Appendix L. Endosulfan Incident Database Review

A review of the Ecological Incident Information System (EIIS) database for ecological incidents involving endosulfan was completed on March 25, 2009. This database consists of exposure incident reports submitted to the EPA from 1994 to present. A summary of ecological incidents involving endosulfan are listed in **Table L.1** below. This table is divided into incidents involving aquatic organisms only, terrestrial organisms only, and both aquatic and terrestrial organisms. Within each of these sections of the table, incidents are ordered by date beginning with the earliest incident.

Incidents listed in EIIS are categorized by the likelihood that a particular pesticide is associated with that particular incident. These classifications include highly probable, probable, possible, unlikely or unrelated. "Highly probable" incidents usually require carcass residues or clear circumstances regarding the exposure. "Probable" incidents include those where residue information was not available or circumstances were less clear than those for "highly probable." "Possible" incidents occur when multiple chemicals may have been involved and the contribution of an individual chemical is not obvious. An "unlikely" incident classification is given when a given chemical is considered nontoxic to the type of organism involved or the chemical was analyzed and not detected in samples. The "unrelated" category is used for incidents confirmed not to involve pesticides. No unrelated incidents were listed for permethrin.

The number of reports listed in the EIIS database is believed to be only a small fraction of the total incidents involving organismal mortality and damage caused by pesticides. Few resources are assigned to incident reporting. Reporting by states is only voluntary, and individuals discovering incidents may not be informed on the procedure of reporting these occurrences. Additionally, much of the database is generated from registrant-submitted incident reports. Registrants are legally required to provide detailed reports of only "major" ecological incidents involving pesticides, while "minor" incidents are reported aggregately. Because of these logistical difficulties, EIIS is most likely a minimal representation of all pesticide-related ecological incidents.

Summary of Endosulfan Incident Review

The EIIS database contained 83 incident reports involving endosulfan. Most of the incidents involve aquatic ecosystems (75 or 90% of the total incidents). Seven incident reports involve terrestrial ecosystems and one involves a combined aquatic/terrestrial ecosystem. California was most represented among all 50 states (26 reports) followed by North Carolina (9), Louisiana and South Carolina (5 each) and Washington State (4). Additional characterization of these incidents is provided below.

<u>Incident Certainty and Legality</u>

Of the 83 incidents reported, 23 (28%) are categorized as 'highly probable' and 40 (48%) are categorized as 'probable.' Collectively the 'highly probable' and 'probable' categories represent 76% of the reported incidents. Regarding the legal status, the 'unknown' and 'misuse accidental' represent the largest legality categories with 36% and 35% of the incident reports, respectively. Approximately 25% of the reports consist of registered uses. Lastly, only three of the incident reports involved intentional misuse.

Of the 15 'highly probable' and 'probable' incident reports that involved only 'registered uses,' most described pesticide runoff following periods of heavy rainfall as the likely event that led to the reported incident. The majority of the 'highly probable' and 'probable' incidents classified as 'accidental misuse' involved aerial application too close to bodies of water as stipulated by the label, spills and equipment washing.

Aquatic Incidents

The vast majority of the aquatic incident reports involved mortality to fish (67), a highly sensitive taxonomic group. Only aquatic three incidents reportedly involved aquatic invertebrates, but the likelihood of observing impacts to aquatic invertebrates is low compared to fish. Of the 67 aquatic incidents involving fish, 53 (80%) are classified as either 'highly probable' or 'probable' in the context of endosulfan use. A wide variety of fresh and estuarine species were reportedly affected (e.g., carp, catfish, largemouth bass, shad, menhaden, mullet, spot, bluegill sunfish, gar and trout).

Terrestrial Incidents

Of the seven terrestrial incidents, none are classified as 'highly probable' and two are classified as 'probable.' The two 'probable' incidents involve birds (blue jay, crow, owl), mammals (squirrel, opossum, red fox) and an amphibian (unidentified frog).

Plant Incidents

Only one reported incident involved plants and this was classified as 'possible,' but the plant species was not identified.

Table L.1. Summary of Ecological Incident Reports in the Ecological Incident Information System for Endosulfan[(1)].

Incident ID	Use Site	Date [(1)]	State [(2)]	County [(3)]	Cert. Code [(4)]	Legal. Code [(5)]	Species	Magnitude	Effect [(6)]	Summary Description [(7)]
AQUATIC INCIDENTS										
B0000-233	Potato	7/30/1970	WA	Stevens	3	MA	unknown fish	thousands	M	A large fish kill occurred near Chewelah that resulted, evidently, from an aerial application of a mixture of Mag-6 flowable sulfur, dithane m-45, and thiodan. Witnesses reported seeing the aircraft continue its spraying even when it was over the river.
B0000-228-01	Agr. Area	8/25/1970	NC	Hyde	3	MA	unknown fish	5000	M	This large fish kill occurred in a drainage canal at the intersection of SR-1139 and SR-1152, approximately 2.5 miles east of Sladesville, NC. It was the result of aerial spraying of a mixture containing parathion (13,000 ppm), thiodan (63,000 ppm), DDT (18,000 ppm), DDE (14,000 ppm), and DDD (38,000 ppm) to the nearby soybean fields by a commercial certified applicator. The drift of pesticides might have happened accidentally over the drainage canal during the operations.
B0000-228-02	Soybean	8/28/1970	NC	Hyde	3	MA	eel menhaden mullet perch pumpkinseed sand perch spot	250 280 3000 517 180 143 500	M	With such large numbers of fish killed (including an estimated 750,000 menhaden) it is difficult to make accurate estimates of the individual fish species although specific numbers are given (e.g. 1875 mullet and 295 eels).
B0000-231-01	Agr. Area	5/1/1971	CA	Yolo	4	MA	unknown fish	2000	M	It is suspected that thiodan was responsible for the fish kill near Clarksburg. An aerial application of thiodan was reportedly made to a nearby safflower field and analyses of water, fish, vegetation, and safflower showed 0.5 ppb in the water, and 0.5 ppm in the fish tissue. Vegetation contained from 0.98 to 5.8 ppm, and the residue on the safflower was 11.4 ppm.
B0000-232	N/R	7/6/1971	NC	Duplin	4	MA	catfish pickerel shiner sunfish	93 15 110 354	M	A fish kill took place in Bear Swamp Creek at S.R. 1301 bridge on July 6, 1971. All indications are that it was caused by endosulfan which probably was spilled from a broken bottle that had been discarded on the bank. No analyses of fish tissue were reported but concentrations of Endosulfan I and II in the water were 16 and 12 ppb, respectively.
B0000-230	Potato	7/8/1971	MN	Chisago	4	RU	bullhead	thousands	M	No data were given for pesticide concentrations in the fish, but water samples contained as high as 266 ppb endosulfan, so that was probably the cause of the fish kill.
B0000-229	N/R	7/23/1971	PA	Columbia	2	UN	trout	45	M	Thiodan is suggested as the active ingredient concerned with this fish kill but there are no data on concentrations in the water or in the fish tissues.

Incident ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
B0000-227	N/R	4/1/1972	WA	Yakima	3	RU	rainbow trout	50000	M	A large fish kill occurred in a hatchery in Yakima, WA, but details are lacking regarding the specific location or the source of the pollution. Supposedly the fish died as the result of exposure to thiodan which entered the hatchery in Wide Hollow Creek. Analyses of the fish, for thiodan, showed 0.58 and 0.81 ppm for the liver and 0.11 ppm for the fish flesh.
B0000-245-01	N/R	5/24/1972	NY	N/R	4	MA	unknown fish	10000	M	According to "Summary of Reported DDT, Endrin, and Methyl Parathion Episodes Involving Fish from 1967 to February, 1975" there was a large fish kill in the state of New York on May 24, 1972. A spray rig being filled with thiodan and captan overflowed into a stream, resulting in the death of 10,000 fish.
B0000-226	Agr. Area	8/15/1972	WA	Chelan	2	RU	trout	10000	M	The fish kill occurred along a 2.5 mile strecth of Mission Creek. No analytical data were provided but thiodan was reputed to be the cause of the problem.
B0000-225	Agr. Area	5/17/1973	NC	Wake	4	MA	unknown fish	10000	M	The fish kill was caused by the spillage of 1/2 gallon of Champion Super Worm Whipper Tobacco Spray into a pond. Active ingredients are endosulfan and malathion, both at 12.2% in the formulation.
B0000-224	Alfalfa	7/17/1973	CA	Glenn	3	MA	carp catfish sunfish	1000 unknown 100	M	Approximately 1000 fish were killed in a stream running through an alfalfa field, presumably as the result of spraying of the field with a pesticide mixture containing dylox (trichlorfon), thi odan, and toxaphene. Analyses of water samples taken in the area indicated that lethal conditions existed. Upstream of the affected area the only pesticide found was dylox, at 0.8 ppb. In the area of the alfalfal field the following concentrations were found: Dylox (8.3 to 12.5 ppb), thiodan (0.30 to 0.59 ppb), and toxaphene (0 to 3.5 ppb).
B0000-223	Potato	8/7/1973	OR	Washing-ton	2	MA	bass	unknown	M	Some of the fish in a 15-acre pond were killed, presumably as the result of the drift of a pesticide mix containing 6% maneb and 3% thiodan which had been applied 10 days earlier.
B0000-220	Agr. Area	8/11/1974	CA	Imperial	3	MA	unknown fish	thousands	M	An extensive fish kill (10,000 in California and 60,000 in Arizona) occurred, probably as the result of a thiodan spill. Reports are that a "nurse truck" was being filled while on a bridge over the Main Canal at 3:30 AM, and that a leaking tank and/or a hose that caused a back siphon caused contamination of the water. Water samples taken at two locations later that day in the Main Canal contained thiodan at 0.04 and 0.2 ppb but no methyl parathion. The Yuma Department of Health's initial water samples contained 0.15 ppm thiodan and 0.0073 ppm methyl parathion.

Incident ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
B0000-218-08	Agr. Area	9/5/1975	CA	San Joaquin	3	MA	unknown fish	thousands	M	This incident took place in a pond in the vicinity of the San Joaquin River near Tracy. Samples of the fish were analyzed for Thiodan but the result was negative (LOD not given, but in 1975 it might have been rather high). The fish kill was attributed to Thiodan, nevertheless, because the field adjacent to the pond had been sprayed the day before the fish kill was observed. The flying service responsible for the Thiodan application admitted responsibility for the loss.
B0000-218-16	Lettuce	9/29/1975	CA	Riverside	2	RU	unknown fish	500	M	The death of 500 fish took place in the Palo Verde Valley area on September 29, 1975. It is not certain what caused the kill but there was a lettuce field nearby and an analysis of the lettuce showed the presence of 0.21 ppm thiodan. No thiodan was found in the G.I. tract and the gills of the fish (the limit of detection was not mentioned).
B0000-218-11	Tomato	6/24/1976	CA	Merced	4	MA	unknown fish	1500	M	This event occurred in the Volta Channel. More than 1500 fish died and an analysis of a fish liver showed the presence of 0.55 ppm Thiodan, which was assumed to be the cause of the kill.
B0000-218-12	Canal/Drain	7/1/1976	CA	Yolo	3	MI	blue catfish bluegill carp	200 100 400	M	This fish kill took place in a pond on the grounds of the Yolo Sportsmen's Club, July 1, 1976. All of the water in the pond comes from an agricultural drain running close to the Yolo County airport. A spray plane operator was seen washing equipment in the drain, resulting in a concentration of Thiodan in the ditch water (0.12 ppb) and in the pond water (0.6 ppb).
B0000-500-44	Fish Pond	10/2/1976	CA	Merced	3	MA	bluegill carp catfish largemouth bass shad striped bass	thousands thousands thousands thousands thousands thousands thousands	M	A State survey covered herein submits a report within the period of 01 July, 1976 to 30 June, 1977: (P-121) An investigation began at the local water treatment plant where below its outfall fish loss started (the Colony Canal in Dos Palos). Water samples contained pesticide (amounts not given). It was determined that a local high school had used a pesticide tanker truck that had been washed of its residue into the canal. Immediately prior to this event, it had transported pesticide. The tanker truck had been used by the high school to haul water from the canal to their fish pond.
B0000-216-19	Lettuce	11/18/1976	CA	Riverside	2	RU	unknown fish	n/r	M	Fish were killed in Canal 18 in the Palo Verde Valley on Nov. 18, 1976. Lettuce fields surround the canal and, according to the Agricultural Commissioner's office, these fields had been sprayed with phosdrin. However, analyses of lettuce and the water in the Canal did not show phosdrin but did show thiodan. There were no analyses made of the fish.
B0000-216-16	Rice	1/28/1977	CA	Imperial	4	RU	carp	30	M	Thirty carp were killed in Rice Drain #3 in Imperial County on Jan. 28, 1977. One fish was analyzed and the liver and intestines contained 1.4 ppm thiodan so this compound was probably the cause of death.

Incident ID	Use Site	Date [1]	State [2]	County [3]	Cert. Code [4]	Legal. Code [5]	Species	Magnitude	Effect [6]	Summary Description [7]
B0000-501-34	Agr. Area	11/26/1977	CA	Imperial	4	RU	carp	1200	M	More than 1200 non-game fish were killed in the Vail cut-off drain, Imperial County, on November 26, 1977. An adjacent lettuce field had been irrigated and tail water flowed into the drain. Thiodan residues of 2.65 ppm in the gills and 1.92 ppm in the GI tract were found in distressed carp collected from the drain. The water contained 1.33 ppb Thiodan.
B0000-501-36	N/R	1/7/1978	CA	Riverside	4	UN	catfish largemouth bass	hundreds hundreds	M	A fish kill occurred in the CO-3 canal near Blythe, CA, on January 7, 1978. Approximately 540 fish were killed in an area of standing water. Lannate, Parathion, and Thiodan were suspected as being the cause but analyses of the water and of the fish showed only Thiodan to be present. Water samples contained between 0.27 and 0.64 ppb, but catfish gills and liver contained 2500 and 1100 ppb respectively, and gills of largemouth bass contained 930 ppb Thiodan.
B0000-500-02	Field	10/2/1978	CA	Imperial	3	RU	molly	12000	M	The investigation of a fish kill in PAMPAS DRAIN #1 in the area of East Highline Canal and the Pampas Canal headgate led to options as to causation. One, pointed to empty bags of DIAZINON along with white crystals that were found in the immediate area; two, was that a large fertilizer trailer was leaking fluid to the ground and that it was leaching to water through the ground. HOWEVER, a pesticide application on September 27, to a lettuce field nearby affected the immediate area where the dead fish were found, and that was, in the opinion of Wildlife Management, the cause of this loss.
B0000-500-08	Agr. Area	10/31/1978	CA	Riverside	4	UN	carp catfish	n/r n/r	M	In Palo Verde Valley between N. Lovekin Blvd. in "A" canal and main "C" canal, there was a fish kill. The local warden collected carp, catfish and lettuce samples forwarded to the Pesticide Investigation Laboratory.
B0000-234	Agr. Area	4/4/1980	SC	Charles-ton	2	RU	unknown fish	n/r	M	This incident took place on Wadmilaw Island and the numbers of fish killed were "minor."
B0000-235	Tomato	4/12/1980	SC	Charles-ton	2	RU	crab oyster unknown fish	n/r unknown thousands	M	Apparently there was a continuum of fish kills beginning with April 4 and continuing with the one associated with April 12. For the database, the April 4 data are to be found in Incident B0000-234, and the April 12 data are in Incident B0000-235 Pesticides were applied to the fields adjacent to the kill site on April 11 according to an observer, and on April 12 according to the report given. When the fish kill began in what is referred to the April 12 incident is unclear because a patrolman inspecting both sites noted about 50 badly decomposed carcasses; the presumption would be that these were from the April 4 (or before) time period. On April 13 there was a new crab and fish kill.

Inci-dent ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
B0000-502-15	Agr. Area	4/15/1980	SC	Charles-ton	2	UN	crab minnow mullet spot	unknown unknown unknown unknown	M	A fish kill occurred on John's Island (access from Haulover Creek) on April 5, 1980. Fish had begun dying on April 4 in Leadenwah Creek. Nearby tomato fields had been sprayed on April 3 and that was followed by a heavy rain on April 4. A water sample taken from Haulover Creek on April 5 contained 3.5 ppb toxaphene, and a fish sample taken at the same time contained 4400 micrograms/kg (4.4 ppm) toxaphene. Spraying was done a week later, causing another fish kill. For example, an oyster sample taken from Haulover Creek on April 15 contained 2.64 ppm toxaphene.
B0000-502-11	Agr. Area	5/25/1980	SC	Florence	2	UN	bream crappie	1000 1000	M	A fish kill occurred in a private pond in Florence, S.C., on May 25, 1980. Toxaphene and p,p'-DDE were detected in the fish tissue at low concentrations, and endosulfan was found in the water. It is difficult to establish the exact cause of the fish kill since it may have been the result of several pesticides acting synergistically.
I003948-013	N/R	6/30/1988	CA	Imperial	4	UN	catfish shad	unknown unknown	M	Approximately 100 threadfin shad and catfish were killed by endosulfan poisoning in Imperial County on June 30, 1988.
I003948-014	N/R	9/20/1988	CA	Riverside	3	UN	carp	550	M	In Riverside County 550 carp died of endosulfan poisoning on September 20, 1988. No tissue residue or any other data was submitted.
B0000-500-15	Cucum-ber	5/26/1989	GA	Turner	3	UN	bream crappie trout white perch	several 2 3 several	M	A fish kill occurred in a pond not far from where a field of cucumbers was sprayed with Bravo and endosulfan. There were differing accounts of the wind conditions but the aerial applicator estimated the wind speed at 5 mph, and a witness to the aerial spraying said that there was no wind. The inspector of the scene noted that there had been no fish mortality in the pond in the field that had been sprayed. The complainant's counter argument was that more passes had been made near his field than over the pond area in the sprayed field. There were no violations charged in this incident but grass and leaf tissue from around the pond contained 21.4 ppm Bravo (chlorothalonil) and 2.62 ppm endosulfan. These samples were taken just the day after the incident. Analyses of the water samples showed <0.06 ppb chlorothalonil and 0.75 ppb endosulfan.
I000383-001	Cotton	7/1/1989	MS	Holmes	3	UN	channel catfish gizzard shad	unknown unknown many	M	A fish kill took place on Bee Lake, near the Thornton Community, in Holmes County on July 2, 1989. The lake is surrounded by cultivated land, primarily cotton fields. Aerial spraying of the field had occurred on the cotton fields on June 30th. Heavy rains occurred the afternoon and evening after the spraying. An undetermined number of fish were killed in the lake. Water samples detected a significant quantity of endosulfan sulfate and trace amounts of endosulfan I and endosulfan II.
I000383-002	Cotton	7/1/1989	MS	Holmes	3	UN	unknown fish	extensive	M	This was the second report of a fish kill on Bee Lake. Analyses of water and two fish carcasses showed the presence of endosulfan.

Inci-dent ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
I000389 -001	Agricultu ral Area	7/6/1989	MS	Yazoo	2	UN	bowfin bullhead carp channel catfish grizzard shad	1 56 104 3 1	M	Cotton and soybean crops were sprayed every 2-3 days. Fish kill sampling took place at 5 sites on Silver Creek near Holly Bluff. To control peach aphids (without success) planters also sprayed BIDRIN, CYTHION, LANNATE, DURSBAN AND THIODAN. Monetary value of freshwater fish was $211.75.
I000799 -009	N/R	6/23/1991	NC	Onslow	3	UN	bass bream catfish crappie eel	hundreds hundreds hundreds hundreds	M	Fish kill occurred on a one-acre pond (June 23rd). A tobacco farmer nearby stated that he incorporated MOCAP into tobacco rows, and sprayed ORTHENE, two weeks ago. However, the pond owner stated that on June 22 the tobacco farmer sprayed and the very next morning, after a heavy rain, dead fish abounded in the pond (e.g. 6 & 7 lb. bass). As a result, the tobacco farmer was given a warning and later was notified of an impending hearing, by the North Carolina Dept. of Agriculture. No fish were analyzed.
I000109 -024	Field	7/31/1991	LA	Richland	3	RU	unknown fish	unknown	M	A certified applicator aerially treated cotton fields with Methyl Parathion and Endosulfan on 7/27/91. These pesticides were applied according to its labeled concentration and recommendation. The application followed by 1.39 inches rainfall, which caused runoff to Joe's Bayou as the fields treated are located on both sides of the Bayou. The Louisiana Department of Agriculture & Forestry(LDAF) and The Louisiana Department of Wildlife & Fishery (LDWF) jointly investigated this incident. The water samples taken from the Bayou were tested and detected the presence of Methyl Parathion among other pesticides. LDAF concluded that both of these pesticides are what killed the fish.
I000165 -005	Nut, Pecan	4/8/1992	GA	N/R	3	MA	unknown fish	n/r	M	After Thiodan 3EC had been applied to a pecan grove, there was a fish kill in an adjacent pond. The presumption is that Thiodan was responsible for the fish kill because the pond is closer to the site of application than is allowed on the label.

Inci-dent ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
I000799 -008	Apple	4/18/1992	NC	Hender-son	3	MA	catfish unknown fish	some 600	M	According to the incident report it was suspected that a farmer used an air blast sprayer to treat his apple orchard with endosulfan (FMC Thiodan 3EC) resulting in drift to a small (1/4 acre) pond and allegedly causing mortality to the fish in the pond 3 days later. There was no rainfall during this time. One of the farmers reported seeing several dozen small dead fish but according to the investigator there were approx. 600 small (2-6") fish and "some" (12-14") medium-sized catfish. The orchard had also been treated with fenarimol and a mix of Maneb plus zinc which was referred to as Mancozeb* or ethylene dithiocarbamate (EBDC). Water samples were collected from the pond at its over-flow. A soil sample was collected half way between the orchard and the waterway. Both revealed the presence of endosulfan. Sections of the orchard were within 47 feet of the pond. Legality requires that endosulfan cannot be sprayed within 300 feet of a fishpond. There was no fish tissue analysis.
I000165 -060	Tobacco	6/29/1992	TN	N/R	3	MA	unknown fish	unknown	M	A tobacco farmer used endosulfan on his crop which was less than 200 feet from a pond. Heavy rains ensued, causing the endosulfan to be transported into the pond and kill the fish. This was a 6(a)2 submission from FMC which had been called by the farmer, who wanted to know how soon the cattle could drink from the pond. The label would ban such a use so near the pond.
I000165 -062	Tobacco	6/30/1992	(USA)	N/R	3	MA	unknown fish	n/r	M	Fish died in a pond next to a tobacco field that had been sprayed with Golden Leaf Tobacco Spray. The pond was closer to the field than that allowed on the label, and the pond was over-sprayed by the airplane; also, subsequent heavy rains caused erosion of the soil which ended in the pond.
I000799 -002	Tobacco	7/4/1992	NC	Granville	4	MA	unknown fish	n/r	M	According to the report two tobacco fields near a 1 acre fish pond were treated with pesticide. Heavy rains followed during the same day. A fishkill allegedly resulted. Dead fish were observed floating in the pond. During the next week one water and two soil samples were collected for pesticide residue analysis. The report did not give a numerical value for the extent of the fishkill nor did it mention which fish species were affected. It was emphasized that the applicator failed to follow packaging guidelines for safe handling of the pesticide. This pesticide is registered for tobacco use but is not registered to be applied within 300 feet of a body of water.
I000116 -001	Potato	7/6/1992	DE	New Castle	3	UN	unknown fish	1000	M	1. Movement of aerial pesticide application to a potato field allegedly caused a fishkill in a non-target area fish pond 2. Pesticide application was followed by heavy rain and runoff. 3. According to the investigative report either Metalaxyl, as Ridomil*, and/or Endosulfan, as Thiodan*, and/or Kryocide, as Cryolite*, was responsible for the fishkill.

Incident ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
I000256-020	Agricultural Area	8/1/1992	SC	N/R	3	UN	unknown fish	n/r	M	According to this report fields were treated with Endosulfan and Acephate. Ensuing rains resulted in pesticide runoff to a nearby pond and allegedly caused a small fishkill. No residue analysis was made for the fish or the pond water. The SC Dept. of Health and Environmental Control filed charges against grower.
I000256-019	Pumpkin	8/5/1992	IN	N/R	3	UN	unknown fish	n/r	M	According to the report a pond fishkill occurred near a pumpkin field which allegedly had been treated with Endosulfan followed by heavy rain. No other information was given relating to this incident. Since it is known that Endosulfan is a hazard to fish it is probable that this chemical is responsible for the observed mortality among the fish.
I003037-091	N/R	6/25/1993	(USA)	N/R	2	UN	unknown fish	unknown	M	There was a fish kill allegedly caused by drift from an aerial application of Phaser three weeks prior to the event. No details were given.
I010792-001	N/R	1/1/1994	(USA)	N/R	3	MA	n/r	unknown	M	To comply with 6(a)2 regulations, Makhteshim-Agan of North America Inc. (MANA) reported a fish kill that resulted from a misapplication of a product containing endosulfan. This occurred in 1994 but the site was not identified in the report. MANA said that the specific product involved was not their product (the MANA product is Thionex Technical).
I002363-001	Citrus	5/13/1994	FL	St Lucie	3	RU	florida gar striped mullet unknown fish	n/r thousands n/r	M	According to the report a fishkill, due to runoff, was discovered in Ten Mile Creek and reported as a part of a survey study noted as a Ecosystem Management Report on Pesticide Contamination in Ten Mile Creek. Water samples of the extensive fishkill were taken at 10 sites. Of ten pesticides, (3 exceeding state standards), concentrations of endosulfan, ethion and azenphos-methyl violated water quality state standards. Numbers and all species which suffered mortality were not reported but was, from this report, estimated to be thousands. It was reported that 1450 dead striped mullet and 50 dead Florida gar were seen, over a 5 mile stretch, floating in the water. It was believed that the incident was due to extensive citrus farming in the area. Affected fish are known to be highly resistant to depleted oxygen. The report further stated that since fish are more resistant to pesticides than invertebrates, it can be assumed that crustacean and insect populations were severely affected during this event.
I003826-019	Tobacco	7/14/1994	NC	Davidson	3	MA	n/r	unknown	M	A fish kill occurred in a 1-acre pond in Davidson County, NC, on July 13, 1994. Pesticides were suspected as the cause because there had been spraying of a nearby tobacco field several days before, after which there had been rain. A water sample taken the next day was found to contain endosulfan. A fine of $200 was levied against the owner of the tobacco farm because the spraying took place within 300 feet of the pond, which is forbidden according to the label.

Incident ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
I001849-008	Field	7/20/1994	LA	N/R	4	MA	n/r	400	M	This event (Fish kill #94-55) occurred in Beacon's Gully which is situated between two sweet potato fields. Thiodan (endosulfan) was applied aerially and the pilot did not realize that a water body was present so it received the same treatment as the fields. Analyses of water samples by the LSU School of Veterinary Medicine indicated that endosulfan was the cause of death of the fish, frogs, and crawfish in Beacon's Gully. Data were not included in the report on which this account is based. A warning was issued to the pilot for this infraction.
I003402-001	Tobacco	8/15/1994	VA	Franklin	4	MA	crappie	12	M	Fish were killed in a pond that became contaminated with endosulfan following a heavy rain storm. Just prior to the storm Golden Leaf Tobacco Spray (endosulfan) had been applied to a tobacco field above the pond, and runoff from the field carried the endosulfan into the pond.
I001280-039	Tobacco	8/22/1994	VA	N/R	3	UN	unknown fish	several	M	A tobacco field located very near an irrigation pond was sprayed with endosulfan immediately prior to a very heavy rain. It was alleged that "several" fish, species not given, suffered mortality because of resulting runoff into the pond. The report implied that, in the pesticide application, care was not taken to observe label buffer requirements.
I003238-001	Cotton	8/1/1995	AL	N/R	4	RU	unknown fish	thousands	M	More than 240,000 fish were killed along a 16 mile stretch of the Big Nance Creek that flows into the Tennessee River. A pesticide product (made by FMC Corp. of Philadelphia), containing methyl parathion and endosulfan, was sprayed by airplanes and tractor-type applicators on about 10 farms in early August. Shortly thereafter, heavy rains washed the pesticide product into the creek. Reports indicate that the spraying was done within the guidelines on the label but the results show that the provisions on the label should be revised.
I002591-001	Cotton	8/6/1995	AL	Lime-stone	4	RU	bluegill catfish	thousands thousands	M	According to Alabama Department of Agriculture, 240,000 fish of diffent species were killed along a 16 miles stretch of the Big Nance Creek from North Courtland to where the water flows into Tennessee River just south of Wheeler Dam. A pesticide application to the cotton field followed by heavy rain was suspected as a cause of this huge fish kill due to a pesticide runoff from the cotton field to the Big Nance Creek. Samples of water and the dead fish were obtained for analysis to determine the cause of the fish kill.
I010444-005	Lettuce	12/1/1995	CA	Imperial	3	MA	n/r	1000	M	To comply with 6(a)2 regulations, FMC reported a fish kill that took place in Bard, CA in December 1995. It was FMC's understanding that either the Imperial Co. Ag Commissioner, the FBI, or the Bureau of Reclamation had notified EPA of the incident but that was not the case. An applicator was fined for spraying endosulfan into a water drain next to a lettuce field, causing a kill of approximately 1000 fish.

Incident ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
I003668-001	Agricultural Area	6/10/1996	LA	Rapides	4	RU	bass bowfin carp channel catfish crappie flathead catfish shad	hundreds hundreds hundreds hundreds hundreds hundreds hundreds	M	A large fish kill occurred in Bayou Rigolette and Bayou Rapids on or about June 10, 1996. The kill stretched between Grant and Rapides parishes. Endosulfan had been applied to neighboring areas and extremely heavy rain (over 9 inches) washed much of it into the bayous. Samples of water, sediment, and fish tissue indicated that endosulfan caused the fish kill.
I004668-003	N/R	6/19/1996	LA	Rapides	4	UN	bowfin carp crappie shad	some of 500	M	Fish kill #96-43 occurred in Bayou Rapides from west of England Air Base to Hot Wells. Approximately 500 fish were killed. Fish tissue were found to contain endosulfan.
I004993-010	N/R	6/29/1996	CA	Placer	3	UN	trout	200	M	Two hundred rainbow trout died of endosulfan poisoning on June 29, 1996, in Placer County.
I003659-001	Tomato	7/1/1996	VA	Accomack	3	UN	clam	thousands	M	A farmer accustomed to raising clams, using water from the Gargatha Creek which flows nearby, has had to import water from Chincoteague Bay 10 miles away. Gargatha Creek has been badly contaminated, evidently, with pesticides as the result of a new procedure for growing tomatoes commercially. Farmers form soil beds running the length of fields, with drip irrigation tubes along those beds. The beds are covered tightly with a long shroud of thin plastic and tomato seedlings are punched at intervals through the plastic. Pesticides are applied to the plants in, presumably, the usual fashion. The problem is that when rain comes, there is a large runoff of pesticides from the plants and, because so little soil is available to absorb the runoff, the nearby creeks are badly contaminated with the pesticides. As these creeks flow into adjacent waterways their loading of pesticides kills the shellfish in the waterways.
I004864-001	Alfalfa	7/15/1996	CA	Imperial	4	MI	carp threadfin shad tilapia	unknown unknown unknown	M	An extensive fish kill took place in Imperial County following an aerial application of Thiodan 3 EC (a.i. endosulfan). The state Fish & Game warden reported 3000 fish killed, whereas the federal Fish & Wildlife warden reported 5000+ fish killed. Analysis of fish tissue, water, and vegetation confirmed the presence of endosulfan. The grower irrigated an alfalfa seed field that was adjacent to the Pumice drain, which flows into the Salton Sea. This application was made in violation to the label restriction which prohibits irrigation within 72 hours of application. This caused endosulfan to A civil penalty was assessed.

Incident ID	Use Site	Date [1]	State [2]	County [3]	Cert. Code [4]	Legal. Code [5]	Species	Magnitude	Effect [6]	Summary Description [7]
I004993-011	N/R	7/15/1996	CA	Imperial	4	UN	carp shad tilapia	thousands thousands thousands	M	According to the report from CA Fish & Game, 3000 carp, tilapia, and threadfin shad died in Imperial County on July 15, 1996. Cause of deathwas attributed to endosulfan.
I004439-069	Alfalfa	8/4/1996	CA	N/R	3	RU	unknown fish	thousands	M	Approximately 3000 to 4000 fish were found dead in a canal near Calapatria, CA. This canal runs close to an alfalfa field that had recently been sprayed with endosulfan. The incident is under investigation by state officials.
I007546-050	Agricultural Area	6/16/1997	IN	N/R	3	MA	n/r turtle	unknown 1	M	To comply with 6(A)2 regulations, FMC Corp. reported an incident in Indiana that was caused by Thiodan 3 EC. The product was applied closer to a field than allowed per label instructions, the result being dead fish, a dead turtle, and a dead deer near the pond.
I006173-001	Agricultural Area	10/2/1997	TX	N/R	3	RU	n/r	unknown	M	A citizen reported that Asana@ XL(Esfenvalerate) was applied at rate of 0.02 lb a.i/acre, along with Thiodan (Endosulfan) at rate of 1 qt/acre, to treat cowpeas for curculio. In addition a 4-11-11 fertilizer had recently been applied to the field at rate of 20 gal./acre. Five days later, it rained 3"-5" in a short amount of time, thus, causing runoff to the nearby fish pond. This caused some fish kill in the pond. No number of fish kill or any other data was reported.
I012265-002	Potato	7/23/1998	(Can.)	N/R	3	RU	n/r	unknown	M	A fish kill occurred in a portion of the Huntley River, on Prince Edward Island, Canada, on July 23, 1998. There had been a hard rain the previous night and, when the fish kill was reported, an investigation of the incident began. Dead fish were found at a number of locations along the Huntley River. Samples were collected at selected sites along the river. It was determined that runoff from an adjacent potato field entered the river at one point, and samples of water were taken from above and below that point; dead fish were found only below that point. A survey of farmers in the area was made to determine which pesticides had been used, and then analyses were made of the water samples and sediments for those particular pesticides. No analyses were made of the fish, therefore one cannot say what caused the death of the fish. However, in certain areas the concentrations of azinphos-methyl and endosulfan were extremely high and either could have been responsible.
I017028-001	Potato	8/9/2000	(Can.) P.E.	N/R	2	UN	stickleback trout	unknown >50	M	On August 9th, 2000, the Department of Fisheries, Aquaculture, and Environment (DFAE) reported a fish kill on the French River in Prince Edward Island, Canada. An unknown number of dead trout and sticklebacks was found. Approximately 50 trout were collected. Azinphos-methyl was found in the livers (0.22 ppm) and gills (0.39 ppm) of the dead trout. The azinphos-methyl was thought to originate from a potato farm up-river. However, only one trace detection of azinphos-methyl was found in a sediment sample from outside the suspected field in French River.

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I012283 -001	Agricultu ral Area	9/1/2000	TN	Sequatch-ie	3	MA	darter largemouth bass	thousands thousands	M	In September, 2000, endosulfan was accidentally introduced by a produce farmer into the Sequatchie River, killing approximately 200,000 fish (from tiny darters to largemouth bass) in a 12-mile section of the river. The farmer illegally instructed his employees to add endosulfan to his irrigation system. The pesticide was then introduced into the river when the system was backwashed. The farmer was order to pay approximately $43,370 to the Tennessee Wildlife Resource Agency for restitution of loss of the fish.
I013531 -001	Water Treatmen t System	9/1/2000	TN	Bledsoe	3	MI	bass	thousands	M	An article in the ESPN Outdoor Fishing News, of Sept. 25, 2001, told of a sentencing that took place in the U.S. District Court in Chattanooga, TN, on Sept. 7, 2001. The case concerned a Pikeville man who was responsible for a major fish kill in the Sequatchie River when he instructed the employees of his produce company to dump endosulfan into an irrigation system; the river was contaminated when the irrigation system was backwashed, causing the pesticide to be introduced into the Sequatchie River. The defendant was ordered to pay $42,369.98 to the Tennessee Wildlife Resources Agency and $1,602.44 to the Dunlap Water System for damage to their water treatment system. He also had to perform 150 hours of community service.
I014189 -001	Cotton	9/10/2002	CA	Riverside	4	RU	channel catfish striped bass threadfin shad tilapia	at least 1 600-700 at least 4 at least 2	M	On September 12, 2002, a fish kill in the Palo Verde outfall lagoon was reported. It was estimated that between 600 to 700 fish were found dead. Species involved were Thredfin Shad (600), Catfish (20), Tilapia and Striped Bass. The incident appeared to be two to three days old based upon the state of the fish carcasses. Fish suitable for necropsy and collection of tissues for residue analysis. These were four shads, one catfish, one striped bass and two tilapias. Water samples from the lagoon and outfall were also taken. The fish tissue and water samples were analyzed for the presence of organophosphate, carbamate and organo-chlorine pesticides. The conclusion was that the presence of endosulfan residues in the gill tissue and in both lagoon and outfall water suggest that it was probable responsible for the fill kill. A follow-up report was prepared for EPA Region IX. The investigation summary showed that RIV CAC did not fine any violations. No enforcement action taken. Data are from the USGS National Wildlife Health Center quarterly mortality report. No other details given.
I014884 -022	N/R	10/14/2003	CA	Kings	3	UN	bullhead carp threadfin shad	over 50 over 100 over 200	M	California Department of Fish and Game report of fish and wildlife incidents involving pesticides for calendar years 2002 and 2003. The State reported that several species of fish were affected by Endosulfan and Chlorpyrifos. The report did not give the number of each species used for chemical analysis. Their Certainty Index was given as most probable. The Department of Fish and Game Pesticide Laboratory reported its analysis. This included water and fish gill tissue. Their findings gave endosulfan as the primary exposure with

Inci-dent ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
										chlorpyrifos contributing to the fish kill.
I018075 -001	Alfalfa	6/21/2006	CA	Imperial	4	RU	carp catfish redhorse	most of 5,000 unkown unknown	M	Endosulfan was released into the Pumice Drain, adjacent to the Sony Bono Salton Sea NWR. The release was contained in the Imperial district drain. Dead fish were traced approx. two miles upstream from the drainage ditch. Approximately 5,000 fish (primarily carp) were killed. In addition to carp, some dead catfish and redhorse minnows were found. Eight of nine water samples found levels of total endosulfan that would be lethal to fish. Endosulfan and endosulfan degredation products were also found in carp gill samples and in a redhorse minnow. Endosulfan had been applied to alfalfa fields in the area. Staff of the Imperial County Agricultural Commissioner indicated that the applications complied with irrigation restrictions on the endosulfan label. However, a large amount of irrigation water had backed up in one of the fields, immersing much of a field, prior to being discharged into the Pumice Drain. This likely contributed to the high levels of endosulfan leaving the field and entering the drain.
B0000-300-42	Potato		DE	New Castle	2	UN	unknown fish	1000	M	A letter from H. Grier Stayton, Delaware Dept. of Agriculture, Div. Consumer Protection, to Frank Davido (7/23/92) contained a packet of wildlife poisoning incidents that had been documented since 1989. Included in it was the record of a fish kill in the city of Townsend caused by the runoff of pesticides from a potato field after a rainstorm. The pesticides were applied at the rate of 5 gallons/acre and the pesticides used were Ridomil (metalaxyl, 0.96 lb), Thiodan 3EC (endosulfan, 0.85 lb), and Kryocide (cryolite, 7.76 lb). There were no analyses made of the water or of the fish that died.
I004875 -002	N/R		LA	Grant	4	UN	bass bowfin carp catfish crappie shad	thousands thousands thousands thousands thousands thousands	M	A fish kill occurred in Bayou Rigolette at the intersection of Hwys 71 and 3169, all the way past the intersection of Hwy 92. Thiodan was found in the samples of water sediment, and fish tissue and was adjudged to be the cause of death. No violations were found and no enforcement action was taken.
I005754 -017	Agricultu ral Area		CA	Riverside	1	MA	unknown fish	13000	M	A heavy rain in Riverside County, CA, resulted in a substantial runoff of pesticides from a crop dusting loading area. Approximately 13,000 fish were killed and legal action was taken against the aviation company. The event occurred some time between January 1, 1972 and June 30, 1973.

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I011716-002	Cotton		AZ	Maricopa	3	MA	white amur grass carp	dozens	M	A crop-dusting plane by pilot John Pew, misdirected spray suffocated dozens of White Amur grass carp. The pilot was to spray Thiodan and Checkmate over a cotton field to kill the common whitefly, The fish kill cost the Salt River Project (SRP) $4,000 to replace the fish, but, the pilot was fined $113 plus $182 for spraying the house.
TERRESTRIAL INCIDENTS										
I014404-001	Tree Farm/Plantation	6/1/1990	WA	Thurston	2	UN	unknown plant	n/r	P.D.	The Annual Report 1991 from the State of Washington included an incident in Thurston County in which a complainant charged that a pesticide applied to a Christmas tree plantation drifted onto his property. There is no mention of specific damage caused by the incident. The report from the Environmental Health program indicated that endosulfan was the pesticide that was sprayed.
B0000-219	Potato	7/22/1974	ID	Canyon	2	MA	bee	unknown	M	Many bees were killed, presumably as the result of the aerial spraying of thiodan on a neighboring field. No analytical data were provided as proof.
I002135-001	Industrial Waste	1/1/1995	(Mex.)	N/R	2	UN	duck	40000	M	According to the report more than 40000 dead or moribund ducks were discovered near a reservoir where migrating ducks dwelled. Endosulfan was suspected as being responsible for the observed mortalities because the reservoir receives wastes from adjacent tanneries. Investigation conducted through the Ministry of Water confirmed this hypothesis through revealing positive endosulfan residue in sediment, water and duck livers. This investigation is being challenged by AgrEvo Research Center because the university and the Ministry of Health did not confirm the endosulfan hypotheses but set forth supporting evidence that the duck mortality was due to the ingestion of heavy metals. There has been no resolution at the time of the reporting memo.
I003826-009	Orchard	4/28/1995	NC	Henderson	2	UN	bee	unknown	M	A bee keeper in Hendersonville, NC, asked the NC Dept. of Agriculture to determine the cause of his bees' death. Accordingly the Ag. representative interviewed farmers in the surrounding area and learned that a variety of products had been used, but none admitted to spraying Penncap M, which is what the bee keeper suspected as being the cause of the incident. On April 18, Polyram and Nova (maneb, myclobutanil) were sprayed; on April 27, Sevin (carbaryl) was sprayed; on April 29 Phaser, Polyram, and Rubigan were sprayed (endosulfan, maneb, fenarimol); on April 18 a second farmer applied Polyram and Nova; on April 19 Captan and Rubigan (fenarimol) were sprayed along with sulfur. Dead bees were noticed on April 28 and some were collected for analysis on May 1, at which time various samples of vegetation were also taken. The dead bees contained 3.1 ppm methyl parathion, 0.10 ppm chlorpyrifos, dimethoate and metabolite (1.7 ppm), and endosulfan and metabolite (0.20 ppm). Vegetation from the nearby orchards contained various

Inci-dent ID	Use Site	Date (1)	State (2)	County (3)	Cert. Code (4)	Legal. Code (5)	Species	Magnitude	Effect (6)	Summary Description (7)
										amounts of chlorpyrifos, captan, dimethoate, endosulfan, and carbaryl but no methyl parathion. The conclusion of the Dept. of Agriculture was that it could not identify the source of the methyl parathion which probably was mainly responsible for the bee deaths.
I010533 -001	Cotton	1/1/1999	(Afr.)	N/R	3	RU	frog owl termite	1 1	M	Ceres International LLC is a member of the Endosulfan Task Force, and felt it necessary to inform EPA of a situation in Benin, Africa, that is causing multiple deaths. Human health is not within the purview of our EIIS database, so much of the material covered in the lengthy article that was enclosed is not pertinent. A minor portion of the report was pertinent. A farmer in the Banikoara region witnessed the breakup of the food chain by endosulfan. His account is as follows: "Some termites were killed in a cotton farm sprayed by endosulfan. A frog fed on the dead termites, and was immobilized a few minutes later. An owl which flew over the immobilized frog, caught it as a prey, and then sat down on a tree branch to enjoy its meal. Ten minutes later, the owl fell down and died
I012973 -001	N/R	7/7/2001	NY	Monroe	1	UN	cooper's hawk	1	M	A Cooper's hawk died on July 7, 2001, in Pittsford, NY, and ultimately necropsied by the NY Wildlife Pathology Unit. There were no signs of traumatic injuries, but a presumptive diagnosis of chlorinated hydrocarbon pesticides was made. A test for West Nile Virus was negative. A chlorinated hydrocarbon screen of the brain showed that more than twice the lethal level of dieldrin was present along with a potentially lethal combination of chlordane metabolites; also, endosulfan I and II were found. A dead red-tailed hawk was recovered from farm land near Fruita, CO and a necropsy showed that the hawk died from the ingestion of Famphur. This was part of a report from the Fish and Wildlife Service which alleges that the hawk probably died from ingesting a magpie that, in turn, had been killed by Famphur. Famphur is the active ingredient in Warbex which is commonly used to control grubs in cattle. The report from FWS indicates strongly that the hawk died ultimately from a prior use of Warbex, but the evidence is not completely convincing about that. It can be said, however, that the hawk died from Famphur toxicosis.

Incident ID	Use Site	Date [1]	State [2]	County [3]	Cert. Code [4]	Legal. Code [5]	Species	Magnitude	Effect [6]	Summary Description [7]
I012626-001	N/R	1/14/2002	MD	Montgom-ery	3	UN	blue jay crow opossum red fox squirrel	1 1 1 1 12	M	Four gray squirrels were submitted to SCWDS for necropsy by the MD Dept. of Natural Resources. These were submitted as part of a mortality event involving several species of birds and mammals. A walk through of the 2 acre vacant lot retrieved 12 squirrels, 1 blue jay, 1 crow, 1 red fox, and 1 possum. Two neighborhood dogs experienced seizures, and the dogs improved and were discharged from the local veterinary clinic. Toxicology results showed 126 ppm of endosulfam in the pooled GI content sample from the four squirrels. There was no indication of where the exposure to endosulfam happened and its source.
AQUATIC/TERRESTRIAL INCIDENTS										
B0000-501-87	Agricultural Area	5/9/1988	CA	Imperial	2	MA	catfish egret shad	50 12 50	M	On May 9, 1988, approximately 100 fish and 12 birds died at a pond at a duck club in Imperial County, CA. The fish were analyzed and found to contain dacthal (26.3 ppm), DDE (0.11 ppm), diazinon (0.1 ppm), and endosulfan (0.92 ppm) based on whole body and fresh weight. An analysis of the water showed no pesticides present, but no mention was made of the time lag between the event and the sampling of the water. Analyses of the livers of several egrets showed dacthal to be present but at less than 1 ppm. Two weeks later, on May 24, several catfish were seined from the pond and high concentrations of dacthal were found in their livers (1.77 to 9.2 ppm) The source of the pollution of the pond seemed to be a nearby crop dusting loading facility.

[1] Source: USEPA Ecological Incident Information System. (Download date: March 25, 2009).
[2] Date: = start date of incident report.
[3] State: values in parenthesis represent countries of origin when states are not reported or applicable.
[4] Certainty Code: 1 = unlikely; 2 = possible, 3 = probable, 4 = highly probable
[5] Legality Code: MA = misuse accidental, MI = misuse intentional, RU = registered use, UN = unknown
[6] Effect Code: M = mortality; P.D. = plant damage.