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

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CAS 408C

OFFICE OF
PESTICIDES AND TOXIC SUBSTANCES

MEMORANDUM

TO: George LaRocca
Registration Division (TS-767c)

THRU: Harry Craven
Ecological Effects Branch
Hazard Evaluation Division (TS-769c)

THRU: Clayton Bushong, Chief
Ecological Effects Branch
Hazard Evaluation Division (TS-769c)

SUBJECT: Disulfoton Registration Standard

Attached is EEB's portion of the disulfoton Registration Standard. The Data Evaluation Records will be provided at a later date under Separate cover.

Ed Fite
Wildlife Biologist
Ecological Effects Branch
Hazard Evaluation Division, TS-769c

Ecological Effects

The following studies were sent to EEB but are not cited in the Topical Summaries. They received only an abbreviated review.

Author	Fiche ID No
Brussell & Honeycutt (1966)	00065498
Butler (19??)	00060994
Butler (1963)	00060996
Butler (19??)	00038471
Butler (1965)	00058502
Chemagro Corp. (1963)	00060626
Cunningham et al. (1967)	00037820
Cunningham and Schafer (1968)	00037822
DeCino (1963)	00051310
DeCino (1963)	00077863
DeWitt et al (1962)	00030114
DeWitt et al (1960)	00004769
DeWitt et al (1962)	00061002
Howell (1963)	00051524
Howell (1963)	00063387
Lamb & Roney (1972)	00094237
Lamb & Roney (1972)	00078527
Lowe (19??)	00037809
Lowe (1964)	00049250
Marking (1965)	00051551
Mawdesley (1971)	05004845
Menzie (1961)	00081334
Mobay Chem. Corp. (1973)	00094232
Parisot (1968)	00051552
Perkering et al (1960)	00065495
Pickering et al (1962)	00035796
Reinert & Parke (1976)	00092137
Reinert & Parke (1976)	00092139
Roberts & Parke (1977)	00092141
Sanders (1969)	00097842
Sanders (1972)	05017538
Stauffer Chem. Co. (1980)	00098468
Union Carbide Co. (1974)	00048824
U.S. Department of Agriculture (19??)	00060869
U.S. Department of the Interior (1962)	00021677
U.S. Fish and Wildlife Service (19??)	00081342
U.S. Fish and Wildlife Service (1963)	00038470
U.S. Fish and Wildlife Service (19??)	00005215
Walker (1963)	00051526
Walker (1963)	00058503
Walker (1963)	00049249
Walker (1963)	00046397
Walker (1963)	00032314
Walker (1963)	00058507

Disulfoton Topical Discussion

Effects on Freshwater Fish

Table I contains the twelve(12) studies contained in three(3) references which were received and evaluated under this topic. All were acceptable for use in the hazard assessment for freshwater fish.

Table I - Studies Evaluated

Author	Fiche I.D. No.
Johnson and Finley	00003503
McCann	00095647
Lamb and Roney	00068268

The minimum data required for establishing the acute toxicity of disulfoton to freshwater fish are results from two(2) 96-hour studies with technical disulfoton; one coldwater species (preferably rainbow trout) and one warmwater species (preferably bluegill sunfish). Guidelines requirements are described in Sec. 72-1. The acute toxicity data from the above listed studies using technical grade disulfoton are listed in table II below.

TABLE II

Freshwater Fish Acute Toxicity Data Using Technical Disulfoton

Species	Percent Active	Results 96 hr LC_{50} ppm 95% C.L.	Author/ID	Fulfills Guideline Requirement
Bluegill sunfish (*Lepomis macrochirus*)	Technical 95%	0.039 (0.021-0.073)	Lamb & Roney 00068268	Yes
Rainbow trout (*Salmo gairdneri*)	Technical 95%	3.0 (2.6-3.5)	Lamb & Roney 00068268	Yes
Bluegill sunfish (*Lepomis macrochirus*)	98% (Technical)	.3 No C.L. rep.	Johnson & Finley 0003503	Partial

Table II Cont.

Rainbow Trout (Salmo gairdneri)	98% (Technical)	1.8 No. C.L. Rep.	Johnson & Finley 00003503	Partial
Fathead minnow (Pimephales promelas)	98% (Technical)	4.3 No. C.L. rep.	Johnson & Finley 0003503	Partial
Channel catfish (Ictalurus punctatus)	98% (Technical)	4.7 No. C.L. rep.	Johnson & Finley 0003503	Partial
Largemouth Bass (Micropterus salmoides)	98% (Technical)	.060	Johnson & Finley 00003503	Partial

There is sufficient information to characterize the toxicity of disulfoton as "very highly toxic" to bluegill sunfish and "moderately toxic" to rainbow trout. The supplemental studies appear to confirm this characterization.

The guideline requirements for acute toxicity studies on cold and warmwater fish species are satisfied for an acute 96 hour LC_{50}.

Aquatic toxicity studies on formulated (end-use-single active ingredient, products can be required as per Sec. 72-1 (c) (i), (ii) or (iii). Although no such requirements are made for this topic at this time the acceptable acute studies testing freshwater fish with formulated products are listed in Table III below.

Table III

Freshwater Fish Acute Toxicity Data Using formulations

Species	Percent Active Formulation	Results 96 hr. LC_{50} (ppm)	Author ID	Would Fulfill Guideline Requirement
Bluegill Sunfish	15% Granular	0.25 (0.21-0.29)	Lamb & Roney 00068268	Yes
Bluegill sunfish	65% 6 lbs/gal Spray concentrated	0.059 (0.051-0.069)	Lamb & Roney 00068268	Yes

Table III cont.

Rainbow trout	15% Granular	13.9 (10.4-18.5)	Lamb & Roney 00068268	Yes
Rainbow trout	65% 6 lbs/gal Spray concentrate	3.5 (3.1-4.0)	Lamb & Roney 00068268	Yes
Bluegill Sunfish	2% Miller's Granular Systemic Insecticide	>100 ppm[1]	McCann 00095647	Partial

[1] 48 hour LC_{50} based on formulation

These studies on formulated products in general support the characterization of disulfoton from test proformed with the technical product. Although the Agency does not have definitive information on the toxicity to freshwater fish for all end use products, given the available data, the Agency considers the acute toxicity of formulated disulfoton to be reasonably characterized and will not require additional data on end-use products for use in non-aquatic sites at this time.

Precautionary Labeling

Based upon the existing data, products containing disulfoton should have a statement concerning toxicity to fish.

Effects on Freshwater Invertebrates

Table I contains the one(1) study which was received and evaluated under this topic.

Table I - Studies Evaluated

Author	fiche ID No
Johnson and Finley	00003503

The minimum data requirement for establishing the acute toxicity of disulfoton to freshwater invertebrates is the result from one(1) 48-hour study with technical disulfoton on a representative native freshwater invertebrate species, perferably Daphnia magna (Sec. 72-2). The acute toxicity data from the above listed study using technical disulfoton are listed in Table II below.

Table II

Freshwater Invertebrates Acute Toxicity Data using Technical Disulfoton.

Species	Percent Active	Results 96-hr LC50 ppm 95% C.L.	Author ID	Fulfills Guideline Requirement
Scud (Grammarus fasciatus)	98%	.052 .049-.058	Johnson & Finley 0003503	partial
Glass shrimp (Palaemonetes kadiakensis)	98%	.0039 .0027-.0057	Johnson & Finley 00003503	partial
Stoneflies (Pteronacys californica)	98%	.0050 .0037-.0067	Johnson & Finley 00003503	partial

While these tests do not fulfill guideline data requirements they are sufficient to indicate that disulfoton is very highly toxic to freshwater invertebrate species.

The guideline requirement for acute toxicity of disulfoton to freshwater invertebrates are not satisfied.

Precautionary Labeling: Based upon the existing data, products containing disulfoton should contain a statement concerning toxicity to aquatic invertebrates.

Effects on Estuarine and Marine Organisms

No studies were received under this topic.

Under Sec. 72-3 acute toxicity testing of the technical grade of the active ingredient may be required to support the registration of formulated products if the pesticide is intended for direct application to the estuarine/marine environments, or may be expected to enter such environments. Uses such as cotton and corn for which this chemical is presently registered may be expected to result in disulfoton entering the estuarine environment.

Guideline requirements for Acute LC_{50} Estuarine and Marine Organisms are not satisfied.

Effects on Birds

Thirteen(13) studies under ten(10) citations were received and evaluated under this topic. Nine studies are acceptable for use in hazard assessment for birds. Table I below lists the studies that were reviewed and evaluated.

Table I

Studies Received and Evaluated

Author	ID
Lamb & Jones	00094233
Shellenberger	00095655
Lamb & Nelson	00095657
Lamb & Nelson	00095658
Lamb & Nelson	00095656
Dewitt et al	00048109
Heath et al	00058746
Schafer	00020568
Hudson et al	05008363
Hill & Camardese	EDODIS00

The minimum data required for establishing the acute toxicity of disulfoton to birds is the result from one(1) single-dose oral LD_{50} study on either an upland game species (preferably Bobwhite or other native quail or the Ring-necked Pheasant) or a wild waterfowl (perferably the Mallard Duck) (Sec. 71-1) using the technical grade of the active ingredient. The acceptable data is listed in Table II below.

Table II

Single-Dose Oral LD50 - Technical
Disulfoton

Species	% a.i. (technical)	Results (95% c.i.) mg/kg	Author ID	Fulfills Guideline Requirement
Mallard (Anas platyrhyhos)	95%	6.54	Hudson 05008363	Partial
Bobwhite quail (Colinus virginianus)		31.0 (28.0-35.0) 28.0 (22.0-27.0)	Shellenburger 00095655	yes
Bobwhite quail (Colinus Virginianus)		12 (7-19)	Hill and Camardese EDODIS00	yes

The guideline requirement is satisfied, characterizing Disulfoton as "highly toxic" to upland game birds. The other study, while not sufficient to satisfy the guideline requirement was determined adequate to characterize disulfoton toxicity, as "very highly toxic" to waterfowl.

The minimum data required for establishing the dietary (subacute) toxicity of disulfoton to birds are the results from at least two(2) avian dietary toxicity studies (LC_{50} values) (Sec. 71-2). These test one (1) upland gamebird (preferably Bobwhite or other native quail, or the Ring-necked Pheasant), plus one (1) wild waterfowl (preferably the Mallard Duck). Acceptable data addressing this topic are listed in Table III below.

Table III

Dietary Toxicity to Birds - Disulfoton Technical

Species	% a.i. (technical)	Results LC_{50}= 95% C.I. ppm	Author ID	Fulfills Guideline Requirement
Bobwhite quail (Colinus virginianus)	Technical	544 (469-630)	Lamb & Jones 00094233	Yes
Mallard (Anas platyrhyhos)		692 (552-866)	Lamb & Jones 0094233	Yes
Bobwhite (Colinus Virginianus)	Technical	715 (617-827)	Heath et al 00058746	Yes
Mallard (Anas platyrhyhos)	Technical	510 (415-625)	Heath et al 00058746	Yes
Pheasant (Phasianus Colchicus)	Technical	634 (547-737)	Heath et al 00058746	Yes

The guideline's requirements for (2) avian dietary toxicity studies are statisfied. There is sufficient information to characterize disulfoton as "moderately toxic" to birds when administered in subacute dietary tests.

Avian acute toxicity studies on formulated products can be required as per Sec. 70-3 (c)(3)(vi). Although no such requirement are made for this topic at this time the acceptable acute studies with formulated products are listed in Table IV.

Table IV

Acute Toxicity to Birds - Formulated Products

Species	Formulation % a.i.	Results LD50[1] 95% C.I. mg/kg	Author ID	Would Fulfill Guideline requirement
Bobwhite Quail (Colinus virginianus	granular 15%	3.3 (29-37) 14.5[o] (12.0-17.5)	Shellenberger 00095655	yes
Bobwhite Quail (Colinus virginianus	granular 15%	29 (24-34)	Hill & Camardese EDOD15500	yes

1) LD50 - Reported mg/kg ai in formulated product.

Simulated and or actual field studies may be required to support the registration of formulated products (Sec 71-5).

Two of the three studies received and evaluated provided some insight into potential hazards to non-target species. Table V summaries the results.

Table V

Simulated or Actual Field Tests with Non-targets

Species	Formulation	Results	Author ID	Fulfills Guideline Requirement
Bobwhite Quail	15% granular	Juvenile Bobwhite quail were penned on sorghum and treated with Di-syston 15% Granular. The compound was	Lamb & Nelson 00095657	Partial

		applied 3 times with 7-day intervals at a rate of 2 lbs ai/A. No hazard found. However weaknesses in study design limit use-fulness of test in evaluation of hazard.		
Bobwhite Quail New Zealand Rabbits	Spray concentrate	Bobwhite quail and New Zealand Rabbits were penned on alfalfa. Alfalfa as treated four times with 7-day intervals at a rate of .5 or 1.0 lb ai/A. No hazard found at the .5 lb ai/A. One quail and 3 rabbits died at the 1.0 lb ai rate.	Nelson & Lamb 00095658	partial

These studies do not satisfy the requirement for simulated or actual field studies. These types of studies are necessitated by toxicity data and use information.

Precautionary labeling:

Based upon exisiting data, products containing disulfoton must bear a statement concerning toxicity to birds.

Disulfoton - Ecological Effects Disciplinary Review

1. Ecological Effects Profile

a. Technical - Disulfoton

i Avian studies

Shellenburger, (1969, ID00095655) and Hill and Camardese (1984, ID, ED0DIS00) performed acute oral studies with technical disulfoton on Bobwhite Quail. Shellenburger reported the LD_{50} for technical disulfoton to be 31.0 mg/kg for male Bobwhites and 28.0 mg/kg for female Bobwhite. Hill and Camardese reported a value of 12 mg/kg (pooled sexes) for adult Bobwhites. Hudson et al (1979, ID 05008363) performed the same type of study with mallards which showed an LD_{50} of 6.54 mg/kg. Technical Disulfoton may therefore be considered "highly" to "very highly toxic to avian species in acute doses.

Lamb and Jones (1973, ID 00094233) and Heath et al (1972, I.D. 00058746) evaluated the dietary toxicity of technical Disulfoton to avian species. Lamb and Jones reported the following values, Bobwhite Quail LC_{50} = 544 ppm and Mallard LC_{50} = 692 ppm. Heath et al. reported the LC_{50} for Bobwhites to be 715 ppm, for Mallards 510 ppm, and for Pheasants 634 ppm. Technical disulfoton may therefore be considered "moderately toxic" to avian species when consumed in the diet.

ii Aquatic Studies

Two studies reported the 96 hr acute exposure to freshwater fish. Lamb and Roney (1972, I.D. 00068268) reported the LC_{50} of technical disulfoton for Bluegill sunfish and Rainbow trout to be 0.039 ppm and 3.0 ppm respectively. Johnson and Finley (1980 I.D. 00003503) reported LC_{50} values for Bluegill sunfish, Rainbow trout, Fathead minnows, Channel catfish and Largemouth bass to be .3 ppm, 1.8 ppm, 4.3 ppm, 4.7 ppm, and .060 ppm, respectively. Therefore disulfoton is considered as "moderately" to "very highly toxic" to freshwater fish.

Insufficient information was available to fully characterize the toxicity of disulfoton to freshwater invertebrates. Available information, however, indicates that the LC_{50} for these species is less than 0.1 ppm (Johnson and Finley 1980, ID0003503 which would put it in the "very highly toxic" range.

b. Formulated Disulfoton products

15% granular.

i Avian Studies -

Hill and Camardese (1984, ID ED0D1S00) as well as Shellenberger (1969, ID00095655) evaluated the acute toxicity of the 15% granular formulation of Disulfoton. Shellenberger reported the LD_{50} of this granular formulation to be 33 mg/kg to male Bobwhites and 14.5 mg/kg to female Bobwhites. Hill and Camardese reported the LD_{50} to be 29 mg/kg to the same species. Based on these studies the 15% granular formulation is characterized as "highly" toxic to birds.

ii Aquatic Studies

Lamb and Roney (1972 ID 00068268) tested the acute toxicity of 15% Granular to Bluegill sunfish and Rainbow trout. The 96-hour LC_{50}'s were .25 ppm and 13.9 ppm, respectively. This indicates the 15% granular is "slightly" to "highly toxic" to freshwater fish.

6 lbs/gal Spray Concentrate

i. Avian studies - no studies

ii. Aquatic studies

Lamb and Roney (1972 ID 00068268) tested the toxicity of the 6 lbs/gal spray concentrate to Bluegill sunfish and Rainbow trout. The 96-hour LC_{50} were 0.059 ppm and 3.5 ppm. This indicates the 6 lbs/gal Spray Concentrate is "moderately" to "very highly toxic" to freshwater fish.

2. Hazard Assessment

Discussion

The Qualitative Use Assessment for disulfoton indicates it is used on a broad spectrum of food and non-food agricultural crops and numerous ornamental plantings. In most cases it is a soil applied pesticide in either granular form or spray; however there are also a foliar treatments. According to The Use Assessment cotton, sorghum, and wheat account for approximately 70% of the total use of disulfoton. Futhermore, there are over 60 additional crops occurring in the EPA Index to Pesticide Chemicals.

Disulfoton is basically used as either a granular or emulsifiable concentrate, however it is also formulated into pelleted/tableted and 95 percent ready to use forms. Application methods fall mainly into two types, band or broadcast treatments. Application rates for the granular and emulsifiable concentrate when broadcast range from 0.5 to 6 lb ai/A. Application rates for the band treatments of these formulations range from 0.3 to 11.0 oz/1000 ft row, equivalent to 1.6 to 59.9 lb ai/A if the band is 6 inches wide). A few uses including potatoes, tobacco, strawberries, cotton, and tomatoes fall in the higher use range. Most uses are between 5 to 15 lb ai/band acre. The pelleted/tableted formulation is applied to soil at a rate of 0.5 cartridge per 3 ft. of growth for ornamental trees and woody shrubs. The 95 percent ready to use formulation is used as a cotton seed treatment at a rate of 4 to 8 oz ai/100 lb of seed. (Above information based on information in the EPA Index to Pesticide Chemicals - Disulfoton 1982).

B. Aquatic Hazard Assessment

Disulfoton is "very highly toxic" to some species of fish with LC_{50} values reported for the Bluegill sunfish and the Largemouth bass of 39 and 60 ppb, respectively (Lamb and Roney 1972 ID 00068268, Johnson and Finley 1980 ID 0003503). The hazard to fish from disulfoton, however, cannot be assessed due to the absence of adequate Environmental Chemistry data (Per. comm. EAB). Therefore an evaluation of potential impacts to aquatic species must be deferred until data is available to estimate these values.

While data is insufficient to fully evaluate hazard the available data indicates the potential need for at least a fish early life-stage study. This test can be required if any LC_{50} value determined in acute toxicity test for freshwater fish is less than 1 mg/l (Sec. 72-4 (a) (ii)).

C. Terrestrial Hazard Assessment

In general, as indicated in the Qualitative Use Assessment for disulfoton, disulfoton is applied to soil. However it is also registered as a foliar application on several crops, including, alfalfa (0.5-1 lb ai/A) barley (0.5-1 lb ai/A, corn (0.5-1 lb ai/A), cotton (.18-.56 lbs ai/A), pecan (1.0-1.5 lbs a.i. A), potato (0.375- 3 lb ai/A) sorghum (0.25-0.5 lb ai/A), sugarcane (0.375-0.56 lb ai/A) and wheat (0.25-0.75 lb ai/A). With the exception of potatoes, all foliar application rates are equal to or less than 1.5 lbs ai/A. At those rates maximum expected residues in and around fields are expected to range from 18 to 350 ppm. While in the toxic range of avian species these residues are below the LC_{50} of the most sensitive avian species tested, the mallard (LC_{50} = 510 ppm). However for potatoes, at the higher use rate of 3 lbs ai/A, expected residues exceed the LC_{50} of avian indicator species, ranging from 22 to 730 ppm on wildlife food sources.

While these residues raise concern, a decision as to whether avian reproduction data is required on this use pattern will be deferred until adequate Environmental Chemistry Data is available to assess the severity of the potential risk.

Mammalian species may also be susceptible to disulfoton foliar appilcation. Rat and mice toxicity data indicate that disulfoton is "very highly toxic" to mammals with LD_{50}'s in the range of 2-5 mg/kg (Tox. Branch per com.) Futher, indication of the potential susceptibility of mammals to disulfoton is the study by Lamb and Nelson (1971 ID00095657). They reported a 25% mortality in New Zealand Rabbits when exposed to disulfoton sprayed at 1 lb ai/A on alfalfa. The 25% mortality, however may be slightly misleading in that, this figure includes two treatment group, one with food remaining during spraying and the other with food removed during spraying. Of the rabbits which did not have their food removed during spraying, 50% died. Furthermore this mortality did not occur until after the third application, yet following a fourth appliction no additional mortality occurred. An explanation for these results is not readily apparent.

Given this indication of risk from the above study and that disulfoton is "very highly toxic" to mammalian species, futher field monitoring is required.

Band treatments of soil appear to present risk to non-target species. Disulfoton is applied as a band treatment to soils as granular or emulsifiable concentrates at rates ranging from 0.3 to 11.0 oz/1000 ft rows. Most uses however fall within .75 to 2.4 oz/1000 ft rows which is equivalent to 4.08 to 13.068 lbs ai/band acre. Both the spray and granular product

would be expected to leave sufficient numbers of granules or contaminated food and grit items on or near the surface to expose these species.

The emulsifiable concentrate, when applied at .75 to 2.4 oz/1000 ft row in a 6 inch band, may produce residues on small seed and insect ranging from 240 to 700 ppm and from 50 to 150 ppm for larger insects. Therefore residues on some food items exceed the LC_{50} of indicator species (Mallard LC_{50} = 510 ppm).

For crops with higher use rates, including, potatoes (2.25-3.5 oz/1000 ft row), strawberries (2.55-5.2 oz/1000 ft row), and Tomatoes (1.2 to 11 oz/1000 ft rows), risk is greater. At the higher rates expected residues on small seeds and insects range from approximately 1000 to 7000 ppm and for large insects from approximately 200 to 3000 ppm.

Hazard is expected for avian species feeding in treated areas, particularly at the higher use rates; hence, avian field monitoring is required.

The granular application may present an even an greater risk, in that avian species may consume the granules directly. Field studies on other granular products have shown this to occur (Balcomb 1983).

Balcomb (per com.) found that the mean weight of a 15% disulfoton granule is .083 mg. Therefore, each 15% granule contain 0.01245 mg of active ingredient. For birds the size of Bobwhite quail (200 g) they would have to consume approximately 233 granules to receive an LD_{50}. For birds the size of sparrows (10 to 20g) as few as 12 granules would contain an LD_{50}. (Calculations based on LD_{50} of, 14.5 mg/kg reported by Shellenberger for female Bobwhites.)

The potential for impacting avian species the size of bobwhite or larger, seems remote considering the numbers of granules they must consume. However for avian species which weigh less than 20g, mortality may occur. Booth et al. (unpublished) found as high as 53 granules in birds found dead in association with another granular pesticide. While in this study only a few indiciduals were found with in the higher range, several birds were found to contain between 10 and 20 granules. There appears to be risk to avian species from the higher percent granular formulation of Disulfoton, thereby necessitating field monitoring.

Precautionary Labeling

Manufacturing Use

This pesticide is toxic to fish and wildlife. Do not discharge into lakes, streams, ponds or public waters unless in accordance with an NPDES permit for guidance contact your Regional Office of the EPA.

End Use

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

Classification

No evidence exists at this time to change the classification of products classified by regulation. Until receipt of EAB and EEB data no modification will be recommended.

Endangered Species

Due to the absence of adequate data to estimate expected aquatic concentrations of disulfoton, potential impacts to Endangered Aquatic Organisms can not be addressed. However, for other endangered species data is available.

The endangered species Regulatory Risk Triggers for avian and mammalian species are:

avian 1/5 the LC_{10}
LC_{10} for mallard = 377.82 ppm
1/5 LC_{10} = 75.6 ppm

mammals 1/10 LD_{50}
LD_{50} = 2-5 mg/kg
1/10 LD_5 = .2 - .5 mg/kg

Calculated maximum residues for most of the crops where disulfoton is used exceed these criteria.

Several of the crops where disulfoton is used have been considered under the cluster procedure for evluating impacts to endangered species. These crops include: corn, soybeans, sorghum, and small grains. While disulfoton was included in these evaluations not all use patterns were considered.

Avian species identified which could be exposure from use of disulfoton in these crop include the Attwater's Greater Prairie Chicken (Tympanuchus cupido attwateri) and the Everglade Kite (Rostrhamus sociabilis plumbeus).

No mammalian endangered species were identified which could potentially be exposed from pesticide use on these crops.

Five additional consultations covering other compounds used on the same crops as disulfoton have been made with the Office of Endangered Species. These crops include: Tomatoes peanuts, potatoes, cotton, and sugar cane. No addition avian or mammalian species were indentified in these consultations.

The remaining use patterns have not yet been addressed by the Office of Endangered Species.

TABLE A
GENRIC DATA REQUIREMENTS FOR DISULFOTON

Data Requirement	Composition 1/	Use Pattern 2/	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)? 3/
§158.145 Wildlife and Aquatic Organisms					
AVIAN AND MAMMALIAN TESTING					
71-1 - Avian Oral LD_{50}	TGAI	A,B,G,H	yes	05008363** 00095655* E00D1S00*	No
71-2 - Avian Dietary LC_{50}				00058746*	
a-waterfowl	TGAI	A,B,G,H	yes	00094233*	No
b-upland game	TGAI	A,B,G,H	yes	00094233*	
71-3 - Wild Mammal Toxicity		N/A			
71-4 - Avian Reproduction	TGAI	A,B,G	No		Reserve 4/
71-5 - Simulated and Actual Field Testing - Mammals and Birds	TEP	A	partial	00095657** 00095658**	yes 5/
AQUATIC ORGANISM TESTING					
72-1 - Freshwater FIsh LC_{50}				0003503**	
a. warmwater	TGAI	A,B,G,H	yes	00068268**	No
b. coldwater	TGAI	A,B,G,H	Yes	00068268* 00003503*	No
72-2 - Acute LC_{50} Freshwater Inbertebrates	TGAI	A,B,G,H	partial 7	00003503**	yes
72-3 - Acute LC_{50} Estuarine and Marine Organisms	TGAI				
a. Shrimp		A,B	No		yes 4/
b. Marine fish		A,B	No		yes 4/
c. Oyster		A,B	No		yes 4/

72-4 - Fish Early Life Stage and Aquatic Invertebrate Life-Cycle	TGAI	A,B	No	Reserved[4]
72-5 - Fish Life - Cycle	TGAI	A,B	No	Reserve[6/]
72-6 - Aquatic Organism Accumulation	TGAI	A,B	No	Reserve[4/]
72-7 - Simulated or Actual Field Testing - Aquatic Organisms	TEP	AB	No	Reserve[4/]

1/ Composition: TGAI - Technical grade of the active ingredient; PAI = pure active ingredient; TEP = Typical end-use product;

2/ The use patterns are coded as follows: A=Terrestrial, Food Crop; B= Terrestrial, Non-Food Crop; C=Aquatic, Food Crop; D=Aquatic, Non-food; E=Greenhouse, Food Crop; F=Greenhouse, Non-Food; G=Forestry; H=Domestic Outdoor I=Indoor.

3/ Data must be submitted no later than _____.

[4] Reserved pending indication of Environmental Fate information.

[5] Field studies are required due to the toxicity of the chemical in relution to expected environmental concentrations. At this time three field monitoring studies are required: One for the use of the 15% granular product on a crop with higher use rates, one for the use of the emulsifiable concentrate band treatment on a crop with a higher use rates and one for the broadcast foliar application. Depending on the results of studies, further testing on additional crops may be necessary.

[6] Disulfoton has LC_{50} values below 1 ppm for aquatic invertebrate and fish. Several crops are grown in excess of 300,000 acres in coastal counties. The following disulfoton uses meet this requirement: corn, soybean, sorghum and cotton.

[7] A more sensitive life stage must be tested.

* Study on its own fulfills Guideline Requirement

** Study must be combined with other studies to fulfill Guideline Requirement.