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Item ID Number:	00067
Author	Oliver, Kelly H.
Corporate Author	Vitro Corporation of America, Eglin AFB, Florida
Report/Article Title	An Ecological Study on the Effects of Certain Concentrations of Cacodylic Acid on Selected Fauna and Flora
Journal/Book Title	
Year	1966
Month/Day	September
Color	☑
Number of Images	34
Description Notes	APGC-TR-66-54, Contract No. AF08(635)5150, PGVE task no. 394-65

Oliver, K.H. et al. 1966.

Military

Cacodylic Acid

APGC-TR-66-54

An Ecological Study on the Effects of Certain Concentrations of Cacodylic Acid on Selected Fauna and Flora

by

Kelly H. Oliver, Jr.
Gary H. Parsons
C. T. Huffstetler

VITRO SERVICES DIVISION
VITRO CORPORATION OF AMERICA, EGLIN AFB, FLORIDA

SEPTEMBER 1966

AIR PROVING GROUND CENTER
AIR FORCE SYSTEMS COMMAND • UNITED STATES AIR FORCE
EGLIN AIR FORCE BASE, FLORIDA

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FOREWORD

This work was carried out by the Chemical-Biological Laboratories of Vitro Services Division, Vitro Corporation of America, under Air Force Contract AF 08 (635)-5150. The work is a result of PGVE task 394-65 performed in the period 23 April 1965 to 26 July 1965.

This investigation was carried out by Kelly H. Oliver, Jr., Biological Laboratory Chief, G. H. Parsons, C. T. Huffstetler, D. E. McSurley, and J. H. Sewell.

This technical report has been reviewed and is approved.

R. A. SOUKUP, Colonel, USAF
Director of Technical Support

ABSTRACT

A study has been made of the effects of cacodylic acid on the flora and fauna of specific ecotones. Approximate lethal dosages have been determined for specific plants and animals under certain conditions. The five ecotones, sandhills, hammock, grasslands, pond, and stream are briefly characterized and the effects of cacodylic acid on the inhabitants of each are summarized.

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SECTION I

INTRODUCTION

Cacodylic acid (dimethylarsenic acid or alkargen) is a pentavalent organic arsenical. It is a colorless crystalline compound which is odorless and soluble in water. Its formula is $(CH_3)_2AsOOH$; its molecular weight, 138.0; its melting point, 200°C. It is a herbicide.

Compounds of arsenic, such as cacodylic acid, can be separated into three groups according to valence. The groups are plus or minus 3 and plus 5. The pentavalent arsenicals are less toxic to man and animals than the trivalent; organic arsenicals are less toxic to man than inorganic arsenicals.

The flora and fauna of any region are closely related to the nonliving environment. Each environment has specific types of flora and fauna within this relationship which form plant-animal communities. Five of these communities are found in this area; the sandhills, the hammock, the grass covered ranges, the pond, and the stream. In each community, green plants, as converters of solar energy to food, provide the foundation for all other forms of life.

Any consideration of the effects of a herbicide on local flora and fauna must encompass not only direct effects to living organisms, but also indirect effects resulting from the destruction or modification of the plant life.

This paper describes the indirect as well as direct effects cacodylic acid will have on local communities.

These tests were conducted at Eglin Air Force Base, in Northwest Florida.

SECTION II

THE SANDHILL COMMUNITY

The sandhills predominate over the Eglin Reservation. Sandhill soil is characterized as loose and well drained, lacking a hardpan, and composed of sand with some organic material.

TABLE I: DOMINANT TREES OF SANDHILL COMMUNITY

Pinus clausa (Chapm.) Vasey	Sand pine
Pinus palustris Mill	Longleaf pine
Quercus incana Bartr.	Bluejack oak
Quercus laevis Walt.	Turkey oak
Quercus stellata (Asne) Sarg.	Sandpost oak
Quercus virginiana (Michx.) Sarg.	Sandlive oak
Diospyros virginiana L.	Persimmon

Some of the common understory shrubs and grasses are scotchbroom, gopher apple, deer's tongue, broomsedge, and yucca.

The sand pine and turkey oaks are the dominant trees; however, stands of live, post, and bluejack oak are common.

Pines are more fire resistant than the oaks; thus, periodic fires have maintained the population predominance of pines in this community.

TABLE II: DOMINANT VERTEBRATES OF SANDHILL COMMUNITY

Reptiles

Order Chelonia

Terrapene carolina L.	Box turtle
Gopherus polyphemus (Daudin)	Gopher tortoise

Suborder Lacertilia

Sceloporus undulatus (Latreille)	Fence lizard
Cnemidophorus sexlineatus L.	Six lined race runner

Suborder Serpentes

Heterodon simus L.	Southern hognose snake
Coluber constrictor (Dunn and Wood)	Black racer
Masticophis flagellum (Shaw)	Coach whip
Crotalus adamanteus (Beauvois)	Eastern diamondback rattlesnake

Birds

Order Falconiformes

Cathartes aura L.	Turkey vulture
Coragyps atratus (Meyer)	Black vulture
Ictinia mississippiensis (Wilson)	Mississippi kite
Buteo jamaicensis (Gmelia)	Red tailed hawk

Order Columbiformes

Zenaidura macroura L.	Mourning love

Order Piciformes

Colaptes auratus L.	Yellow shafted flicker

Order Passeriformes

Tyrannus tyrannus L.	Eastern king bird
Corvus brachyrhynchos (Howell)	Crow
Cyanocitta cristata L.	Bluejay
Mimus polyglottos L.	Eastern mocking bird
Pipilo erythropthalmus L.	Red-eyed trowhee

Mammals

Order Lagomorpha

Sylvilagus floridanus (Allen)	Eastern cottontail

Order Rodentia

Sciurus niger L.	Eastern fox squirrel

Order Artiodactyla

Sus scrofa	Hog
Odocoileus virginianus (Zimmermann)	Whitetailed deer

METHOD: A survey line was made through a typical sandhill community. Rod square plots were staked out and sprayed with cacodylic acid in water at rates of 2, 6, and 30 lbs/acre. After one month the effects of cacodylic acid on the plots were recorded.

TABLE III: EFFECT OF CACODYLIC ACID ON SANDHILL COMMUNITY

Species	2 lb/acre	30 lb/acre
Sand pine	Leaves dead	Dead
Turkey oak	50% leaf brown	Dead
Sand post oak	50% leaf brown	Dead
Bluejack oak	Dead	Dead
Fern	30% leaf brown	----
Scotchbroom	Living but defoliated	----
Deer tongue	Living	Dead
Yucca	Living	----
Wiregrass	Living	Dead
Longleaf pine	----	Dead
Sand live oak	Partially defoliated	Dead

A 6 lb/acre concentration, sprayed 16 July 1965 in the sandhill area, produced 50% browning of leaves of the plants sprayed. Two weeks later no change in the effects had occurred.

In the 30 lb/acre plot all pines were dead after 14 days, and the oaks were 75% defoliated.

In the 2 lb/acre plot no damage to the plants occurred.

DISCUSSION

A single application of 2 lb/acre cacodylic acid on the sandhills did not greatly modify the community. Repeated applications at this rate of the herbicide, or applications of heavier concentrations, would modify the community. A complete kill would require applications on the order of 30 lb/acre.

The plots were sprayed during a period of heavy and frequent rain, which reduced the effect of the herbicide since much of it was washed from the leaves of the plants.

Sandhill fauna would not be directly affected by field concentrations of cacodylic acid. Any change in the plant community will indirectly affect the fauna, especially the species which are highly specialized and unable to adapt to environmental modification. Naturally, a denuded area such as the southern portion of the grid will support only those organisms which decompose the dead plant material.

The predicted progression of a sprayed sandhill community would be as follows: Following the initial kill, fast growing legumes and grasses would be the dominant inhabitants. Gradually the oaks and pines would grow back and the area would again become a sandhill community. The complete cycle would take an estimated 20 - 30 years.

SECTION III

THE HAMMOCK

The hammock is characteristic of stream beds and low areas throughout the reservation. The soil is very moist, poorly drained, and composed of organic material. Hammocks rarely burn and fire resistant pines do not become established. The canopy is very dense with the understory consisting of ferns, mosses, and vines. Young hardwoods are found in areas where the canopy is open.

TABLE IV: CHARACTERISTIC TREES OF A HAMMOCK

Magnolia grandiflora L.	Magnolia
Magnolia virginiana L.	Swamp magnolia
Myrica inodora Bartram	Bayberry
Myrica cerifera L.	Wax myrtle
Ostrya virginiana (Mill) Koch	Hop-hornbeam
Quercus nigra L.	Water oak
Illicium floridanum Ellis	Polecat tree
Nyssa sylvatica L.	Swamp tupelo
Cyrilla racemiflora L.	Swamp cyrilla
Ilex opaca Ait.	American holly

Wild grape, smilax, ferns, and mosses form the understory and ground vegetation in the hammock.

TABLE V: PARTIAL LIST OF VERTEBRATES IN THE HAMMOCK COMMUNITY

Amphibians

Order Urodela

Desmognathus fuscus (Stejneger)	Dusky salamander
Plethodon glutinosus (Allen and Neill)	Slimy salamander

Order Anura

Hyla squirella (Latreille)	Rain frog
Hyla cinerea (Schneider)	Green tree frog
Hyla gratiosa (LeConte)	Barking tree frog

Reptiles

Suborder Lacertilia

Lygosoma laterale (Say)	Brown skink
Anolis carolinensis (Voigt)	Green anole
Eumeces laticeps (Schneider)	Broad headed skink

Suborder Serpentes

Elaphe obscleta (Holbrook)	Rat snake

Birds

Order Falconiformes

Buteo lineatus (Ridgway)	Red shouldered hawk

Order Strigiformes

Otus asio L.	Common screech owl

Order Passeriformes

Thryothorus ludovicianus (Latham)	Carolina wren
Toxostoma rufum L.	Brown thrasher
Pyrrhuloxia cardinalis L.	Cardinal

Mammals

Order Marsupialea

Didelphis marsupialis L.	Opossum

Order Rodentia

Sciurus carolinensis (Gmebin)	Gray squirrel
Glaucomys volans L.	Flying squirrel

Order Carnivora

Procyon lotor L.	Raccoon

Order Artiodactyla

Sus scrofa	Hog
Odocoileus virginianus (Zimmermann)	Whitetailed deer

The boundary between the sandhill and hammock communities, termed ecotone, has some characteristic plants not common to either community. Gallberry, palmetto, and blackberry brambles are common along this boundary.

METHOD: A survey line was constructed through ecotone into the hammock. Species distribution of plants was not uniform, so individual plants were sprayed at rates corresponding to 2 and 30 lb/acre. Evaluation of spray was made two weeks after application.

RESULTS: Heavy rains minimized the effects of the 2 lb/acre spray rate on the hammock flora. The 30 lb/acre concentration was sprayed during a dry period and after two weeks all treated plants were defoliated or the leaves were completely brown.

DISCUSSION

Heavy concentrations of cacodylic acid greatly modify the hammock community. Direct damage to flora has the indirect effect of a reduction and modification of associated animal population. Direct effects of cacodylic acid on fauna will be outlined in a separate part of this paper.

SECTION IV

THE GRASSLAND OR SECONDARY SUCCESSION

Ranges on the Eglin Reservation are in a stage of secondary succession due to human modification of the sandhill community. Vegetation in these areas consists of broomsedges, wiregrass, palmettos, and yucca. The older ranges have typical sandhill dominants, i.e., oaks and pines with a heavy ground cover of grasses.

The fauna of these areas are not all characteristic of the sandhill community. Exceptions include populations of quail, meadowlarks, and field sparrows.

METHOD: A total of five plots were sprayed on the grassland. The 2 lb/acre, 15 lb/acre, and 30 lb/acre plots were one rod square and were sprayed 22 June 1965. Two 10 foot square plots were treated at a rate of 6 lb/acre on 16 July 1965. After two weeks photographs were taken of the rod square plots. On 22 July 1965 a four-week evaluation of these plots was made.

TABLE VI: EFFECT OF CACODYLIC ACID ON GRASSLAND COMMUNITY

6 July 1965:	The 2 lb/acre plot had a 50% kill overall.
22 July 1965:	The 2 lb/acre plot showed almost complete recovery. The vegetation had not grown to normal height. Broomsedges, wiregrass and oaks were living.
6 July 1965:	The 30 lb/acre plot showed 100% kill overall.
22 July 1965:	The 30 lb/acre plot showed little recovery with the exception of wiregrass.
6 July 1965:	The 15 lb/acre plot produced a 75 - 90% kill overall.
22 July 1965:	The 15 lb/acre plot showed limited recovery. Ten to 15% of the surface area was covered with green vegetation. The vegetation was below normal height. Wiregrass, oaks, and broomsedges were living.

The 6 lb/acre plots were observed 22 July 1965 and showed damage to exposed leaves, i.e., those on upper half of plants. On 2 August 1965, the lower leaves were brown.

DISCUSSION

The grassland showed more recovery from a heavy application of cacodylic acid than either the sandhill or hammock community, since the vegetation consists of fast growing grasses and legumes Heavy rains during June and early July also tended to hasten recovery.

SECTION V

ALGAL PRODUCTIVITY AS A FUNCTION OF CONCENTRATIONS OF CACODYLIC ACID

Algae, the most important single link in the life process of the pond, have the dual function of oxygen and primary food production. A reduction in either of these factors would decrease the number of consumers supported by the pond. Chlorophyll, extracted from algae, can be used as an indicator of primary productivity and varies with the amount of algae present. A study of the effects of a herbicide on algae productivity can be accomplished by comparing the amount of chlorophyll in a controlled sample with the amount of chlorophyll in samples containing various concentrations of the herbicide. The same holds true for an oxygen analysis.

CHLOROPHYLL ANALYSIS

METHOD: Six 300 ml. oxygen sampling bottles were filled with pond water containing heavy but equal concentrations of algae. One bottle was used as a control while the other five were inoculated with varying field concentrations of cacodylic acid. The sample bottles were then placed in the pond from which the water samples were taken to maintain field environmental conditions. After 24 hours the samples were returned to the lab for analysis. The above process was repeated for a 48 hour comparison.

24 Hour Series: The contents of each bottle were filtered through 0.45 micron Millipore filters at the rate of one filter for every 100 ml. of liquid. Each of three filters with their algae content collected from each of these water samples was placed in 25 ml. of acetone to extract the chlorophyll from the algae and to dissolve the filter. The samples were then centrifuged and the supernatant liquid poured into Spectronic-20 tubes for reading. The Spectronic-20 was set on a wave length of 430 millimicrons and was zeroed with an acetone blank. Variables were read and recorded below.

48 Hour Series: Modification of the above procedure was necessary due to heavy concentrations of algae present in the water samples. Two standard BOD bottles were used for each variable. The two bottles for each concentration were thoroughly mixed and 100 ml. from each bottle was placed in two centrifuge tubes resulting in a total of four tubes per concentration of cacodylic acid. The four samples were centrifuged for ten minutes and the supernatant liquid discarded. The samples of algae from each bottle were then mixed with 25 ml. of acetone resulting in one mixture of acetone and algae from each of the two samples. The

amount of algae present in each mixture at this time was equal to the amount of algae present in 100 ml. of the original samples. The acetone-algae mixture was then centrifuged for ten minutes to clear the supernatant of debris. The clear supernatant filtrant containing acetone and chlorophyll was placed in Spectronic-20 tubes for reading. This process was duplicated for the above two samples as a check on procedure. Each concentration of cacodylic acid was processed in this manner. The Spectronic-20 readings below were made with a wave length of 430 millimicrons and an average of the four samples from each concentration of cacodylic acid recorded.

TABLE VII: CHLOROPHYLL ANALYSIS RELATIVE TO CONCENTRATIONS OF CACODYLIC ACID

	24 Hour Group	48 Hour Group
Concentrations	Percent Light Transmitted	Percent Light Transmitted
Control	31%	17%
5.53 ppm	42%	20%
27.6 ppm	44%	26%
55.3 ppm	49%	32%
83.0 ppm	48%	33%
162.0 ppm	53%	34%

5.53 ppm is equivalent to a spray rate of 2 lb/acre over a surface of water one foot in depth. A spray rate of 15 lb/acre will result in a 50% reduction in pond productivity after 48 hours.

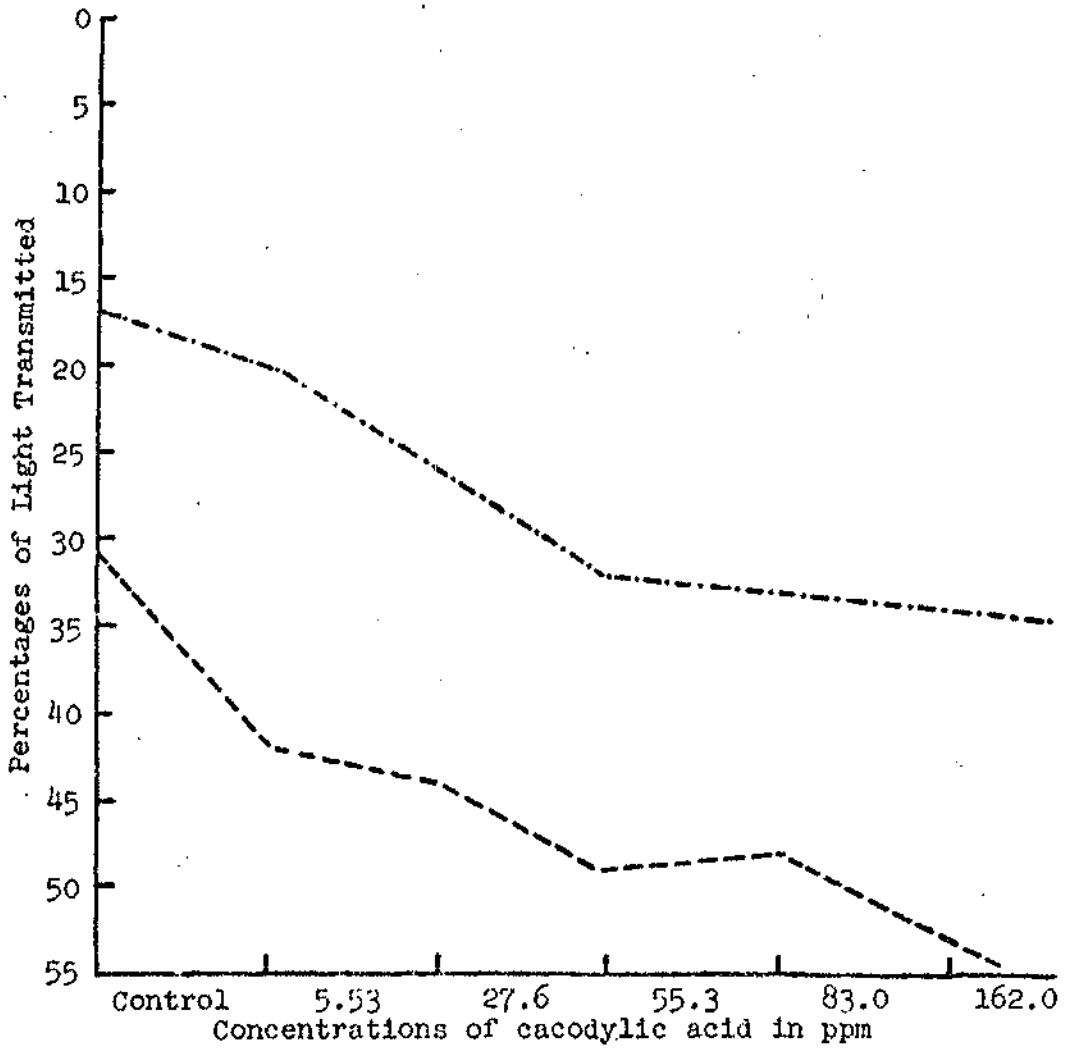

FIGURE 1

Chlorophyll Production by Algae as a Function of the Concentration of Cacodylic Acid

SECTION VI

OXYGEN ANALYSIS

METHOD: For each series of tests, six 300 ml. BOD bottles were filled with pond water containing equal amounts of algae. One of these water samples was used as a control and the remaining five were mixed with cacodylic acid in concentrations of 5.53, 27.6, 55.3, 83.0, and 162.0 ppm respectively. These concentrations were based on field spray rates varying from 2 to 60 pounds per acre. The sample bottles were placed in the pond from which the samples were taken to maintain normal temperature and light conditions. Analysis of the oxygen content was made at 24, 48, 72, and 96 hours. Another group of samples was made with distilled water and was analyzed after 24 hours to check the effect of cacodylic acid on the free oxygen in the water. Analysis was carried out in the laboratory.

ANALYSIS: Two ml. of $MnSO_4$ were added to each water sample, followed by 2 ml. of alkaline iodide azide well below the surface of the water. The bottles were stoppered and inverted to mix the reagents. A precipitate was formed. Two ml. of concentrated H_2SO_4 were allowed to run down the neck of the bottle. Once again the bottles were inverted to assure a complete fixation of the oxygen. Then 200 ml. of the supernatant liquid were decanted into a beaker and 2 ml. of a starch indicator were added. This solution was then titrated with 0.25N sodium thiosulfate. The amount of sodium thiosulfate used in milliliters is equivalent to the amount of dissolved oxygen in the original sample in milligrams per liter or parts per million.

TABLE VIII: DISSOLVED OXYGEN CHANGES RELATED TO SEVERAL CONCENTRATIONS OF CACODYLIC ACID

Concentrations Cacodylic Acid	Distilled H_2O	24 Hrs.	48 Hrs.	72 Hrs.	96 Hrs.
Control	6.9	.9	6.7	7.0	6.8
5.53 ppm	6.8	.9	5.8	5.0	6.5
27.6 ppm	6.5	.5	5.8	1.4	5.4
55.3 ppm	6.5	.5	5.8	.5	5.4
83.0 ppm	6.6	.2	4.7	.2	4.0
162.0 ppm	6.6	.2	4.5	.3	4.5

Oxygen in mg/liter

5.53 ppm is equivalent to a spray rate of 2 lb/acre over a surface of water one foot in depth.

Cacodylic acid did not reduce the O_2 content in distilled water; therefore, the reduction of O_2 in pond water is a result of the destruction of algae. The 24, 48, 72, and 96 hour tests were all made with different water samples, thus they contained varied amounts of dissolved oxygen and algae; however, within the groups the same trend is evident.

DISCUSSION

Any condition which approaches or exceeds the limits of tolerance for a given organism is said to be a limiting factor. Oxygen, in small lentic habitats, is relatively scarce and tends to become one of the major limiting factors to aquatic animal life. Algae, in many of the small ponds found in this area, are a primary source of oxygen for the aquatic animals supported by these ponds communities. Cacodylic acid, when introduced in field concentrations into a pond, reduces the amount of algae which may reduce the amount of oxygen below the tolerance of the pond's inhabitants. This condition could result in a decrease of the number of aquatic organisms for any given area.

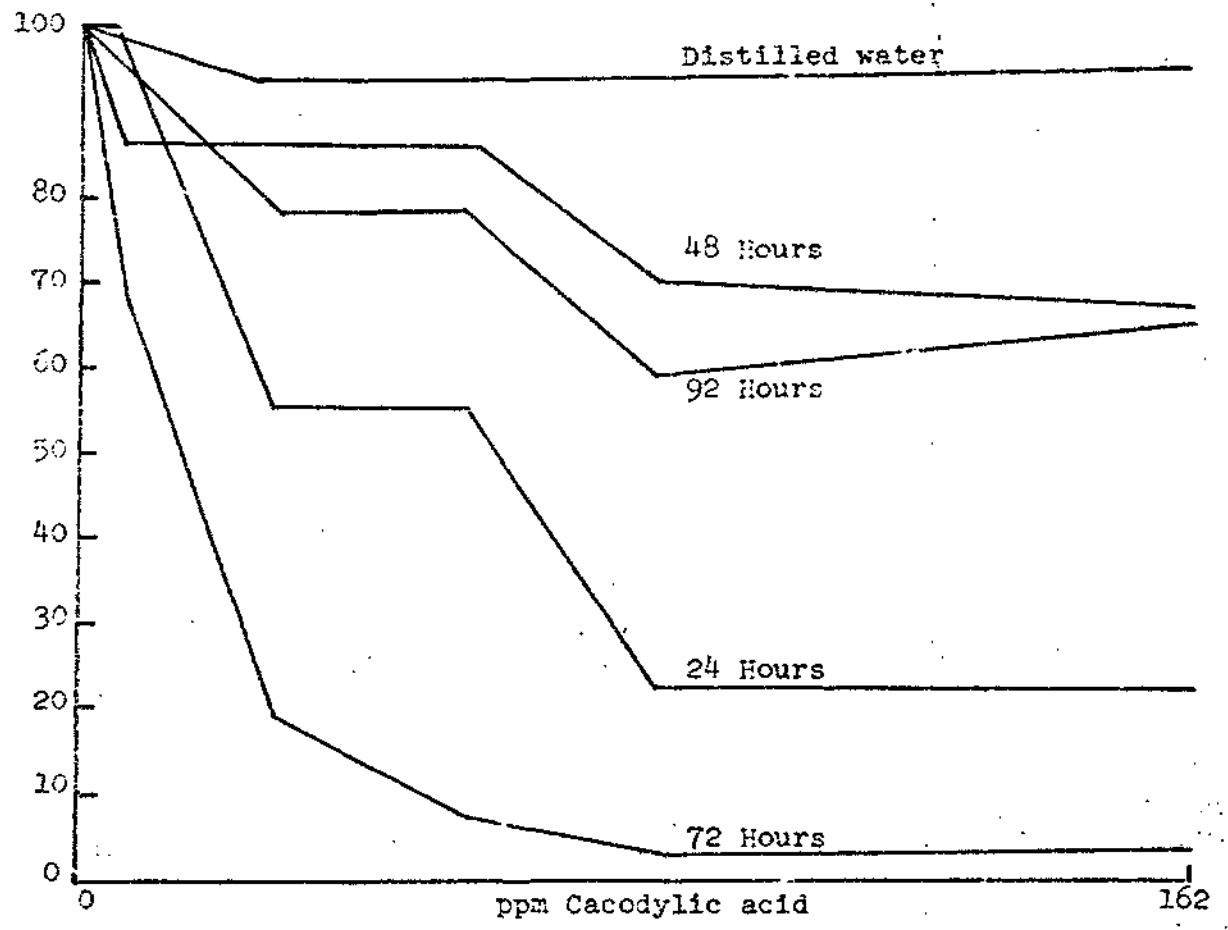

FIGURE 2

Percent Oxygen Reduction

SECTION VII

DIRECT EFFECT OF CACODYLIC ACID ON LOCAL POND FAUNA

Although the main effect of cacodylic acid on pond fauna is indirect through the removal of primary producers such as algae, there is an immediate direct effect only when concentrations greater than 30 lb/acre are used. Testing has been limited to representative phyla which could be obtained in quantity. Following is a list of the more common fauna found in the area of the experimental pond including those species tested:

Fishes

Order Cyprinodontitor

Gambusia affinis (Baird and Girard)	Gambusia (Mosquito fish)

Order Cypriniformes

Notropis maculatus (Hay)	Taillight shiner

Order Perciformes

Micropterus salmoides (Lacepede)	Largemouth black bass

Amphibians

Order Urodela

Notophythalmus viridescens (Rafinesque)	Newt

Order Anura

Bufo terrestris (Bonnature)	Southern toad
Acris gryllus (Le Conte)	Cricket frog
Rana pipiens (Schreber)	Leopard frog

Reptiles

Suborder Serpentes

Natrix sipidon pictiventris L.	Florida banded water-snake
Ancistrodon piscivorus (Lacepede)	Cottonmouth moccasin

Order Crocodilia

Alligator mississippiensis	Alligator

Insects

Order Odonata

Pantala sp.	Sprawling nymph - Dragon fly
Gynacantha nervosa	Climbing nymph - Dragon fly

EXPERIMENTS

Fish: Gambusia affinis, Notropis maculatus, Micropterus salmoides

Experiment One: Thirty fish were placed in each of four 6-liter Erlenmeyer flasks, three of which contained 100, 1000, and 10,000 ppm cacodylic acid, respectively. The fourth flask was used as a control. Counts of the living fish were made at 1, 2, 4, 24, 48, and 72 hours. The water volume in each case was four liters.

TABLE IX: EFFECT OF THREE CONCENTRATIONS OF CACODYLIC ACID ON GAMBUSIA

	Live Fish at Indicated Time					
	1 Hr.	2 Hrs.	4 Hrs.	24 Hrs.	48 Hrs.	72 Hrs.
Control	30	30	30	30	30	30
100 ppm	30	30	30	30	30	30
1000 ppm	30	30	30	14	0	0
10,000 ppm	15	0	0	0	0	0

At 48 hours the lethal dose of cacodylic acid which kills 50% of the Gambusia affinis is between 100 and 1000 ppm.

Experiment Two: Twenty fish were placed in each of seven 6-liter Erlenmeyer flasks containing 100, 158, 251, 398, 631, and 1000 ppm, respectively. The remaining flask was a control. The counts were made at 1, 24, 48, and 72 hours.

TABLE X: EFFECT OF DIFFERENT CONCENTRATIONS OF CACODYLIC ACID ON GAMBUSIA

	Live Fish at Indicated Time			
	Hour	24 Hours	48 Hours	72 Hours
Control	0	20	20	19
100 ppm	20	13	4	0
158 ppm	20	18	18	17
251 ppm	20	18	18	16
398 ppm	20	16	12	12
631 ppm	20	18	18	12
1000 ppm	20	16	12	0

A partial explanation for the fluctuation in the percent kill versus concentrations was the larger size of the Gambusia in Experiment Two.

The LD50 for Gambusia affinis at 48 hours approached 1000 ppm.

Notropis maculatus - Taillight shiners

Experiment Three: Ten Taillight shiners were placed in each of five 6-liter Erlenmeyer flasks containing 158, 398, 631, and 1000 ppm respectively with the remaining flask being a control. Live fish counts were made at 1, 24, 48, and 72 hours.

TABLE XI: EFFECT OF CACODYLIC ACID ON NOTROPIS MACULATUS

	1 Hour	24 Hours	48 Hours	72 Hours
Control	10	9	9	8
158 ppm	10	9	9	9
398 ppm	10	10	10	6
631 ppm	10	10	10	5
1000 ppm	10	7	6	2

At 48 hours the LD50 for shiners approaches 1000 ppm.

Experiment Four: Tests were also conducted on small (4" - 5") Micropterus salmoides - largemouth black bass. Gambusia were placed in 1000 ppm cacodylic acid for 24 hours, then fed to the bass. This test was carried out over a period of two weeks with no apparent effect on the bass.

Amphibians:

Fifty Bufo tadpoles were placed in each of four 6-liter Erlenmeyer flasks containing 100, 1000, and 10,000 ppm cacodylic acid respectively with the remaining flask being used as a control. Live counts were made at 2, 18, 24, 48, and 72 hours.

TABLE XII: EFFECT OF CACODYLIC ACID ON BUFO TADPOLES

	2 Hrs.	18 Hrs.	24 Hrs.	48 Hrs.	72 Hrs.
Control	50	50	50	50	50
100 ppm	50	50	50	50	50
1000 ppm	50	50	29	0	0
10,000 ppm	50	0	0	0	0

The LD50 for Bufo larvae at 48 hours is between 100 and 1000 ppm.

Insects:

Tests were attempted to determine the direct effects of cacodylic acid on the immature stage of two species of dragon fly, Pantala sp. and Gynacantha nervosa. This was not an extensive experiment and due to the cannabalistic nature of insect larva, valid results were not obtained. In the time limits of this test series, no deaths directly attributed to cacodylic acid (in 1000 ppm) occurred.

These data indicate that when concentrations of cacodylic acid approaching 1000 ppm are reached in a pond, a reduction of at least 50% of the small animals can be expected within 48 hours.

DISCUSSION

Cacodylic acid can be expected to produce environmental modifications in local communities when sprayed at concentrations exceeding 2 lb/acre. The high solubility of this chemical will hasten recovery of the plant life.

Cacodylic acid had a low toxicity to the animals tested in an 18 hour period. It is not possible to predict the effects of this herbicide on local flora and fauna when the basis of the prediction is the direct effects of the herbicide on each species. A realistic prediction must be based on a knowledge of the total ecology of a community. This paper has stressed the ecological approach in an attempt to predict the effects of cacodylic acid. A complete evaluation can be made only when large areas are sprayed and studied for a period of several months.

A quantitative study of the effects of cacodylic acid on a stream community and Choctawhatchee Bay is both difficult and costly. No attempt has been made to predict what the effects will be.

Known characteristics of arsenicals include a cumulative effect which may be misleading. Spector (1955) states that rabbits are killed when injected intravenously with 250 mg/kg of cacodylic acid; thus, animals eating contaminated plants could conceivably be killed in an area where a low area concentration has been applied.

SECTION VIII

SUMMARY

1. The sandhills, the predominant biotic community on the Eglin Reservation, would undergo modification of the flora at spray rates of 6 lb/acre or greater.

2. Three weeks after the application of 30 lb/acre cacodylic acid on the hammock community, all exposed plants were defoliated or dying.

3. Grassland plots sprayed at rates up to 30 lb/acre cacodylic acid showed some recovery after four weeks.

4. Cotton plants showed recovery from a 2 lb/acre spray rate of cacodylic acid after three weeks.

5. Algal productivity, measured as the amount of chlorophyll and dissolved oxygen was reduced by concentrations above 2 lb/acre.

6. Pond vertebrates tested had an LD50 at concentrations approaching 1000 ppm in 48 hours.

7. The effects of cacodylic acid on stream and bay habitats were not tested.

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UNCLASSIFIED
Security Classification

DOCUMENT CONTROL DATA - R&D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1 ORIGINATING ACTIVITY (Corporate author)

Vitro Services of America
Eglin Air Force Base, Florida

2a REPORT SECURITY CLASSIFICATION

Unclassified

2b GROUP

N/A

3 REPORT TITLE

An Ecological Study on the Effects of Certain Concentrations of Cacodylic Acid on Selected Fauna and Flora

4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final report, 23 April 1965 to 26 July 1965

5 AUTHOR(S) (Last name, first name, initial)

Kelly H. Oliver, Jr.
Gary H. Parsons
C. T. Huffstetler

6 REPORT DATE	7a TOTAL NO OF PAGES	7b NO OF REFS
July 1966	33	None

8a CONTRACT OR GRANT NO.	9a ORIGINATOR'S REPORT NUMBER(S)
AF 08(635)5150	APGC-TR-66-54
b. PROJECT NO. PGVE task No. 394-65	
c.	9b OTHER REPORT NO(S) (Any other numbers that may be assigned this report)
d.	

10 AVAILABILITY/LIMITATION NOTICES

Distribution of this document is unlimited.

11 SUPPLEMENTARY NOTES	12 SPONSORING MILITARY ACTIVITY
Available in DDC	Air Proving Ground Center Eglin Air Force Base, Florida

13 ABSTRACT

A study has been made of the effects of cacodylic acid on the flora and fauna of specific ecotones. Approximate lethal dosages have been determined for specific plants and animals under certain conditions. The five ecotones, sandhills, hammock, grasslands, pond and stream, are briefly characterized and the effects of cacodylic acid on the inhabitants of each are summarized.

DD FORM 1 JAN 64 1473

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			ROLE	WT	ROLE	WT	ROLE	WT
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