

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

Nebraska Game and Parks Commission -- White  
Papers, Conference Presentations, & Manuscripts

Nebraska Game and Parks Commission

---

1959

# The Results of Four Years of Fish eradication Work with Toxaphene in Nebraska

D. B. McCarraher

*Nebraska Game and Parks Commission*

Jack L. Dean

*U.S. Fish and Wildlife Service*

Follow this and additional works at: <http://digitalcommons.unl.edu/nebgamewhitepap>



Part of the [Environmental Sciences Commons](#)

---

McCarraher, D. B. and Dean, Jack L., "The Results of Four Years of Fish eradication Work with Toxaphene in Nebraska" (1959).  
*Nebraska Game and Parks Commission -- White Papers, Conference Presentations, & Manuscripts*. 34.  
<http://digitalcommons.unl.edu/nebgamewhitepap/34>

This Article is brought to you for free and open access by the Nebraska Game and Parks Commission at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Game and Parks Commission -- White Papers, Conference Presentations, & Manuscripts by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

**THE RESULTS OF FOUR YEARS OF FISH ERADICATION WORK WITH TOXAPHENE  
IN NEBRASKA**

by

**D. B. McCarraher, District Fisheries Supervisor  
Nebraska Game, Forestation and Parks Commission**

and

**Jack L. Dean, Fishery Management Biologist  
U. S. Fish and Wildlife Service**

*Presented at the 21st Midwest Wildlife Conf. Held in  
Minneapolis Dec 7-9, 1959.*

## INTRODUCTION

Experimental use of the compound, toxaphene, (chlorinated camphene), as a fish eradicator was first tried in Nebraska during 1956.

During the period from 1956 to 1958 a total of 3,810 acres of water have been treated with emulsifiable toxaphene to remove rough fish populations. Concentration levels ranged from 0.05 p.p.m., to 0.61 p.p.m. The maximum depth of the nine renovated sandhill lakes was seven feet with an average depth of only 4.5 feet. Numerous spring seeps are found in all lakes and bottom deposits were organic muck and sand. The lakes are considered moderately alkaline in the 8.5 - 9.5 p.H range. Lake waters were for the most part turbid during the periods of application.

A brief discussion of the toxaphene results on nine sandhill lakes will be covered in this paper. A summary of the 1956-1959 toxaphene activities in Nebraska appears in Table III.

U. S. Fish and Wildlife Service personnel originated and programmed the first dispersal of this toxicant on a Federal Wildlife Refuge lake in the spring of 1956. The Nebraska Game, Forestation and Parks Commission, actively seeking an economical and efficient fish toxicant, also became interested in toxaphene at this time, and thus a federal-state cooperative refuge lake rehabilitation project became a reality. The problem fish in all refuge lakes was the carp, while the black bullhead was the secondary target of control.

Following the incomplete fish kills experienced during the initial eradication efforts in 1956, fisheries workers from the Service and Nebraska concluded that toxaphene dosages of 0.12 to 0.15 p.p.m. were not sufficient for complete kills of carp and bullhead in the sandhill region.

A review of the available literature from other states indicated a great diversity of findings regarding the field use of toxaphene. Those states which were experimenting with this toxicant suggested dosage levels from 0.01 to 0.2 p.p.m.; however, none reported treatment on lakes which contained chemical, physical or biological characteristics of the alkaline fertile waters in the Great Plains area. It was decided to continue toxaphene applications in 1957, but with a minimum dosage of 0.40 p.p.m.

Results of Analyses for Toxaphene in Bird Carcasses Collected from Two Sandhill Lakes. 1/

Dead birds were collected from Swan and Pelican Lakes following the eradication of both lakes with toxaphene and sent directly to the Denver Wildlife Research Laboratory, Fish and Wildlife Service. The objective was to determine if toxaphene was present in the tissues of the dead birds picked up from the two lakes.

The skin and feathers, beak, wing tips, and lower half of legs of the specimens were discarded to avoid surface contamination. The method of analysis consisted of drying the sample with sodium sulphate and extraction with petroleum ether-diethyl ether. The residue was passed through an acid celite column and the pesticide identified and measured by the paper chromatographic method of Mitchell.

---

1/ Results and evaluation from Special Report by Wm. H. Robison, Chemist, Denver Wildlife Research Laboratory, Fish and Wildlife Service.

Table I, Swan Lake (0.05 p.p.m.)

Toxaphene Content of Dead Birds in Parts Per Million Based on Non-dried Tissue Weight

<u>Species</u>	<u>Toxaphene Concentration</u>
Blackbird . . . . .	25
Bluewing Teal . . . . .	25
Bluewing Teal . . . . .	7
Bluewing Teal . . . . .	4
Shoveller . . . . .	12
Bluewing Teal . . . . .	9
Sandpiper . . . . .	10

Table II, Pelican Lake (0.44 p.p.m.)

Toxaphene Content of Dead Birds in Parts Per Million Based on Non-dried Tissue Weight

<u>Species</u>	<u>Toxaphene Concentration</u>
Night Heron . . . . .	64
Coot . . . . .	17
Mallard . . . . .	10

Conclusions - Toxaphene Analysis

As the amount of toxaphene that would be recovered from birds killed at minimum lethal dosages (both acute and chronic) is not known, it is difficult to say with certainty that the birds were killed by toxaphene; however, it seems likely that this was the case.

Swan Lake

Application of toxaphene at Swan Lake was by power sprayers from boats. Applied concentration was 0.05 p.p.m. During the actual spraying activities it was observed that numerous damselflys were caught in the spray and settled on the surface of the lakes. Terns and blackbirds began feeding on the surfaced insects almost immediately.

Approximately 85 birds were found dead along the shoreline of the lake two days following the application. An incomplete kill of carp and bullhead resulted from this eradication attempt.

#### Pelican Lake

The application on the 820 acre Pelican Lake was from an airplane sprayer at the rate of 0.40 p.p.m. The mortality of birds following the spraying operation was observed 24 hours later. Species affected were: cormorant, night heron, coot, gadwall, killdeer, pelican, mallard and teal. The fish kill was considered incomplete when gill net sets during the summer of 1959 revealed several carp and yellow perch present. It is anticipated that Pelican Lake will be treated with a higher concentration of toxaphene some time in 1960 or 1961.

An incident occurred shortly following the aerial spraying when a dog, belonging to the Refuge Clerk, drank treated lake water, went into immediately convulsions and died a short time later. We mention this incident in view of the coincidental occurrence of the dog's death with the application of toxaphene.

#### Dewey Lake

The treatment of this lake was by aerial application at a concentration of 0.46 p.p.m. At the date of renovation the water was extremely turbid. The maximum depth was 5.5 feet with an average depth of only 3.0 feet. A satisfactory kill was not achieved, although fish mortality occurred throughout the fall and winter months. The lake was believed to be non-toxic the following spring, and carp and bullhead survived in good numbers. Of all the lakes renovated with toxaphene, Dewey resulted in the least complete fish kill. Aside from the usual waterfowl losses a considerable number of frogs were found dead, floating on the surface of the shore, 24 hours following treatment.

#### Crane Lake

Crane Lake, located on the Crescent Lake Wildlife Refuge, was first treated with toxaphene in May, 1956. That application was by aerial spraying at a dosage of 0.15 p.p.m. Black crappie and golden shiners were eliminated, but the carp and bullhead survived in moderate numbers. A second eradication was attempted in September, 1959 by aerial spraying. This time 0.61 p.p.m. of toxaphene was applied. No effort was made to rally the ducks from the lake, and thus were subjected to direct spraying. Observations 48 hours later indicated that every duck on the lake at the time of aerial spraying was killed. Again, bullheads and carp survived; however, the few carp located by netting appeared in poor condition. Crane Lake was restocked with largemouth bass in 1959.

#### Island Lake

Island Lake is a 711 acre lake with a maximum depth of seven feet. It is located only a half-mile from Crane Lake. First attempt at renovation with toxaphene was made with a concentration of 0.12 p.p.m., in May, 1956. The effort was a failure. Crappie and bullheads were eliminated, but carp survived in moderate numbers. The second eradication was successful at a concentration of 0.52 p.p.m. Post renovation test netting with gill nets and seines was negative; thus a complete fish kill is believed possible.

Waterfowl losses during the aerial application were estimated at 33 percent of the mallard population, 29 percent of the gadwalls, and less than 10 percent of the ring-billed gull and western grebe populations.

#### Little Hay Lake

The treatment of this 18 acre lake was by pack pump at a dosage of 0.25 p.p.m. This lake is shallow, with an average depth of two feet, and has soft muck bottom. Follow-up investigations indicated a complete kill was obtained.

#### Homestead Lake

This 22 acre lake was treated by pouring 0.50 p.p.m. toxaphene into the wake of an outboard motor. Shoal areas were treated by back-pack pump. The lake has clear water, and a firm sand bottom covered with six inches of muck. Test netting studies indicated that a complete kill was obtained.

#### Whitewater Lake

Whitewater Lake, 600 surface acres, was treated by aerial spraying at a dosage of 0.44 p.p.m., on September 16, 1958. Netting in April and June of 1959 indicated that all species present in the lake had survived the eradication in small numbers. By June the pondweeds in the lake were showing in abundance, indicating at least temporary benefit to waterfowl from the eradication. This lake will be renovated again with toxaphene at a concentration of 0.60 to 0.70 p.p.m.

#### Hackberry Lake

Treatment of the 680 acre lake was by outboard motor and back-pack pump at a dosage of 0.40 p.p.m. Eradication was conducted in October, 1957, and fish were observed in distress until early December when the lake froze over. Intensive gill netting studies failed to locate remnant fish in early 1958. Crappies in live boxes were alive after a 30-day exposure period in August, 1958, and the decision was made to restock the lake. Stocking efforts included largemouth bass, bluegill, rock bass and channel catfish fingerlings. A few adult northern pike were stocked in November, 1958. Intensive gill netting studies in the spring of 1959 failed to detect the survival of any of these fish. Fathead minnows of unknown origin were detected in May, 1959, and the lake was subsequently stocked with northern pike, bluegill and largemouth bass fingerlings. A few adult bass were also added. Survival of the 1959 fish plant appears good,



and excellent growth recorded for all species.

Aquatic vegetation made a remarkable recovery by August of 1958, and as a result duck use has increased about 400 percent compared to the pre-renovation waterfowl use.

TABLE III

## A SUMMARY OF SOME TOXAPHENE TREATED LAKES

LAKE	DATE TREATED	METHOD OF APPLICATION	PROBLEM FISH	TOXAPHENE	SUCCESS	WATERFOWL
				CONCENTRATION		LOSS
				P.P.M.		
Crane	May 16, 1956	Aerial	Carp, Bullhead	0.15	Inc. Kill	None
128 s/ac.	Sept. 9, 1958	Aerial	Carp	0.61	Inc. Kill	Yes
Island	May 16, 1956	Aerial	Carp, Bullhead	0.12	Inc. Kill	None
711 s/ac.	Sept. 9, 1958	Aerial	Carp	0.52	Complete Kill	Yes
Swan	June 31, 1958	Boat	Carp, Bullhead	0.05	Inc. Kill	Yes
240 s/ac.						
Hackberry						
680 s/ac.	Oct. 2, 1957	Boat	Carp, Bullhead	0.41	Complete Kill	None
Pelican						
819 s/ac.	Sept. 16, 1958	Aerial	Carp	0.44	Inc. Kill	Yes
Whitewater						
600 s/ac.	Sept. 16, 1958	Aerial	Carp, Bullhead	0.41	Inc. Kill	Yes
Dewey						
550 s/ac.	Sept. 17, 1958	Aerial	Carp	0.46	Inc. Kill	Yes
Homestead						
22 s/ac.	Sept. 11, 1956	Boat	Bullhead, sunfish	0.50	Complete Kill	None
Little Hay						
18 s/ac.	Sept. 12, 1956	Boat	Bullhead, sunfish	0.25	Complete Kill	None

### CONCLUSIONS

1. The concentration of toxaphene to achieve a maximum kill of carp and bullhead in sandhill lakes appears to be above the 0.50 p.p.m. level. Dosage levels less than 0.50 will cause carp and bullhead mortality, although the fish kill is not always complete.
  2. Aerial spraying of toxaphene was conducted on five of ten renovation projects. Waterfowl losses occurred during all five spraying projects, and ranged from approximately 15 percent to 100 percent mortality of birds present. Mammals thought to be directly affected by toxaphene applications were: raccoon, dog, cow and skunk. These mammals were observed, dead, along the lake shorelines 36 hours following treatment.
  3. Invertebrate populations reappeared in all lakes before toxicity levels were suitable for restocking of fish. Cladoceran pulses prevailed in toxaphene levels of 0.40 to 0.50 p.p.m.
  4. The duration of the toxicity period differed between lakes using the approximate same concentration. Turbidities (silt and algae) and alkalinity values may have some buffering and de-toxifying influence. We have, to date, been unable to predict the duration of toxicity. In one instance a lake renovated with toxaphene at 0.41 p.p.m., in September still retained some toxicity ten months later, while another lake of the same physical and chemical properties became non-toxic within three months at the same dosage level.
  5. Toxaphene application by boat resulted in superior fish kills and limited mortality of waterfowl. All lakes treated by aerial spraying methods resulted in incomplete fish kills and variable waterfowl losses. The effectiveness of boat application methods precludes the future use of aerial renovation.
- 

Presented at The  
Twenty-first Midwest Wildlife Conference  
Minneapolis, Minnesota  
December 7, 8, 9, 1959