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098301
SHAUGHNESSEY NO.

REVIEW NO.

EEB BRANCH REVIEW

DATE: IN 5/4/81 OUT 02/20/82

FILE OR REG. NO. 261-330 264-331

PETITION OR EXP. PERMIT NO.

DATE DIV. RECEIVED

DATE OF SUBMISSION 5/4/81

RD ACTION CODE 335 Amendment - Food Use

TYPE PRODUCT(S): I, D, H, F, N, R, S Nematicide/Insecticide

DATA ACCESSION NO(S).

PRODUCT MANAGER NO. J. Ellenberger PM-12

PRODUCT NAME(S) Temik 15-G / Temik 10-G

COMPANY NAME Union Carbide

SUBMISSION PURPOSE Conditional Registration of Temik on sorghum, tomatoes, and citrus.

(Hazard Assessment contains OES biological opinion and results of 1981 Texas grapefruit monitoring study.

SHAUGHNESSEY NO.	CHEMICAL, & FORMULATION	% A.I.
098301	Aldicarb [2-methyl-2-(methylthio)propion-	
	aldehyde -O- (methylcarbamoyl)oxime. [10-G]	10
098301	Same as above [15-G]	15

100.0 Pesticide Use

For control of certain nematodes, insects, and mites in sorghum, tomatoes (field and greenhouse), and citrus (grapefruit, lemons, limes.

100.1,.2 Application methods/direction/rates

(See attached Labels Appendix I and II)

100.3 Purpose of submission

To amend both the 10G and 15G labels to include tomatoes, sorghum, citrus

100.4 Environmental hazards statement

Proposed label
THIS IS TOXIC TO FISH, BIRDS, AND OTHER WILDLIFE. Birds feeding on treated areas may be killed. Keep out of any body of water. Do not contaminate water when cleaning equipment or disposing of wastes. Apply this product only as specified on this label.

101.0 Chemical and physical properties

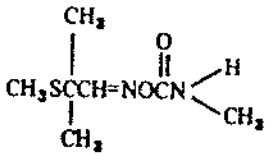
101.1 Chemical name

2-methyl-2-(methylthio)propionaldehyde-o-(methylcarbamoyl)oxime

101.2 Common name

Aldicarb, TEMIK 10G, Temik 15G

101.3 Structural formula



101.4 Molecule weight

190.3

101.5 Physical State

White crystalline solid with slightly sulfurous odor.

102.1 Mammals

Test Species	LD50 (mg/kg)	Confidence Limits (P <.05)	% Active Ingredient	Validation Status
Rats (males)	0.9	?	?	?
Rats (females)	1.0	?	?	?
Rat	0.6 mg/kg	N.R	?	?
Mouse	0.4 mg/kg	N.R	?	?

102.2 Bird (oral)

Test Speices	LD50 (mg/kg)	Confidence Limits (P <.05)	%Active Ingredient	Validation Status
Mallard (14-day)	1	(1-2)	100	core (Matheny 9/24/79)
Mallard	4.44	unknown	unknown	Supplemental (Felthousen 1/19/79)
Bobwhite 1/	3.4	unknown	10	Supplemental (Felthousen 1/19/79)
Pigeon	3.16	1.78-5.62	tech	not validated (Schafer, 1979)
Grackle	0.75	(0.33-1.69)	tech	not validated (Schafer, 1979)
Red-wing	1.78	(1.00-3.16)	tech	not validated (Schafer, 1979)
House sparrow	0.75	0.33-1.69	tech	not validated (Schafer, 1979)

Footnotes

1/ Supposedly the above cited LD50 was obtained using the 10% formulation (LD50= 34 ppm). The study in question was reportedly conducted by the registrant cia 1978 or 1979. Several attempts at retrieving the study data from Union Carbide representitives (Larry Hodgers) were unsucessful and as such these data will not be used in EEB's avian hazard assessment(Section 104.0).

102.3 Bird (Dietary)

Test Species	LC50 (ppm)	Confidence Limits (P <.05)	%Active Ingredient	Validation Status
Mallard (5-day)	594	(507-695 ppm)	100	Core (Turner 1/9/78)
Bobwhite	2400	(1860-3096 ppm)	10	Supplemental (Turner 1/9/78)
Bobwhite	71	(59-85 ppm)	100	Core (Matheny 9/24/79)
Ring necked Pheasant	>300 ppm	N/A	unknown	
Japhanese Quail	381	(317-453 ppm)	unknown	Supplemental (unknown)

102.4 Fish

Test Species	96-hour LC50 (ppm)	Confidence Limits (P <.05)	%Active Ingredient	Validation Status
Rainbow	0.56	0.47-0.68	100	Core (Faatz 2/19/80)
Bluegill	0.063	0.052-0.076	100	Supplemental* (Faatz 2/19/80)
Rainbow	0.88	Not cited	10	Invalid (Unkown)

* Re-evaluated and upgraded to supplemental status in this review (Appendix IV).

102.5 Freshwater Invertebrates

Test Speices	48 hour LC50 (ppm)	Confidence Limits (P <.05)	% Active Ingredient	Validation Status
Daphnia magna	0.410	0.338-0.498	100	core (Turner 1/6/78)

102.6 Marine Invertebrates

Organisms

Static Test :EC50 or LC50 (ppb)

Algae	-	$5X10^4$	(EPA, Gulf Breeze Data)
Oyster (Larval)	-	8,800	(EG & G data)
Mysid shrimp	-	13	(EPA, GBL data)
Penaeid shrimp	-	72	(" " ")
Pinfish (spot)	-	202	(" " ")
Sheepshead Minnow	-	168	(" " ")

Dynamic Test :LC50 (ppb)

Mysid shrimp	-	16	(EG & G data)
Penaeid shrimp	-	27	(")
Pinfish (spot)	-	218	(")
Sheepshead Minnow	-	111	(")

Chronic Toxicity - MATC (ppb)

Mysid shrimp	-	1	(EG & G data)
Grass shrimp	-	>10	(")
Sheepshead Minnow	-	50	(")

EPA, Gulf Breeze Laboratory - LC_{50} data - estuarine organisms vs. - Aldicarb - Most recent testing (as of 2/28/80).

Species	LC50 (ppb)	95% c.i. (ppb)
Mysid shrimp	16	(13 - 20)
Pink shrimp	12	(7.5 - 18)

* as of 10/02/81 data has not been validated by the Ecological Effects Branch.

Product Description (Felthousen 1/19/79)

Aldicarb is a carbamate insecticide which causes cholinesterase inhibition at very low doses. It has muscarinic effects at exocrine, excretory, cardiac and bronchial sites which are exhibited overtly by salivation, lacrimation, defecation, urination, slowing of the heart and trouble with breathing. It also has nicotinic effects evidenced by muscle fasiculations. Atropine has been shown to antagonize the muscarinic effects of most cholinesterase inhibitors. Aldicarb's chief metabolites, aldicarb sulfoxide and aldicarb sulfone are also potent cholinesterase inhibitors. Atropine was shown to be antidotal to the muscarinic and lethal effects of aldicarb and its metabolites when these compounds were given to rats at twice their LD_{50}.

Introduction

This review is being made as an incremental risk assessment for conditional registration. Currently Temik is registered to control certain insects, mites and/or nematodes on cotton, peanuts, potatoes, sugar beets, oranges, dried beans, pecans, soybeans at planting, ornamentals and, in Louisiana only, sugar cane and sweet potatoes. The current proposal is for an added use on tomatoes, sorghum, and citrus (Grapefruit, Limes, Lemons).

Agricultural Practices

Sorghum

Expanding the use of Aldicarb on sorghum will result in adding up to 18 million acres in roughly 21 states (USDA Agricultural Statistics, 1978). This new proposed use is to control nematodes in sorghum with a single application of Temik 10G or 15G at the time of seed planting (April through June). Granules are applied in seed furrow and covered with soil. The maximum rate of application is one pound active ingredient/acre. The toxicant is released from the granule carrier when moisture is added to the soil. See Appendix I and II for detailed use direction and specific rates of application.

Major Sorghum growing states (from USDA Agric. Statistics 1978)

State	Acres (X1000)	State	Acres (X1000)
Texas	8,000	Arizona	130
Kansas	4,000	North Carolina	115
Nebraska	2,100	Georgia	80
Oklahoma	760	Mississippi	75
Missouri	625	Alabama	65
Colorado	510	Tennessee	51
South Dakota	410	Iowa	40
Maryland	24	Florida	129

New Mexico	353	Kentucky	36
Arkansas	230	South Carolina	30
California	230		
		Total	18,440,000

Tomatoes

Expanding the use of Temik on tomatoes (field and greenhouse) will result in adding up to 500 thousand acres in roughly 27 states (USDA Agricultural Statistics, 1978). This new proposed use is to control nematodes in tomatoes with a single application of Temik 10G or 15G just prior to or at the time of transplanting or seeding usually in February or March in southern states and up to May in northern states. Granules are drilled or broadcast (uniform or banded) and then worked (disked, tilled) or watered into the soil. The maximum rate of application is 4 pounds active/acre. Aldicarb is released from the granule carrier when moisture is added to the soil. See Appendix I and II for specific use directions and rates of application.

States where tomatoes are commercially grown for market and processing are listed below (USDA Agricultural Statistics 1976)

State	Acres
Alabama	8,000
Arkansas	3,200
California	326,000
Colorado	1,020
Connecticut	640
Florida	31,600
Georgia	2,600
Hawaii	230
Illinois	1,100
Indiana	17,700
Kentucky	700
Louisiana	850
Maryland	6,700
Massachusetts	630
Michigan	8,700
Missouri	680
New Jersey	17,100
New Mexico	860
New York	5,500
North Carolina	1,700
Ohio	25,300
Pennsylvania	9,450
South Carolina	8,000
Tennessee	1,900
Texas	11,000
Washington	600
Virginia	6,400
Total	498,160

Citrus

Expanding the use of Temik on citrus (grapefruit, Limes, Lemons) will result in adding up to 324,116 acres in roughly 4 states (USDA Agricultural Statistics, 1978). This new proposed use is to control nematodes in citrus with a single application of Temik 10G or 15G just prior to or during spring flush of foliage growth usually February through March. Granules are applied in bands along driplines or in irrigation furrows at rates up to 10 lbs/active/ acre. Applications are worked in the soil(preferred method) or shanked 2 to 3 inches deep. Irrigation is recomended following application. See Appendix I and II for specific use directions and rates of application. The toxicant is released from the granule carrier when moisture is added to the soil.

	Texas	California	Arizonia	Florida
Grapefruit	47,800	20,714	9,697	161,468
Lemons	62	52,75	19,184	6,065
Limes	-	468	-	5,908

Total citrus acreage = 324,116

104.0 HAZARD ASSESSMENT

Introduction

Granular hazards to non-target mammalian and avian species are based upon the average weight of one (1) 15-G granule and the LD50 for the most sensitive organisms tested (Section 102.1-102.2). Aquatic hazards are based upon estimated aquatic concentrations resulting from contaminated rainwater runoff and the LC50 for the most sensitive aquatic organism tested (Section 102.3 -102.6). Toxicological extrapolations across species lines do not include the possibility of species hyper-sensitivity to Aldicarb.

Review of the wildlife kills by granular pesticides indicates that minor application errors can result in significant adverse effects. The following application errors have been implicated in wildlife incidents:

1. Failure to thoroughly wash granules into turf.
2. Improper positioning of the granule delivery tube.
3. Application to wet soil, i.e., poor mixing.
4. Failure to incorporate immediately after application.

It is the Agency's position that any failure to follow use directions or good farming practices, the end result of which increases the surface exposure of granules, will significantly increase the hazard to wildlife.

Aldicarb's label directions requiring soil incorporation are particularly important because it serves to reduce pesticide exposure to wildlife. It is the Agency's position that soil incorporation may reduce exposure; however, granular formulations of Aldicarb are of such high toxicity that the qauntity left on the soil surface, even by the most advanced technology, still poses a significant hazard for wildlife. Furthermore, it is important to note that incorporation also serves to attract numerous species of birds that regularly utilize soil invertebrates, seeds, and foliage exposed during this type agricultural activity.

Mammalian Exposure

Aldicarb (Temik 10G and 15G)is extremely toxic to mammal (rat LD50= 0.6 mg/kg; mouse LD50 = 0.4 mg/kg). Exposure to mammals is expected to occur through the accidental ingestion of granules during the process of feeding and/or grooming. A rat LD50 of 0.6 mg/kg was used to establish a mammalian classification trigger (1/5 LD50) of 0.12 mg/kg. Comparison of this trigger with the amount of aldicarb known to be present in both the 10-G (0.06 mg/kg) and 15-G (0.09 mg/kg) reveals that ingestion of a single granule of either

formulation by any mammal weighing less than 500 grams will exceed this trigger. The toxicological hazards posed by Alidcarb residues to four (4) species of mammals known to frequent cultivated fields and citrus groves are further delineated in Table 1. These calculations indicate that even the heavier mammals (approximately 1 kg) are not immune to Alidcarb since ingesting as few as 7 granules could exceed an individuals LD50 value. However, considering that exposure is likely to occur accidentally, mammals that can exceed their LD50 by ingesting one or two granules would be the ones most likely effected. Calcuations for maximum weight(g) for mammals likely to exceed their LD50 by ingesting one (1) or two (2) 10-G or 15-G granules are shown below:

$$\text{Animal Weight (g)} = \frac{(\text{Granule Weight(mg)} \times \text{Percent Active}) \times 1000}{\text{LD50}}$$

		1 Granule	2 Granule
For 15G :	$\text{Animal Weight (g)} = \frac{(0.6\text{ mg} \times .15) \times 1000}{0.6\text{ mg}}$	= 150 g.	300 g.
For 10G :	$\text{Animal Weight (g)} = \frac{(0.6\text{ mg} \times .10) \times 1000}{0.6\text{ mg}}$	= 100 g.	200 g.

In conclusion, registration of Aldicarb (10G/15G) for an additional 19.2 million acres of sorghum, tomatoes, and citrus will result in a significant increase in exposure, but not in acute risks to non-target mammals. More specifically, mortalities are expected to result from the accidental ingestion of granules and as such, the likelihood of a mammalian species ingesting a lethal dose of Aldicarb should increase in use patterns with high rates of application (i.e., tomatoes, grapefruit,lemons,limes). Mortalities are expected to occur primarily in small mammals (less than 300 grams) and to be heaviest during the first week following product application. Because Aldicarb is a carbamate insecticide (i.e., cholinesterase inhibition is reversible) non-target mammalian mortalities are expected to occur via acute toxicity and predator depredation of temporarily paralysed individuals. The hazard to mammalian wildlife should be significantly reduced following rainfall or irrigation of incorporated areas. While the above review can predict both increased exposure and acute risks to non-target mammals it cannot determine the extent of mortalities that will occur under actual use conditions. Therefore, the Ecological Effects Branch will require the registrant to conduct field searches that will quantify non-target mammalian mortalities resulting from aldicarb granules (See Section 107.5 Data Requests).

Table 1. Adicarb's (10G/15G) Hazard to Four Species of Non-Target Mammals.

Species	Body Weight (g)	MG/ Animal (g) §§	Number of Granules equal to LD_{50} 1/ 10G Granules @@	15G Granules ©©
Rat -††	200	0.12	2.0	1.3
Eastern Cottontail (Adult)	1100	0.660	11.0	7.3
Weaned Young 20 Days Old	85	0.051	0.9	0.6
Grey Squirrel (Adult-Female)	520	0.312	5.2	3.5
Weaned Young 10 Weeks Old	200	0.120	2.0	1.3
Delmarva Fox 1/ Squirrel (Adult-Female)	795	0.477	8.0	5.3
Weaned Young 8-10 Weeks Old	454	0.272	4.5	3.0

FOOTNOTES

††-Rat LD50= 0.6 mg/kg (Emperical Data).

1/ Weight one (1) 15G granule = 0.6 mg (Bowen/Balcomb,Beltsville Lab. 7/24/81).

@@- Weight one (1) 10G granule = 0.6 mg X 10 % = 0.06 mg/Aldicarb/granule.

©©- Weight one (1) 10G granule = 0.6 mg X 15 % = 0.09 mg/Aldicarb/granule.

§§- Example = Rat LD50 X Animal Weight(kg) = 0.6 mg/kg X 0.085 kg = 0.051 mg/kg.

$$\text{Number of 10-G granules required to equal LD50} = \frac{0.051 \text{ mg/kg}}{0.06 \text{ mg/Aldicarb/granule}} = 0.85 \text{ granules}$$

2/ Weight data obtained via telephone conversations with Gary Taylor (301-827-8612) and Dr. Vagan Flyger (454-4641) of the Delmarva Fox Squirrel Recovery Team.

Avian Exposure

Aldicarb is extremely toxic to birds (Mallard LD50= 1.0 mg/kg;Grackel LD50= 0.75 mg/kg;Red-Winged Blackbird= 1.78 mg/kg). Granular formulations of Aldicarb have been responsible for at least eight documented bird kills in England and Germany (See Appendix III). Aldicarb's single dose oral LD50 easily exceeds the Agency's proposed granular classification trigger (LD50 < 50 mg/kg) for a restricted use pesticide. Exposure to birds is expected to occur through the accidental ingestion of exposed and covered granules during feeding or the intentional ingestion as dietary grit, seeds, or other edible materials. The toxicological hazard posed by Aldicarb residues to seven (7) species of birds known to utilize cultivated fields and citrus groves is further delineated in Table 2. These calcuations suggest that birds weighing as much as 1.2 kilograms could exceed their LD50 value by ingesting as few as 12 granules of the 15 % formulation. However, birds that could exceed their LD50 values by ingesting one (1) or two (2) granules would be the ones most likely affected. Calcualtions for maximum weight(g) for birds likely to exceed their LD50 by ingesting one (1) or two (2) 10-G or 15-G granules are shown below:

$$\text{Weight [g.]} = \frac{(\text{Granule Weight [mg]} \times \text{Percent Active})}{\text{LD50}} \times 1000$$

	1 Granules	2 Granules
For 15G = $\frac{(0.6\text{ mg} \times .15) \times 1000}{1.0\text{ mg/kg}}$	= 90 g.	180 g.
For 10G = $\frac{(0.6\text{ mg} \times .10) \times 1000}{1.0\text{ mg/kg}}$	= 60 g.	120 g.

Both Red-winged Blackbirds (Agelaius phoeniceus) and House Sparrows (Passer domesticus) were oral dosed with Aldicarb 15G granules at EPA's Beltsville Laboratory (Balcomb and Bowen 11/20/80). Twenty four (24) hour mortality data are presented below:

Number of Granules	Red-Winged BlackBird	House Sparrow
1	2 of 5 birds dosed died(40% mortality)	4 of 6 birds dosed died (66 % mortality)
5	5 of 5 birds dosed died(100% morality)	not tested

Table 2. Aldicarb's (10G/15G) Hazard to Seven Species of Non-Target Birds.

Species	Body Weight (g)	MG/ Animal (g) §§	Number of Granules equal to LD_{50} 1/ 10G Granules @@	15G Granules ©©
Mallard ®® (14-day)	200	0.20	3.3	2.2
Mallard (adult)	1200	1.20	20.0	13.3
Robin	80	0.08	1.3	0.9
Mourning Dove	100	0.10	1.7	1.1
House Sparrow	20	0.02	0.3	0.2
Redwing Blackbird	50	0.05	0.8	0.6
Grasshopper Sparrow	13.9	0.01	0.2	0.1
Attwater's 2/ Prairie Chicken (adult)	1000	1.00	16.7	11.1
(14-day)	50	0.05	0.8	0.6

FOOTNOTES

®®- Mallard LD50= 1.0 mg/kg.

1/ Weight of one(1) 15G granule = 0.6 mg (Bowen/Balcomb,Beltsville Lab. 7/24/81)

@@- Weight one (1) 10G granule = 0.6 mg X 10 % = 0.06 mg/Aldicarb/granule.

©©- Weight one (1) 10G granule = 0.6 mg X 15 % = 0.09 mg/Aldicarb/granule.

§§- Example = Mallard LD50 Animal Weight(kg) = 1.0 mg/kg X 0.200 kg = 0.200 mg/kg

$$\text{Number of 15-G granules required to equal species LD50} = \frac{0.200 \text{ kg}}{0.09 \text{ mg/Aldicarb/Granule}} = 2.2 \text{ granules}$$

2/ Weight data supplied by Wayne Shifflet (713-234-3021) refuge manager of Attwater's Prairie Chicken Refuge, Aransas, Texas.

Results from these studies not only document the acute toxicity of the formulated product to small birds but also serve to reinforce the estimated avian hazards cited in Table 2 since emperical and estimated toxicity data for Red-wings and Sparrows are in concurrence.

In conclusion, registration of Aldicarb (10G/15G) for an additional 19.2 million acres of sorghum, tomatoes, and citrus will result in a significant increase in exposure,but not an acute risk to non-target birds. More specifically, mortalities are expected to result from the accidental ingestion of exposed granules and as such the likelihood of an avian species ingesting a lethal dose of Aldicarb should increase in use patterns with high rates of application (i.e., tomatoes grapefruits, lemons, limes). Avian mortalites are expected to occur primarily in small birds (less than 180 grams) and to be heaviest during the first week following product application. Because Aldicarb is a carbamate insecticide (i.e, cholinesterase inhibition is reversible) avian mortalites are expected to occur via acute toxicity and predator depredation of temporarily paralysed individuals. The hazard to non-target avian wildlife will be significantly reduced following rainfall or irrigation of incorporated areas. While the above review can predict both increased exposure and acute risks to non-target birds it cannot determine the extent of the hazard that will occur under actual use conditons. Therefore, the Ecological Effects Branch will require the registrant to conduct field searches that will quantify non-target avian mortalities resulting from aldicarb granules (See Section 107.5 Data Requests).

Aquatic Exposure

Aldicarb is acutely toxic to fish (bluegill LC50= 0.06 ppm; sheepshead minnow LC50= 0.050 ppm) and aquatic invertebrates (Daphina magna LC50= 0.41 ppm; pink shrimp LC50= 0.012 ppm). The chronic effects of Aldicarb on freshwater fish and aquatic invertebrates are not known (See Section 107.5; Data Requests). Chronic toxicity (MATC) data indicates that relatively low levels (1 to 50 ppb) will cause adverse effects in marine fish and shrimp.

Aldicarb is stable to hydrolysis at pH 5-7 but proceeds at a faster rate under alkaline conditions with half-lives dependent upon temperature and pH. Aldicarb degradation in soils is dependent upon soil properties. It is most stable in soils exhibiting coarse texture, low pH, and low moisture. The compound is readily displaced by water and is carried deep into the soil material during periods of rain or irrigation. Estimated aquatic concentrations were calcuated by EFB to determine the exposure to non-target aquatic organisms from contaminated rain water runoff. Projected residues for lotic and lentic environments recieving runoff from sorghum fields and citrus groves are presented in Table 3 (Moraski,D. 07/09/81).

Table 3. Estimated Aquatic Residues For Lentic and Lotic Ecosystems Contaminated From Rainwater Runoff.

Citrus (Application Rate= 10.0 lbs/acre)

Lentic ##

% Chemical Runoff	Pond Depth (ft)	Pond Area (Acres)	Expected Concentrations(ppm) Water	Hydrosoil
1	10	2	0.4	0.2

Small Lotic Situation (10 CFS)##

1 % Runoff Situation

Maximum initial Concentration in Water = 5 ppbillion.

Maximum initial Concentration in Sediment = 3 ppbillion.

Sorghum (Application Rate = 1 lbs/acre)

Lentic ##

% Chemical Runoff	Field Size	Pond Depth(ft)	Pond Size(Acres)	Estimated Aldicarb Concentrations(ppb) Water	Hydrosoil
1.5	20 A	10	2	2	1
1.5	40 A	10	2	5	3
1.5	120 A	10	2	14	8

Small Lotic Situations(10 CFS)

Estimates for sorghum use were not calcuated by EFB.

##- See EFB review by Moraski, D. 07/09/81 for assumptions underlying exposure scenarios for citrus and sorghum applications.

A 96-hour bluegill sunfish bioassay (LC50=0.063 ppm) was used to establish a freshwater fish classification trigger (1/10 LC50) of 0.0063 ppm. A 48-hour Daphnia magna bioassay (LC50= 0.41 ppm) was used to calcuate a freshwater invertebrate classification trigger of 0.041 ppm. Comparison of the respective triggers to estimated Aldicarb residues occurring in lotic and lentic ecosystems contaminated by rainwater runoff reveals the following (Table 3):

1. Aquatic residues for lentic (2 acres/10 ft deep) ecosystems adjacent to citrus groves (10 lbs/active/acre) could exceed the 1/10 LC50 critera for fish and aquatic invertebrates.

2. Aquatic residues for lotic (1% runoff/10 cfs) ecosystems adjacent to citrus groves (10 lbs/active/acre) should not exceed the 1/10 LC50 critera for fish and aquatic invertebrates.

3. EFB aquatic residue estimates for lentic ecosystem adjacent to sorghum (1.0 lbs/acre/active) do not exceed the 1/10 LC50 critera for aquatic organims and as such should not pose an acute hazard to non-target fish and invertebrates. Estimates for watersheds drained by small(<10 CFS) lotic ecosystems were not calculated by the Environmental Fate Branch but are presumed to be lower than corresponding levels for lentic systems.

4. Aldicarb's existing data is deficient in chronic fish and invertebrate studies. Therefore, the Ecological Effects Branch cannot comment on Aldicarb's potential chronic effects of this products residues on non-target fish and invertebrates (See Section 107.5, Data Requests).

Aldicarb is extemely toxic to marine shrimp (chronic MATC 1 and 10 ppbillion). The conditional registration of this product on citrus (grapefruit, lemons, limes) could result in the contamination of marine and brackish water ecosystems. Aldicarb's potential for adversely impacting brown shrimp in Laquna Madre Bay came to light when the registrant requested a Section 18 for grapefruit grown in Texas. As a result of this EEB's concern, the Agency imposed a monitoring requirement inorder to determine the degree to which marine organisms are exposed to Aldicarb residues (As per E. Johnson 2/24/81 telegram).

1981 Grapefruit Monitoring Study

The Texas grapefruit monitoring study was conducted by the Texas Department of Agriculture during the spring and summer of 1981. Results of this study were submitted to the agency in November of the same year and subsequently reviewed by both the Environmental Fate Branch (Malak 12/4/81) and the Ecological Effects Branch (Bowen 12/4/81).

Reported Results

Analyses of all water samples reflected no detectable Aldicarb residues in either ground water or surface water (Table 4). The sensitivity of the analytical technique was 1 ppb. Brown shrimp samples also contained no detectable Adlicarb residues (Table 5.). The sensitivity of the analytical technique was 10 ppb (Lucus, 1981). Figure 1 shows the relative location of all sampling sites.

EEB's Comments

All citrus (oranges and grapefruit) grown within the study were irrigated from waters pumped from the Rio Grande River. Feeder canals supplying water were above ground level and as such should not be contaminated by runoff or irrigation return flow (flushing) waters. Runoff from citrus grown within this watershed is disposed of by one of two methods. Citrus groves located in the northern half of Hildago county channel runoff waters into naturally occuring "aosoca's" (20-2500 acres in size) or oxbow lakes (Davis, 1981). Runoff occuring from groves located in the southern portions of Hildago and Cameron Counties is discharged into a network of drainage ditches. Canals such as the Arroyo Colorado subsequently drain into the Laguna Madre Bay (Sample Site 103). On the average, groves contributing runoff water are approximately 45-60 air miles from the Bay.

The 1981 monitoring study differed significantly from the registrant's 1980 study since it (1) includes samples collected during Aldicarb's application and (2) samples were collected bimonthly for a approximately six (6) months after the final applicaiton. Data collected during the 1981 study indicated that Aldicarb's use on citrus did not contribute detectable residues to the waters or invertebrate fauna of the Laguna Madre Bay. The fact that no resiudes were detected in shrimp or water samples collected from the Arroyo Colorada (Site 103) is believed to be particulary noteworthly since this location would represent a potential worst case location.

The lack of detectable residues could be attributed to the following:

1. The alkaline condition of the ground water in the area sampled. Aldicarb is stable to hydrolysis at pH 5-7 and temperature of 15-25 C, however, the reaction at pH $\geq$ 8 is much faster with a half-life of 8 days.

2. Only a portion of the study area contributes runoff to waters of the Laguna Madre Bay.

3. The distance with which citrus groves are located from Laguna Madre Bay

Data collected during the 1981 monitoring study are sufficient to alleviate EEB's concern over the incremental use of aldicarb and the possible contamination of Laguna Madre Bay, Texas.

Table 4. **Results of Well and Surface Water Analysis for Aldicarb Residues Prior to, as well as Posttreatment Time Samples.**

Date	Lab #	Site: 101*	102**	103***	104****
4-2-81	850-853	0	0	0	0
4-16-81*****	838-841	0	0	0	0
4-16-81*****	834-837	0	0	0	0
5-14-81	846-849	0	0	0	0
5-29-81	842-845	0	0	0	0
6-11-81	71-74	0	0	0	0
6-25-81	75-78	0	0	0	0
7-9-81	79-82	0	0	0	0
7-23-81	83-86	0	0	0	0
8-6-81	87-90	0	0	0	0
8-20-81	91-94	0	0	0	0
9-3-81	95-98	0	0	0	0
9-17-81	99-102	0	0	0	0

*Site 101: From [redacted] Well near Cameron/Hidalgo County line, south of the headwaters of the Arroyo Colorado.

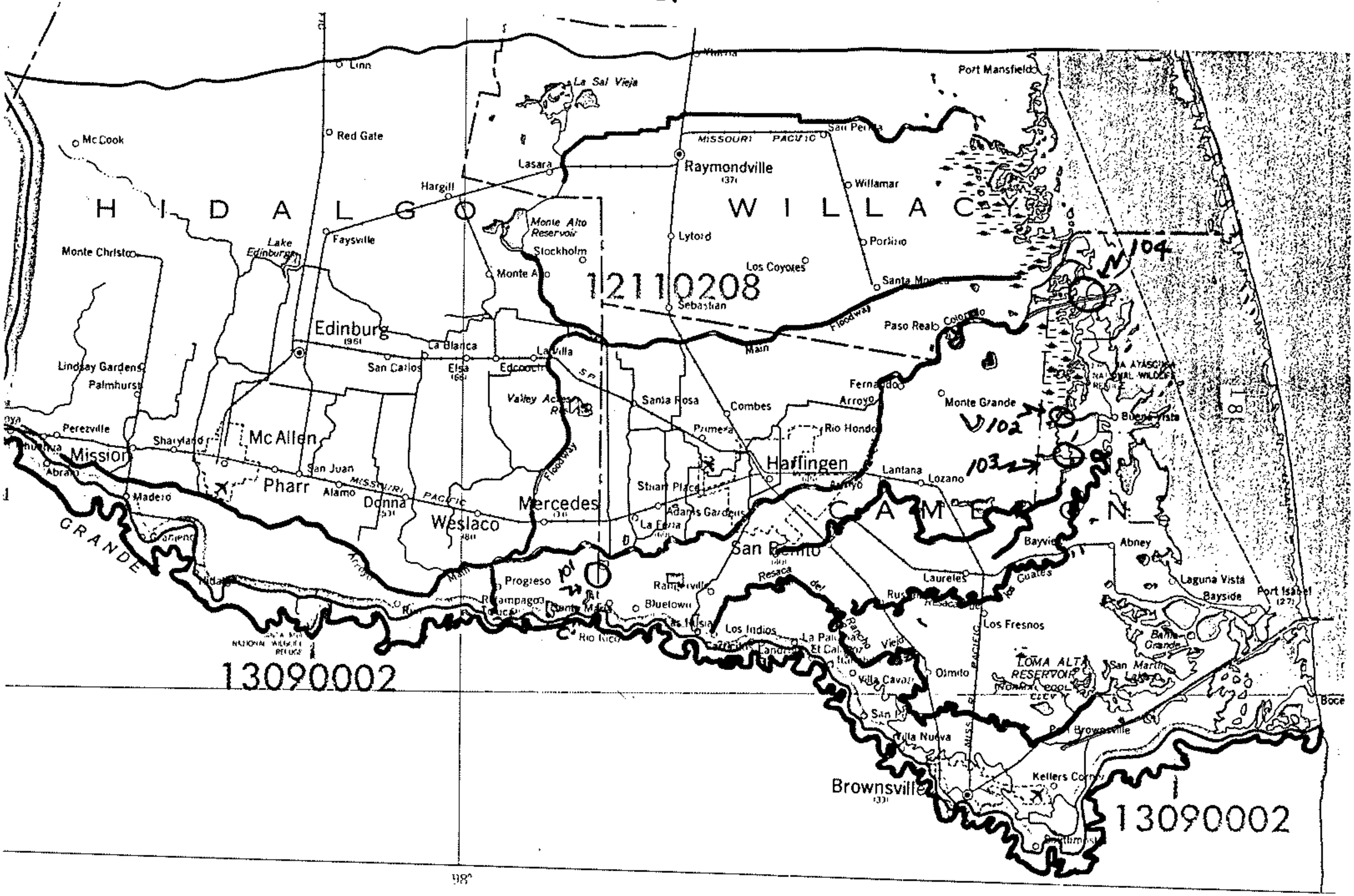
**Site 102: At the Ospray Overlook at Laguna Atascosa in Laguna Atascosa National Wildlife Refuge.

***Site 103: From the major drainage way into the Laguna Atascosa at State Highway 106.

****Site 104: In the Arroyo Colorado downstream from State Highway 1847 at Sanchez Bait Stand. The Arroyo Colorado is the major drainage from the citrus area into the Laguna Madre.

*****Duplicate Samples

FIGURE 1.



HIDALGO
WILLACY
CAMERON
12110208
13090002
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104
102
103
101
Raymondville
Edinburg
McAllen
Pharr
Mission
Weslaco
Mercedes
Harlingen
San Benito
Brownsville
Port Mansfield
Port Isabel
Laguna Vista
Bayside
Abney
Los Fresnos
Los Indios
Monte Grande
Lasara
Hargill
Faysville
Linn
Red Gate
McCook
Monte Christo
Lindsay Gardens
Palmhurst
Perezville
Sharyland
San Juan
Alamo
Donna
La Blanca
San Carlos
Elsa
Edcouch
La Villa
Santa Rosa
Combes
Lyford
Sebastian
Los Coyotes
Willamar
Santa Monica
Paso Real
Stockholm
Monte Alto
Monte Alto Reservoir
La Sal Vieja
Lake Edinburg
Progreso
Bluetown
Rio Rico
Lantana
Lozano
Laureles
Olmito
Villa Nueva
Kellers Corner
Port Brownsville
Loma Alta Reservoir
San Martin Lake
Bahia Grande
Stuart Place
Adams Gardens
La Feria
Rio Hondo
Madero
GRANDE
MISSOURI PACIFIC
Floodway
Main
Arroyo
Colorado
98°

It should be noted, however, that a concurrent review by EFB (Malak 12/4/81) concluded that the 1981 monitoring study was unsatisfactory primarily because of deficiencies in groundwater and soil sampling.

In conclusion$, the Ecological Effects 8ranch (EEB) is unable to complete its an incremental risk assessment (3(c)7) finding for non-target fish and aquatic invertebrates because pertinent data are lacking. More specifically, acute toxicity data indicates that fish and aquatic invertebrate indigenous to small lentic ecosystems adjacent to citrus groves could be adversely impacted by Aldicarb residues. In order to acurately assess the risks associated with Aldicarb's use on sorghum, tomatoes, and citrus, EEB will require the following additional information (See also 107.5 Data Requests).

1. Fish embryo larvae test using rainbow trout and fathead minnow.

2. An aquatic invertebrate life-cycle test.

TABLE 5. Results of Analysis of Commercial Brown Shrimp Samples from the Laguna Madre and/or the Arroyo Colorado for Aldicarb Residues.

Date	Lab #	Commerical Brown Shrimp Samples Aldicarb Detected
4-2-81	103	0
6-2-81	104	0
9-17-81	105	0

** Lucus, Wilford. Personal communication, November 1981. Texas Department of Agriculture (512-787-8866).

** Davis, Jim. Personal communication, Novermber 1981. Texas Department of Agriculture (512-475-3681).

Non-target Insect Exposure

Proposed uses of granular Aldicarb on sorghum, tomatoes, and citrus should present no hazard to bees (Allen W. Vaughan 8/22/81)

Endangered Species Considerations

Mammalian

States currently listed in USDA 1979 Agricultural Statistic as containing sorghum, tomatoes, and citrus groves (i.e, lemons,limes,grapefruit acreage) were examined for the presence of federally threatened or endangered mammals. All federally protected mammals residing in or migrating through the above ced agricultural areas have specific dietary habits, habitat requirements, and/or seasonal migration patterns that preclude their exposure to Aldicarb residues (See Also Footnote # 2).

Avian

States currently listed in USDA's 1979 Agricultural Statistic as containing sorghum, tomatoes, and citrus groves (i.e.,lemons,limes,grapefruit acreages) were examined for the presence of federally threatened or endangered birds. With the exception of the Attwater's Prairie Chicken, all currently listed avian species residing in or migrating through the above cited agricultural areas have specific dietary habits, habitat requirements, and/or seasonal migration patterns that preclude their exposure to Aldicarb residues.

Footnote # 2

This reviewer is cognizant of concerns expressed in previous reviews on Aldicarb's potential for adversely impacting the Delmarva Peninsula Fox Squirrel (Felthousan, 1/19/79; etc.). Estimated mammalian toxicity calculations presented in Table 2 suggest that relatively few granules (7 to 3) are needed to exceed the estimated LD_{50} of adult and recently weaned fox squirrels. However, numerous telephone conversations with Gary Taylor (301-827-8612) and Dr. Vagan Flyger (454-4641) of the Delmarva Fox Squirrel Recovery revealed that (1) relatively few acres of tomatoes are grown along in the eastern shore of Maryland and (2) that the forest habitat requirements of this protected species will preclude its exposure to Aldicarb granules.

Telephone conversations with Wayne Shifflet (713-234-3021), Attwater's prairie chicken refuge manager confirms that the Attwater's prairie chicken would be exposed to Aldicarb residues if this nematocide is registered for use on sorghum in the state Texas. More specifically, chickens in Fort Bend, Refugio, Aransas, and Victoria Counties establish breeding (booming) territories in sorghum fields. According to Mr. Shifflet, chickens routinely utilize sorghum field before (February),during (March), and after (April) planting. Sorghum planting in the four counties in question takes place from March 1 to 15 (See Footnote # 3). Considering the amount of time individuals spend in fields exposure to aldicarb residues (whether accidental or intentional) would be inevidable and as such consitutes an unacceptable risk to this federally protected species. Exposure of Attwater's chicks is not anticipated because (1) eggs do not hatch until April, (2) brooding adults move off of sorghum fields after breeding, and (3) rain and/or irrigation should have significantly reduced residue levels.

Data supplied by the 1978 Census of Agriculture (US Department of Commerce) indicates that approximately 319,616 acres of sorghum are grown annually in counties known to contain populations of the Attwater's prairie chicken. In order to further delineate this potential exposure, individual county sorghum acreages and the results from recent prairie chicken population estimates are listed below:

		Prairie Chicken Census	
County	Acreage	1980	1981
Victoria	43,835	64	64
Fort Bend	42,256	54	44
Refugio	75,864	726	658
Goliad	6,670	34	100
Arkansas	-	76	38
Austin	7,778	326	234
Colorado	4,435	186	184
Galveston		96	110
Harris	1,393	-	4
Wharton	110,044	-	-
Waller	2,097	-	-
De Witt	10,284	-	-
Brazoria	14,960	20	20
Total	319,616	1,582	1,456

Footnote # 3

Telephone conversations with Dr. John Bremer (512-265-9203), Weed Control Specialist, Corpus Christe Agricultural Reseach Center revealed that sorghum crops in the counties Fort Bend, Refugio, Aransas,and Victoria are planted sometime during the first two weeks in March. Dr. Bremer explained that farmers in the above counties were restricted in planting times because sorghum crops planted prior to March 1 were subject to freezing; crops planted after March 15 were subject to losses from infestation of the sorghum midge fly.

The estimated toxicological hazards posed by Aldicarb granules (10G/15G) to adult and newly hatched (14-day) prairie chickens are shown in Table 2. Using available toxicity data and species weight information obtained from Wayne Shifflet these calculations suggest that ingestion of as few as 11 granules of the 15% formulation could exceed the estimated LD50 of an adult female prairie chicken. These calulations also reinforce this Branch's concern for chick exposure since one granule of either the 10G or 15G formulation could exceed an individuals estimated LD50 value.

Office of Endangered Species (OES) Biological Opinion **

San Joaquin Kit Fox

The San Joaquin kit fox was listed as Endangered on March 11, 1967 (32 FR 4001). Critical Habitat has not yet been determined. These foxes do not readily adapt to intensive modern agricultural practices as evident from the extirpation of the species from much of its original range. Its diet is primarily small mammals, although it will eat birds, reptiles, and insects. The majority of the fox population is located away from irrigated agricultural areas; however, these areas are marginally used by remnant populations, and the potential for secondary poisoning does exist. The impact is expected to be low, and therefore the proposed action is not likely to jeopardize the continued existence of the San Joaquin kit fox.

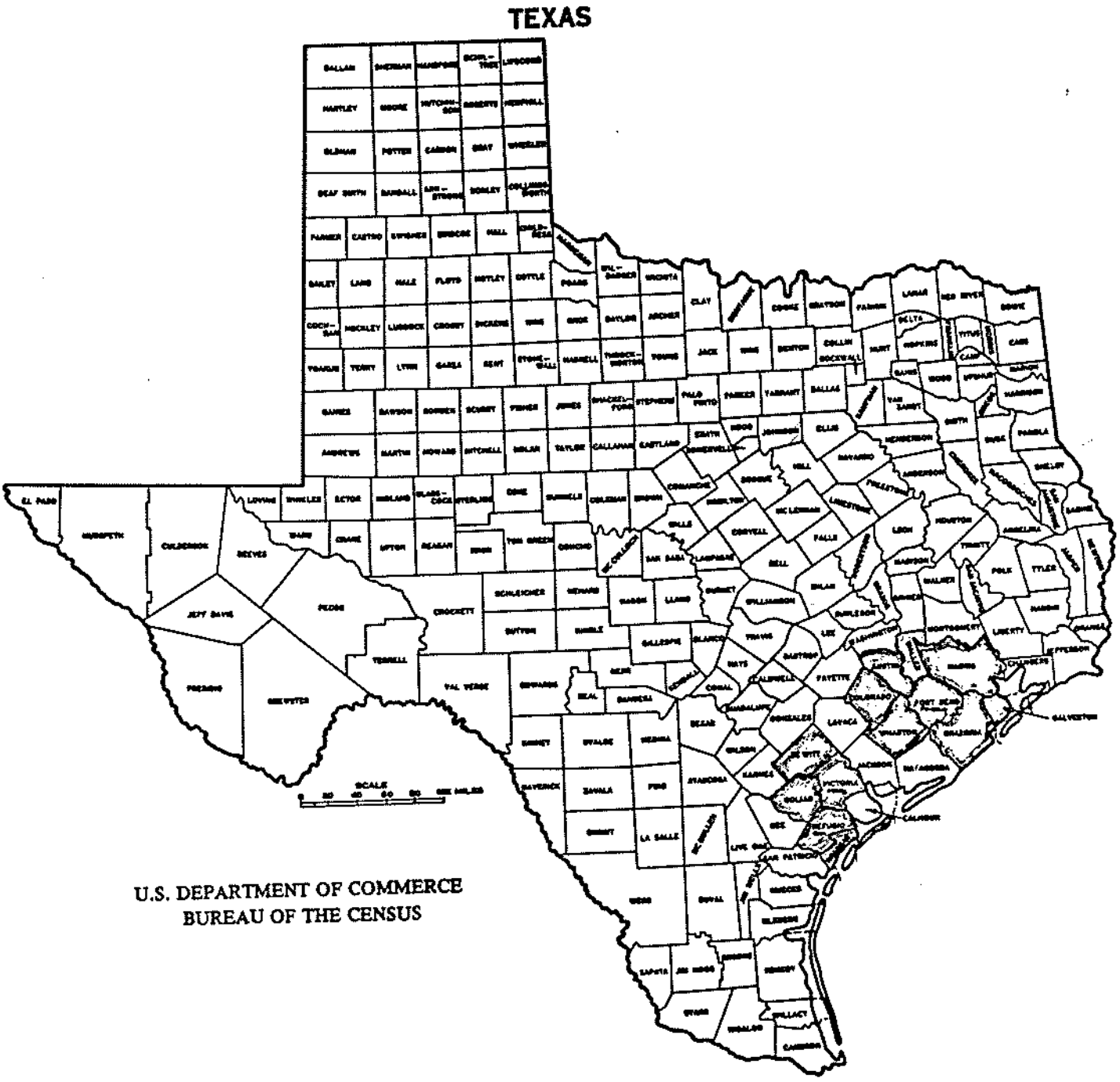
Attwater's greater prairie chicken was determined to be endangerd and was included on the list of Endangered Native Fish and Wildlife on March 11, 1967 (32 FR 4001). Critical Habitat has not yet been determined. Habitat loss, the conversion of natural tall grass prairie to agricultural lands, and urban and commerical developments have drastically reduced this species' range which formerly extended over the entire Gulf coastal prairie of southwestern Louisiana and Texas, south to the Rio Grande. Presently, an estimated 1,580 Attwater's prairie chickens are confined to small, disjunct populations scattered over 15 counties in Texas, with over 78 percent of the total population occurring in Refugio, Austin, and Colorado Counties. It has been extirpated from Louisiana.

Grassland habitat supporting Attwater's prairie chickens is frequently adjacent to sorghum and peanut croplands throughout this bird's range. Sorghum fields are routinely utilized for breeding purposes during February - March and are extensively used for cover and feeding during the brood-rearing period (April - August). The planting period for sorghum is generally March 1 - 15 at which time Aldicarb would be applied. Peanut fields are heavily utilized during the fall. Food of adults is approximately 85 percent vegetable and 15 percent animal. This ratio is reversed for young. Because of the extensive use of sorghum fields by prairie chickens and the documented acute toxicity of Aldicarb to avian species, it is apparent that the Attwater's prairie chicken would be particularly vulnerable to Aldicarb poisoning. This could occur directly by picking up granules as grit, by feeding on vegetable matter treated with Aldicarb, or indirectly by feeding on invertebrates killed by the pesticide. As few as 11 granules of the 15G formulation or 17 granules of the 10G formulation exceeds the LD_{50} for adults while just one granule of either formulation exceeds the LD_{50} for 2 week old chicks. Therefore,

** - See appendix V for complete copy of this document.

it is our (OES) biological opinion that your action, as proposed, is likely to jeopardize the continued existence of Attwater's greater prairie chicken.

The following reasonable and prudent alternative to the proposed action, if implemented, would avoid jeopardy to the Attwater's greater prairie chicken: since the Attwater's greater prairie chicken uses agricultural lands all year long, the use of Temik on sorghum should be prohibited in the counties of Aransas, Refugio, Goliad, Austin, Colorado, Galveston, Harris, Victoria, Waller, Wharton, Fort Bend, De Witt, and Brazoria, Texas (shown below).



In conclusion, the Ecological Effects Branch has determined that the the registration of Aldicarb (10G/15G) granules on sorghum would result in a significant increase in exposure and acute risks to Attwater's prairie chickens. However, based upon the biological opinion rendered by the Office of Endangered Species (OES), the hazard to this federally protected bird could be avoided by prohibiting Aldicarb's use on sorghum grown in the counties of Fort Bend, Aransas, Victoria, Refugio, Goliad, Austin, Colorado, Galveston, Harris, Waller, Wharton, De Witt, and Brazoria, Texas (see Section 107.5 Data Requests).

Fish and Invertebrates

As stated earlier (See Aquatic Exposure), Aldicarb has the potential for adversely impacting fish and aquatic invertebrates. A 96-hour LC50 bluegill sunfish bioassay (LC50=0.063 ppm) was used to establish a no-effect level (1/10 LC10) of 0.0026 ppm for federally protected fishes. A 48-hour Daphnia magna bioassy (LC50=0.41 ppm) was used to establish a no-effect level of (1/10 LC10) of 0.017 ppm for federally protected invertebrates (See Appendix IV). Exposure to fish and aquatic invertebrates could occur from contaminated ground, surface, and return flow irrigation waters.

Comparison of no-effect fish and invertebrate triggers to estimated aquatic concentrations (EAC) shown in Table 3 suggests the following:

1. There is a potential for adversely impacting listed fishes indigenous to small (<10 CFS) lotic and lentic ecosystems receiving 1 % or greater chemical runoff.

2. There is a potential for adversely impacting listed aquatic invertebrates indigenous to lentic ecosystem receiving 1 % or greater chemical runoff.

Personnel from the Office of Endangered Species (OES) were contacted via telephone in an effort to identify listed species that would be particularly vulnerable to residues from this nematicide/insecticide (i.e, species indigenous to small streams, springs, and ponds). Species discussed below were examined for possible adverse exposure to Aldicarb residues at the request of various OES personnel. All other federally protected aquatic organisms are believed to inhabit aquatic ecosystems with sufficent discharge (CFS) to preclude their exposure to adverse concentrations of Aldicarb residues. EEB emphasizes, however, that it cannot comment on Aldicarbs potential chronic risks to aquatic organisms due to the lack chronic fish and invertebrate bioassays (See Section 107.5 Data Requests).

The Scorro Isopod (Scorro County, Texas) is the only federally protected invertebrate listed as being indigenous to small springs. Mr. John Hubbard (505-827-2438) of New Mexico Fish and Game Department stated that this listed isopod should not be exposed to Aldicarb residues since it inhabits a spring located within the city limits of the town of Scorro.

Personnel in FWS Region 4 suggested that the Alabama cavefish (Lauderdale County) and the watercress darter (Jefferson County) could be exposed to Aldicarb residues as a result of applications made to sorghum and tomatoes (Dave Fleming FTS-242-3583; Pete Douglas FTS 490-5835). Potential target acreages in Jefferson and Lauderdale Counties are detailed below:

	Acreage ##	
	Lauderdale	Jefferson
Sorghum	324	0
Tomatoes	8	17

Aldicarb is currently registered for use on 80,000 acres of cotton and soybeans in Jefferson and Lauderdale Counties. The registration of Aldicarb on sorghum and tomatoes would represent an increase of approximately 335 acres. The addition of sorghum and tomatoes to Aldicarb's label could represent a potential for a 0.39 % increase in exposure to populations of the Alabama cavefish and the watercress darter

Region 4 personnel also suggested that the slackwater darter could be exposed via Aldicarb's application to sorghum and tomatoes (Dave Fleming FTS 242-3583; Pete Douglas FTS 490-5835). Potential target acreages in counties known to contain slackwater darters are shown below:

	Acreage ##				
	Madison	Lauderdale	Limestone	Lawrence	Wayne
Sorghum	287	324	518	571	259
Tomatoes	8	8	0	0	0
Grapefruit	0	0	0	0	0
Lemons	0	0	0	0	0
Limes	0	0	0	0	0

Aldicarb is currently registered for use on 417,316 acres of cotton and soybeans in the five counties cited above. The registration of Aldicarb on sorghum and and tomatoes would represent an increase of approximately 1,875 acres. The addition of sorghum and tomatoes to Aldicarb's label could result in a 0.44 % increase in potential exposure to populations of the slackwater darter.

##- USDC 1978 Cenus of Agriculture.

FWS personnel in Region 2 suggested that the Gila Topminnow (Gila, Pima, and Santa Cruz Counties, Arizona), Pecos Gambusia, Commanche Springs Pupfish (Jeff Davis and Reeves Counties, Texas) and Sonora Topminnow (Pecos County, Arizonia) could be exposued to Aldicarb residues via contaminated runnoff and/or irrigation return flow waters (Or.W.L. Minckley FTS-766-6518; Or. Carl Hubbs FTS 965-6518; Dr. James Johnston FTS 766-3974). Potential target acreages for counties containing populations of federally threatened or endangered fishes are outlined below:

	Acreage ##					
	Gila	Pima	Santa Cruz	Jeff Oavis	Reeves	Pecos
Sorghum	0	2,156	0	0	0	0
Tomatoes	0	0	0	0	0	0
Grapefruit	0	0	0	0	0	0
Lemons	0	0	0	0	0	0
Limes	0	0	0	0	0	0

Aldicarb is currently registered on 23,363 acres of cotton and soybeans in Pima County, Arizona. The registration of Aldicarb on sorghum could represent an increase of approximately 2,156 acres. The addition of sorghum to Aldicarb's label could result in a 9.2 % potential increase in exposure to populations of the Gila topminnow in Pima County, Arizonia. Department of Commerce aicultural data indicates that the pecos gambusia, commance spring pupfish, and the sonora topminnow should not be exposed to Aldicarb residues.

In conclusion, the Ecological Effects Branch has examined the possiblity of adversely impacting federally protected aquatic species that were considered to be vulnerable to Aldicarb residues. Data compiled on potential target acreages within areas of concern suggest that the the addition of sorghum, tomatoes, and citrus to Aldicarb's should not pose a significant increase in hazard to federally protected aquatic organism. The above anaylsis does, however, suggest that listed aquatic species could be currently exposed to Aldicarb residues resulting from this products application to currently registered uses (i.e.,soybeans, cotton, and etc.) Since Aldicarb's hazard to endangered aquatic organisms will eventually be reexamined during the re-registration process, OES personnel may want to consider initiating a monitoring program that could be use to emperically determine the extent and duration of such exposure.

USDA 1978 Census of Agriculture

107.0 Conclusions

107.1 Classification

Granular Aldicarb (10-G/15-G) is currently classified as a "general use" pesticide. Changes in classification will be considered at the time of product re-registration.

107.3 Label amendments to avoid impacting the Attwater's greater prairie chicken are as follows:

"Because Temik may pose a hazard to the Attwater's greater prairie chicken, users must not apply this product to sorghum fields in the following Texas counties:

Aransas, Refugio, Goliad, Austin, Colorado, Galveston, Harris, Victoria, Waller, Wharton, Fort Bend, De Witt, and Brazoria, Texas.

For further information users should contact the regional U.S. Fish and Wildlife Service Office (Endangered Species Specialist) or personnel of the State Fish and Game Agency."

107.5 Data Requests

The following studies are needed to complete an incremental risk assessment of Aldicarb (10-G/15-G formulations) for sorghum, citrus, and tomatoes:

1. Field searches that will quantify non-target mammalian and avian mortalities resulting from Aldicarb's incremental use.

2. An aquatic invertebrate life-cycle test.

3. Fish embryo larvae test using rainbow trout and fathead minnow.

107.6 Note to PM

Should any changes be made in the alternative presented in this opinion, the registration be modified, or a new species listed that may be affected by the project, EEB will be required to reinitiate consultation with Office of Endangered Species. Please advise this Branch whether you intend to implement the alternative provided by OES for the Attwater's prairie chicken.

107.7 EEB' Findings

EEB has completed an incremental risk assessment (3(c)(7) Finding) of the proposed Conditional Registration of Aldicarb (10-G/ 15-G) for use on sorghum, tomatoes, and citrus (grapefruit,lemons,limes). Based upon the available data EEB concludes that the proposed uses provide for a significant increase in exposure, but not in acute risks to non-target organisms. Possible jeopardy to federally protected species can be avoided by following the label recomendation outlined in Section 107.3. EEB wants to emphasize, however, that it cannot comment on Aldicarbs potential chronic risks to aquatic organisms because pertinent data are lacking. In order to completely assess the risks associated with these uses, EEB requires the data requested in Section 107.5.

Charles A Bowen II 2/19/82
Charles A. Bowen II
Fisheries Biologist, Section I
Ecological Effects Branch / HED

Raymond Matheny Raymond W. Matheny 2/19/82
Head Section I
Ecological Effects Branch / HED

Clayton Bushong Clayton Bushong 2/19/82
Chief,
Ecological Effects Branch / HED

APPENDIX II

PRODUCT LABEL FOR 15-G FORMULATION

(Available Upon Request From Product Manager)

APPENDIX I

PRODUCT LABEL FOR 10-G FORMULATION

(Available Upon Request From Product Manager)

APPENDIX III

GRANULAR FORMULATIONS OF ALDICARB RESPONSIBLE FOR BIRD KILLS

Table II. Bird Kills Attributed to Granular Insecticides

Pesticide	Date	Location	Species	Total Number Killed	Crop	Comments
Aldicarb	1975	England	Gulls	40	Potatoes	A common feature in the 1975 English reports was that the granules had been applied under wet soil conditions and, in some cases, had been left on the soil surface for a considerable time prior to ~~incorporation~~ Incorporation
Aldicarb	1975	England	Gulls	20	Potatoes	
Aldicarb	1975	England	Gulls, songbirds, moorhen	180	Potatoes	
Aldicarb	1975	England	Gulls, sparrows	50	Sugar beets	
Aldicarb	1976	England	Gulls	12	Onions	
Aldicarb	1976	England	Pheasant	7	Sugar beets	
Aldicarb	1976	England	Pheasant, partridge, wood pigeon	9	Sugar beets	
Aldicarb	1976	Germany	Songbirds	>600	Sugar beets	Union Carbide reports 12 kills occurred.

Total ca. 834

APPENDIX IV

FINNEY PROBIT ANALYSIS OF DOSE RELATED MORTALITY DATA FOR

1. Mallard Duck LD50.
2. Daphnia magna LC50.
3. Bluegill Sunfish LC50.

Temik 099120

Accession #

Bluegill LC50

10. ppb
1.
10.

18. ppb
0.
10.

32. ppb
0.
10.

56. ppb
2.
10.

100. ppb
10.
10.

3.341	slope M
-1.029	YINT
1.992	LW M
33.780	CHI²
ppb	
63.811	LD50
45.385	LOCL
89.718	UPCL
26.371	LD10
16.373	LOCL
42.474	UPCL
154.409	LD90
78.009	LOCL
305.631	UPCL

Acute oral Mallard.

CLR

1.
1. mg/kg
1.
10.

1.59 mg/kg
5.
10.

2.51 mg/kg
10.
10.

3.98 mg/kg
10.
10.

6.31 mg/kg
10.
10.

8.494	Slope M
3.504	YINT
1.311	LW M
0.765	CHI²
mg/kg	
1.500	LD50
1.274	LOCL
1.767	UPCL
1.060	LD10
0.819	LOCL
1.372	UPCL
2.124	LD90
1.652	LOCL
2.730	UPCL

48 hr LC_{50}

Daphnia magna

Aldicarb 100%

CLR

Reclassification of Bluegill Fish study.
ACC # 099120

The registrant's 96 hour bluegill bioassay was initally classified as Invalid because of (Faatz 2/19/80):

1. Low disloved oxygen.
2. poor dose response.

Review of this study again confirms that the test organism were undoubtedly stressed (i.e., the single mortality occuring in the lowest level tested (10 ppb) could have resulted from this stress). However, I see no reason why this study cannot be re-classified to Supplemental since the LC50 reported takes into consideration both the stress and the toxicity of the chemical tested.

10C. ppb	
1.	
2C.	
18C.	
8.	
2C.	
32C.	
8.	
2C.	
56C.	
1S.	
2C.	
100C.	
1S.	
2C.	
3.482	M
-4.083	YINT
1.937	LW M
6.158	CHI²
406.250 ppb	LD50
330.195	LOCL
499.823	UPCL
174.011	LD10
125.130	LOCL
241.987	UPCL
948.441	LD90
661.416	LOCL
1360.022	UPCL

APPENDIX V

Copy of Office of Endangered Species Biological Opinion

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

United States Department of the Interior

FISH AND WILDLIFE SERVICE
WASHINGTON, D.C. 20240

In Reply Refer To:
FWS/OES EPA-82-1

JAN 22 1982

Mr. Clayton Bushong
Chief, Ecological Effects Branch/HED
Environmental Protection Agency
Washington, D.C. 20460

Dear Mr. Bushong:

This letter is in response to your October 9, 1981, request (received October 15, 1981) for a Section 7 consultation on the conditional registration of Temik (Aldicarb) 10-G/15-G and its effect on listed Endangered or Threatened species. This granular nematicide would be used for tomatoes, sorghum, grapefruit, lemons, and limes. Treatment would involve incorporation of the granules into the soil. Application rates, time of application, and methods are described in Enclosure I.

During the course of this consultation, information from the Environmental Protection Agency (EPA), other Federal agencies, academic sources, State agencies, as well as from our files, was reviewed. Copies of pertinent reports and documents are included in an administrative record maintained in the Office of Endangered Species, Washington, D.C.

Aldicarb is relatively short-lived in the environment with a half-life of 8 days at a pH of 8 or greater. The toxicity of its metabolites is unknown. Laboratory tests have shown Aldicarb to be very toxic to birds, mammals, and aquatic organisims. The LD 50 acute toxicities for aquatic species range from .41 ppm for (Daphnia magna) to .063 ppm for the bluegill (Lepomis macrachirus), and .56 ppm for the rainbow trout (Salmo gairdneri). Avian LD 50's ranged from 1 mg/kg for the 2-week old mallard (Anas platyrhynchos) to 3.4 mg/kg for the bobwhite (Colinus virginianus) and 0.75 mg/kg for the house sparrow (Passer domesticus). Mammalian data is represented by the rat (Rattus norvegicus) with an LD 50 of 0.6 - 1.0 mg/kg and the mouse (Mus musculus) at 0.4 mg/kg. Acute toxicity data for reptiles and amphibians and chronic toxicity data are not available. Bird kills in England and Germany in 1975-76 well illustrate the danger to wildlife. In eight incidents, approximately 830 gulls, gallinaceaous birds, and song birds were killed from Aldicarb poisoning (Environmental Protection Agency, EEB Review of Temik 10-G/15-G).

Terrestrial species can be exposed to Aldicarb through direct ingestion of granules; indirectly through the ingestion of invertebrates, birds, or small mammals which have died or are dying from contact with the pesticide; or the ingestion of invertebrates such as earthworms that have granules adhering to their mucoid epidermis. Because Aldicarb is a systemic pesticide, the ingestion of vegetation could also result in poisoning. Aquatic species could be exposed to Aldicarb from run-off of treated croplands.

Crop use patterns were examined for affected States in conjunction with the known distribution, habitat requirements, and dietary habits of listed species in order to identify species which may be affected by the proposed action. This review indicates that, with the exception of the Attwater's greater prairie chicken (Tympanuchus cupido attwateri) and the San Joaquin kit fox (Vulpes macrotis mutica), listed species would be precluded from adverse exposure.

Biological Opinion

San Joaquin Kit Fox

The San Joaquin kit fox was listed as Endangered on March 11, 1967 (32 FR 4001). Critical Habitat has not yet been determined. These foxes do not readily adapt to intensive modern agricultural practices as evident from the extirpation of the species from much of its original range. Its diet is primarily small mammals, although it will eat birds, reptiles, and insects. The majority of the fox population is located away from irrigated agricultural areas; however, these areas are marginally used by remnant populations, and the potential for secondary poisoning does exist. The impact is expected to be low, and therefore the proposed action is not likely to jeopardize the continued existence of the San Joaquin kit fox.

Attwater's Greater Prairie Chicken

The Attwater's greater prairie chicken was determined to be Endangered and was included on the list of Endangered Native Fish and Wildlife on March 11, 1967 (32 FR 4001). Critical Habitat has not yet been determined. Habitat loss, the conversion of natural tall grass prairie to agricultural lands, and urban and commercial developments have drastically reduced this species' range which formerly extended over the entire Gulf coastal prairie of southwestern Louisiana and Texas, south to the Rio Grande. Presently, an estimated 1,580 Attwater's prairie chickens are confined to small, disjunct populations scattered over 15 counties in Texas, with over 78 percent of the total population occurring in Refugio, Austin, and Colorado Counties. It has been extirpated from Louisiana.

Grassland habitat supporting Attwater's prairie chickens is frequently adjacent to sorghum and peanut croplands throughout this bird's range. Sorghum fields are routinely utilized for breeding purposes during February - March and are extensively used for cover and feeding during the brood-rearing period (April - August). The planting period for sorghum is generally March 1 - 15 at which time Aldicarb would be applied. Peanut fields are heavily utilized during the fall. Food of adults is approximately 85 percent vegetable and 15 percent animal. This ratio is reversed for young. Because of the extensive use of sorghum fields by prairie chickens and the documented acute toxicity of Aldicarb to avian species, it is apparent that the Attwater's prairie chicken would be particularly vulnerable to Aldicarb poisoning. This could occur directly by picking up granules as grit, by feeding on vegetable matter treated with Aldicarb, or indirectly by feeding on invertebrates killed by the pesticide. As few as 11 granules of the 15G formulation or 17 granules of the 10G formulation exceeds the LD 50 for adults while just one granule of either formulation exceeds the LD 50 for 2-week old chicks. Therefore, it is my biological opinion that your action, as proposed, is likely to jeopardize the continued existence of Attwater's greater prairie chicken.

The following reasonable and prudent alternative to the proposed action, if implemented, would avoid jeopardy to the Attwater's greater prairie chicken: since the Attwater's greater prairie chicken uses agricultural lands all year long, the use of Temik on sorghum should be prohibited in the counties of Aransas, Refugio, Goliad, Austin, Colorado, Galveston, Harris, Victoria, Waller, Whorton, Fort Bend, De Witt, and Brazoria, Texas.

Should any changes be made in the alternative presented in this opinion, the project be modified, or a new species listed that may be affected by the project, you must reinitiate consultation. Please advise this Office whether you intend to implement the alternative provided by us for the Attwater's prairie chicken.

We appreciate EPA's assistance in this consultation. Should you require clarification of items in this opinion or desire future assistance, we will be pleased to respond.

Sincerely yours,

J. Eugene Hester

Acting Director

Enclosure