UNDATED ± 1984

TOPICAL SUMMARY

Effects on Birds

Nine studies were received and evaluated under this topic. These studies were used in performing a hazard assessment.

Author	MRID#
Dieterich	00039146
Fink	00068753
Shults	00030389
Shults	00030388
Beavers	00030395
Fink	00041441
Fink	00041440
Beavers	RIOCHL03
Beavers	RIOCHL04

The minimum data requirement for establishing the toxicity of chlorothalonil to birds are results from 3 studies. Two 8-day avian dietary (one with an upland game species the other with a water fowl) and an acute oral test with either an upland gamebird or a water fowl. (Section 71-1,2) These requirements have been fulfilled. These studies show that technical chlorothalonil is practically non-toxic to birds.

Species	Test 1/ Material	Results	Author	Date	MRID#	Fulfills Requirements
Mallard Duck	Tech	LC50 = 21,500 ppm	Dieterich	1965	00039146	Yes
Mallard Duck	96%	LD50 > 4640 mg/kg	Fink	1977	00036753	Yes
Mallard Duck	96%	LC50 > 10,000 ppm	Shults	1979	00030389	Yes
Bobwhite	96%	LC50 > 10,000 ppm	Shults	1979	00030388	Yes

Toxicity studies may also be required on any degradate of an active ingredient (section 70-3). Avian studies with DS-3701 were required because it is the primary degradate of chlorothalonil and is extremely persistent. Three studies were submitted; an 8-day dietary LC50 on Mallard ducks and Bobwhite quail, and an acute oral LD50 on Mallard ducks, to fulfill this requirement. They show that DS-3701 is moderately to slightly toxic to birds.

1/ Chlorothalonil unless otherwise specified.

Species	Test Material	Results	Author	Date	MRID#	Fulfills Requirements
Mallard	DS-3701	LC50 = 2000 ppm	Beavers	1981	RIOCHL03	Yes
Bobwhite	DS-3701	LC50 = 1746 ppm	Beavers	1981	RIOCHL04	Yes
Mallard	DS-3701 (87%)	LD50 = 158 mg/kg	Beavers	1978	00030395	Yes

Avian reproduction studies may be requested (Section 71.4). Chlorotholonil is persistent and does not photodegrade rapidly on leaf surfaces so a reproductive study on both the mallard and bobwhite were required. The studies submitted fulfill this requirement and show that avian reproduction is not affected at 50 ppm.

Species	Test Material	Results	Author	Date	MRID#	Fulfills Requirements
Mallard	99.6% Chloro	NEL > 50 ppm[1/]	Fink	1976	00041441	Yes
Bobwhite	99.6% Chloro	NEL > 50 ppm[1/]	Fink	1976	00041440	Yes

Avian reproduction studies may also be required for a degradate of an active ingredient (Section 70-1). DS-3701 is the primary degradate of chlorothalonil. It is extremely persistent and more toxic than its parent. Therefore avian reproductive studies on both mallards and bobwhite quail with DS-3701 are needed. No studies of this nature were submitted.

Precautionary Labeling

Based on the available information, no toxicity labeling for birds is needed.

1/ Results are based on measurement of the following reproductive parameters: eggs laid; eggs set; viable embryos; hatchability, 14-day survival; and eggs cracked.

Effects on Freshwater Fish

Twelve studies were received and evaluated under this topic. These studies were used in performing a hazard assessment.

Author	MRID#
Shults	00056486
Shults	00041439
Dieterich	00039145
Shults et al.	00030390
Szalkowski	00029410
Pitcher	RIOCHL01
Shults	00030391
Szalkowski	00029415
Buccafusco	00030393
Pitcher	00087304
Pitcher	00087303
McCann	00087258
Shults	RIOCHL06

The minimum data required for establishing the acute toxicity of chlorothalonil to fish are the results from two 96-hour studies with the technical product. One with a coldwater species, the other with a warmwater species. (Section 72-1). This requirement has been fulfilled and shows that chlorothalonil is very highly toxic to highly toxic to some fish.

Species	Test Material	Results LC_{50}	Author	Date	MRID#	Fulfills Requirements
Rainbow trout	96%	47 ppb	Shults	1980	00056486	Yes
Bluegill	96%	62	Shults	1980	00041439	Yes
Rainbow trout	Tech	250	Dieterich	1965	00039145	Partial
Bluegill	Tech	386	Dieterich	1965	00039145	Partial
Channel catfish	Tech	430	Dieterich	1965	00039145	Partial
Channel catfish	96%	43	Shults	1980	00030390	Yes
Bluegill	99.7%	84	Szalkowski	1979	00029410	Yes
Bluegill	98%	51	Pitcher	1976	RIOCHL01	Yes

Formulated product studies may be requested (Section 70-1). Presently there is no requirement for fish studies using the formulated products. Therefore although all of the studies were scientifically sound and some would fulfill such a requirement, no requirement has been fulfilled by those studies.

Species	Test Material	Results (LC50) PPB	Author	Date	MRID#	Fulfills Requirements
Rainbow trout	75%	152	Pitcher	1972	00087304	No[1/]
Rainbow trout	75%	103	Pitcher	1972	00087303	No
Bluegill	75%	167	McCann	1973	00087258	No

Studies using a degradate of a pesticide active ingredient may be required (Section 70-1). Such studies were required because DS-3701 (primary degradate of chlorothalonil) is longlived in water. This requirement can be considered fulfilled with the two studies conducted on bluegill. The coldwater fish study will not be necessary since DS-3701 is so-much less toxic to the bluegill than chlorothalonil. These studies show DS-3701 to be slightly toxic to fish.

Species	DS-3701 Test Material	Results LC_{50}	Author	Date	MRID#	Fulfills Requirements
Bluegill	Tech	45 ppm	Szalkowski	1979	00029415	Yes
Bluegill	99%	16 ppm	Buccafusco	1977	00030393	Yes

Fish reproductive studies may be required (Section 72.4). Chlorothalonil is relatively longlived in water and is likely to get into aquatic habitats because of it widespread use, therefore a reproductive study was required. The one submitted fulfills this requirement and shows that chlorothalonil may affect fish reproduction at low levels (3 ppb to 6.5 ppb).

Species	Test Material Chloro.	Results*	Author	Date	MRID#	Fulfills Requirements
Fathead minnow	96%	(>3<6.5 ppb)	Shults	1980	00030391	Yes

* The estimated 96-hr. LC50 under flowthrough conditions with measured concentrations was 23 ppb (95% C.L.=20 to 26 ppb). Parameters measured and affected that determined effects to reproduction were: Number of spawns of F_0 generation fish; and number of F_1 eggs per spawn of F_0 generation fish.

Field studies may also be required to determine the effects of a pesticide on aquatic organisms (Section 72.7). Based on the toxicity data chlorothalonil is expected to have both acute and chronic effects on fish. Therefore a field study was required. It has been completed (Shults, RIOCHL06)

1/ 48-hour study

but does not fulfill the requirements. The purpose of the study was to show that chlorothalonil could be used on soybeans without killing fish or showing up as residues in adjacent aquatic habitats. The problems with the study were that: the site did not represent typical soybean scenario, i.e., the pond was too big for the treated area; there were apparent adverse effects but the researchers attributed the mortality to an eye parasite; and the residue analysis results reflected problems with the chemistry methods employed, i.e., the results showed chlorothaloril in the pond before treatment (but not afterward) and in the control pond. The study did not fulfill the requirements and should be reconducted.

Precautionary Labeling

In light of the currently available fish toxicity data, products containing chlorothalonil will require the following toxicity statement about fish:

This pesticide is toxic to fish.

EFFECTS ON AQUATIC INVERTEBRATES

Three studies were received, evaluated and used to perform the hazard assessment on aquatic invertebrates.

Author	MRID#
Le Blanc	00068754
Suprenant	RIOCHL05
LeBlanc	RIOCHL02

The minimum data requirement for establishing the acute toxicity of chlorothalonil to aquatic invertebrates is the result from one 48-hour acute toxicity study with the technical product (Section 72-2). The guideline requirement has been fulfilled in this regard.

The characteristics of chlorothalonil and its degradate (DS-3701) and the label uses resulted in additional data requirements. They were a 48-hour acute test with DS-3701 and a chronic study with chlorothalonil. Both of these requirements have been fulfilled. See following table.

Toxicity Studies on Aquatic Invertebrates with Chlorothalonil and DS-3701.

Species	Test Material	Results LC50/(MATC)	Author	Date	MRID#	Fulfills Requirements
Daphnia magna	Tech *	70 ppb	LeBlanc	1977	00068754	Yes
Daphnia magna	99.8%*	(>39<79 ppb)**	Suprenant	1981	RIOCHL05	Yes
Daphnia magna	DS-3701 (99%)	26 ppm	LeBlanc	1977	RIOCHL02	Yes

* Chlorothalonil

** Number of F_1 offspring significantly reduced at these levels. Reported concentrations are calculated based on the measured concentrations which were less than 79% of nominal throughout the study.

These studies show chlorothalonil to be very highly toxic to daphnids and to affect their reproduction at low levels (i.e., less than 79 ppb). DS-3701 is shown to be substantially less toxic than its parent.

Precautionary Labeling

In light of the currently available aquatic invertebrate toxicity data, chlorothalonil products would require a statement regarding toxicity: "This pesticide is toxic to aquatic invertebrates."

NOTE: This statement need not appear on the label as the fish toxicity statement takes precedence.

EFFECTS ON ESTUARINE AND MARINE ORGANISMS

Three studies were received and used to perform the hazard assessment on marine/estuarine organisms.

Author	MRID#
Armstrong	05001356
Ward	RIOCHL07
Ward	RIOCHL08

Toxicity tests using estuarine organisms may be requested, (Section 72-3). The requirements under this category include a 96-hour LC50 for an estuarine fish, a 96-hour LC50 for pink shrimp and either a 48-hour embryo larvae study or a 96-hour shell deposition study with oysters. Estuarine/marine studies are necessary because chlorothalonil is highly toxic to freshwater fish, persistent in water and is registered for soybeans which is grown in countries along the coast.

These requirements have been partially fulfilled and the studies show that chlorothalonil is very highly toxic to estuarine fish and highly toxic to estuarine invertebrates.

Species	Test Material	Results	Author	MRID#	Fulfills Requirements
Sheepshead minnow	Tech	96-hr LC50 = 32 ppb	Ward	RIOCHL07	Yes
Pink Shrimp	Tech	96-hr LC50 = 165 ppb	Ward	RIOCHL08	Yes
Dungeness crab	75%	96-hr LC50 = 140 ppb	Armstrong	05001356	No*

* There is presently no requirement for a test on crabs; the LC50 was adjusted so it is the equivalent of a 100% a.i. value.

The oyster study has yet to be submitted.

Estuarine fish and invertebrate reproduction studies may be required (Section 72-4). Chlorothalonil is relatively long-lived in water and is likely to reach estuarine/marine water because of its use on soybeans. However the LC50 for the marine fish is similar to the fathead minnow LC50 therefore a chronic study with a marine fish is not required. Also the reproductive study with mysid shrimp is not considered necessary because of the higher toxicity value for pink shrimp (165 ppb) as compared to the daphnid LC50 value of 70 ppb. The MATC for shrimp would not be expected to be any lower than the one available for daphnids or for the fish MATC on file.

Precautionary Labeling

In light of the currently available marine/estuarine organism data, products containing chlorothalonil should have the following warning:

"This pesticide is toxic to marine/estuarine organisms"

NOTE: This statement need not appear on the label as the fish toxicity statement takes precedence.

± 1984

DISCIPLINARY REVIEW

Ecological Effects Profile

Technical Chlorothalonil

Six studies show chlorothalonil to be practically non-toxic to birds. One acute oral study (Fink, 00068753) resulted in an LD50 of 4640 mg/kg to mallards. Three 8-day dietary studies, two with mallards (Dieterich, 00039146 and Shults, 00030389) and one with bobwhite quail (Shults, 00030388) had LC50's of >21,500 ppm, >10,000 ppm and 10,000 ppm respectively.

Two one-generation reproductive studies (Fink, 00041440 and 00041441) using mallards and bobwhite quail resulted in NEL's of >50 ppm for both.

Seven studies using technical chlorothalonil were reviewed and can be used to characterize both its acute and chronic toxicity to fish. Four acute tests (all by Shults, 00056486; 00041439; 00030390; and 00030391) show the 96-hour LC50 to be 47, 62, 43 and 23 ppb for rainbow trout, bluegill sunfish, channel catfish, and fathead mennow respectively. Two other acute studies with bluegill sunfish (Pitcher, RIOCHL02 and Szalkowski, 00029410) resulted in LC50s of 51 ppb and 84 ppb, respectively. A sixth study (Dieterich, 00039145) conducted with rainbow trout, bluegill sunfish and channel catfish resulted in LC50s of 250, 386 and 430 ppb, respectively.

A chronic embryo-larvae* study with fathead minnows (Shults, 00030391) resulted in an MATC of >3 and <6.5 ppb. Parameters which showed this effect include: numbers of spawns of F_0 generation fish; and number of F_1 eggs per spawn of F_0 generation fish.

One acute study using technical chlorothalonil on Daphnia magna shows it to be very highly toxic to aquatic invertebrates (LeBlanc, 00068754, LC50 = 70 ppb). A second Daphnia study (Suprenant, RIOCHL05), a reproduction test, resulted in an MATC >39 <79 ppb. This effect was determined by observing that the number of F_1 offspring were significantly reduced at those levels.

Two studies using technical chlorothalonil on estuarine/marine organisms show it to be very highly toxic to marine fish and highly toxic to shrimp. A study by Ward (RIOCHL07), showed technical chlorothalonil to have a 96-hour LC50 of 32 ppb to sheepshead minnows. The second study by Ward (RIOCHL08) showed technical chlorothalonil to have a 96-hour LC50 of 165 ppb to pink shrimp.

* full life-cycle test

Formulated Product

No studies using a formulation on birds have been submitted.

75% Formulation

Three studies characterizing the toxicity of formulated products to fish, were reviewed. These used a 75% a.i. test material (Pitcher, 00087303 and 00087304; and McCann, 00087258) two with rainbow trout (103 and 152 ppb) and one with bluegill (167 ppb) respectively. They confirm that products with chlorothalonil would be highly toxic to fish.

One study with a 75% a.i. test material was performed on the dungeness carb (Armstrong, 05001356). With a 96-hour LC50 of 140 ppb, it shows that products with chlorothalonil are highly toxic to some marine organisms.

40% Formulation

A field study using Bravo 500 (40.4% a.i.), was submitted (Shults, RIOCHL06). It did not fulfill the requirements for a field study designed to show that using chlorothalonil on soybeans is not hazardous to fish. The results of the residue analysis were inconsistent, the site did not reflect a typical soybean pond size to treated area ratio, and the apparent adverse effects reported were attributed to a parasite and not the treatment.

DS-3701 Primary Degradate of Chlorothalonil

Two acute fish studies were reviewed using DS-3701 (Szalkowski, 00029415 and Buccafusco, 00030393). With resulting LC50's of 45 ppm and 16 ppm, respectively, the studies show DS-3701 to be slightly toxic to fish.

One study with Daphnids (LeBlanc, RIOCHL01) show DS-3701 to be slightly toxic to aquatic invertebrates (48-hour LC50 = 26 ppm).

An acute oral study using DS-3701 on mallards (Beavers, 00030395) resulted in a 158 mg/kg LD50. Two dietary studies (Beavers, RIOCHL03 and RIOCHL04) resulted in LC50s of 2000 ppm for mallard duck and 1746 ppm for bobwhite quail. These studies show that DS-3701 is moderately to slightly toxic to birds.

ECOLOGICAL EFFECTS HAZARD ASSESSMENT

Uses

Chlorothalonil is a non-systemic protectant fungicide used to control foliar diseases of vegetable and ornamental crops. It is also registered for peanuts, soybeans, papaya, passion fruit, application to seeds of cotton, and as a antimildew and antifouling paint additive. It can be applied to crops as a spray or dust via ground or aerial application. Treatment may also be done by overhead irrigation systems.

Use Sites and Use Rates

The following summarizes the chlorothalonil use sites and rates compiled from labels of federally-registered products.

Crop	lb ai/acre[1/]
Vegetables:	
Beans	2.2
Dry Beans	1.5
Navy	
Pinto	
Kidney	
Lima	
Blackeye	
Broccoli	1.2
Brussels sprouts	1.2 to 1.5
Cabbage	1.2
Carrots	1.2 to 1.5
Cauliflower	1.2
Celery	0.8 to 2.3
Corn (sweet)	1.2 to 1.5
Cucumbers	1.2 to 1.5
Melons[2/]	1.2 to 1.5
Onions	1.2 to 2.3

1/ Exceptions as noted.
2/ Includes cantaulopes, honeydew melons and muskmelons.

Crop	lb ai/acre[1/]
Vegetables:	
Potatoes	0.8 to 1.2
Pumpkins	1.2 to 1.5
Squash	1.2 to 1.5
Tomato	1.4 to 2.3
Watermelons	1.2 to 1.5
Field Crops:	
Peanuts	0.8 to 1.2
Soybeans	0.8 to 1.8
Fruit:	
Citrus	5.7[4/]
Passion fruit[3/]	1.4
Papaya	1.6 to 3.0
Stone fruit	3 to 4
Peach	
Nectarine	
Apricot	
Cherry	
Plum	
Prune	
Seed Treatment:	
Cotton	0.8 to 1.2 oz/ 100 lb seed.
Ornamentals:	
Conifers	2.0 to 6.4
Turf	3.8 to 7.5
Outdoor	1.1 to 1.5
Greenhouse	0.04 lb/1000 sq. ft. area
Bluegrass (for seed)	1.5
Industrial Use:	
Paints and stains	2.4 to 11.5 lb/100 gallon paint
Lumber treatment	
Other:	
Antifouling paints	

1/ Exceptions as noted.
2/ Includes cantaulopes, honeydew melons, and muskmelons.
3/ Hawaii only.
4/ Registration No. 677-313, not registered for it yet.

The other intrastate registrations are for crop uses which are federally registered but which vary as to use rates and/or diseases controlled.

Fate
The following information is from these EFB reviews (4/5/79, R. Ney; 4/2/76, R. Terkowitz).

Soils
Chlorothalonil degrades at a moderate rate in most soils, with a half-life of less than 30 days. Lack of moisture tends to slow down this degradation process. Rate of breakdown increases as temperature rises from 21°C to 39°C. DS-3701 (4-hydroxy-2,5,6-trichloroisophthalonitrile) is the major degradate of chlorothalonil. It is extremely persistent, with no dissipation of this product observed within 90 days. It leaches in many types of soils.

Water
Chlorothalonil does not hydrolyze under acid or neutral conditions, while it hydrolyzes to DS-3701 or DS-19221 (3-cyano-2,4,5,6-tetrachlorobenzamide) in basic solution with a one-half life of 35 days. DS-3701 is stable to hydrolysis.

Plant
Chlorothalonil apparently does not translocate from soil into plants. Both chlorothalonil and DS-3701 are stable to photodegradation on surfaces which would include plant surfaces. Crops treated with 3.75 lbs. a.i./acre chlorothalonil have been analyzed, with residues of 3 ppm and 0.26 ppm for chlorothalonil and DS-3701 respectively after 42-76 day PHI. (RCB review by P. Errico dated 8/13/80).

Animal
The bioconcentration of chlorothalonil in bluegill plateaus at 60 to 200X in edible tissues and 900 to 3000X in nonedible tissues. DS-3701's bioconcentration in bluegill plateaus at 50X in edible tissues and 250X in nonedible tissues. Residues of both parent and degradate declined in their respective tests to less than 50% of plateau concentration after 7 to 10 days in clean water.

Discussion of Exposure and Hazards

Chlorothalonil is registered for numerous uses and it is likely that it is used in every state. This broad coverage results in potential exposure of many non-target organisms to chlorothalonil.

The studies provided indicate that chlorothalonil:

1. Is extremely toxic to all aquatic organisms;
2. Significantly reduces fish reproduction at very low concentrations; but
3. Is practically non-toxic to birds.

Furthermore, the studies show that DS-3701:

1. Is slightly toxic to the aquatic organisms tested; and
2. Is moderately to slightly toxic to birds.

According to data from the Environmental Fate Branch, chlorothalonil could have a half-life of over 30 days in soil and 35 days in water. Its degradate DS-3701, leaches significantly in many soils and is extremely persistent in water.

For this discussion exposure will be addressed in two categories: a low use rate category (i.e., 1 to 2 lbs. a.i. per acre) and a high use rate category (i.e., 4 to 7 lbs a.i. per acre).

CATEGORY I

The first category includes the majority of the crops, vegetables, dry beans, peanuts and soybeans, and the largest acreage. Soybeans make up the biggest portion of this acreage so it will be used as the example to discuss exposure and hazard.

Terrestrial

Game mammals and birds which typically utilize soybeans for either food or cover are deer, rabbit, gray and fox squirrel, turkey, quail, morning dove, pheasant, and ducks and geese. It is likely that these and other terrestrial animals would be exposed to chlorothalonil. Based on the results of residue studies of crops to which chlorothalonil has been applied (see "fate" section), and the toxicity of chlorothalonil to the birds and mammals tested, it would appear that the hazards to terrestrial organisms would be minimal. DS-3701, the primary and persistent degradate of chlorothalonil, is more toxic than its parent and could therefore pose some threat to these exposed wildlife species. Reproduction studies are necessary to determine if chronic affects may be occurring. When these studies are completed, it will be possible to determine the impact of DS-3701 on birds.

Aquatic

Chlorothalonil is highly toxic to aquatic organisms and reduces reproduction in fish at low levels. An EEC was performed by H. Appleton (EFB review dated 2/10/81) and is summarized in the following table.

Table 1. Estimated Concentrations in Pond

	Chlorothalonil	DS-3701
Water	10 ppb	4 ppb
Hydrosol	190 ppb	13 ppb

According to this, chlorothalonil could reach levels of 10 ppb in pond wter near a soybean field. This exceeds the MATC for fathead minnows but does not exceed the MATC for Daphnia magna nor does it exceed the lowest 96-hour LC50's for fish.

The concentration in the hydrosol (190 ppb) is potentially high enough to have acute adverse effects to be hazardous to benthic organisms, assumming they are as sensitive to chlorothalonil as daphnids. This is the habitat and group of organisms that is probably affected the most by chlorothalonil.

No EEC was performed for a stream (moving water) scenerio because the dilution factor would be so great that concentrations would be miniscule.

DS-3701 is not considered to be a problem because of its low EEC levels, low toxicity, and non-bioaccumulative properties.

It was noted in the EFB review that drift is the major source of the residues in the scenario (assuming aerial application). This means that water bodies close to treated areas (<200 feet) would probably have residues higher than the EEC, while those further way would have lower residues. A field study was conducted to determine actual concentration in the environment and their effects. The results of this study are inconclusive. The study does not meet the requirements.

CATEGORY II

This category includes such uses as citrus (two applications; 5.7 lbs a.i./acre), stone fruits (3 to 4 lbs a.i./acre) and turf (3.8 to 7.5 lbs a.i./acre with multiple applications).
The turf use will be addressed as typical of this use category as well as oranges and grapefruit even though the citrus use is pending and not registered.

Estimated Environmental Concentration (EEC)

The following information was included in a memo on citrus use from EFB to EEB. (EFB memo by J. Reinert dated 10/15/80.)

Foliar EECs. EECs in/on vegetation and some other deviant food items are calculated immediately following the second application at the maximum rate of 5.73 lb ai/A (the first application was assumed to be 14 days earlier). EECs are calculated assuming a direct spray to long grass and leaves, and are for total residues (parent, chlorothalonil plus degradates) calculated as parent. (Presumably this EEC also assumes no degradation between first and second application.

Vegetation	Max. EEC (ppm) for total residues
Long grasses	1200
Leaves and leafy items	1400

EEC in a 1A X 0.5 ft. pond. Runoff is not expected to be a significant possibility for this use pattern, so only spray drift is considered in this calculation. The edge of the pond is assumed to lie 100 ft. downwind from the closest pass of the airplane, and spraying is assumed to be with multiple passes under the climatic conditions of an air inversion. The EEC is calculated immediately following the second application at the maximum rate. Since chlorothalonil is expected to be stable to hydrolysis and photolysis over a period of two weeks, the EEC is calculated for parent. The soil-water partition coefficient is unknown, but was estimated from the aqueous solubility (0.6 ppm) to be 32 for hydrosoil with 0.5% organic matter, and this predicted value was used for the calculation.

The calculated EEC in the pond water is 0.01 ppm (parent).

The concentration in pond water could reach 0.01 ppm (10 ppb) from drift. This is less than one half the lowest fish LC50 and daphnid MATC. This level does exceed the fish MATC. Note that this is based on a use, citrus, that is only proposed. EAB indicated that they could not provide an EEC for turf.

It is likely that the primary degradate of chlorothalonil (DS-3701) will leach through the soil and enter water systems. It could eventually transport to surface water. But its low toxicity will limit possible adverse effects.

According to this EEC the residues on long grasses, leaves and leafy items will not exceed the dietary LC50 for birds. Those levels and possible levels on food items (forage - 540 ppm; pod containing seeds - 110 ppm; and fruit-65 ppm[1/]) could have chronic effects on birds or mammals since they equal or exceed the no effect levels determined in chronic studies.

However these levels should decline within two months to less than these no effect levels. According to Residue Chemistry data (8/13/80 review by P.V. Errico; attached to EEB review #20 dated 5/1/80) at a rate of 3.75 lbs a.i. per acre there were residues on soybean plant material of 3 ppm for chlorothalonil and 0.26 ppm for DS-3701 after about 2 months (42-76 days). This suggests that the residue levels decrease quickly enough to minimize chronic effects to terrestrial animals.

ENDANGERED SPECIES

Sites in Cluster Approach

The effects that chlorothalonil may have on endangered species when used on sweet corn, soybeans, and cotton are addressed in the cluster approach for those crops. Labeling that may be required will be developed at a later date.

Sites in Previous Opinions

A previous Office of Endangered Species (OES) opinion for apples has indicated potential hazard to the following aquatic species. The pesticide was chloropyrifos.

Woundfin
Colorado river squawfish
Gila trout
Pecos Gambusia

When these EEC's are available formal consultation with the OES may be initiated if necessary. Labeling that may be required will be developed at a later date.

Other Sites (not addressed above)

Terrestrial

Chlorothalonil is not likely to adversely affect listed terrestrial species because of its low toxicity to mammals and birds.

Aquatic

Before the adverse effects to aquatic endangered species from the use of chlorothalonil on these sites can be addressed, EEB requires appropriate Estimations of Environmental Concentration (EEC's) from the Enviromental Assessment Branch. When these EEC's are available formal consultation with the OES may be initiated if necessary. Labeling that may be required will be developed after that.

SUMMARY OF HAZARDS

It is unlikely that chlorothalonil is having acute adverse effects on terrestrial animals. However the primary degradate is persistent and no chronic testing has been conducted. It is not possible to conclude this assessment until avian reproduction studies with DS-3701 are done. It is not likely that fish and other free swimming aquatic organisms are experiencing acute hazards. However in standing water (i.e., ponds) near aerially treated sites, non-target benthic organisms may be acutely affected and under these same conditions fish could be chronically affected. If the water is moving or the treated area is farther away (i.e., greater than 200 feet) then the effects are reduced.

Ecological Effects Labeling Requirements

According to the toxicity data and hazard assessment the following hazards labeling is required.

Manufacturing Use

This pesticide is toxic to fish. Do not discharge into lakes, streams or public water unless in accordance with an NPDES permit. For guidance contact your regional office of the EPA.

End Use Products

Non-aquatic

This pesticide is toxic to fish. Do not apply directly to wter or wetlands. Drift and runoff from treated sites may be hazardous to fish in neighboring areas. Do not contaminate water by cleaning of equipment or disposal of wastes. Cover or incorporate spills.

Aquatic

This pesticide is toxic to fish. Do not contaminate water by cleaning of equipment or disposaal of wastes.

1/ From Kenega's nomograph

Summary of Data Gaps

See Table 4.

The following Fiche/Master ID Nos. represent studies which were reviewed but not included in the topical summaries.

00072803
05017343
05003926

Table 2. GENERIC DATA REQUIREMENTS

Guideline Citation	Data Requirement	Composition and Use Pattern[1]	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Bibliographic Citation	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)[2]
71-1	Avian Single - Dose Oral LD_{50}	A,B,D,E, F H,I	Yes	00068753 00030395[3] 00039146	No
71-2	Avian Dietary LC_{50}	A,B,D[7],E[7],F[7], H[7],I[7]	Yes	00030389 00030388 RIOCHL03[3] RIOCHL04[3]	No
71-3	Wild Mammal Toxicity	A,B,D,H	No		Not normally required.
71-4	Avian Reproduction	A,B,D,H	Partially [8]	00041441 00041440	Yes
71-5	Simulated and Actual Field Testing for Mammals & Birds	A,B,D,H	No		No
72-1	Fish Acute LC_{50}	A,B,D,E,F,H,I	Yes	00041439 00030390 00029410 00030393[3] RIOCHL02 00087303[4] 00087258[4] 00029415[3]	No
72-2	Acute LC_{50} Aquatic Invertebrates	A,B,D,E,F,H,I	Yes	00068754 RIOCHL01[3]	No

Table 2. GENERIC DATA REQUIREMENTS cont'd.

Guideline Citation	Data Requirement	Composition and Use Pattern[1]	Does EPA Have Data To Satisfy This Requirement? (Yes, No or Partially)	Bibliographic Citation	Must Additional Data Be Submitted Under FIFRA Section 3(c)(2)(B)[2]
72-3	Acute LC_{50} Estuarine + Marine Organisms	A,B,D,H	Partially[5]	RIOCHL07 RIOCHL08	Yes
72-4	Fish Early Life-Stage aquatic invertebrate life cycle.	A,B,D,H	Partially	00030391(fish) RIOCHL05(inv.)	No[6]
72-5	Fish Life-Cycle	A,B,D,H	No		No
72-6	Aquatic Organism Accumulation	A,B,D,H	No		No
72-7	Simulated or Actual Field Testing for Aquatic Organisms	A,B,D,H	No		Yes

1/ Composition of the material to be tested is technical grade unless otherwise specified in footnotes. The use patterns are coded as follows: A=Terrestrial, Food Crop; B=Terrestrial, Non-Food; C=Aquatic, Food Crop; D=Aquatic, Non-Food; E=Greenhouse, Food Crop; F=Greenhouse, Non-Food; G=Forestry; H=Domestic Outdoor; I=Indoor.

2/ Data must be submitted no later than August, 1985.

3/ Test material was DS-3701, primary degradate of chlorothalonil.

4/ Test material was 75% a.i.

5/ The citrus and soybean uses must be supported by the estuarine studies. An oyster study (either 48 hour embryo-larvae or 96 hour shell deposition) is outstanding.

6/ The citrus and soybean uses need not be supported by an a chronic estuarine study. The marine fish embryo-larvae study is not needed because the LC50 of the sheepshead is similar to the fathead minnow LC50 and the MATC for the fathead minnow is available. The chronic study with a mysid shrimp is not considered necessary because the shrimp LC50 is much higher than the daphnia LC50 and the sheepshead minnow LC50. A daphnia MATC is available and is expected to be lower than a shrimp MATC.

7/ Only one species need be cited.

8/ Studies on the more toxic and persistent degradates are required to support all outdoor uses.