on a case-by-case basis. depending on the results of lower tier laboratory mammalian studies, intended use pattern and pertinent environmental fate characteristics. In most cases, rat or mouse toxicity values obtained from the Agency's Health Effects Division (HED) substitute for wild mammal testing. These toxicity values are reported below.

Mammalian Toxicity

Species/ Study Duration	% ai	Test Type	Toxicity Value	Affected Endpoints	MRID Acc No.
laboratory rat (*Rattus norvegicus*)	96%	acute oral	LD50=165 (males) LD50=156 (females)	Death	071364 252512
Laboratory rat (*Rattus norvegicus*)	97.2%	reproduction	LOEC=18.5 ppm NOEC=5 ppm	Systemic effects: (decreased liver/spleen wts and litter size)	264667-264676

The results indicate that TPTH is moderately toxic to small mammals on an acute oral basis (MRID/Acc#'s 071364/252512). Results from a chronic study indicate reproductive/systemic effects at an LOEC of 18.5 ppm (MRID/Acc #'s 264667-264676).

Insects

A honey bee acute contact study using the TGAI is required for TPTH because its use on tree fruits, vegetable crops, and field crops will result in honey bee exposure. Results of this test are tabulated below.

Nontarget Insect Acute Contact Toxicity

Species	% ai	LD50 (µg/bee)	Toxicity Category	MRID No. Author/Year	Study Classification
Honey bee (*Apis mellifera*)	Tech.	114.8	Prac. Non-toxic	00018842	Core

The results indicate that TPTH is practically non-toxic to bees on an acute contact basis. The guideline (141-1) is fulfilled (MRID# 00018842).

Toxicity to Freshwater Aquatic Animals

Freshwater Fish, Acute

Two freshwater fish toxicity studies using the TGAI are required to establish the toxicity of TPTH to fish. The preferred test species are rainbow trout (a coldwater fish) and bluegill sunfish (a warmwater fish). Results of these tests are tabulated below.

Freshwater Fish Acute Toxicity

Species	% ai	96-hour LC50 (ppb)	Toxicity Category	MRID/Acc No.	Study Classification
Goldfish (*Carassius auratus*)	100.0	62.0	Very highly toxic	400980-01	Supplemental
Bluegill sunfish (*Lepomis macrochirus*)	100.0	23.0	Very highly toxic	400980-01	Core
Rainbow Trout (*Onchoryhncus mykiss*)	100.0	<28.0	Very highly toxic	400980-01	Core
Rainbow Trout (*Onchoryhncus mykiss*)	97.0	22.0	Very highly toxic	258233	Core
Fathead minnow (*Pimephales promelas*)	100.0	20.0	Very highly toxic	400980-01	Core
Fathead minnow (*Pimephales promelas*)	Tech	7.1	Very highly toxic	433496-01 Jarvinen et. al., 1989	Supplemental

Because the 96-hour LC50 for the technical grade material falls in the range of 7.1 to 62.0 ppb, TPTH is considered to be very highly toxic to freshwater fish on an acute basis. The guideline (72-1) is fulfilled (400980-01 and 258233).

Testing with formulated product:

Freshwater Fish Acute Toxicity

Species	% ai	96-hour LC50 (ppb)	Toxicity Category	MRID/Acc No.	Study Classification
Rainbow trout (*Oncorhynchus mykiss*)	Form	14.5	Very highly toxic	00086574	Supplemental
Bluegill sunfish (*Lepomis macrochirus*)	Form	62.2	Very highly toxic	00086574	Supplemental
Fathead minnow (*Pimephales promelas*)	Form	23.5	Very highly toxic	00086574	Supplemental

Because the 96-hour LC50 for the formulated product falls in the range of 14.5 to 62.2 ppb, formulated TPTH is considered to be very highly toxic to freshwater fish on an acute basis.

Freshwater Fish, Chronic

A freshwater fish early life-stage test using the TGAI is required for a pesticide because the end-use product is expected to be transported to water from the intended use site, and the following conditions are met: (1) any aquatic acute LC50 or EC50 is less than 1 mg/l and studies of other organisms indicate the reproductive physiology of fish may be affected, physicochemical properties indicate cumulative effects, or the pesticide is persistent in water (e.g., half-life greater than 4 days). The preferred test species is rainbow trout. Results of this test are tabulated below.

Freshwater Fish Early Life-Stage and Life-cycle Chronic Toxicity

Species/ Study Duration	*% ai*	*NOEC/LOEC (ppb)*	*MATC[1] (ppb)*	*Endpoints Affected*	*Study Classification/ MRID*
(Life-Cycle) Fathead Minnow (*Pimephales promelus*)	97.9 (Flow-through)	0.065/ 0.161	0.103	reduced growth in P1	Core/434901-01
(E. L. Stage) Fathead Minnow (*Pimephales promelus*)	97.3 (Static)	>0.48/<1.1	>0.48<1.1		Core/TOUORT06

[1]MATC = Maximum Allowed Toxic Concentration, defined as the geometric mean of the NOEC and LOEC.

The guideline (72-4) is fulfilled (Acc# 434901-01 and TOUOTR06). The data indicate that TPTH significantly affected growth of parental generation at concentrations of 0.161 ppb and above.

Freshwater Invertebrates, Acute

A freshwater aquatic invertebrate toxicity test using the TGAI is required to establish the toxicity of TPTH to aquatic invertebrates. The preferred test species is Daphnia magna. Results of this test are tabulated below.

Freshwater Invertebrate Acute Toxicity

Species	*% ai*	*48-hour LC50/ EC50 (ppb)*	*Toxicity Category*	*MRID/Acc No.*	*Study Classification*
Waterflea (*Daphnia magna*)	97.3	10.0	Very highly toxic	TOUOTR04	Core
Scud (*Gammarus fasciatus*)	100.0	66.0 (96hr)	Very highly toxic	400980-01	Core

Because the LC50/EC50 of the TGAI is between 10.0 and 66.0 ppb, TPTH is considered to be very highly toxic to freshwater aquatic invertebrates on an acute basis. The guideline (72-2) is fulfilled (MRID# 400980-01 and TOUOTR04).

Freshwater Invertebrate, Chronic

A freshwater aquatic invertebrate life-cycle test using the TGAI is required for a pesticide when the end-use product may be applied directly to water or is expected to be transported to water from the intended use site, and the following conditions are met: (1) the pesticide is intended for use such that its presence in water is likely to be continuous or recurrent regardless of toxicity, (2) any aquatic acute LC50 or EC50 is less than 1 mg/l, or, (3) the EEC in water is equal to or greater than 0.01 of any acute EC50 or LC50 value, or, (4) the actual or estimated environmental concentration in water resulting from use is less than 0.01 of any aquatic acute EC50 or LC50 value and any of the following conditions exist: studies of other organisms indicate the reproductive physiology of invertebrates may be affected, physicochemical properties indicate cumulative effects, or the pesticide is persistent in water (e.g., half-life greater than 4 days). The preferred test species is Daphnia magna. Results of this test are tabulated below.

Freshwater Aquatic Invertebrate Life-Stage Toxicity

Species	% ai	21-day NOEC/LOEC (ppb)	MATC[1] (ppb)	Endpoints Affected	MRID No. Author/Year	Study Classification
Waterflea (*Daphnia magna*)	97.3	<0.2/>0.77<1.5	N/A	Behavior	TOUOTR05	Core

[1]Maximum Allowed Toxic Concentration, defined as the geometric mean of the NOEC and LOEC.

The data indicate that TPTH significantly affected chronic parameters in daphnia. The NOEC was <0.2 ppb for behavioral abnormalities. Survival of daphnids was significately affected at exposure concentrations as low as 1.5 ppb. Survival and offspring production were unaffected at concentrations as high as 0.77 ppb. The guideline (72-4) is fulfilled. (Acc# TOUOTR05).

Toxicity to Estuarine and Marine Animals

Estuarine and Marine Fish, Acute

Acute toxicity testing with estuarine/marine fish using the TGAI is required for TPTH because the active ingredient is expected to reach marine/estuarine environments because of its use in coastal counties. The preferred test species is sheepshead minnow. Results of these tests are tabulated below.

Estuarine/Marine Fish Acute Toxicity

Species	*% ai*	*96-hour LC50 (ppb)*	*Toxicity Category*	*MRID No.*	*Study Classification*
Sheepshead minnow (*Cyprinodon variegatus*)	97.23	25.5	Very highly toxic	432127-02	Core
Sheepshead minnow (*Cyprinodon variegatus*)	Tech	34.0	Very highly toxic	00096632	Supplemental
Spot (*Leiostomus xanthurus*)	100	46.0	Very highly toxic	402284-01	Supplemental

Since the LC50 ranges between 25.5 and 46.0 ppb, TPTH is considered to be very highly toxic to estuarine/marine fish on an acute basis. The guideline (72-3a) is fulfilled (MRID# 432127-02).

Estuarine and Marine Fish, Chronic

An estuarine/marine fish early life-stage toxicity test using the TGAI is required for a pesticide when the end-use product may be applied directly to the estuarine/marine environment or expected to be transported to this environment from the intended use site, and the following conditions are met: (1) any aquatic acute LC50 or EC50 is less than 1 mg/l and studies of other organisms indicate the reproductive physiology of fish and/or invertebrates may be affected, physicochemical properties indicate cumulative effects, or the pesticide is persistent in water (e.g., half-life greater than 4 days). The preferred test species is sheepshead minnow.

No data were submitted.

Estuarine and Marine Invertebrates, Acute

Acute toxicity testing with estuarine/marine invertebrates using the TGAI is required for TPTH because the active ingredient is expected to reach the marine/estuarine environment because of its use in coastal counties, and the following conditions are met: (1) any aquatic acute LC50 or EC50 is less than 1 mg/l and studies of other organisms indicate the reproductive physiology of fish and/or invertebrates may be affected, physicochemical properties indicate cumulative effects, or the pesticide is persistent in water (e.g., half-life greater than 4 days). The preferred test species are mysid shrimp and eastern oyster. Results of these tests are tabulated below.

Marine Invertebrate Acute Toxicity

Species	*% ai.*	*96-hour LC50/EC50 (ppb)*	*Toxicity Category*	*MRID No./ Acc#*	*Study Classification*
Mysid (*Mysidopsis bahia*)	Tech	3.7	Very highly toxic	00096632	Supplemental
Mysid (*Mysidopsis bahia*)	97.23	4.3	Very highly toxic	432117-03	Core
Eastern oyster (*Crassostrea virginica*)	100	1.5	Very highly toxic	402284-01	Core
Eastern oyster (*Crassostrea virginica*)	Tech	0.57	Very highly toxic	00096634	Supplemental
Eastern oyster (*Crassostrea virginica*)	97.23	0.29	Very highly toxic	440239-01	Core
Eastern oyster (*Crassostrea virginica*)	97.2	0.36	Very highly toxic	432127-03	Supplemental
Pink shrimp (*Penaeus duorarum*)	100.0	64.0 (48hr)	Very highly toxic	402284-01	Core
Buckley's filter clam (*Elliptio buckleyi*)	47.5	4,200.0	Moderately toxic	00099053	Supplemental
Quahog clam (*Mercenaria mercenaria*)	47.5	>5,600,000.0	Prac. Non-toxic	00099053	Supplemental
Fiddler crab (*Uce pugilator*)	47.5	55,700.0	Slightly toxic	00099053	Supplemental
Green crab (*Carcinus maenas*)	47.5	464,900.0	Prac. Non-toxic	00099053	Supplemental

Since the LC50/EC50 ranges between 0.29 and 64.0 ppb, TPTH is considered to be very highly toxic to estuarine/marine fish on an acute basis. The guideline (72-3a) is fulfilled (MRID# 402284-01, 432117-03, 440239-01 and 432127-03). Also, because the LC50/EC50 ranges from 55,700 to 464,900 ppb, the formulated product is considered to be slightly to practically non-toxic to estuarine/marine invertebrates on an acute basis.

Estuarine and Marine Invertebrate, Chronic

An estuarine/marine invertebrate life-cycle toxicity test using the TGAI is required for a pesticide when the end-use product may be applied directly to the estuarine/marine environment or expected to be transported to this environment from the intended use site, and the following conditions are met: (1) any aquatic acute LC50 or EC50 is less than 1 mg/l and studies of other organisms indicate the reproductive physiology of fish and/or invertebrates may be affected, physicochemical properties indicate cumulative effects, or the pesticide is persistent in water (e.g., half-life greater than 4 days). The preferred test species is mysid shrimp.

No data were submitted. The guideline (72-4) requirement has not been fulfilled.

Toxicity to Plants

Aquatic plant testing is required for any fungicide that has outdoor non-residential terrestrial uses and that may move off-site by runoff, and/or by drift (aerial or irrigation). Since TPTH is a fungicide and is aerially applied, the following species should be tested at Tier I : Kirchneria subcapitata and Lemna gibba.. Currently, the guideline (122-2) has not been fulfilled.

Field Testing

EFED has field test data on TPTH (some reported in the 1984 TPTH registration standard as Grigarick et.al., 1977). A summary is included in the table below:

Test Type	Rate (lbs ai)	Test Organisms	Results	Category
Aquatic Field Test (Rice)	0.5	Natural insect populations	Aquatic arthropods significantly reduced	Supplemental
		Mosquito fish	96 hrs post-treatment 100% of fish were dead	Supplemental
		Natural invert populations	All major species of Crustaceans were adversely affected. 1/3 of insect taxa collected showed significant reduction in populations in the treated rice patties.	Supplemental

Appendix IV: Exposure and Risk Characterization

Introduction

A means of integrating the results of exposure and ecotoxicity data is called the quotient method. For this method, risk quotients (RQs) are calculated by dividing exposure estimates by ecotoxicity values, both acute and chronic.

RQ = EXPOSURE/TOXICITY

RQs are then compared to OPP's levels of concern (LOCs). These LOCs are criteria used by OPP to indicate potential risk to nontarget organisms and the need to consider regulatory action. The criteria indicate that a pesticide used as directed has the potential to cause adverse effects on nontarget organisms. LOCs currently address the following risk presumption categories: (1) acute high - potential for acute risk is high, regulatory action may be warranted in addition to restricted use classification (2) acute restricted use - the potential for acute risk is high, but this may be mitigated through restricted use classification (3) acute endangered species - the potential for acute risk to endangered species is high, regulatory action may be warranted, and (4) chronic risk - the potential for chronic risk is high. regulatory action may be warranted. Currently, EFED does not perform assessments for chronic risk to plants, acute or chronic risks to nontarget insects, or chronic risk from granular/bait formulations to mammalian or avian species.

The ecotoxicity test values (i.e., measurement endpoints) used in the acute and chronic risk quotients are derived from the results of required studies. Examples of ecotoxicity values derived from the results of short-term laboratory studies that assess acute effects are: (1) LC50 (fish and birds) (2) LD50 (birds and mammals) (3) EC50 (aquatic plants and aquatic invertebrates) and (4) EC25 (terrestrial plants). Examples of toxicity test effect levels derived from the results of long-term laboratory studies that assess chronic effects are: LOEC (birds, fish, and aquatic invertebrates) (2) NOEC (birds, fish and aquatic invertebrates) and (3) MATC (fish and aquatic invertebrates). For birds and mammals, the NOEC value is used as the ecotoxicity test value in assessing chronic effects. Other values may be used only when justified. Generally, the NOEC is also used as the ecotoxicity test value in assessing chronic effects to fish and aquatic invertebrates.

Risk presumptions, along with the corresponding RQs and LOCs are tabulated below.

Risk Presumptions for Terrestrial Animals

Risk Presumption	RQ	LOC
Avaian		
Acute High Risk	EEC[1]/LC50 or LD50/sqft[2] or LD50/day[3]	0.5
Acute Restricted Use	EEC/LC50 or LD50/sqft or LD50/day (or LD50 < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC50 or LD50/sqft or LD50/day	0.1
Chronic Risk	EEC/NOEC	1
Wild Mammals		
Acute High Risk	EEC/LC50 or LD50/sqft or LD50/day	0.5
Acute Restricted Use	EEC/LC50 or LD50/sqft or LD50/day (or LD50 < 50 mg/kg)	0.2
Acute Endangered Species	EEC/LC50 or LD50/sqft or LD50/day	0.1
Chronic Risk	EEC/NOEC	1

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

2 mg/ft2 / LD50 * wt. of bird

3 mg of toxicant consumed/day / LD50 * wt. of bird

Risk Presumptions for Aquatic Animals

Risk Presumption	RQ	LOC
Acute High Risk	EEC[1]/LC50 or EC50	0.5
Acute Restricted Use	EEC/LC50 or EC50	0.1
Acute Endangered Species	EEC/LC50 or EC50	0.05
Chronic Risk	EEC/MATC or NOEC	1

1 EEC = (ppm or ppb) in water

Risk Presumptions for Plants

Risk Presumption	RQ	LOC
Terrestrial and Semi-Aquatic Plants		
Acute High Risk	EEC[1]/EC25	1
Acute Endangered Species	EEC/EC05 or NOEC	1
Aquatic Plants		
Acute High Risk	EEC[2]/EC50	1
Acute Endangered Species	EEC/EC05 or NOEC	1

1 EEC = lbs ai/A

2 EEC = (ppb/ppm) in water

Terrestrial Exposure Assessment

The terrestrial exposure assessment is based on either the methods of Hoerger and Kenaga[13] as modified by Fletcher et al.[14] or on the calculation of an LD50 ft^2 for granular products (Felthousen. 1977). Uncertainties in the terrestrial EECs are primarily associated with a lack of data on interception and subsequent dissipation from foliar surfaces. EFED assumes that the foliar dissipation rate is equal to the aerobic soil metabolism rate. Open literature data suggest that foliar dissipation rates are generally less than 20 days[15].

Hoerger-Kenaga estimates are based on residue data correlated from more than 20 pesticides on more than 60 crops. Representative of many geographic regions (7 states) and a wide array of cultural practices, Hoerger-Kenaga estimates also considered differences in vegetative yield, surface/mass ratio and interception factors. In 1994, Fletcher, Nellessen and Pfleeger, reexamined the Hoerger-Kenaga estimates to determine whether the terrestrial EECs were accurate. They compiled a dataset of pesticide day-0 and residue-decay data involving 121 pesticides (85 insecticides, 27 herbicides, and 9 fungicides from 17 different chemical classes) on 118 species of plants. After analyses, their conclusions were that Hoerger-Kenaga estimates needed only minor modifications to elevate the predictive values for forage and fruit categories from 58 to 135 and from 7 to 15. Otherwise, the Hoerger-Kenaga estimates were accurate in predicting the maximum residue values. In addition, their findings indicate that residue levels of persistent pesticides (applied as granules or powders) were very low in comparison to day-0 values and that modification of these estimates to include decay or accumulation of pesticide over time following application is not justified. As a result, only 5 percent of actual residues will exceed the maximum values indicated. These values represent the arithmetic mean of values from samples collected the day of pesticide treatment. These values are the predicted 0-day maximum and mean residues of a pesticide that may be expected to occur on selected avian, mammalian or reptilian food items immediately following a direct single application at a 1 lb ai/a application rate.

Only two bird species are tested--one waterfowl species and one upland gamebird species--under the Fish and Wildlife Data Requirements listed in CFR 158. There is a great deal of uncertainty associated with extrapolating from the acute oral and subacute dietary data from two species to the large numbers of bird species associated with agricultural areas. Field surveys indicate that a large variety of birds are associated with these areas, including a multitude of songbirds and many others. Waterfowl are also likely to be present in these regions. As the EFED ecological database indicates that songbirds tend to be more sensitive than the two required test species, using the maximum estimated environmental concentration to calculate risk helps to compensate for this uncertainty in the toxicity data.

Birds and mammals use agricultural fields and adjacent habitat for a number of purposes including feeding, resting and nesting. There is a misconception that wildlife in the adjacent edge habitat are not exposed to the pesticide at the levels present in the treated fields and consequently are not at risk. However, edge habitat around treated fields receives the same amount of pesticide residues; the reduction in residue levels from spray applications occurs a distance from the treated fields. Therefore wildlife occupying edge habitat and those in the treated field are equally at risk (Palmer et al. 1998).

Furthermore, a review of over 40 terrestrial field studies conducted as part of registration requirements (Guideline 71-5) for a number of highly toxic pesticides showed that field mortality of wildlife nearly always occurred when the risk index indicated high risk calculated by the risk index of 240 ppm residues/dietary LC50 value for that pesticide. Therefore, use of this index is reasonable for predicting wildlife kills.

Although, there have not been incidence reported from TPTH use, this does not negate the concern for toxic exposure to birds and mammals. Finding dead animals in the field is difficult, even when experienced field biologists are searching treated fields. Reporting of incident data is still rather accidental, and only carefully designed field studies can confidently indicate the likelihood of field kill incidents occurring.

Environmental Residue Values

The value of 240 ppm residues on short rangegrass is a screen to cover all routes of exposure, not just ingestion of pesticide contaminated food items. Ingestion can also occur from drinking contaminated water, through preening of feathers, licking of fur containing pesticide residues or when animals dust themselves in fields treated with pesticides. Examples of other routes of exposure include dermal absorption and inhalation of pesticide particles suspended in the air. All these routes together contribute to the total exposure an animal faces when it is present in a treated field or adjacent habitat sprayed with a toxic chemical. As the exact contribution of each exposure component has not been determined, the use of the risk index calculated by 240 ppm/LC50 is not conservative, but may actually underestimate total risk.

The index does not account for the differences between dry/wet weight measurements, but it assumes safety factors, such as using the range of EECs from Fletcher (Hoerger and Kenaga as modified by Fletcher, 1994) which will help compensate for these differences. That is, laboratory birds are fed a mash that contains little water, about 10 percent by weight, while most of the residue data are reported as ppm wet weight. Estimates of avian dietary exposure may be understated when toxicity values based on dry laboratory diet values are compared to wet weight residue levels. This is because birds eating their natural diet in the field need to eat a higher portion of their body weight compared to birds eating laboratory food with a low moisture content to obtain the same amount of food energy. In doing so, birds in the field will consume greater quantities of pesticide than birds on laboratory diets. Therefore, the use of 240 ppm may underestimate the risk.

Toxicity Values

The LC50 toxicity value has a great deal of uncertainty. This index of toxicity denotes the concentration that killed 50 percent of the laboratory test population. Although the LC50 value has long been accepted in the field of toxicology as a reliable indicator of hazard, it may not be a good predictor of mortality to wildlife in the field. Although 50 percent mortality may be acceptable for comparisons of toxicity among several pesticides, this level of mortality may too high for a natural population to maintain itself. Therefore lower toxicity values calculated from the dose-response curve may be better predictors of risk. Two alternative approaches are: 1) to use the confidence interval around the LC50 value, particularly the lower value which provides a greater degree of safety in the risk calculation and 2) use of LC10 or LC5 values as more realistic indices of hazard in the field. Using either of these alternatives will produce risk estimates greater than that used in this risk assessment.

USEPA/EFED Incident Data on file for TPTH:

There were no adverse incidents reported involving wildlife and/or fish.

Exposure and Risk to Nontarget Terrestrial Animals

Birds: Acute and chronic

Non-Granular products:

The acute and chronic risk quotients for broadcast applications of nongranular products are tabulated below.

Avian Acute and Chronic Risk Quotients for Single Application of Nongranular Products (Broadcast) Based on a quail LC50 of 253 ppm and a quail reproductive NOEC of 3 ppm.

Site/App. Method	App. Rate (lbs ai/A)	Food Items	Maximum EEC (ppm)	LC50 (ppm)	NOEC (ppm)	Acute RQ (EEC/ LC50)	Chronic RQ (EEC/ NOEC)
Potato	0.1875	Short grass	45	253	3	0.18	15.00
		Tall grass	21	253	3	0.08	7.00
		Broadleaf plants/Insects	25	253	3	0.10	8.30
		Seeds	3	253	3	0.01	1.00
Pecan	0.375	Short grass	90	253	3	0.40	30.00
		Tall grass	41	253	3	0.16	13.66
		Broadleaf plants/Insects	51	253	3	0.20	17.00
		Seeds	6	253	3	0.02	2.00
Beets	0.25	Short grass	60	253	3	0.24	20.00
		Tall grass	28	253	3	0.11	9.30
		Broadleaf plants/Insects	34	253	3	0.13	11.30
		Seeds	4	253	3	0.02	1.30

An analysis of the results indicate that for a single broadcast application of nongranular products, avian endangered species levels of concern are exceeded at all registered maximum application rates (except for seed-based food items). In addition, the restricted use LOC is exceeded for pecans (short range grass and broadleaf plant/insect feed items) and for beets (short range grass). The avian chronic level of concern is exceeded at all registered maximum application rates.

Avian Acute and Chronic Risk Quotients for Multiple Applications of Nongranular Products (ground and aerial broadcast) Based on a quail LC50 of 253 ppm and a quail reproductive NOEC of 3 ppm.

Site/App. Method	App.Rate (lbs ai/A)/ No. of Apps./min interval between apps	Food Items	Maximum EEC[1] (ppm)	LC50 (ppm)	NOEC (ppm)	Acute RQ (EEC/ LC50)	Chronic RQ (EEC/ NOEC)
Potatoes	0.1875/4/7	Short grass	180	253	3	0.71	60.00
		Tall grass	82.5	253	3	0.33	27.50
		Broadleaf plants/Insects	101.25	253	3	0.40	33.75
		Seeds	11.25	253	3	0.04	3.75
Pecans	0.375/10/14	Short grass	900	253	3	3.60	300.00
		Tall grass	412.5	253	3	1.60	137.50

Avian Acute and Chronic Risk Quotients for Multiple Applications of Nongranular Products (ground and aerial broadcast) Based on a quail LC50 of 253 ppm and a quail reproductive NOEC of 3 ppm.

Site/App. Method	App.Rate (lbs ai A) No. of Apps., min interval between apps	Food Items	Maximum EEC[1] (ppm)	LC50 (ppm)	NOEC (ppm)	Acute RQ (EEC/ LC50)	Chronic RQ (EEC/ NOEC)
		Broadleaf plants/Insects	506.25	253	3	2.00	168.75
		Seeds	56.25	253	3	0.22	18.75
Sugarbeets	0.25/3 10	Short grass	180	253	3	0.71	60.00
		Tall grass	82.5	253	3	0.33	27.50
		Broadleaf plants/Insects	101.25	253	3	0.40	33.75
		Seeds	11.25	253	3	0.04	3.75

[1]Because TPTH is stable to hydrolysis and photolysis, and no foliar disapation data are available, no degredation value was used

An analysis of the results indicate that for multiple broadcast applications of nongranular products, avian acute high levels of concern are exceeded for all uses for short range grass, and in pecans all feed items except seeds. Restricted use and endangered species levels of concern are exceeded for all registered maximum application rates for all food items other than seeds in the sugarbeet and potato use patterns. The avian chronic level of concern is exceeded at all registered maximum application rates for all food items.

Mammals: Acute and chronic

Non-Granular products:

The acute and chronic risk quotients for broadcast applications of nongranular products are tabulated below.

Mammalian Acute and Chronic Risk Quotients for Single Application of Nongranular Products (Broadcast) Based on a calculated rat LC50 of 3210 ppm (ave.male/female LD50=160.5 mg/Kg/% body wt. consumed (0.05)=3210 ppm) and a rat reproductive NOEC of 5 ppm.

Crop	App. Rate (lbs ai/A)	Food Items	Maximum EEC (ppm)	LC50 (ppm)	NOEC (ppm)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC)
Potato	0.1875	Short grass	45	3210	5	0.01	9.00
		Tall grass	21	3210	5	0.00	4.20
		Broadleaf plants/Insects	25	3210	5	0.00	5.00
		Seeds	3	3210	5	0.00	0.60
Pecan	0.375	Short grass	90	3210	5	0.03	18.00
		Tall grass	41	3210	5	0.01	8.20
		Broadleaf plants/Insects	51	3210	5	0.02	10.20
		Seeds	6	3210	5	0.00	1.20
Beets	0.25	Short grass	60	3210	5	0.02	12.00
		Tall grass	28	3210	5	0.00	5.60
		Broadleaf plants/Insects	34	3210	5	0.01	6.80
		Seeds	4	3210	5	0.00	0.80

An analysis of the results indicate that for a single broadcast application of nongranular products. there are no acute mammalian risks from registered maximum application rates. However, mammalian chronic levels of concern are exceeded for all uses and food groups, other than for seeds for both the potato and sugarbeet uses.

Mammalian Acute and Chronic Risk Quotients for Multiple Applications of Nongranular Products (Broadcast) Based on a calculated rat LC50 of 3210 ppm (ave.male/female LD50=160.5 mg/Kg/% body wt.consumed (0.05)=3210 ppm) and a rat reproductive NOEC of 5 ppm.

crop	App.Rate (lbs ai/A)/ No. of Apps./min app. interval	Food Items	Maximum EEC[1] (ppm)	LC50 (ppm)	NOEC (ppm)	Acute RQ (EEC/ LC50)	Chronic RQ (EEC/ NOEC)
Potatoes	0.1875/4/7	Short grass	180	3210	5	0.06	36.00
		Tall grass	82.5	3210	5	0.03	16.50
		Broadleaf plants/Insects	101.25	3210	5	0.03	20.25
		Seeds	11.25	3210	5	0.00	2.25
Pecans	0.375/10/14	Short grass	900	3210	5	0.30	180.00
		Tall grass	412.5	3210	5	0.13	82.50
		Broadleaf plants/Insects	506.25	3210	5	0.16	101.25
		Seeds	56.25	3210	5	0.02	11.25
Sugarbeets	0.25/3/10	Short grass	180	3210	5	0.06	36.00
		Tall grass	82.5	3210	5	0.03	16.50
		Broadleaf plants/Insects	101.25	3210	5	0.03	20.25
		Seeds	11.25	3210	5	0.00	2.25

[1]Because TPTH is stable to hydrolysis and photolysis, and no foliar disapation data are available, no degredation value was used.

An analysis of the results indicate that for multiple broadcast applications of nongranular products, mammalian acute levels of concern are not exceeded at registered maximum application rates for the sugarbeet and potato uses. However, acute restricted use and endangered species levels of concern are exceeded for the pecan use. In addition, the mammalian chronic level of concern is exceeded at all registered maximum application rates for all food catagories.

Insects

Currently, EFED does not assess risk to nontarget insects. Results of acceptable studies are used for recommending appropriate label precautions. As TPTH appears to be practically non-toxic (LD50=114.8 ug/bee) to honeybees, no risk is assumed.

Aquatic Risk Assessment

Exposure to aquatic nontarget organisms is possible through surface water runoff, soil erosion, off-target spray drift, and movement into groundwater. Directions and precautions must be followed in order to reduce the possibility of incidents occurring from the proposed use of TPTH. EFED calculated EEC's in aquatic environments, specifically edge-of-field ponds, using PRZM-EXAMS. The Pesticide Root Zone Model (PRZM 3.1) simulates pesticide field runoff on daily time steps, incorporating runoff. infiltration, erosion, and evaporation. The model calculates foliar dissipation and runoff, plant uptake, microbial transformation, volatilization, and soil dispersion and retardation. The Exposure Analysis Modeling System (EXAMS 2.97.5) simulates pesticide fate and transport in an aquatic environment.

Risk Quotients for Estuarine/Marine Fish based on a sheepshead minnow LC50 of 25.5 ppb.

Crop	LC50 (ppb)	NOEC (ppb)	PRZM EEC Initial/ Peak (ppb)	PRZM EEC 60-Day Average (ppb)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC or MATC)
Potato	25.5	ND	1.4	0.6	0.05	N/A
Beet	25.5	ND	1.6	0.7	0.06	N/A
Pecans	25.5	ND	13.7	6.6	0.54	N/A

ND= No data provided

An analysis of the results indicate that acute endangered species LOC's for estuarine/marine fish are exceeded for all use patterns and high acute and restricted use LOC's are exceeded for the pecan use pattern. No data were submitted to assess chronic risk.

Estuarine and Marine Invertebrates

Risk Quotients for Estuarine/Marine Aquatic Invertebrates based on an Eastern oyster LC50/EC50 of 0.29 ppb.

Crop	LC50 (ppb)	NOEC (ppb)	PRZM EEC Initial/ Peak (ppb)	PRZM EEC 21-Day Average (ppb)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC)
Potato	0.29	ND	1.4	0.9	4.77	N/A
Beet	0.29	ND	1.6	1.0	5.70	N/A
Pecans	0.29	ND	13.7	8.3	47.10	N/A

ND= No data provided

An analysis of the results indicate that high acute risk, endangered species and restricted use LOC's for estuarine/marine invertebrates are exceeded for all use patterns. No data were submitted to assess chronic risk.

Terrestrial and Aquatic plants

No data were submitted to use in a risk assessment. Risk to plants can not be assessed at the present time without valid toxicity data. However, TPTH, being a fungicide, is not required to be tested on plants.

Literature Cited

1. Goring, C.A.I., D.A. Laskowski, J.W. Hamker, and R.W. Meikle. 1975. Principles of pesticide degradation in soil. p. 135-172. In R. Haque and V.H. Freed (ed.) Environmental dynamics of pesticides. Plenum Press, New York

2. Swanson, G.A., M.I. Meyer and V.A. Adomaitis. 1985. Foods consumed by breeding mallards on wetlands of south-central North Dakota. J. Wildl. Management 49(1):97-202.

3. Reinecke, K.J. 1979. Feeding ecology and development of juvenile black ducks in Maine. The Auk 96:737-745.

4. Bartonek, J.C. and J.J. Hickey. 1969. Food habits of Canvasbacks, Redheads, and Lesser Scaup in Manatoba. Condor 71:280-290.

5. Sugden, L.G. 1973. Feeding ecology of Pintail, Gadwall, American Widgeon, and Lesser Scaup ducklings. Canadian Wildlife Service Report Series No. 24.

6. Hunter Jr., M.L., J.W. Witham and H. Dow. 1984. Effects of a carbaryl-induced depression in invertebrate abundance on the growth and behavior of American black duck and mallard ducklings. Canadian Journal of Zoology 62:452-456.

7. Hunter Jr., M.L., J.J. Jones, K.E. Gibbs and J.R. Moring. 1986. Duckling responses to lake acidification: do black ducks and fish compete? Oikos 47:26-32.

8. Vos, J.G., M.J. Van Logten, J.G. Kreeftenberg and W. Kruizinga. 1984. Effect of triphenyltin hydroxide on the immune system of the rat. Toxicology 29(4):325-336.

9. Cimaa, F., L. Ballarina, G. Bressab, A. Sabbadina and P. Burighela. 1996. Triphenyltin pesticides in sea water as immunotoxins for tunicates.

10. Kannan, K. and R.F. Lee. 1996. Triphenyltin and its degradation products in foliage and soils from sprayed pecan orchards and in fish from adjacent ponds. Environmental Toxicology and Chemistry 15(9):1492-1499.

11. Schaefer, C.H., T. Miura, E. F. Dupras and W.H. Wilder. 1981. Environmental impact of the fungicide, triphenyltin hydroxide, after application to rice fields. Journal of Econ Entomology 74(5):597-600.

12. Grisolia, C.K. and M.E. Bicalho-Valadares. 1997. Toxicity and genotoxicity of the fungicide triphenyltin hydroxide. Brazilian Journal of Genetics 20(2):243-246.

13. Hoerger, F., and E.E. Kenaga. 1972. Pesticide residues on plants: Correlation of representative data as a basis for estimation of their magnitude in the environment. In F. Coulston and F. Korte, eds., Environmental Quality and Safety: Chemistry, Toxicology, and Technology, Georg Thieme Publ, Stuttgart, West Germany, pp. 9-28.

14. Fletcher, J.S., J.E. Nellessen, and T.G. Pfleeger. 1994. Literature review and evaluation of the EPA food-chain (Kenaga) nomogram, an instrument for estimating pesticide residues on plants. Environ. Tox. Chem. 13:1383-1391.

The EEC's generated are then divided by the appropriate toxicity endpoint to generate the risk quotients (RQ's) in the tables below:

Freshwater Fish

Acute and chronic risk quotients are tabulated below.

Risk Quotients for Freshwater Fish Based On a fathead minnow LC50 of 20 ppb and a fathead minnow NOEC of 0.065 ppb.

Crop	LC50 (ppb)	NOEC (ppb)	PRZM EEC Initial/Peak (ppb)	PRZM EEC 60 day Ave. (ppb)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC)
Potato	20	0.065	1.4	0.6	0.07	9.20
Beets	20	0.065	1.6	0.7	0.08	10.80
Pecans	20	0.065	13.7	6.6	0.70	101.50

An analysis of the results indicate that the acute high risk LOC for freshwater fish is exceeded for the pecan use pattern and the endangered species LOC is exceeded for the potato and beet uses as well. Chronic LOC's for freshwater fish are exceeded for all use patterns and are especially high for the pecan use.

Freshwater Invertebrates

The acute and chronic risk quotients are tabulated below.

Risk Quotients for Freshwater Invertebrates Based On a daphnia EC50/LC50 of 10 ppb and a daphnia NOEC of 0.77 ppb.

Crop	LC50 (ppb)	NOEC (ppb)	PRZM EEC Initial/Peak (ppb)	PRZM EEC 21-Day Average (ppb)	Acute RQ (EEC/LC50)	Chronic RQ (EEC/NOEC)
Potato	10	0.77	1.4	0.9	0.14	1.17
Beets	10	0.77	1.6	1.0	0.20	1.30
Pecans	10	0.77	13.7	8.3	1.37	10.80

An analysis of the results indicate that the high acute risk LOC is exceeded for the pecan use and endangered species and restricted use LOC's are exceeded for all use patterns as well for freshwater invertebrates. Chronic LOC's for freshwater invertebrates were exceeded for all use patterns.

Estuarine and Marine Fish

The acute risk quotients are tabulated below.

Appendix V: Data Requirement Table

Guideline	MRID	Adequacy of Data
	Environmental Fate Studies	
161-1 Hydrolysis	0093874 0093875	accepted
161-2 Photodegradation in water	42049502	accepted
161-3 Photodegradation on soil	42119801	accepted
162-1 Aerobic soil metabolism	00156004	accepted
162-3 Anaerobic soil metabolism	00143246 00156005	accepted
163-1 Leaching and absorption/desorption	0156006	accepted
164-1 field dissipation study		not fulfilled
165-4 Bioaccumulation in fish	42995601	accepted
	Ecological Effects Studies	
71-1 Avian oral	Acc# TOUOTRO/1980	core
71-2 Avian dietary	00142758	core
71-4 Avian reproduction	431785-01 431785-02	core core
72-1Freshwater Fish - acute	400980-01 258233	core core
72-2 Freshwater invertebrate - acute	400980-01 TOUOTR04	core core
72-3a Estuarine and marine fish - acute	432127-02	core
72-3a Estuarine and marine invertebrates - acute	402284-01 432117-03 440239-01 432127-03	core core core core
72-4 Fish early life stage	434901-01 TOUOTR06	core core
72-4 Aquatic invertebrate life-cycle	TOUOTR05	core
72-4 Estuarine/marine invertebrate early life stage		not fulfilled
122-2 Aquatic plant growth		not fulfilled
141-1 Honey bee acute contact	00018842	core

15. Knisel, W.G., ed. 1980. CREAMS: A field-scale model for chemicals, runoff, and erosion from agricultural management systems. USDA Conserv. Res. Rep. No 26).