

MISCELLANEOUS PAPER EL-90-23



ASSESSMENT OF AVIAN BOTULISM CONTROL PILOT PROJECT AT THE DIKE 14 CONFINED DREDGED MATERIAL DISPOSAL FACILITY, CLEVELAND, OHIO

AD-A231 729

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Original contains color plates: All DTIC reproduct-ions will be in black and white



December 1990 Final Report

Approved for Public Release; Distribution Unlimited



Prepared for US Army Engineer District, Buffalo Buffalo, New York 14207-1399

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Unclassified SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE			Form Approved OMB No. 0704-0188		
1a REPORT SECURITY CLASSIFICATION		16 RESTRICTIVE MARKINGS			
Unclassified 2a. SECURITY CLASSIFICATION AUTHORITY		3 DISTRIBUTION	. AVAILABILITY O	FREPORT	
26 DECLASSIFICATION / DOWNGRADING SCHEDU		ļ			
26 DECLASSIFICATION / DOWNGRADING SCHEDO		Approve	d for public rel	ease; dis	stribution unlimited.
4 PERFORMING ORGANIZATION REPORT NUMBER	R(S)	5 MONITORING	ORGANIZATION R	EPORT NU	MBER(S)
Miscellaneous Paper EL-90-23		i			
6a. NAME OF PERFORMING ORGANIZATION	6b. OFFICE SYMBOL (If applicable)	7a NAME OF M	ONITORING ORGA	NIZATION	
USAEWES Environmental Laboratory	(" applicable)				i
6c. ADDRESS (City, State, and ZIP Code)		76 ADDRESS (CI	ty, State, and ZIP	Code)	
3909 Halls Ferry Road		•			
Vicksburg, MS 39180-6199					
Ba. NAME OF FUNDING / SPONSORING	86 OFFICE SYMBOL	9 PROCUREMEN	T INSTRUMENT ID	ENTIFICAT	ION NUMBER
ORGANIZATION USAED, Buffalo	(If applicable)	[
8c. ADDRESS (City, State, and ZIP Code)		10 SOURCE OF	UNDING NUMBER	5	
Duffelo NV 14207 1200		PROGRAM ELEMENT NO	PROJECT NO	TASK NO	WORK UNIT
Buffalo, NY 14207-1399				1	
11 TITLE (Include Security Classification)			· 		
Assessment of Avian Botulism Control Cleveland, Chio	Pilot Project at the	Dike 14 Confin	ed Dredged Ma	iterial Di	isposal Facility,
12 PERSONAL AUTHOR(S)					
Simmers, John W.; Apfelbaum, Steven					
Final report 13b TIME CO	OVERED TO	14 DATE OF REPO Decembe		Day) 15	PAGE COUNT
16. SUPPLEMENTARY NOTATION		Decembe	1770		VA
Available from National Technical Info	ormation Service, 528	85 Port Royal R	load, Springfiel	d, VA 2	22161.
17 COSATI CODES	18 SUBJECT TERMS (C	ontinue on revers	e if necessary and	l identify	by block number)
FIELD GROUP SUB-GROUP	Avian botulism	CDF m	anagement		
	<u> </u>				
19 ABSTRACT (Continue on reverse if necessary	and identify by block no	ımber)			
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Unclassified

SECURITY CLASSIFICATION OF THIS PAGE
19. ABSTRACT (Continued).
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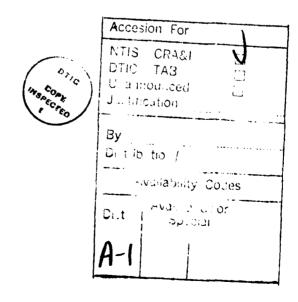
SUMMARY

The Dike 14 Confined Dredged Material Disposal Facility (CDF) at Cleveland, OH, was the site of an avian botulism outbreak in 1986. At that time the use of noisemaking devices was not successful in preventing the use of the CDF by shorebirds, wading birds, and waterfowl susceptible to botulism.

The Buffalo District of the US Army Corps of Engineers identified the problem as one requiring a generic solution that could be applied at other operational CDFs. The following report describes a pilot project in which plant propagules were planted at the CDF prior to the disposal operations so that a vegetative cover would rapidly appear as the CDF dewatered after disposal operations. The presence of the vegetation on the dewatering dredged material was expected to make the CDF unattractive to shorebirds, wading birds, and waterfowl.

The pilot project was a qualified success in the prevention of a 1987 outbreak of avian botulism. The duration of the disposal operation and the depth of the dredged material placed in the CDF limited the anticipated vegetation establishment. The final elevation of the dredged material relative to the level of Lake Erie allowed the site to dewater and the vegetation that emerged attracted a terrestrial avifauna. The observed botulism abatement was the result of both additional filling and vegetation establishment.

The procedures used to establish vegetation were feasible, compatible with dredging and disposal schedules, and cost-effective. A unique combination of equipment was required, but all of the components were readily available.



PREFACE

This work was sponsored by the Buffalo District of the US Army Corps of Engineers (CENCB). The work was conducted by the Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES), Vicksburg, MS. The study was conducted under the direction of Dr. John Harrison, Chief of EL, and under the general supervision of Dr. C. R. Lee, Chief of the Contaminant Mobility and Regulatory Criteria Group, and Mr. Donald L. Robey, Chief of the Ecosystem Research and Simulation Division (ERSD).

The study was conducted by Dr. John W. Simmers of ERSD, Mr. Steven I. Apfelbaum of Applied Ecological Services, Juda, WI, and Mr. Len F. Bryniarski, Planning Division, CENCB. The CENCB Project Manager was Mr. Donald E. Borkowski.

Funding for the study was provided by CENCB. Technical reviewers were Drs. Douglas Gunnison and C. R. Lee, ERSD, and Dr. Gerould Wilhelm, The Morton Arboretum, Chicago, IL.

COL Dwayne G. Lee, CE, was the Commander and Director of WES at the time of the study. COL Larry B Fulton, EN, is the present Commander and Director. Dr. Robert W. Whalin is Technical Director.

This report should be cited as follows:

Simmers, John W., Apfelbaum, Steven I., and Bryniarski, Len F. 1990. "Assessment of Avian Botulism Control Pilot Project at the Dike 14 Confined Disposal Facility, Cleveland, Ohio," Miscellaneous Paper EL-90-23, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

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CONVERSION FACTORS, NON-SI TO SI (METRIC) UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

Multiply	By	To Obtain
acres	4,046.873	square metres
cubic yards	0.7645549	cubic metres
Fahrenheit degrees	5/9	Celsius degrees*
feet	0.3048	metres
horsepower (550 foot-pounds (force) per second)	745.6999	watts
inches	2.54	centimetres
square inches	6.4516	square centimetres

^{*} To obtain Celsius (C) temperature readings from Fahrenheit (F) readings, use the following formula: C = (5/9) (F - 32).

ASSESSMENT OF AVIAN BOTULISM CONTROL PILOT PROJECT AT THE DIKE 14 CONFINED DREDGED MATERIAL DISPOSAL FACILITY, CLEVELAND, OHIO

PART I: INTRODUCTION

Background

Avian botulism

- 1. Botulism is a bacterial disease often associated with anaerobic conditions on mud flats. Six strains of the bacterium *Clostridium botulinum* that may cause illness have been identified by Duffus (1980).*
- 2. Avian botulism is a common disease of waterfowl. The disease, also called limberneck or Western duck sickness, usually occurs in shorebirds or wading birds congregating on emerging mud flats during the late summer. The causative organisms are bacteria of the genus Clostridium that multiply and produce a toxin in the bodies of dead invertebrate animals under anoxic conditions. Clostridium botulinum type C is the specific strain responsible for limberneck in shallow-water-dwelling, insect-feeding, and omnivorous birds. The bacteria are naturally present in sediments and soils, as spores. Under anaerobic conditions, mesophilic temperatures, and pH levels ranging from 5.7 to 8.0, the spores "germinate" and the bacteria multiply rapidly. It would appear that the appropriate conditions for the multiplication of the bacteria are often present in the hot late summer and early fall months (July-October). During this period, decaying vegetation or vertebrate and/or invertebrate animal carcasses may occur along shorelines and in shallow water providing a source of protein for the bacterial growth. As a carcass decays, the decomposition process uses up available oxygen in the carcass, producing anaerobic conditions. Bacterial spores, possibly ingested when the animal was alive, "germinate" after the animal's death. As the bacteria multiply, they release toxin. As the outbreak progresses, the presence of the carcasses of dead birds may provide additional sources of infection for unaffected birds. Birds may feed directly on invertebrate carcasses that contain the toxin. Alternatively, the birds may feed on live maggots of flesh flies or blowflies that lay eggs on dead vertebrates. These insects apparently accumulate C. botulinum toxin in their bodies as they feed on the carcasses. Some infected birds may carry the disease to neighboring wetlands and mud flats. Once a bird is infected, the botulism toxin attacks the parasympathetic nervous system and usually causes death.
- 3. Botulism bacteria are naturally present in waterways and widely distributed in organic soils. Avian botulism occurs in mud flats and in naturally occurring or manmade wetlands. While little is known about the occurrence or extent of botulism infections in naturally occurring wetlands, the incidence of the disease and the presence of dead and dying birds within confined dredged material disposal facilities (CDFs) are often singled out for attention by resource agencies and the general public. As a result, Corps of

^{*} Duffus, J. H. 1980. Environmental Toxicology, John Wiley and Sons, New York.

Engineers Districts are often requested to take action after the disease is established. Frequently attempts to reduce the populations of susceptible species with noisemakers or trained raptors are both ineffective and expensive.

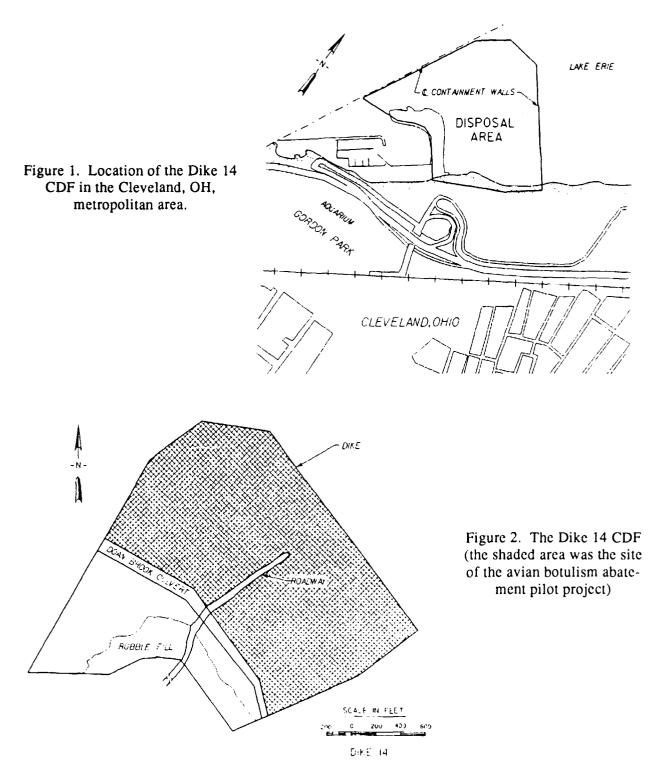
CDF management

- 4. All CDFs progress through the same general stages. At first the dike is placed around an aquatic area. With filling, the enclosed aquatic area is replaced by a wetland and/or mud flat and, finally, an upland as the CDF is filled to capacity. At this point, control of the CDF is returned to the sponsor. Each of these stages requires management procedures appropriate to the habitat and the attracted wildlife. These management procedures are necessary to prevent the movement of contaminants, establishment of undesirable animal species, and wildlife diseases. CDF management must anticipate the possibility that avian botulism may occur at some time during CDF development. Should this event occur, the site must be managed to reduce or eliminate contact by populations of susceptible species.
- 5. In the US Great Lakes, CDFs contain dredged material contaminated with toxic metals, polychlorinated biphenyls, polyaromatic hydrocarbons, and other substances of industrial origin. Generally CDFs are located in waterways that are contaminated to some extent. There are no data that connect contaminants to avian botulism. The impacts of contaminant mobility and the potential incidence of botulism are apparently independent factors that must be considered in management of CDFs for wildlife usage.
- 6. The following report is a summary of a 1987 botulism control pilot project conducted at the Dike 14 CDF at Cleveland, OH, for the US Army Corps of Engineers Buffalo District (CENCB). The CDF was the site of an avian botulism outbreak in 1986 (Appendixes A-D). During the pilot project, a vegetative cover was used to eliminate open mud flat areas that attract wading birds. The recommended management procedures contained in this report are intended to be compatible with CENCB maintenance and operations procedures and are generically applicable to other Districts and locations. A botulism control management plan developed for the Saginaw Bay CDF in Saginaw, MI, is included as Appendix E.

Dike 14 CDF

7. The Dike 14 CDF is an endiked disposal facility of approximately 80 acres* projecting into Lake Erie in the Cleveland Harbor (Figure 1). The CDF is divided into east and west portions by the culvert that transfers Doan Brook through the CDF to the lake (Figure 2 and Photo 1). The CDF contains dredged material from the Cuyahoga River and the Cleveland outer harbor. Yearly maintenance dredging operations typically result in the placement of approximately 320,000 yd³ of dredged material into the site. One third of the material is dredged from the outer harbor and two thirds of the material is dredged from the heavily contaminated Cuyahoga River. The site is currently filled to between 50 and 60 percent of capacity. Doan Brook culvert physically divides the site into two cells and rests on stone rubble requiring the hydrostatic pressure to be balanced on both sides.

^{*} A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page iv.



Therefore, the differential in the levels of dredged material slurry on either side could not exceed 1 ft until the site had been filled to a depth sufficient to bury the culvert.

8. During 1986, the filling of the site reached the point that there were extensive areas of shallow water in the CDF. As the dredged material dewatered, areas of anaerobic mud flat were exposed, the mud flats attracted large numbers of birds, and an avian botulism

incident occurred. Lists of the species killed in the September 1986 outbreak are included in Table 1 and Appendix A.

Methods of control

9. Hunter et al.* extensively studied botulism in California and summarized techniques that have been used to reduce the severity of outbreaks. These methods are based on improvement of ponds and generally involve the maintenance of controlled water levels to minimize the presence of mud flats. Other approaches have included use of carbide cannons or other noisemakers, falconry, and effigies of predators to keep birds away, and removal of dead and/or infected birds to reduce sources of infection. All methods mentioned, while effective to varying extents, are neither compatible with the logistics of a typical maintenance dredging schedule nor easily converted to a standard operating procedure.

Objectives

- 10. The objectives of the pilot project were:
- a. To demonstrate the use of vegetation to discourage waterfowl and shorebirds from landing on the site, reducing the incidence of avian botulism at CDFs.
- b. To demonstrate the feasibility of the above approach as a standard operating procedure.
- c. To evaluate the results of the approach when applied to a regularly scheduled dredging and disposal operation.

Approach

- 11. The techniques that have been suggested and/or applied to reduce the incidence of avian botulism have not been compatible with the operational requirements of a Corps of Engineers District. A District's dredging operations involve one or more contractors, and often several waterways must be dredged. There are also seasonal, construction, and/or environmental restrictions (or constraints) that must be met. Therefore, it is not possible to schedule the placement of dredged material into each CDF at the optimum period for the safety of all waterfowl and shorebird species that are attracted to the site.
- 12. CDF management usually does not consider the selection or control of colonizing species. As a result, birds are frequently attracted to new habitats provided by CDFs. Birds attracted to early successional habitats may develop dense populations on mud flats. Certain threatened and endangered species attracted to mud flats may also colonize contaminated sites in contaminated waterways. These are also locations where conditions favorable to the spread of naturally occurring diseases may temporarily occur.
- 13. The management of a CDF must be a continuing process that is based on the anticipation of the sequence of events that occur in the transition of the CDF from an

^{*} Hunter, B. F., Clark, W. E., Perkins, P. J., and Coleman, P. R. 1970. "Applied Botulism Research Including Management and Recommendations - A Progress Report," Wildlife Management Branch, California Department of Fish and Game, The Resources Agency, Sacramento, CA.

aquatic to a terrestrial ecosystem. The reduction of the incidence of avian botulism is one goal of management; however, the processes managed cannot be separated from the other processes that occur at the CDF. It is critical that any habitat, either naturally occurring or specifically created, must be evaluated by answering the following questions:

- a. Which species will be excluded?
- b. Which species will be attracted?
- c. Will there be significant seasonal differences in species? (i.e., will the mud flat used for nesting by an endangered species in the spring be the site of botulism in late summer?)
- d. Are the habitats selected for pathogen abatement consistent with the management of the CDF to reduce contaminant mobility?
- e. Will a species be attracted that may be adversely affected by the area surrounding the CDF? (i.e., will species attracted to the CDF dike for nesting be adversely impacted by feeding in a nearby industrial area?)
- 14. Plant species were established in the areas of the Dike 14 CDF where it was anticipated that shallow water would exist after the 1987 dredging operations. The naturally occurring dewatering during late summer and early fall could contribute to a potential botulism problem. The plants introduced prior to the disposal operations were expected to colonize or emerge through the mud flats as the dredged material dewatered. The vegetated mud flats were expected to be unattractive to the wading birds susceptible to botulism, and to attract a diverse upland avifauna that would neither be susceptible to botulism nor adversely impacted by contaminants due to habitat and feeding preferences. All efforts to modify the postdisposal habitat with vegetation were applied without requiring either costly or time-consuming modifications in the CENCB operations schedule.

PART II: METHODOLOGY

Plant Species

- 15. A mix of plant species was selected to provide initial and long-term cover on the east side of the culvert (Figure 2). Annual grasses and wetland species were used to create the early successional conditions needed to enable the development of perennial species. These species were planted as seeds, roots, or stem cuttings (Table 2). Common reed (*Phragmites australis*) and sandbar willow (*Salix interior*) were planted as rhizomes and twig cuttings, respectively. All species chosen have either been found within the CDF (Table 3), or are commonly found in disturbed wetlands, and can produce dense vegetative cover.
- 16. The reed rhizomes were harvested at the Consumers Power Plant, Karns coal-fired electrical generating plant in Bay City, MI. Rhizomes were collected from a graveled road shoulder with a 3-point-hitch spring harrow attached to a 70-hp four-wheel-drive tractor. The tines of the spring harrow cut and lifted the dense rhizome mass from the gravel base. The rhizomes were then cut into 4- to 6-in. lengths, iced, packed in peat moss and stored in Styrofoam chests. The rhizomes were stored at Applied Ecological Services facilities (Juda, WI) at $44\pm2^{\circ}$ F for the 2-week period between collection and planting at Dike 14.
- 17. Willow cuttings were collected near Brodhead, WI, 2 days before planting at Dike 14. The willow was collected as whips 6 ft in length. After collection, half of the willow whips were cut to 1-ft lengths. All cuttings were packed on ice in Styrofoam chests until planting.

Equipment

- 18. Specialized equipment was assembled for planting seeds, cuttings, and rhizomes at Dike 14. A four-wheel-drive Honda all-terrain vehicle (ATV) fitted with rubber half-tracks (Tracker Industries) was used in planting areas containing standing water and/or unconsolidated dredged material (Photos 2 and 3). Loading rates of the ATV, plant material, and driver were 0.3 to 0.7/sq in. Seeding was accomplished with a 3-bushel cyclone seeder driven by a 5-hp Briggs and Stratton engine carried on the ATV. Rhizomes and 1- and 6-ft willow cuttings were planted by hand from the ATV.
- 19. A four-wheel-drive Pasquali tractor, with dual wheels, was used in the more consolidated areas to plant reed rhizomes and willow cuttings (Photos 4 and 5). A 3-point-hitch strawberry planter was modified and attached to the tractor as a single row planter. The planter's colter disc opened substrates for insertion of rhizomes and cuttings and packing wheels pressed the substrate around the plant materials. Rhizomes or cuttings could be planted at the rate of up to 3,000/hr.
- 20. A draw-bar-mounted spring harrow was used to rip the surface 3 to 4 in. of the consolidated substrate at the 1986 botulism problem area, and in the relatively dry south end of the CDF (Photo 6). This tool produced a corrugated seed bed and incorporated the seed into the upper inch of the substrate. A 7.5-ft tined drag was pulled by the ATV in areas too wet to harrow in order to provide microtopographic relief for seed incorporation.

Planting Schedule and Rates

21. Planting was initiated 18 May and completed 21 May 1987. Seeding rates (lb/acre) and the approximate numbers of cuttings and rhizomes are shown in Table 2. The seed mix was homogenized by hand in the hopper of the seeder and then spread at a uniform rate. A 30- to 40-ft seed spread width was typical and provided relatively uniform coverage.

PART III: RESULTS AND DISCUSSION

Planting Strategy Feasibility

- 22. Three days were required for a crew of five persons to collect and prepare the propagules, and 4 days, 17-21 May 1987, were required for planting by two persons. Five hours were required to till the consolidated portions of the CDF (approximately 20 acres). Seeding required roughly 10-15 min per acre including loading, seed mixing, and spreading. Rhizomes and cuttings were planted at rates of 800 to 3,000 plants per hour depending on the substrate conditions.
- 23. The dredged material along the northern edge of the dike was neither drivable nor walkable and was covered by 1 to 3 ft of water. The unconsolidated material in this area clogged the ATV track grousers and the vehicle buried itself. Use of a winch and cable to pull the ATV was sufficient to permit planting activities in unconsolidated areas. Prevailing winds and waves were also used to distribute propagules in ponded areas.

Dredging Operations

- 24. Dredged material disposal operations began 29 May 1987, 8 days after the completion of planting, and continued through 31 July. The dredging contractor, Great Lakes Dredge and Dock, placed 320,000 yd³ of dredged material in the CDF; 220,000 yd³ were dredged from the Cuyahoga River and the remaining 100,000 yd³ were from the Cleveland outer harbor. The unplanted portion of the site (approximately 35 acres west of the Doan Brook culvert) was filled first (Figure 2). Dredged material was then alternately pumped to the east and west halves to maintain equal hydrostatic pressure on the culvert (±1 ft). Within a month, the dredged material completely overflowed the culvert. By the time the disposal operations were completed, most of the planted area east of the culvert was covered by up to 6 ft of dredged material, or was flooded.
- 25. By 2 September the CDF had dewatered and the dredged material consolidated. The Doan Brook culvert was covered, there were no shallow areas of standing water to attract wading birds, and there were no indications of avian botulism. Some planted vegetation had emerged through the dredged material.
- 26. The pilot project was evaluated at the end of the growing season (26 October 1987). During the disposal operations the CDF was filled level with the culvert. The north end of the east half (planted) and the west half (unplanted) of the CDF each received up to 6 ft of dredged material. In the east half of the CDF, depths of dredged material decreased with increased distance from the dredge pipe. The gravel access road in the east half of the CDF supported lush vegetation that apparently acted to filter suspended material so that the south 30 acres of the east half experienced only intermittent flooding.

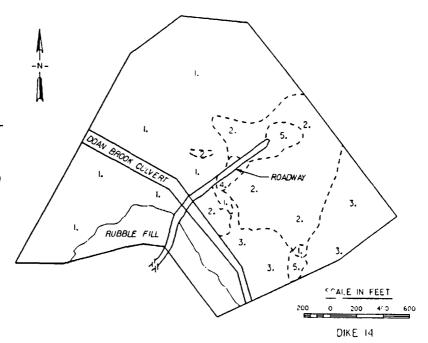
Vegetation

27. Vegetation was not established during the 1987 growing season in areas where deep burial occurred (Photo 7). Only vegetation capable of growing through shallow burial was evident in October (Figure 3 and Photo 8). Smartweed species were able to sprout adventitious roots along the stems and incrementally grew through over 3 ft of

Figure 3. Vegetation at the Dike 14 CDF 26 October 1987

Key:

- 1. Dry mud flat, unvegetated
- 2. Dominant plant, smartweed (*Polygonum*)
- 3. Dominant plant barnyard grass (Echinochloa)
- 4. Dominant plaant giant reed (*Phragmites*)
- 5. Dominant plants cottonwood (*Populus*) and willow (*Salix*)



dredged material. In areas of shallow dredged material deposits, smartweed and barnyard grass were present in dense stands. Interspersed in these stands were reeds and willow from the spring planting.

- 28. Seeds of smartweed and barnyard grass littered the substrate throughout the CDF. The seeds in and on the substrate produced by the vegetation planted in 1987 germinated in spring 1988, and by 26 June 1988, 75 percent of the site was vegetated (Photo 9). The reed and willow propagules expected to emerge in 1988 were not evident, and the vegetation was composed mainly of grasses and cattails with isolated stands of reed and willow. Observations made 31 August, after disposal operations were completed, indicated that smartweed was the most prevalent species. Areas of *Phragmites* and willow had expanded, and approximately 75-80 percent of the CDF was vegetated (Photo 10). On 31 August there was no standing water on the site and the only shorebirds or waterfowl present were gulls resting in the dry but unvegetated area left by the most recent (1988) disposal operations.
- 29. It is interesting to note that, while areas of comparably sized willows and cotton-woods were partially buried by the dredged material, only the willows survived.

Avifauna

30. The combination of increased dredged material elevation relative to the lake level and the dense growths of planted and volunteer grasses and forbs substantially changed the bird habitat. Foraging shorebirds and waterfowl were no longer the most numerous birds at the CDF. Bird watchers at the CDF noticed a shift in the avifauna to species of sparrows, finches, other songbirds, and doves. These bird groups generally feed on seeds or terrestrial insects and therefore do not usually contract avian botulism. Detailed lists

of species have been compiled by the local Cleveland bird watchers. The observations of one volunteer bird bander confirm the magnitude of the change. Jerry Talkington, a volunteer bird bander for the US Fish and Wildlife Service, banded a great many shorebirds and only about 100 sparrows at Dike 14 in 1986. In fall 1987, in 1 day, almost 400 sparrows were banded and by 26 October 1987, Mr. Talkington had banded 17 different sparrow species (Photo 11). William A. and Nancy R. Klamm of Lakewood, OH, have maintained detailed records of the birds observed at Dike 14. Their records for 1986, 1987, and 1988 through September are included as Appendix D. These records document the changes in avifauna visitations that have occurred with the filling of Dike 14 and the related vegetational changes. The Klamm's records confirm the changes in avifauna from various lakeshore-related species to upland birds that have accompanied the filling of the CDF. In particular, long-term records such as these document the presence of stages of finite length or "windows" in the life cycle of a CDF when management of colonizing species may be necessary.

PART IV: CONCLUSIONS AND RECOMMENDATIONS

- 31. The pilot project was a qualified success in the establishment of vegetation at Dike 14. The duration of the disposal operation and the depth of the dredged material limited the anticipated vegetation establishment. The final elevation of the dredged material relative to the lake level allowed the site to dewater rapidly and the vegetation attracted a different avifauna. The observed botulism abatement was the result of both additional filling and vegetation establishment.
- 32. The procedures used to establish vegetation were feasible and cost-effective. A unique combination of equipment was required, but all of the components were readily available.
- 33. Ideally, division of a CDF into two cells would permit the use of one cell for disposal while vegetation developed on the other. This would allow both cells to be vegetated during the critical stage in CDF development when shallow water and mud flats are the only features present. This approach is often not possible due to construction or operational constraints. Therefore, it is critical that the botulism "window" is identified and action is taken before the first outbreak. At Dike 14, an effort to establish emergent vegetation would have been most effective in the spring of 1986.
- 34. The procedures applied at Dike 14 require fine tuning before they can be considered standard operating procedures. The procedures can be further defined through application at other CDFs where conditions that favor botulism can occur.
- 35. The pilot project described was a field test of methodology that could contribute toward either preventing or reducing the potential of avian botulism outbreaks at CDFs.

Table 1
Birds Killed in the September 1986 Avian Botulism Outbreak

Number Dead	Common Name	Species
13	Semipalmated plover	Charadrius semipalmatus
12	Spotted sanderling	Calidris sp.
7	Sanderling	Calidris alba
3	Pectoral sandpiper	Calidris melanotos
2	Least sandpiper	Calidris minutilla
2	Ruddy turnstone	Arenaria interpres
2	Mute swan	Cygnus olor
1	Stilt sandpiper	Micropalama himantopus
1	Lesser yellowlegs	Tringia flavipes
1	Knot	Calidris canutus
1	Canada goose	Brantia canadensis
1?	Mallard	Anas platyrynchos
1?	Ring-billed gull	Larius delawarensis

NOTE: List compiled from data provided by the Cleveland Museum of Natural History, a more extensive description of the outbreak and list of bird species involved is given in the US Fish and Wildlife Service Columbus Field Office Report included as Appendixes A-D. The total number of dead birds was estimated to be between 587 and 716.

Table 2
Species Selected for the Vegetation of the Dike 14 CDF

		Planting Rate per Acre for 45-Acre CDF
Common Name	<u>Species</u>	lb/acre
Italian rye grass	Lolium multiflorum	11.00
Bentgrass	Agrostis sp.	0.90
Bulrush	Scirpus atrovirens	0.10
Wool grass	Scirpus cyperinus	0.10
Barnyard grass	Echinochloa crusgalli	20.00
Smartweed	Polygonum pennsylvanicum	5.00
Reed canary grass	Phalaris arundinaceae	2.00
Rice cutgrass	Leersia oryzoides	0.04
Switchgrass/Cocklebur	Panicum virgatum Xanthium sp. mixture	0.40
Common reed	Phragmites australis	3,350 rhizomes
Sandbar willow	Salix interior	3,350 cuttings

Table 3
Inventory of Plant Species Present on the Dike 14 CDF
Estimates Made February 1987

Common Name	Species	Percent Cover
	Mudflat Area	
Cocklebur	Xanthium strumarium	<20 to <5
Shepherd's purse	Capsella bursa pastoris	
Barnyard grass	Echinochloa crusgalli*	
American wormseed	Chenopodium ambrosioides	
Beggar's ticks	Bidens sp.	
Smartweed	Polygonum lapathifolium	
	Coarse-grain-size material	
Sandbar willow	Salix interior*	50-100
Cottonwood	Populus deltoides*	
Reed canary grass	Phalaris arundinacea*	
Common reed	Phragmites australis*	
Purple Loosestrife	Lythrium salicaria	
Rice cutgrass	Leersia oryzoides*	
Cocklebur	Xanthium strumarium	
Love grass	Eragrostis hypnoides	
Bog rush	Juncus sp.	
Aster	Aster pilosus	
	Fine-grain-size material	
Broad-leaved cattail	Typha latifolia	100
Narrow-leaved cattail	Typha anguistifolia	
Common reed	Phragmites australis*	
Buttercup	Ranunculus rhomboideus	
Bog rush	Juncus sp.	
Three-square	Scirpus americanus	
Smartweed	Polygonum lapathifolium	

^{*} Species selected for site vegetation.



Photo 1. Dike 14 CDF. The concrete structure on the right is the Doan Brook culvert that divides the Dike 14 CDF into east and west portions. The west portion is shown in this photograph. The CDF dike is in the background



Photo 2. The Honda ATV with half tracks as used in the pilot project. The 3-bushel cyclone seeder is mounted on the ATV. This equipment was used in planting unconsolidated mud flats and ponded areas



Photo 3. The Honda ATV operating in water depths of 1-2 ft



Photo 4. The four-wheel-drive articulated Pasquali tractor with dual wheels as used in the pilot project

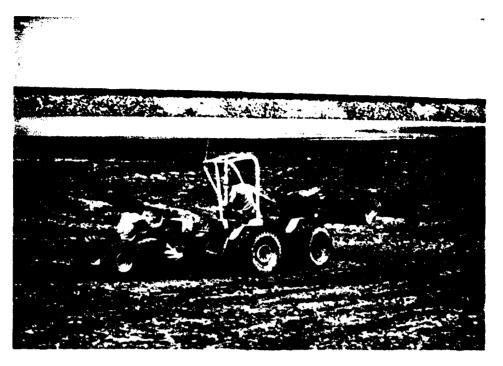


Photo 5. A three-point-hitch modified strawberry planter was used with the Pasquali tractor to plant cuttings and rhizomes in the relatively consolidated portions of the CDF



Photo 6. A 30-hp four-wheel-drive Pasquali tractor was used to pull a modified spring harrow to break up consolidated surface material before planting. This equipment could only be used in the drier areas of the CDF



Photo 7. Planted areas receiving 3-6 ft of dredged material had not become well vegetated by 26 October 1987. There were, however, no areas of standing water and no botulism reported



Photo 8. Planted areas receiving 1 ft of dredged material or less produced relatively lush vegetation in the short time between the completion of the disposal operations and the end of the growing season



Photo 9. Vegetation at Dike 14 during disposal operations (June 1988)



Photo 10. Vegetation at Dike 14 at maximum vegetational growth, September 1988. As in October 1987, there were no areas of standing water and the site was not used by bird species susceptible to avian botulism



Photo 11. Dense grass and forb vegetation substantially changed the bird habitat. Volunteer bird banders captured, marked, and released many seed-eating birds and a few wading birds in 1987. During fall 1987, sparrows representing 17 species were banded

APPENDIX A US FISH AND WILDLIFE SERVICE REPORT ON THE 1986 AVIAN BOTULISM OUTBREAK AT DIKE 14

An Account of the Botulism Outbreak at the Cleveland, Ohio Confined Disposal Facility in 1986

by William J. Kurey, US Fish and Wildlife Service, February 1987

Closteridium botulinum type C is the bacterium that produces the toxin responsible for mass waterfowl deaths. There are six different strains of this bacterium labeled A through F on the basis of the neurotoxins they produce. The disease known as avian botulism, western duck sickness, or limberneck is caused by the neurotoxin, not by bacterial infection.

Botulism tends to ignite in areas that have not been recently flooded or where water levels fluctuate along a feather edge shore (as in Cleveland CDF). Other conditions conducive to a botulism outbreak include:

- a. Warm temperatures 60° to 90° F (winter botulism outbreaks are thought to be caused by still-active texin produced under warm conditions earlier).
- b. pH of 5.7 to 8.0.
- c. Suitable nutrient medium consisting almost entirely of animal matter.
- d. Vertebrate as well as invertebrate carcasses.

Flooding of dry land drowns terrestrial invertebrates that then become incubators for the anaerobic botulism bacteria. Botulism can be a problem in water depths up to about 18 in. The decomposition process uses up available oxygen, and bacterial spores ingested during the life of the animal germinate after death. Botulism outbreaks begin when birds feed directly on invertebrate carcasses or live invertebrates containing toxin and are killed, thus providing additional places for C. botulinum to grow. The outbreak gathers momentum as maggots and other invertebrates concentrate toxin from bird carcasses on which they have been feeding. Ingesting just two to five of these toxin-bearing maggots can kill a duck and more than 5,000 maggots can be produced by a single duck carcass. Once an outbreak occurs it is necessary to remove waterfowl carcasses to break the fly/maggot cycle.

The only positive diagnosis is a laboratory procedure using mice and antitoxin. Signs of botulism intoxication in waterfowl include:

- a. Sick birds are of normal weight.
- b. Sick birds don't eat.
- c. Sick birds have trouble holding their head erect, hence the term limber neck. Leg weakness and wing droop progresses to flaccid paralysis. The nictitating membrane over the eye ceases its rhythmic functioning.

Some sick birds can recover from botulism if given the opportunity. There are three stages of the disease:

Class 1. Birds that can walk but not fly. These birds can recover without special treatment.

- Class 2. Birds that suffer a greater degree of paralysis; difficulty walking and usually row their wings. These birds may recover with oral administrations of fresh water.
- Class 3. These birds are almost completely immobilized and require intraperitoneal injection of antitoxin to survive.

The Cleveland confined disposal facility (CDF) is a diked enclosure for sediments dredged from the harbor to maintain navigable depths. It is known as Dike 14 to the US Army Corps of Engineers and covers an area of about 88 acres. The northwest lagoon is about 9 acres in size and contains open water over 3 ft deep. Cattail marsh and shallow water areas fringe the south shore of this lagoon. The large east lagoon is about 55 acres in size with several acres of brushy vegetation in the central area: the rest is unvegetated sediment, some hard enough to walk on but mostly mud. Open water, from 10 in. deep along the north dike feathering to 0 in. southward, covered about 10 to 15 acres. The depth and extent of this ponded water varied with the elevation of Lake Erie due to the permeability of the dikes. It was this area that appeared to be the source of the botulism problem, although some carcasses were also found in areas of the west lagoon.

According to Bill McDonald (Buffalo District), prior to the summer of 1986 the east lagoon was full of water. Indeed, aerial photographs of the CDF taken in March or April of 1986 show it was covered with water except for a relatively small area in the center of the east lagoon. He also mentioned that he thought that the amount of sand in the dredged sediments was greater in earlier years.

Botulism does not appear to have been a problem at the Cleveland CDF prior to 1986. However, there have been outbreaks at the Saginaw, MI CDF and the Toledo, OH CDF in previous years.

The US Fish and Wildlife Service (USFWS) involvement in the botulism outbreak began on August 12, 1986, but the problem might have existed for 2 weeks or more before USFWS personnel were informed. The problem was brought to the attention of the USFWS by Mr. Dick Bartz of the Ohio Department of Natural Resources (ODNR) who was advised by an employee that he and local bird watchers had noticed the birds dying in the Cleveland CDF.

On August 14, the USFWS met on site with representatives of the Ohio Division of Wildlife (ODOW), ODNR, and the Army Corps of Engineers. The Corps agreed to collect and dispose of carcasses and to try to scare the birds. The ODOW provided a propane cannon that day; eventually, there were four at our disposal.

On the day of the meeting we counted about 65 carcasses using binoculars and a spotting scope; mostly shorebirds were observed, perhaps 15 percent were ducks and geese. A few shorebirds were alive in varying stages of paralysis and displaying typical signs of botulism intoxication. Sick birds tried to hide under vegetation, and those that could not reach shelter died on the mud flats and were not retrievable. The broad expanse of mud flats was the complicating factor in all of this. There was no way to cross the mud to search for dead birds.

The USFWS returned on August 18 and 19 with two 12-gauge shotguns and crackershells for frightening off the birds. The USFWS scared birds and left this equipment with the Corps for their use. Two cases of crackershells (1,000 rounds) with a replacement value of over \$500 were expended over the 46 days they were in use. Eight shorebird carcasses were picked up for submission to the National Wildlife Health Center (NWHC) for necropsy. By September 4, the NWHC had confirmed type C botulism as the cause of death.

The Corps reluctantly agreed to use the propane cannons because of disturbance complaints from a residential area. The propane cannons appeared to be effective in keeping ducks and geese out of the CDF, but shorebirds were unimpressed. Shorebirds were also unimpressed by the use of reflective tape, and even crackershells served to move them only short distances on most occasions. A good deal of the area used by shorebirds (the mud flats) was out of range of the crackershells. The dike walls are hazardous to walk over and could not be used to access remote parts of the CDF.

The USFWS made several more trips to the CDF on August 22, August 29, September 4, and September 10. On August 29, Mr. Bill Kurey of the USFWS Columbus office was interviewed for television about the situation. On a later trip, a fishing rod and reel were employed to retrieve some dead birds that were out of reach (treble hook on the end and several split shot sinkers just in front of it). An attempt was made to use a boat to retrieve carcasses which was effective on the west lagoon but unsuccessful in the east because declining water depth make boat launching impossible. Between August 12 and 29, lake level (and therefore CDF level) decreased 4 in.

Records of CDF water temperature range from 73° to 36° F in the east lagoon during the times measured. Oxygen levels in the west lagoon ranged from 12.2 - 12.8 ppm at the surface to 8.0 - 9.5 ppm at the 3-ft depth on the only day measurements were taken. Good measurements were impossible in the east lagoon because of shallowness and inaccessibility. The east lagoon was well mixed by wind, and high oxygen levels would have been expected. It is suspected that the east lagoon would have very little oxygen in the water after several days of calm weather and high temperatures. However, the oxygen level in standing water may have little significance to the progress of the botulism bacteria. These bacteria thrive primarily in the moist mud zone between the water's edge and the dry soil, an area free of the diluting and head-insulating effects of the water. Reflooding makes this botulism-laden area attractive to waterfowl.

On August 24, contractors were engaged by the Corps to take over the job of scaring birds and searching for carcasses. These efforts continued until October 3. Good records are available of the number of birds collected daily from August 24 to Oct 3 (41 days). Although weather conditions or other factors affected collections on some days, it is felt that the number of carcasses collected was an accurate indication of the relative numbers of birds dying from botulism (especially when taken on a weekly basis). These collections were a relative number because an unknown number of the birds died in the mud and could not be retrieved.

A total of 543 dead birds were collected over a period of 41 days. Counts of the earlier mortality add 143 (Corps count) to 173 (USFWS count) to this number. Therefore, we know that from 687 to 716 birds died; but the real number could be higher by several hundred owing to the difficulty presented by the mud flats in getting an accurate count.

Most of the affected birds (a crude estimate is 90 percent) were shorebirds the size of sandpipers, very small and easily overlooked, and this was another complicating factor.

The following list of some birds in the Cleveland CDF area was made by Ann Bugeda (Lake County Metropolitan Parks) on August 19:

Observed Dead

Canada goose
Mallard
Ring-billed gull
Semipalmated sandpiper
Semipalmated plover

Observed Alive

Semipalmated sandpiper Semipalmated plover Ring-billed gull Lesser yellowlegs Pectoral sandpiper Black-bellied plover Bonapartes gull Herring gull Killdeer Mute swan Sandpiper sp. Great blue heron Green heron Red-winged blackbird Flicker Swallow sp.

The two mute swans could not be scared out of the area and eventually died. Some other species were also in the area, including what might have been a falcon (species unknown) which was observed to stoop on a distant group of shorebirds causing them to rise and move out of the area, and the Federally endangered piping plover. The source of the piping plover report also saw marbled godwits, lesser golden plover, and red phalarope in early September. This person was a bird bander who had encountered a total of three piping plover at the CDF in 1986. He saw one in April or May, and two in early August which were sick with botulism. These two birds were banded and nursed back to health by force-feeding flies with tweezers. They were released at Lake Rockwell near Kent, OH, on September 24.

The botulism problem at Cleveland lasted from prior to August 12 to October 3 - about 44 days. About 700 migratory birds, mostly shorebirds, are known to have perished. The Federally endangered species piping plover was among the shorebirds involved, although there was no mortality.

The conditions that led to the 1986 botulism outbreak in Cleveland could exist again in 1987. In order to try to avoid these conditions, the Corps plans to maintain more of a slope on the CDF from the point where sediment filling occurs, and possibly to dredge later in the season to maintain the water level in the CDF. It is expected that up to 300,000 vd³ of sediment could be added to the CDF in 1987.

Mr. John Simmers of the US Army Engineer Waterways Experiment Station in Vicksburg. MS, has suggested that Phragmites sp. might be planted in the CDF to aid

dewatering and make the area unattractive to shorebirds. The Buffalo District has made no decision on this proposal yet.

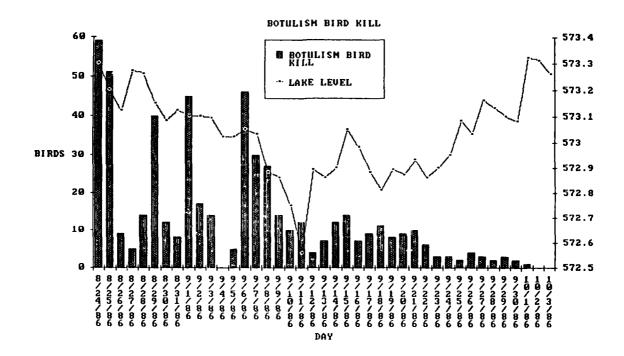


Figure Al. Botulism bird kill

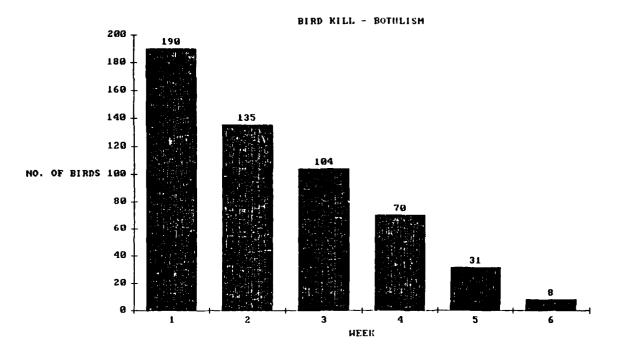


Figure A2. Deaths due to botulism, per week

CDF MATER TEMPERATURE

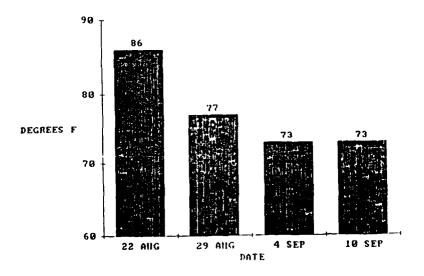


Figure A3. CDF water temperature

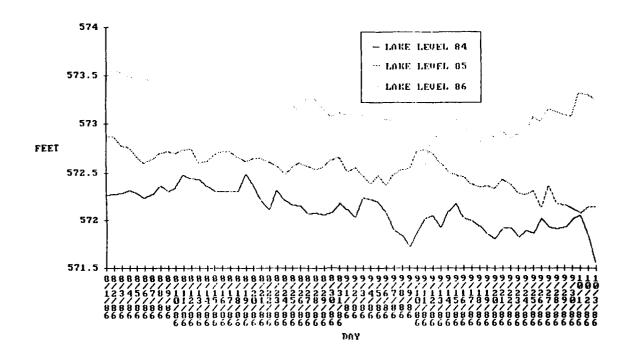


Figure A4. Water level at Dike 14 CDF

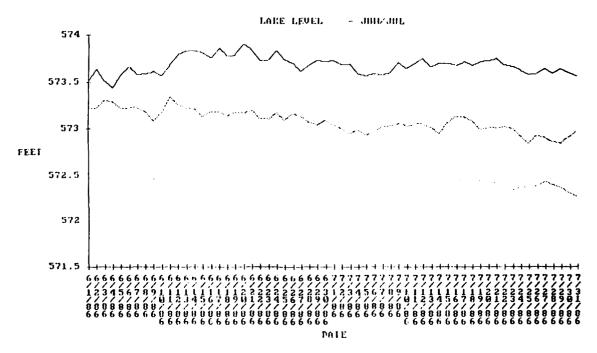


Figure A5. Water level, June and July, 1986

APPENDIX B DOCUMENTATION OF THE NUMBER OF BIRDS KILLED AT DIKE 14



DEPARTMENT OF THE ARMY

BUFFALO DISTRICT, CORPS OF ENGINEERS 1776 NIAGARA STREET BUFFALO, NEW YORK 14207-3199

2 4 NOV 1986

SUBJECT: Cleveland Dike 14 Botulism Problem

Mr. Kent Kroonemeyer
Field Supervisor
U.S. Fish and Wildlife Service
Division of Ecological Services
3990 East Broad Street
Columbus, OH 43212

Dear Mr. Kroonemeyer:

I have enclosed a copy of the day-by-day summary of the number of birds collected by our contractor at the Cleveland, Ohio CDF this past summer as requested. Your continued interest and assistance is greatly appreciated.

My point of contact pertaining to this matter is Mr. William F. MacDonald of my Environmental Resources Branch, who can be contacted by calling commercial number (716)876-5454, extension 2175 or by writing to:

District Commander U.S. Army Engineer District, Buffalo 1776 Niagara Street Buffalo, NY 14207-3199 ATTN: Mr. William F. MacDonald

The Buffalo District -- Leadership in Engineering.

Sincerely,

DANIEL R. CLARK

Colonel, Corps of Engineers

District Commander

Enclosure as stated

Dead Birds (August 24 - October 3, 1986)

(only pickup burn)

```
Date
        Day
                No. of birds
8/24
                 59
        Sun
8/25
                 51
        Mon
8/26
        Tue
                  9 by 9AM
8/27
        Wed
                  5 ducks (2 from park) (1 sent to Vet. by State)
8/28
        Thu
                 14 by 10AM
8/29
        Fri
                 40 birds & 2 ducks
8/30
        Sat
                 12
8/31
        Sun
                 8
9/1
        Mon
                 45
9/2
                 17
        Tue
9/3
        Wed
                 14
9/4
                 0
        Thu
9/5
                 5
        Fri
9/6
        Sat
                 46
9/7
                 30
        Sun
9/8
                 27
        Mon
9/9
                 14
        Tue
9/10
                 10
        Wed
9/11
        Thu
                 12
9/12
        Fri
                 4
9/13
                  7
        Sat
9/14
                 12
        Sun
9/15
                 14
        Mon
9/16
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9/17
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9/18
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9/22
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9/23
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                  3
9/24
        Wed
                  3
9/25
                  2
        Thu
9/26
        Fri
                  4
9/27
                  3
        Sat
9/28
                  2
        Sun
                  3
9/29
        Mon
9/30
                  2
        Tue
10/1
        Wed
                  1
10/2
        Thu
                  0
10/3
        Fri
                  0
```

APPENDIX C
DIAGNOSTIC SERVICES CASE REPORTS,
NATIONAL WILDLIFE HEALTH CENTER,
US FISH AND WILDLIFE SERVICE

U.S. FISH AND WILDLIFE SERVICE NATIONAL WILDLIFE HEALTH CENTER 6006 Schroeder Road Madison, Wisconsin 53711

DIACNOSTI

	STIC SERVICES CASE REPORT
Case # 6546	Epizoo # 86-074 RHT: PG/JCF
Submitter: Ken Multerer Bill Curry FWS-RCA	Specimen description/Identification: Dowitchers/Sandpipers
3990 E. Brood Street Columbus, OH 43216	Date Submitted: 8/19/86
	Location:Corps of Engineer confind disposal facility, Cleveland, O
General Diagnosis: Type C	8 otulism
Comments: As you can see fro to demonstrate Type C botulis (NWHC: 6546-001 thru 008).	om the enclosed necropsy sheets, we were able sm as the cause of death of the shorebirds
concentration of lead found i	, 002, 005, 006 and 007 were analyzed for lead. in the livers of birds 001, 005, and 007 are ge. No lead was detected in livers of birds
Preliminary Report (/ /) X Final Report (09/04/86) date date
X See attached necropsy Note: Copies of this	records for individual specimen observations, report have been sent to:
USFWS Re	gional Office (RO-)
	Pathologist: Lou N. Locke, D.V.M. Pathologist: Lou N. Locke, D.V.M. Pathologist: P. A. Gullett, D.V.M.
If you have questions regardi at 608-271-4640 (FTS 364-5418	ng this case, contact P. A. Gullett, D.V.M.). Include above Case Number.

Submitter's Name, Affiliation Address	_	
Ken Multerer Bill Curty	Case: 6546 Accession: 001	
WS-RCA	Collected: 8/14/86	
1990 E. Brood Street	Exam Date: (8/2 0/86	
Columbus, OH 432.16	Pathologist: LNL / N/	
Species: Short-bill dowitcher Sp Bandtype: (D Ref/Band No: (N) Weight: (Gm) (90)	
History Summary: The submitter suspects a bot	ulism die off. Lagoon has shallow water -	
redging materials stored in this area. There has signs, some green vents and limberneck observed.		
disposal facility near Cleveland, Ohio.	notcality location. Joseph of Engineer Conf	Linea
External/Internal Obser	vations - Laboratory Results	
External: No significant findings (NSF).	•	
Internal/Musculoskeletal system: Pectoral musc	les are moderately reduced +2. There is a	
moderate amount of subcutaneous fat. No fractures	found. There were maggots in the oral cav	ity a
around the vent. Cardiovascular system: A small amount of coronary	, fat was present. No obvious lesions seen	in th
neart muscle.		
Respiratory system: Marked postmortem changes in		ation
of bloody fluid in the ventral portion of the lung Digestive system: Liver - Early postmortem change	gs.	
ormal. There is a small amount of abdominal fat	present. Esophagus and proventriculus are	gross
normal. Gizzard - Gizzard lining is stained dark	blackish-blue due to postmortem change. No	lead
or steel present in the gizzard. Intestinal tract	- Postmortem changes.	_
Urogenital system: Gonads are those of a non-bree changes.	eding adult male. Kidneys - Early postmorter	n
·	(0.11)	
BACTERIOLOGY: Heart Pool- <u>Clostridium</u> <u>botulinum</u> <u>C</u>	(Positive).	
TOXICOLOGY: Liver Lead18 ppm wet wt; .60 ppm	dry wt.	
Preliminary Diagnosis: Suspect botulism		
Sex (M) Age (A)/() Body Cond. (G) Postmo	ortem State (\underline{F}) Giz. Lead $(\underline{0})/(\underline{0})$	
Samples Saved: 1. Bact: heart-bot	4	
2. Tox: liver-Pb	5	
3	6	
Final Diagnosis (order of importance)	Exam type (<u>GCC</u>)	
	topog. morph. etiol. funct.	
· True C hatulism		
1. Type C botulism		
2	_ () () () () (
3	_ () () () () (
		

Submitter's Name, Affiliation Address

Ken Hulterer	Cas	e: <u>6546</u>
Bill Curry		ession: 002
USFWS- RCA		lected: 8/14/86
3990 E. Brood Street Columbus, OH 42216		m Date: (8/20/86)
		hologist: LNL
Species: Short-bill dowitcher Species Bandtype: C. Ref/Band No: (80t2) Euth: (1	cimen: Carcass N) Weight:(Gm) (110)	
History Summary: See 001.	weight.(GE) ()	`
External/Internal Observa External: Prominent sternal keel.	ations - Laboratory Res	ults
Internal/Musculoskeletal system: Pectoral muscle subcutaneous fat still present. There are no fracte Cardiovascular system: Normal - Small amount of con Respiratory system: Normal Abdominal cavity: Liver - Grossly normal. Gall blackdominal fat is absent. Esophagus, proventriculus tambrown in color. No ingested lead or steel shot Urogenital system: Gonads are those of a nombreed: 1 mm or less in diameter. Kidneys - Grossly normal BACTERIOLOGY: Heart Pool - Clostridium botulinum C (EDITIOLOGY: Liver Lead - Not Detected.	ures of the wing or leg ronary fat present. adder is enlarged and f are normal. Gizzard – present. Intestinal t ing adult female. Ovar	bones. illed with greenish bile Gizzard lining is dull ract - Grossly normal.
Preliminary Diagnosis: Suspect botulism Sex (F) Age (A)/() Body Cond. (P) Postmort Samples Saved: 1. Bact: heart-bot 2. Tox: liver-Pb 3. Hist: kidney (renal coccidia)	tem State (<u>G</u>) Giz. Lead 4. 5. 6.	(<u>0</u>)/(<u>0</u>)
Final Diagnosis (order of importance)		Exam type (GO3)
	topog. morph.	
The act 1 + 1.	copog. morphi.	CLICIT AGICET GAGE
1. Type (botalism	() () () () (
2	() () () () (
1		1 () (

	's Name, Affilia	tion Address				
en Multerer					Case:	6546
Mill Curry					Accession:	
WS-RCA					Collected:	
1990 E. Brood Columbus, OH						(8/20/86)
Species:	Short-bill dowi	tohan	Specimen:_	Canada	Pathologist	: LNL
Bandt vpe:	(E) Ref/Band No	: (Bor7)	Specimen:_ Euth: (N) Weig	ht:(Gm) (85)	
History Su	mmary: See 001.		_			
				-		ortem changes and
Internal:						
Ca	ncava evi	rs disc	ia-did			
l			4			
3.						
						
Final Diag	nosis (order of	importance)	•		Exam ty	pe (<u>GO</u>) funct. diseas
M -	DH.	\mathcal{C}	top	og. morpn.	er101.	tunct. GIBER
1.UPen	· Kollen.	Larcasa	6,25) ()	()	()(
					·	
	1	/				
2. CA	lis conde.	<u>c{</u>	(_) ()	()	() (
2. <u>CA</u>						funct. disease () (() (

Cen Multerer	Case: 6546
Sill Curry	Accession: 004
WS- RCA	Collected: 8/14/86
1990 E. Brood Street	Exam Date: (8/20/86)
olumbus, OH 43216	Pathologist: LNL
Species: Semipalmated sandpiper Specimen: Carca Bandtype: (E) Ref/Band No: (Bot5) Euth: (N) Weight: (Grant Bot5) Euth: (N) Weight: (M)	ass (30)
History Summary: See 001.	· · · · · · · · · · · · · · · · · · ·
External/Internal Observations - Lab. External: Sternal keel is somewhat prominent. There is sta the leg or wing bones seen.	
Internal: xamination shows that postmortem changes in this Sandpiper are aboratory study so this carcass will be discarded.	too advanced for subsequent
Ratten	
Preliminary Diagnosis: Rotten	
Preliminary Diagnosis: Rollen Sex (_) Age (_)/() Body Cond. (_) Postmortem State &) Giz. Lead ()/()
Samples Saved:	
Samples Saved: 1.) Giz. Lead ()/()
1. 2. 5. 5	
Samples Saved: 1.	
Samples Saved: 1.	
1. 2	Exam type (GO)
Samples Saved: 1. 2. 4. 5. 5. 3. 6. Final Diagnosis (order of importance)	Exam type (GO)
Samples Saved: 1. 2. 4. 5. 5. 3. 6. Final Diagnosis (order of importance)	Exam type (GO)
Samples Saved: 1. Property 4. 2. 5. 6. Final Diagnosis (order of importance) topog. 1. Rotten Cancars discarded ()	Exam type (GO)

Submitter's Name, Affiliation Address	
Ken MKulterer	Case: 6546
Bill Curry	Accession: 005
SWS-RCA 1990 E. Brood Street	Collected: 8/14/86 Exam Date: (8/20/86)
Columbus, OH 43216	Pathologist: LNL ///
"Species: Semipalmated sandpiper	Specimen: Carcass
Bandtype: (E) Ref/Band No: (Bot3)	Euth: (N) Weight: (Gm) ()
History Summary: See 001.	
External/Interna External: No significant findings (NSF)	l Observations - Laboratory Results
moderate amount of subcutaneous fat and abd Cardiovascular system: Heart - Grossly nor Respiratory system: Lungs - Grossly normal	mal. adder - Normal. Intestinal tract - Grossly normal. ested lead or steel shot.
Urogenital system: Kidneys - Lighter than	
DACTEDIOLOGY, Hand Dool Clookwiding botul	inum C (Pacitiva)
BACTERIOLOGY: Heart Pool- Clostridium botul	Tituli C (FOSTCIVE).
TOXICOLOGY: Liver Lead- 0.0 ppm wet wt; 0.	O ppm dry wt.
Tonious and a pp	
Preliminary Diagnosis: Suspect botulism	
	Postmortem State (G) Giz. Lead (0)/(0)
Samples Saved:	
l. Bact: heart-bot	
2. Tox: liver-Pb	S
·	
Final Diagnosis (order of importance)	Exam type (GO3)
· ·	topog. morph. etiol. funct. disea
Time C P + 1:	
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2.	() () () () () (
• •	
3.	() () (_) () (

Submitter's Name, Affiliation Address	
Ken Multerer Case: 6546	.
Bill Curry Accession: 006	
FWS-RCA Collected: 8/14	
3990 E. Brood Street Exam Date:	(8/20/86)
Columbus, OH 42216 Pathologist: L Species: Semipalmated sandpiper Specimen: Carcass	NL ZAZ
Bandtype: (E) Ref/Band No: (Bot8) Euth: (Y) Weight: (Gm) ()	
History Summary: See OOl. This bird was found sick and then killed.	
External/Internal Observations - Laboratory Results External: No significant findings (NSF)	
Internal/Musculoskeletal system: Pectoral muscles are normal. Excellent deposits subcutaneous fat, 1 to 2 mm thick. Good deposits of abdominal fat. Cardiovascular system: Normal - Coronary fat is present on the heart. Digestive system: Good deposits of abdominal fat. Liver and gall bladder - Normal. Normal. No ingested lead or steel shot. Respiratory system: Normal. Urogenital system: Ovary is that of a non-breeding adult female. Follicles are 1 mm diameter. Kidneys are grossly normal.	Gizzard -
BACTERIOLOGY: Heart Pool- Clostridium botulinum C (Positive).	
TOXICOLOGY: Liver Lead- Not Detected.	
Preliminary Diagnosis: Sex (F) Age (A)/() Body Cond. (G) Postmorten State (E) Giz. Lead (0)/(0) Samples Saved: 1. Bact: heart-bot 4	
	co)
Final Diagnosis (order of importance) Exam type (
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1. Type (. Botulism () () ()	unct. dise
	unct. dise.

Submitter's Name, Affiliation Address Ken Multerer		Case: 6546
Bill Curry		Accession: 007
FWS-RCA		Collected: 8/14/86
3990 E. Brood Street		Exam Date: (8/20/86)
Columbus, OH 43216		Pathologist: LNL
	Specimen: Carcass n: (N) Weight:(Gm) (45)
History Summary: See 001.	··· (<u>···</u>) wexauc. (om) (_	
External/Internal Ob External: No significant findings (NSF)	oservations - Laborato	ry Results
Internal/Musculoskeletal system: There is a moderately reduced +2. Cardiovascular system: The heart is grossly no present. Respiratory system: Grossly normal Digestive system: Grossly normal. Gizzard - No Intestinal tract - Grossly normal. Urogenital system: Grossly normal.	ormal. There is a sma	ll amount of coronary fat
BACTERIOLOGY: Heart Pool- Clostridium botulinum		
TOXICOLOGY: Liver Lead- 0.65 ppm wet wt; 2.25	ppm dry wt.	
Preliminary Diagnosis: Suspect botulism		_
Sex (\underline{M}) Age $(\underline{A})/(\underline{\hspace{1cm}})$ Body Cond. (\underline{G}) Pos	tmortem State (G) Giz	. Lead (<u>0</u>)/(<u>0</u>)
Samples Saved;		
1. Heart		
2. 3.	5	
·		
Final Diagnosis (order of importance)		Exam type (GO)
- 2 + 1	topog. mor	ph. etiol. funct. disea
1. Type C Botalism	() (_) () () (
2	() (_) () () (
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ill Curry WS-RCA SPECIA GOING SPECIA Specias: Least sandpiper Specias: Least sandpiper Section: (8/20/86) Pathologist: LNL Section: Carcass Bendtype: (E) Ref/Band No: (Bot6) Euth: (N) Weight: (Gm) (40) History Summary: See 001. External/Internal Observations - Laboratory Results External: No significant findings (NSF) Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. ardiovascular system: Some coronary fat was present. Heart - Grossly normal. espiratory system: Liver - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No	Submitter's Name, Affiliation Address	
WS-RCA 990 E. Brood Street olumbus, OH 4216 Species: Least sandpiper Species: Carcass External/Internal Observations - Laboratory Results External: No significant findings (NSF) Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. ardiovascular system: Some coronary fat was present. Heart - Grossly normal. sepiratory system: Liver - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No negested lead shot. Preliminary Diagnosis: Suspect botulism Sex (M) Age (A)/() Body Cond. (G) Fostmortem State (G) Giz, Lead (0)/(_0) Samples Saved: 1.	Ken Multerer	Case: 6546
990 E. Brood Street olumbus, OH 4216 Species: Least sandpiper Bendtype: (E) Ref/Band Mo: (Both) Euth: (N) Weight: (Ga) (40) External/Internal Observations - Laboratory Results External: No significant findings (NSF) Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. ardiovascular system: Some coronary fat was present. Heart - Grossly normal. espiratory system: Lungs - Grossly normal. Espiratory system: Liver - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No nagested lead shot. Preliminary Diagnosis: Suspect botulism Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (0)/(0) Samples Saved:		Accession: 008
olumbus, OH 4216 Spacies: Least sandpiper Spacies: (A/) History Summary: See OOI. External/Internal Observations - Laboratory Results External: No significant findings (NSF) Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. espiratory system: Lungs - Grossly normal. espiratory system: Lungs - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No negested lead shot. Pathologist: LNE External/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. espiratory system: Lungs - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No negested lead shot. Preliminary Diagnosis: Suspect botulism Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (O)/(_O) Samples Saved: 1.		Collected: 8/14/86
Species: Least sandpiper Species: Carcass Andriper Species: Carcass Specie		
### Bandtype:(E) Ref/Pand No: (Botb) Euth: (N) Weight:(Gm) (40) ### History Summary: See 001. External/Internal Observations - Laboratory Results External: No significant findings (NSF) Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. ardiovascular system: Some coronary fat was present. Heart - Grossly normal. espiratory system: Lungs - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No nagested lead shot. Preliminary Diagnosis: Suspect botulism		Pathologist: LNL
External/Internal Observations - Laboratory Results External: No significant findings (NSF) Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. ardiovascular system: Some coronary fat was present. Heart - Grossly normal. espiratory system: Lungs - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No negested lead shot. Preliminary Diagnosis: Suspect botulism Sex (1) Age (2)/() Body Cond. (G) Postmortem State (G) Giz. Lead (0)/(0) Samples Saved: 1.	Species: Least sandpiper	Specimen: Carcass (A/)
Internal: No significant findings (NSF) Internal/Musculoskeletal system: Pectoral muscles are slightly reduced. There is a moderate mount of subcutaneous and abdominal fat. ardiovascular system: Some coronary fat was present. Heart - Grossly normal. espiratory system: Lungs - Grossly normal. Intestinal tract - Normal. Gizzard - Normal. No nigested lead shot. Preliminary Diagnosis: Suspect botulism Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (0)/(0) Samples Saved: 1	History Summary: See 001.	(n) weight: (cm) (40)
### Diagnosis (order of importance) Preliminary Diagnosis: Suspect botulism Seax (M) Age (A)/() Body Cond. (©) Postmortem State (©) Giz. Lead (0)/(0) Samples Saved: 1.		ervations - Laboratory Results
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)	mount of subcutaneous and abdominal fat. ardiovascular system: Some coronary fat was pr espiratory system: Lungs - Grossly normal.	esent. Heart - Grossly normal.
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)		
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)		
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)		
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)		
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)		
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)		
Sex (M) Age (A)/() Body Cond. (G) Postmortem State (G) Giz. Lead (_0)/(_0)		
Samples Saved: 1.	Preliminary Diagnosis: Suspect botulism	
1		mortem State (G) Giz. Lead $(\underline{0})/(\underline{0})$
2. 3. Final Diagnosis (order of importance) topog. morph. etiol. funct. disc 1.	•	
3		
Final Diagnosis (order of importance) topog. morph. etiol. funct. discount 1. Suspect Botulism () () () () ()		
topog. morph. etiol. funct. disc 1. Suspect Botulism ()()()()(J	6
topog. morph. etiol. funct. disc 1. Suspect Botulism ()()()()(Final Diagnosis (order of importance)	From tune (CO)
1. Suspect Botulism () () () () (_) (_) (_)	(oract or imhordance)	
2	C 1041	
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	2	() () () () (
3()()()()()		
	3	()()()(

APPENDIX D BIRD SPECIES REPORTED FROM THE DIKE 14 CDF BEFORE AND AFTER THE PILOT PROJECT

Jan., Feb., Mar. 1986

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

No reporte for Gen + Fet du le Localities:

To:

From:

Total:

· Species observed

Distance: By Car — On Foot

Finish:

Start:

Total:

		Stilt Sandpiper
	VULTURES, HAWKS, FALCONS Turkey Vulture	Semipulmated Sandarjer Western Sandarjer
	Shari-shinned Hawk Cooper's Hawk	Buff-breasted Sandpiper Sanderling
WATER BIRDS	Red-tailed Hawk Red-shouldered Hawk	Red Phalarone Wilson's Phalarone Northern Phalarope
Common Loon	Broad-winged Hawk Rough-legged Hawk	GULLS AND TERNS
Horned Grabe	Baid Eagle 11. 4 1-94 C	_ Glaucous Gull
Pied-billed Grebe	Marsh Hawk	Great Black-backed Gull
Double-created Cormorant	Osprey	─ •Herring Gull
		Ring-billed Gull
HERONS	Duck Hawk	Frankin's Guil Bonsparte's Guil
Great Blue Heron	Pigeon Hawk Sparger Hawk Kustrul	
		Forster's Tern Common Tern
Little Blue Heron	GALLINACEOUS BIRDS	Cammon Tern
Green Heron	Ruffed Grouse	Black Tern
Black-crowned Night Heron	Hungarian Partridge	
American Bittern	Bob-white	DOVES AND PIGEONS
Least Bittern	Ring-necked Pheasant	Rock Dove
	MARSH BIRDS	Mourning Dove
SWANS, GEESE, DUCKS	King Rail	, , cuckoos
Whistling Swan	Virginia Rail	Yellow-billed Cuckoo
Canada Goose	Sora	Black-billed Cuckoo
Snow Goose	Florida Gallinule	OWLS
Blue Goose		Barn Owl
Mallard Black Duck	SHOREBIRDS	Screech Owl
Gadwall	Piping Plover	Great Horned Owl
European Widgeon	Semipalmated Plover	Snowy Owl
Religione american Triayon	•Killdeer	Long-eared Owl
Pintail	Golden Player	Short-eared Owl
	Black-bellied Plover Ruddy Turnstone	Saw-whet Owl
Blue-winged Teal		
Wood Duck	Wandcock	GOATSUCKERS, ETC.
	Wilson's Snipe Hudsonian Curlew	Whip-poor-will
Redhead	Upland Plover	
Canvas-back	Spotted Sandpiper	Chimney Swift
Greater Scaup Duck	. Solitary Sandpurer	Ruby-throated Hummingbird
Lesser Scaup Duck	Willet	Beited Kingfisher
American Golden-eye	Greater Yellow-legs	A control of the cont
Buffle-head	Lesser Tellow-legs	WOODPECKERS
	Pectoral Sandpiper	• Flicker
	White-rumped Sandpiper	Red-beliled Woodpecker
Ruddy Duck	Baird's Sandpiper	Red-hended Woodnecker
Hooded Merganeer	Least Sandpiper	Yellow-bellied Sansucker Hairy Woodpacker
Merganeer	Red-backed Sandpiper	I I Maley woodnester

FLYCATCHERS		GNATCATCHERS, ETC.	1 1	WEAVER BIRDS
. Eastern Kingbird		Blue-gray Gnatcatcher	il	English Sparrow
Crested Flycatcher	1 1	Golden-crowned Kinglet		· · · · · · · · · · · · · · · · · · ·
Phoebe	1 1	Ruby-crowned Kinglet		BLACKBIRDS AND ORIOLES
Yellow-bellied Flycatcher	}	American Di ta	1 1	Bobolink
Acadian Flycatcher	1 1	American Pipit	• 1	Meadowlark
Alder Flycatcher	l l	Cedar Waxwing	1 1	Western Meadowlark
Least Flycatcher		Northern Shrike		Red-wing Blackbird
Wood Pewee	1 1		1 " 1	Orchard Oriole
Olive-suled Flycatcher		Migrant Shrike	1 1	Baltimore Oriole
Empidonax	• 1 1.	Starling	1 1	Rusty Blackbird
			1 1	Brewer's Blackbird
, LARKS	1 1	VIREOS	-1 1	Bronsed Grackle Common
Horned Lark	1 1	White-eyed Vireo	• []	Cowbird
	I I.	Yellow-throated Vireo		- COWNING
SWALLOWS	1 I	Blue-headed Vireo		TANAGERS
Tree wall.	.1. I	Red-eyed Vireo	1 1	See to Tree
Bank Swallow	I I	Philadelphia Vireo	1 1	Scarlet Tanager
Rough-winged Swallow	I . I	Warbling Vireo		FINCUPS SPANNONS
Barn Swallow			1 1	FINCHES, SPARROWS, etc.
Cliff Swallow		WOOD WARBLERS	•	Cardinal
Purple Martin	I I	Black and White Warbler	1 1	Rose-breasted Grosbeak
	1 1	Prothonotary Warbler	- 1 1	Indigo Bunting
CROWS AND JAYS	i I	Golden-winged Warbler	1 1	Dickeissel
Blue Jay	1 1	Blue-winged Warbler	1 1	Evening Grosbeak
Crow	_ t t	. Tennessee Warbler	1 1	Purple Finch
	1	Orange-crowned Warbler	1 1	Pine Groebeak
TITMICE, NUTHATCHES, CREEPERS	† 1	Nashville Warbier	1 1	Redpoll
Black-capped Chickadee	† †	Parula Warbler	1 1	Pine Siskin
Tufted Titmouse	1 1	Yellow Warbler	1 1	Goldfinch
White-breasted Nuthatch		Magnoba Warbler	1 1	Red Crossbill
Red-breanted Nuthatch	1 1	Cape May Warbler	1 1	White-winged Crossbill
Brown Creever	1 1	Black-throated Blue Warbler		Red-eyed Towhee
, t prown creeper	1 1	Myrtle Warbler	1 1	Savannah Sparrow
WRENS	1 1	Black-throated Green Warbler	1 1	Grasshopper Sparrow
1 1	1	Cerulean Warhler	1 +	Henslow's Sparrow
House Wren	1 1	Blackburnian Warbler	1 1	Sharp-tuiled Sparrow
Winter Wren	1 1	Chestnut-suled Warbler	1 1	Vesper Sparrow
Bewick's Wren	1 1	Bay-breasted Warbler	1 1	Lark Sparrow
Carolina Wren	1 1	Black-poll Warbler	•	State-colored Junco
Long-billed Marsh Wren	1 1	Pine Warbler	•	Tree Sparrow
Short-billed Marah Wren	1 1	Prairie Warbler	1 1	Chipping Sparrow
	1 1	Paim Warbler	•	Field Sparrow
MOCKINGBIRDS	I i	Oven-bird		White-crowned Sparrow
Mockingbird		Northern Water-thrush	1 1	White-thenstel Search
Cathird		lanusinga Water-thrush		Fox Sparrow
Brown Thrasher	1 1	Kentucky Warbler		Lincoln's Sparrow
	1 1	Connecticut Warbler		Swamp Sparrow
THRUSHES	1 1	Mourning Warbler	•	Song Sparrow
Robin	1 1	Yellow-throat		Lapland Lengspur
Word 7 rush	1 1	Yellow-breasted Chat	1 1	Snow Bunting
Hermit Thrush	1 !	Howled Warbier		Fouse Finch
Olive-backed Thrush	! !	Wilson's Warbler		
Gray-cheeked Thrush	1 1	Canada Warbler		
Neery	1 1	Reistart		

Total Species:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To: From: Localities:

Total:

Distance: By Car — On Foot

Finish:

Start:

Total:

		VULTURES, HAWKS, FALCONS Turkey Vulture Shari-shinned Hawk Cooper's Hawk	Stit Sandpiper Semipulmated Sindpiper Western Sandpiper Buff-breasted Sandpiper Sanderling
	WATER BIRDS	Red-tailed Hawk Red-shouldered Hawk Broad-winged Hawk Rough-legged Hawk	Red Phalarone Wilson's Phalarone Northern Phalarone
	Horned Grebe	Baid Eagle	GULLS AND TERMS Gull of aughling
<u>' </u>	Pied-billed Grebe	MATER HAWK	Great Black-backed Gull Herring Gull
<u> </u>	Double-crested Cormorant	Osprey	Ring-billed Gull
	Tructered Miners MERONS Great Blue Heron American Egret Jennmen	Duck Hawk Pigeon Hawk Sparrow Hawk Klatel	Franklin's Gull Bonsparte's Gull Porster's Tern
,	Snowy Egret Little Blue Heron Green Heron	GALLINACEOUS BIRDS Ruffed Grouse	Common Tern Caspian Tern Black Tern
	Black-crowned Night Heron	Hungatian Partridge Bob-white	DOVES AND PIGEONS
	Least Binern	Ring-necked Pheasant	Rock Dove
81	WANS, GEESE, DUCKS	MARSH BIRDS	CUCKOOS
	Whistling Swan	Virginia Rail	Yellow-billed Cuckoo
: [. Canada Goose		
	Snow Goose	Sora Florida Galiffrale Crawnen Remain	OWLS
	Mallard		Barn Owl
• .	Black Duck	SHOREBIRDS	Great Horned Owl
•	, Gadwall	Piping Plover	Snowy Owl
	European Widgeon	Semipsimated Plover	Barred Owl
	Baldones american is cargon	• Killdeer	Long-eared Owl
	Pintail	Golden Player	Short-eared Owl
		A Disch hallfad Discuss	
	. Green-winged Teal	Black-hellied Plover	Saw-whet Owl
	Green-winged Teal Blue-winged Teal	Black-hellied Plover Ruddy Turnstone	Saw-whet Owl
	Green-winged Teal Blue-winged Teal Showeller	Ruddy Turnstone Woodcock	
	Green-winged Teal Blue-winged Teal	Ruddy Turnstone Woodcock Wilsome Snipe 2-mmen	Saw-whet Owl
	Green-winged Teal Blue-winged Teal Showeller	Ruddy Turnstone Woodcock Wilsoms Snipe 2-mmen Hudsonian Curlew	GOATSUCKERS, ETC.
	Green-winged Teal Blue-winged Teal Shweller Wood Duck	Ruddy Turnstone Woodcock Wilsome Snipe Lammen Hudsonian Curlew Upland Plover	GOATSUCKERS, ETC
	Green-winged Teal Blue-winged Teal Showeller Wood Durk Radhead Ring-necked Duck Canvas-back	Ruddy Turnstone Woodcock Wilsome Snipe Lammen Hudsonian Curlew Upland Plover Spotted Sandpiper	GOATSUCKERS, ETC
	Green-winged Teal Blue-winged Teal Blue-winged Teal Shweller Wood Durk Radhead Rinz-necked Duck Canvas-back Greater Scaup Duck	Ruddy Turnstone Woodcock Wilseam's Snipe Limmen Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper	GOATSUCKERS, ETC
	Green-winged Teal Blue-winged Teal Shreeller Wood Duck Radhead Ring-necked Duck Canvas-back Ligeator Scaup Duck Lesser Scaup Duck	Ruddy Turnstone Woodcock Wilsome Snipe Lemmen Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet	GOATSUCKERS, ETC
	Green-winged Teal Blue-winged Teal Shweller Wood Durk Radhead Rinz-necked Duck Canvas-back Greater Scaup Duck Lesser Scaup Duck American Golden-wye	Ruddy Turnstone Woodcock Wilsomes Snipe Lommen Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet Greater Yellow-legs	GOATSUCKERS, ETC
	Green-winged Teal Blue-winged Teal Shweller Wood Durk Radhead Rinz-necked Duck Canvas-back Greater Scaup Duck Lesser Scaup Duck American Golden-wye Buffle-head	Ruddy Turnstone Woodcock Wilesens Snipe Limmen Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet Greater Yellow-legs Lesser Yellow-legs	GOATSUCKERS, ETCWhip-poor-willNgbthawk Chimney Swift Ruby-throated Hummingbird Beltad Kingfisher
	Green-winged Teal Blue-winged Teal Shrweller Wood Durk Radhead Ring-necked Duck Canvas-back Greater Scaup Duck Lesser Scaup Duck American Golden-wye Buffle-head Old-equaw	Ruddy Turnstone Woodcock Wilseame Snipe Lammen Hudsonian Curlew Upland Plover Snoted Sandpiper Solitary Sandpiper Willet Greater Yellow-legs Lesser Yellow-legs Knot	GOATSUCKERS, ETCWhip-poor-will Nighthawk Chimney Swift Ruby-throated Hummingbird Belted Kingfisher WOODPECKERS
	Green-winged Teal Blue-winged Teal Shweller Wood Durk Radhead Rinz-necked Duck Canvas-back Greater Scaup Duck Lesser Scaup Duck American Golden-wye Buffle-head	Ruddy Turnstone Woodcock Wiscome Snipe Lament Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet Greater Yellow-legs Lesser Yellow-legs Knot Pectoral Sandpiper	GOATSUCKERS, ETCWhip-poor-willNighthawkChimney Swift Ruby-throated HummingbirdBeltad Kingfisher WOODPECKERSFlicker
	Green-winged Teal Blue-winged Teal Shreeller Wood Durk Radhead Ring-necked Duck Canvas-back Greater Scaup Duck Lesser Scaup Duck American Golden-wye Buffle-head Old-equawWhite-winged Scoter	Ruddy Turnstone Woodcock Wilesens Snipe Limmen Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet Greater Yellow-legs Lesser Yellow-legs Knot Pectoral Sandpiper White-rumped Sandpiper	GOATSUCKERS, ETC. Whip-poor-will Nighthawk Chimney Swift Ruby-throated Hummingbird Belted Kingflaher WOODPECEERS Flicker Rab-bellied Woodpecker
	Green-winged Teal Blue-winged Teal Shreeller Wood Durk Radhead Ring-necked Duck Canvas-back Greater Scaup Duck Lesses Scaup Duck American Golden-wye Buffle-head Old-equawWhite-winged ScoterRuddy Duck	Ruddy Turnstone Woodcock Wilsesse Snipe Lament Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet Greater Yellow-legs Lesser Yellow-legs Knot Pectoral Sandpiper White-rumped Sandpiper White-rumped Sandpiper Baird's Sandpiper	GOATSUCKERS, ETCWhip-poor-will Nighthawk Chimney Swift Ruby-throated Rummingbird Beltad Kingflaher WOODPECEERS Flicker Rad-besided Woodpecker Rad-besided Woodpecker
	Green-winged Teal Blue-winged Teal Shreeller Wood Durk Radhead Ring-necked Duck Canvas-back Greater Scaup Duck Lesser Scaup Duck American Golden-wye Buffle-head Old-equawWhite-winged Scoter	Ruddy Turnstone Woodcock Wilesens Snipe Limmen Hudsonian Curlew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet Greater Yellow-legs Lesser Yellow-legs Knot Pectoral Sandpiper White-rumped Sandpiper	GOATSUCKERS, ETC. Whip-poor-will Nighthawk Chimney Swift Ruby-throated Hummingbird Belted Kingflaher WOODPECEERS Flicker Rab-bellied Woodpecker

, ,	FLYCATCHERS		GNATCATCHERS, ETC.		WEAVER BIRDS
1 1	Eastern Kingbird	1 1	Hlue-gray Gnateatcher	1 1	English Sparrow
1 1	Crested Hycatcher	1 1	tolden-crowned kinglet		
1 1	Phoebe	1 1	Ruby-crowned Kinglet		BLACKBIRDS AND ORIOLES
1 1	Yellow-bellied Flycatcher			1 1	1
1 I	Acadian Flycatcher	1 1	American Pipit	الما	Bobolink
∍i I	Alder Flycatcher Hellew	1 1	Cedar Waxwing	- I	Meadowlark
• 1	Least Flycatcher	1 1			Wes ern Meadowlark
• 1 1	Wood Pewre	1 1	Northern Shrike	- 1	Red-wine Blackbird
1 1	Olive-suled Flycatcher	1 1	Migrant Shrike	<u> </u>	Orenard Orode
1 [Empidonax	-	Starling	- T	Busty Blackbird
			VIREOS	1 1	Brewer - Blackbord
. 1	, I ARKS	1 1	VIREUS	•	Brunsed Grackle Can me to
	i Horned Lark	1 1	White-eyed Vicen	1	Cowlard
			Yellow-throated Vireo		
	SWALLOWS	1	Blue-beaded Vireo		TANAGERS
.1	Tree Swallow	-1 1	Red-eyed Vireo	1 !	Scarlet Tanager
•	Bank Swallow	l i	Philadelphia Vireo		Stittet tanager
	Rough-winged Swallow	• 1	Warbling Vireo		FINCHES, SPARROWS, etc.
1	Barn Swallow			1 1	FISCHES, SPARROWS, 202.
1	Cliff Swallow		WOOD WARBLERS	•	Cardinal
i j	Purple Martin	1 1	What and What Wentley	1 i	Rose-breasted Grosbeak
		1 !	lillack and White Warbler	1 1	Indigo Bunting
	CROWS AND JAYS	1 1	Prothonotary Varbler	1 1	Dickeinsel
• [Blue Jay	1 !	Golden-winged Warhler	I 1	Evening Grosbesk
. 1	Crow	1 1	Blue-winged Warbler	Ii	Purnte Finch
	1 Clow	1 1	Tennessee Warhler	1 !	Pine Groebenk
TITME	CE. NUTHATCHES, CREEPERS	+ +	Orange-crowned Warbler	1 1	Refuell
	ř	1 1	Nashville Warhler	1 1	Pine Siskin
	Black-capped Chickadee		Parula Warbler	• 1	Goldfinch
7	Tufted Titmouse	•	Yellow Warbler	1 1	Rost Crossbill
•	White-breasted Nuthatch	• 1	Magnolia Warbler	1 1	
	Red-breasted Nuthatch	1 1	Cape May Warbler	-1 1	White-wincod Crossfull Reduced Towher Kinfons and
1 1	Brown Crosper	4 i	Black-throated Blue Warbler	- 1	Registers Lunitée Verfaire.
		1 1	Myrtle Warbler	- 1	Savannah Sparrow
	WRENS	1 1	Black-throated Green Warbler	1 1	Grasshorper Sparrow
,	1	1 1	Cerulean Warbler	l t	Hension - Sparron
1 :	House Wren	1 1	Blackburnian Warbler	_ ! !	Sharp-tailed Sparrow
t	Winter Wren	1 1	Chestnut seied Warbler	•	Vesper Sparrow
, ;	; Bewick's Wren		flay-breasted Warhfer	_} }	Lank Sparrow
1 1	Carolina Wren]]	Black-boll Warbler	~ +	Slate colored Junco
+ +	Long-billed Marsh Wren	1 1	Pine Warbler	•	free Sparrow
	Short-billed Marsh Wren	[1	Prairie Warhler	• 1	Chiming Sparrow
		• i 1	Pulm Wurbler	•	Forld Stattow
	MOCKINGBIRDS	1 1	Ovenhard	•	White-crownes Starrow
• !	: . Mockingbird	•1	Northern Water-thrush	•	White-throated Sparrow
•	Cathrd	- 1		1 1	Fox Sparrow
	Brown Thrasher	1 1	Louisiana Water-thrush	•	Lincoln . Sentrow
	: prown intanner	1 1	Kentucky Warbler	• I	Swamp Starrow
		1 1	Connecticut Warbler	•] [Song Scarrow
	THRUSHES		Mourning Warbler	• 1	Lapland Langspur
	, Robin	- 1 ;	Yellow-throat	1	now Burting
	Weekl Throsh	1	Yellow-breasted Chat	•	would inch
	Hermit Thousa	i	Hoosled Wastler		### PPTML # /927070
	Huse backed Through Scalebackers	•	Wilson's Warther		
	ter syschenked Through	0)	Canada Warbler		
. :	Veres	•	Redstart		

Total Species:

July aug, dept 1916

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To: From: Total: Localities:

 ${\bf Distance: By\ Car-On\ Foot}$

Finish:

Start:

Total:

1			•	Still Sandpiper
, 1	VULTU	RES, HAWKS, FALCONS	•	Semipulmuted Sindinger
	1 1 !	Turkey Vulture	•	Western Sandpuser
	1 ! '		•	Buff-breasted Sandjuper
	•1	Sharteshinned Hawa	• 1 4	Sanderling
		Cooper a Hawk	•	Red Philarone
T I		Red-tailed Hawk		Wilson a Phaiarone
WATER BIRDS		Red-shouldered Hawk	•	Northern Phalarope
		Broad-winged Hawk		
Common Loon	• •	Rough-legged Hawk		GULLS AND TERMS
Horned Grebe		Baid Eagle	1 1	Giaucous Guli
Pied-billed Grebe		Marsh Hawk	• (Great Black-backed Gull
. Double-crested Cormorant		Cepter	•1	Herring Gull
	• • • • •		- 1	Ring-belled Guil Franklin's Youll
HERONS	- Table - 1	Deck-Hook Fire-wine	,	Bonaparte's Gull
Great Blue Heron	• • • •	Pigeon Hawk Listed		
. American Egret	- () 1	What I can see and and		Forster's Tern
Snowy Egret	G.A.	LLINACEOUS BIRDS		Common Tern
Little Blue Heron	' "	Ruffed Grouse	ام	Caspan Tern
Black-crowned Night Heron	1 " 1 " 1	Hungarian Partridge		Hinck Tern
		Hob-white		DOVES AND PIGEONS
		Ring-necked Pheasant	•1	Rock Dove
* : Least Bittern			•i	Mourning Dove
SWANS GEESE DUCKS Wall Juan		MARSH BIRDS		
Whistling Swan		King Rail	1 1	CCCROOS
. ' ' ————		Virginia Rail	+ +	Yellow-billed Cuckoo
Canada Goose		Sora Florida flationale Jeruman Terretan	1 1	Black-billed Cuckon
, Snow Goose	71	Coot		OWLS
Blue Goose		Coor	1 1	Barn Owl
Mallard		SHOREBIRDS		, Screech Owl
Black Duck Gadwall	• i 1 !	Piping Plover		. Great Horned Owl
	• !	Semipaimated Plover		. Snowy Owl
Baldoute a merican Audgum	• 1 1	Killdeer	. i	Barred Owl
Pintail	•	Golden Plover		Long-eared Owl
Green-winged Teal	•	Black-beilied Plover		Short-eared Owl
Blue-winged Teal	•	Ruddy Turnstone		i Saw-whet Uwi
Shoveller		Wendrock		GOATSUCKERS, ETC.
• Wood Duck	: []	Wilson's Snupe	! !	Whip-poor-will
Redheed	•	Hudsonian Curlew	1 1	Nighthawk
. Ring-necked Duck		Upland Plover	• '	Chimney Swift
	•	Spotted Sandruper		
Greater Scaup Duck		Solitary Sandoiper	, ,	Ruby-throated Hummingbird
, , Lesser Scaup Duck		Willet	•	Belted Kingfisher
American Goldenseye		Greater Yellow-less		
Buffle-head		Lesser Yellow-less Knot		WOODPECKERS
, , .Old-equaw		Rnot Pertoral Sandniper	•	Flicker
. White-winged Scoter	• '	White-rumped Sandpuper	1 1.	Red-bellied Woodpecker
Ruddy Duck	<u> </u>	Baird's Sandpiter		Red-hended Woodperker
1			• []	Yellow-beilled Sapeucker
	•	Least Sandpiper		
Hooded Merganser		Red-backed Sandpiper	1 1	Hairy Woodpecker Downy Woodpecker

GNATCATCHERS, ETC.	WEAVER BIRDS
Hiperray (instructor	English Sparrow
	- Sparrow
	BLACKBIRDS AND ORIOLES
	• Bobolink
American Pipit	Meadowlark
	Western Meadowtark
Northern Shrike	Red-wing Blackbirt
	Orchard Oriole
	Bultimore Oriole
Starling	Rusty Blackbird
VIDEOS	Brewer v Blackbord
	Bronned Grackle Commun.
White-eyed Vireo	• Lewbird
Yellow-throated Vireo	
Blue-headed Virco	TANAGERS
Red-eyed Vareo	Scarlet Tanaver
Philadelphia Vireo	
Warbling Vireo	FINCHES, SPARROWS, etc.
 	A J
WOOD WARBLERS	Cardinal
Hack and White Warber	Rose-breasted Grosheak
	Indigo Bunting
	Dickerssel
	Evening Groubeak
	Purple Finch
	Pine Grosbeak
	Redpoll
	Pine Siskin
	• Goldfine's
	Red Cr ac.
	White-winger Crossfull
	Red-eyed Towhee
	Savannah Sparrow
	Grashopper Sparrow
	Houston's Sparrow
	Sharp-turled Sparrow
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Vester Sparrow
	Late Sparrow
	Slate-colored Juneo
	tice Sparrow
	• bipping Sparrow
	l eid Sparrow
The state of the s	White-crowned Scarrow
1	White-throated Sparrow
	I ix Starrow
	Lincoln's Sparrow
	· Aamp Sparrow
	Song Sparrow
	Lapland Langson
	from Bunting
	· we sinch
	TOMAN THE ODER
Canada Warbler	
Reistart	
	Bluescray G inteatcher Golden-cross and Kinglet Ruby-crowned Kinglet American Pipit Cedar Waxwing Northern Shrike Migrant Shrike Starling VIREOS White-eyed Vireo Pellow-throated Vireo Blueschended Vireo Red-eyed Vireo Philadelithia Vireo Warbling Vireo WOOD WARBLERS Black and White Warbler Prothonotary Washler Golden-winged Warbler Blues-winged Warbler Tennessee Warbler Orange-crowned Wichler Nashville Warbler Parida Warbler Parida Warbler Hack-throated Gire Warbler Hack-throated Gire Warbler Black-throated Gire Warbler Black-throated Gire Warbler Cerulean Warbler Black-throated Gire Warbler Corulean Warbler Black-throated Gire Warbler Black-throated Gire Warbler Black-throated Gire Warbler Corulean Warbler Corulean Warbler Black-throated Gire Warbler Black-throated Gire Warbler Black-throated Gire Warbler Connecticut Warbler Connecticut Warbler Connecticut Warbler Connecticut Warbler Mourning Warbler Yellow-throat Y Blow-breasted Chat Blow-broat Gire Warbler Visions Warbler

Total Species:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To:

Localities:

From:

Total:

Distance: By Car — On Foot Finish:

Start:

Total:

	VULTURES. HAWKS, FALCONS Turkey Volture Share him ed Hawk Cooper's Hawk	Skill Sandpiper Semipalmated Sindpiper Western Sandpiper Ruff-breasted Sandpiper Sanderling
1 : 1		Red Phaiarope
	Red-taile, Hawk	Wilson's Phalarone
WATER BIRDS	Red-shouldered Hawk	8 Northern Phalarope
Common Loon	Broad-winged Hawk Rough-legged Hawk	
	Bald Eagle	GULLS AND TERNS
Horned Grebe		Giaucoua Gull
Pied-billed Grebe	Marsh Hawk	Great Black-backed Gull
Double-crested Cormorant	Osprey	Prop billed Cull
	Buck Howk Fitte greene	Ring-billed Gull Franklin's Gull
HERONS		Bonaparte's Gull
Great Blue Heron	Pigeon Hawk Sparrow Hawk Kishul	
American Egret	- 1 / Special dept /Utiles	Forster's Tern
, Snowy Egret	GALLINACEOUS BIRDS	Common Tern
Little Blue Heron		Caspian Tern
Green Heron	Ruffed Grouse Hungarian Partridge	Black Tern
Black-growned Night Heron	Bob-white	DOVES AND PIGEONS
	Ring-necked Pheasant	Rock Dove
Least Bittern		Mourning Dove
SWANS, GEESE, DUCKS	MARSH BIRDS	
Whistling Swan	King Rail	CUCKOOS
	Virginia Rail	Yellow-billed Cuckoo
Canada Goose	Sora Stationale Common Merchen	Black-billed Cuckoo
Snow Goose		OWLS
Blue Gonse	• i. Coot	Barn Owl
Mallard	SHOREBIRDS	Screech Owl
Black Duck		Great Horned Owl
Gadwall	Piping Plover	Snowy Owi
Buldpate american Triciyeen	Semipalmated Plover Killdeer	Barred Owl
Pintail	Golden Player	Long-eared Owl
Grean-winged Teal	Black-hellied Plover	Short-eared Owl
Blue-winged Test	Ruddy Turnstone	Saw-whet Owl
Shoveller		GOATSUCKERS, ETC.
Wood Duck	Woodcock	1 1 1 1
Redhead	Wilson's Snipe Hudsonian Curiew	Whip-poor-will
i Ring-necked Duck	Upland Plover	Nighthawk
Canvas-back	Spotted Sandpiper	Chimney Swift
Greater Scaup Duck	Solitary Sandpiper	Ruby-throated Hummingbird
Lesser Scaup Duck	Willet	
American Golden-eye	Greater Yellow-legs	Betted Kingflaher
Buffle-head	Leaser Yellow-lere	WOODPECKERS
Old-equaw	● Knot	1 1 1
White-winged Scoter	Pectoral Sandpiper	Flicker
Ruddy Duck		Red-belied Woodnecker Red-bended Woodnecker
	Baird's Sandpiper	Red-headed Woodpacker Yellow-beilied Saneucker
Honded Merganeer	Least Sandpiper	Hairy Woodsecker
American Merganeer	Red bashed Stridition Dunlin	
Bed-breasted Merganser	Dowitcher	Downy Woodpacker

FLYCATCHERS	GNATCATCHERS, ETC.	WEAVER BIRDS
Eastern Kingbird	Blue-gray Gnatestcher	English Sparrow
Crested Flycatcher	Golden-crowned Kinglet	
Phoebe	Ruby-crowned kinglet	BLACKBIRDS AND ORIOLES
Yellow-beilied Flycatcher	1 Di C- 5	Bobolink
Acadian Flycatcher	American Pipit Macti	Meadowlark
Alder Flycatcher	Cedar Waxwing	Western Meadowlark
Least Flycatcher	Northern Shrike	Red-wine Blackbird
Wood Pewee	Migrant Shrike	Orchard Oriole
Olive-sided Flycatcher	MIRERART SHEIKE	Baltimore Oriole
. Empidonax	Starling	Rusty Blackbird
* * * * * * * * * * * * * * * * * * * *	VIREOS	Brewer's Blackbird
LARKS	1 1 1	Diconand Grackle Linnon
Horned Lark	White-eyed Vireo	f Cowbird
SWALLOWS	Yellow-throated Vireo Blue-headed Vireo	TANAGERS
Tree Swallow	Rod-eyed Virgo	
Bank Swallow		Scarlet Tanager
Rough-winged Swallow	Philadelphia Vireo Warbling Vireo	
Barn Swallow	1 1 Maidling Aireo	FINCHES, SPARROWS, etc.
Cliff Swallow	WOOD WARBLERS	• Cardinal
Purple Martin	_1 1 1	Rose-breasted Grosbeak
- Torple Marcia	Black and White Warbler	Indigo Bunting
CROWS AND JAYS	Prothonotary Warbler	Dickeissel
• i I I	Golden-winged Warbler	Evening Groshesk
Blue Jay	Blue-winged Warbler	
1 Crow	Tennewee Warbler	Purple Finch
	Orange-crowned Warbler	Pine Grosbeak
TITMICE, NUTHATCHES, CREECERS	Nashville Warbler	Redpott
Black-capped Chickane	Paruta Warbler	Pine Siskin
. Tufted Titmouse	Yellow Warbier	Goldfinch
White-breasted Nuthatch	Magnolia Warbler	Red Crossbill
Red-breasted Nuthatch	Cape May Warbler	White-winged Crosshill
I Brown Creeper	Black-throated Blue Warbler	Rudeyed Towhee Augress - water
	" Morrite Warhler Gelin - Lumped	Savannah Sparrow
WRENS	Black-throated Goen Warbler	Grashopper Sparrow
	Cornigan Washing	Henslow's Sparrow
House Wren	Blackburman Wachler	Sharp-tuded Sparrow
. Winter Wren	thestput sided Warhler	Vesper Sparrow
. Bewick's Wren	Have be desired Warehour	Lark Sparrow
· Carolina Wren	Black-pull Warbler	State-colored Junco
Long-billed Marsh Wren	P ne Warbier	Tree Sparrow
Shuttabilled Mittel Wren Strige	Prairie Warbler	Chipping Sparrow
MOCKINGBIRDS	Pidm Witbler	Field Sparrow
	Ovenhird	White-crowned Sparrow
- Mockinsbird	1 Northern Water-thrush	White-throated Sparrow
• Cathird	Leonsana Water-thrush	Fox Sparrow
Brown Thrasher	Kentucky Warbler	Lincoln's Sparrow
· · · · · · · · · · · · · · · · · · ·	Connecticut Warbler	Swamp Sparrow
THRUSHES	Mostroing Warbler	Song Sparrow
Robin	Yellow-throat	Lapland Longspor
Wood Thrush	Yellow-breasted Chat	Snow Bunting
. (Hermit Thrush	Howled Warbler -	· Tank Janch
Ulive-bucked Thrush	Wilson - Warbier	Je Coule's Staron
'rrav-cheeked Thrush	Canada Warbler	
Viery	Reistart	

Total Species: Individuals: Jun Fet, Mar 1487

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To: From: Total: Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

		VULTURES, HAWKS, FALCONS Turkey Vulture on fright Shari-shinned Hawk Cooper's Hawk	Scit Said, over Semipalmated Sandioper Western Sandioper Buff-breasted Sandioper Sanderling Red Phalarope
	WATER BIRDS	Red-tailed Hawk Red-shouldered Hawk Broad-winged Hawk Rough-legged Hawk	Wilson's Phalarone Northern Phalarone
	Horned Grebe Pied-billed Grebe	Bald Eagle Marsh Hawk	GULLS AND TERNS Glaucous Gult Great Black-backed Gull
1	Double-created Cormorant	Oaprey	Herring Gull
•	HERONS Great Blue Heron American Egret	Duck Hawk Pigeon Hawk Sparrow Hawk	Franklin's Gull Bonaparte's Gull Forster's Tern
† ÷ · · ·	Snowy Egret Little Blue Heron Green Heron Black-crowned Night Heron	GALLINACEOUS BIRDS Ruffed Grouse Hungarian Partridge	Common Tern Caspian Tern Black Tern
	American Bittern Least Bittern	Bob-white Ring-necked Pheasant	DOVES AND PIGEONS Rock Dove Mourning Dove
s w	ANS, GEESE, DUCKS Whistling Swan Canada Goose Snow Goose Blue Goose	MARSH BIRDS King Rail Virginia Rail Sora Florida Gallinule Coot	CUCKOOS Yellow-billed Cuckoo Black-billed Cuckoo OWLS
	Mailard Black Duck Gadwall European Widgeon Baldmete Pritorian And gran. Pintail Green-winged Teal Blue-winged Teal	SHOREBIRDS Piping Flover Semipalmated Plover Killdeer Golden Plover Black-bellied Plover Ruddy Turnstone	Barn Owl Screech Owl Great Horned Owl Snowy Owl Barred Owl Long-sared Owl Short-sared Owl Saw-whet Owl
	Shoveller Wood Duck Redhead Ring-necked Duck Canvas-back	Woodcock Wilson's Shipe Hudsonian Curlew Utiland Plover Spotted Sendinger	GOATSUCKERS, ETC. Whip-poor-will Nighthawk Chimney Swift
	Greater Scaup Duck Lesser Scaup Duck	Solitary Sandquer Willet	Ruby-throated Hummingbird Belted Kingflaher
	American Golden-eye Buffle-head Old-equaw White-winged Scoter	Greater Yellow-legs Lenser Yellow-legs Knot Pectoral Sandruper	WOODPECKERS Flicker
•	Ruddy Duck	White-rumped Sandpiper Baird's Sandpiper Least Sandpiper	Red-bellied Woodpecker Red-headed Woodpecker Yellow-bellied Sapeucker
	Hooded Merganeer American Merganeer Red-breasted Merganeer	Red-backed Sandjujer	Hairy Woodpecker Downy Woodpecker

	FLYCATCHERS		GNATCATCHERS, ETC.		WEAVER BIRDS
1 1	Eastern Kingbird	1 1	Blue-gray Gnatcatcher	! !	English Sparrow
	Crested Flycatcher	1 1	Golden-crowned Kinglet		
1 1	Phoebe	1 1	Ruby-crowned Kinglet	8	LACKBIRDS AND ORIOLES
1 1	Yellow-bellied Flycatcher	1 1		1 1	Bobolink
1 1	Acadian Flycatcher	1 1	American Pipit	-1	Mendowiark
1 1	Alder Flycatcher	1.1	Cedar Waswing	-	
1 !	Least Flycatcher	1 [-1 !	Western Meadowlark
1 1	Wood Pewee	1 1	Northern Shrike	· 1	Red-wing Blackbird
1 1	Olive-sided Flycatcher		Migrant Shrike	1 1	Orchard Oriole
] [Empidonax	-1	Starling	1 1	Bultimore Oriule
				1 1	Rusty Blackbird
	LARKS		VIREOS	1 1	Brewer's Blackbird
1 1	Horned Lark	1 1	White-eyed Vireo		Bronzed Grackle
		_ 1 1		- (Cowbird
	SWALLOWS	- 1 1	Yellow-throated Vireo		TANAGERS
• [Tree Swallow	1 1		1 1	1 AMAGERS
	Bank Swallow	1 1	Red-eyed Vires	1 i	Scarlet Tanager
1	Rough-winced Swallow	1 1	Philadelphia Vireo		
	Barn Swallow		I Warbling Virgo	. I	INCHES, SPARROWS, etc.
!	Chff Swallow		WOOD WARBLERS	• 1 1	(
1	Purple Martin	1 1	"ARBLERS	t i	Cardinal
	. Turple martin	1 1	Black and White Warbier	1 1	Rose-breasted Grosbeak
	CROWS AND JAYS	-	Prothonotary Warbler	1 1	Indigo Bunting
. 1	:	1 1	Golden-winzed Warbler	1 1	Dickeissel
1	Blue Jay		, Blue-winged Warbler	1 1	Evening Grosbeak
' '	Crow	1 :	, Tennessee Warbler	+ +	Purple Finch
		- ;	, Grange-crowned Warbier	+ 1	Pine Grosheak
TITMI	ICE, NUTHATCHES, CREEPERS	ii	Nashville Warbler	1 1	Red: off
1 1	Black-carped Chickadee	1 !	Parula Warbler	_ + +	Pine Siskin
1 .	Tufted Fitmouse	1 [Yellow Warbler	•	Goldfineh
	White-breasted Nuthatch	- [Magnoba Warbler	+ +	Red Crosshill
	Red-breasted Nuthatch		Cape May Warbler	1 1	White-winged Crossbill
1 1	Brown Croeper	1 :	Black-throated Blue Warther	1 1	Red-eyed Towhee
		- [[Wertle Warbier		Savannah arrow
	WRENS	1 !	Black-throated Green Warbice	;	Grasshopper Sparrow
	T .	1 !	Cerulean Washier	1 1	Henslow - Sparrow
	, House Wren	1 1	Rhickburnian Warlder	1 1	Sharpet ofed Sparrow
	Winter Wren	1		1 1	Vester Sparrow
, 1	, Rewick's Wren		Chestnut sited Warhler Bay-breasted Warhler	i i	Laux Surrow
	. Carolina Wren			•	State-colored Junea
	. Laing-fulled Marsh Wren	, ,	Mack-poil Warner	•	Lies Sparrow
i	. Short-hilled Marsh Wren	! '	I ne Wishier	1 1	hirdane Starrow
			Printie Warnier	• [Leid Scarrow
	MOCKINGBIRDS		i'dm Worthler	•	White-crowned Sparrow
,		1 :	then to the		White-throatest Sparrow
	Mockinghird	1 1	Sorthern Water thrush	1 1	Fox Sparrow
	Cathird	· •	Louisian i Water thrush	1	Lancoin a Sparrow
	Brown Thrasher		isentacky Wartoer	.	Swiftip Sparrow
			Contractical Warner	•1 1	John Starrow
	THRUSHES	1 1	Mourning Warbles		Lay land Longspur
٠	, Rotan	1 ;	Yellow threat	1 1	
	, West Thrush	i 1	Yellow breasted a hat		how Bunting
	. Hermit Thrush		Horsten Warbier	•	Liner 3 chen
	Olive-bucked Though	; ;	Wilson's Wichier		
. ,	Contro beesend. Thrush		Canada Warbler		
	Verry		Redstart		

Total Species: Individuals: afer, May, june 1987

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To: From: Total: Localities:

Distance: By Car — On Foot Finish:

Start:

Total:

		VULTURES, HAWKS, FALCONS Turkey Vulture Sharu-shinned Hawk	Skilt Sandpuper Seminalmated Sandpuper Western Sandpuper Buff-breasted Sandpuper Sanderling
	WATER BIRDS	Cooper's Hawk Red-shouldered Hawk Broad-winged Hawk	Red Phalarone Wilson's Phalarone Northern Phalarone
		Rough-legged Hawk Baid Eagle	GULLS AND TERNS
+	Pied-billed Grebe	Marsh Hawk	Great Black-backed Gull
		Osprey	Ring-billed Gull
1 !	HERONS Great Blue Heron	Duck Hawk Pigeon Hawk	Franklin's Gull Bonaparie's Gull
+ +	American Extet for anoth	Sparrow Hawk restret	Forster's Tern
1	. Snowy Exret	GALLINACEOUS BIRDS	Common Tern
1 - ;	, Green Heron	Ruffed (irouse	Caspian Tern Black Tern
• •	Black-crowned Night Heron	Hungarian Partridge	
	American Bittern	Bob-white Ring-necked Pheasant	DOVES AND PIGEONS
1	. Least Bittern	1 1 Acting-mecked Phemson:	Rock Dove
S	WANS, GEESE, DUCKS	MARSH BIRDS	
	Whistling Swan		CUCKOOS
1 1	Canada Goose	Virginia Rail	Yellow-billed Cuckoo
1 :	. Snow Goose	Florida Calliagle Common Morrhen	Black-billed Cuckoo
	Blue Goose	Coot	OWLS
1 .	Mallard		Barn Owl
•	Black Duck	SHOREBIRDS	Screech Owl
	Gadwail	Pining Plover	Showy Owl
.1	Buldrate Combunt in addition	Seminalmated Plover	Barred Owl
1 1	Pintail	Golden Plover	Long-eared Owl
1 1	Green-winged Test	Black-bellied Ployer	Short-eared Owl
1	Dive-winged Teal	Ruddy Turnstone	Saw-whee Owl
i :	Shoveller		
·	Wood Duck	Woodcock Wilsonia Snape Common	GOATSUCKERS, ETC.
1.1	Redhead	Hudaohian Curlew	Whip-poor-will Nighthawk
L.J	Ring-necked Duck	Upland Plover	
1	Canvan-back	Spotted Sandpiper	Chimney Swift
+ +	Greater Scaup Duck	Solitary Sandpiper	Ruby-throated Hummingbird
1	Lesser Scaup Duck	Willet	Bolted Kingfisher
+ +-	American Golden-eye	Greater Yellow-legs) (A. Detter Kingianier
1 :	, Buffle-head , Old-squaw	Lesser Yellow-legs	WOODPECKERS
1 1	White-winged Scoter	Pectoral Sandpiner	Flicker
		White-rumped Sandpiper	Red-bellied Woodpecker
1 1	Ruddy Duck	Baird's Sandpiper	Red-headed Woodpecker
1 1		₹	Yellow-bellied Sansucker
	Hooded Merganeer	Least Sandpiper	
	Hooded Merganeer American Merganeer Red-breasted Merganeer	Bedt Sandriper Sunding	Hairy Woodpacker

FLYCATCHERS	GNATCATCHERS, ETC.	WEAVER BIRDS
Eastern Kingbird Crested Flycatcher Phoebe	Blue-gray Ghatcatcher Golden-crowned Kinglet	English Sparrow
Yellow-bellied Flycatcher	Ruby-crowned Kinglet	BLACKBIRDS AND ORIOLES
Acadian Flycatcher	American Pipit	Bobolink
* Histor Flycatcher Willer	Cedar Waxwing	Meadowlark Western Meadowlark
Least Flycatcher	Northern Shrike	Red-wing Blackbird
Wood Pewee Olive-sided Flycatcher	Migrant Shrike	Orchard Oriole
Empidonax	Starling	Maltimore Oriole Northurn
		Rusty Blackbird Brewer's Blackbird
LARKS	VIREOS	Bronzed Grackle
Horned Lark	White-eyed Vireo	Cowbird
SWALLOWS	Yeilow-throated Vireo -	TANGE
Tree Swallow	Blue-headed Virea	TANAGERS
Bank Swallow	Rod-eyed Vireo Philadelphia Vireo	Scarlet Tanager
Rough-winged Swallow	Warbling Vireo	
Barn Swallow -		FINCHES, SPARROWS, etc.
Cliff Swallow	WOOD WARBLERS	Cardinal
Purple Martin	Black and White Warbler	Rose-breasted Grosbeak
CROWS AND JAYS	Prothonotary Warbler	Indico Bunting
Blue Jay	Golden-winked Warbler	Dickeissel
Crow	Blue-winked Warbler	Evening Grosbeak Purple Finch
	· Tenneseee Warbler	Pine Grosbeak
TITMICE, NUTHATCHES, CREEPERS	trange-crowned Warbier Nashville Warbier	Respons
Black-capped Chickadee	Parula Warbler	Pine Siskin
Tufted Titmouse	• Yellow Warhier	Goldfinch
White-breasted Nuthatch	Magnolia Warbler	Red Crosshill
Red-breasted Nothaten	Cape May Warbler	White-winced Crosshill
● I Brown Croeper	Black-throated Blue Wartiler	Hertinan Towher Aufour and
WRENS	Trette Warbler (MU20 -) Wholes	Savannah Sparrow Grasshopper Sparrow
WRENS	Rack-throated trees Warth r	Henslow's Sparrow
House Wren	Corollean Worbler Rhackburnian Warbler	Sharp-turked Sparrow
Winter Wren	Chestnut-subst Warbler	Vesper Sparrow
Bowick's Wren	Bay-breasted Warbler	Lark Sparrow
Carolina Wren Long-billed Marsh Wren	Black-poll Warbler	Slate-colored Junco
Short-billed Marsh Wren	i ne Wirbler	Fine Sparrow
The state of the s	Prairie Wathler	Chipping Sparrow
MOCKINGBIRDS	Film Wirbler	Lield Sparrow White-crowned Sparrow
Mockinichird	i i i com bird	Whitesthroated Sparrow
• Cithird	+ Sorthern Water-thrush	Fox Sparrow
• Brown Thrasher	Leonsiana Water-thrush	Lancoin v Sparrow
	onnecticut Warbier	• Swamp Sparrow
THRUSHES	Lucining Wartiler	Song Sparrow
• Robin	Y. How throat	Lateland Longspur
Word Thrush	Ye, ow breasted Chat	Enow Bontony
6 Hermit Thrush	Hossied Warbler	* Trace Firsch
Olive-backed Thrush	Wilson's Warbier	
Gray-checked Thrush	inada Warbler	
Vecty	Reistart	
illuebuid		

Total Species:

July, Aug, Lept 1987

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To:

Localities:

From: Total:

Distance: By Car — On Foot

Finish:

Start:

Total:

		VULTURES, HAWKS, FALCONS Turkey Vulture on fought Sharp-shinned Hawk Cooper's Hawk	Still Sandpiper Semipulmated Sandpiper Western Sandpiper Buff-breasted Sandpiper Sanderling
	1	Red-tailed Hawk	Red Phalarone
1 1 1	1	Red-shouldered Hawk	Wilson's Phalarone
1 1	WATER BIRDS	Broad-winged Hawk	1 1. 1Northern Phalarope
·• • •	Common ! con	Rough-legged Hawk	GULLS AND TERNS
1	Horned Grebe	Baid Eagle	Glaucous Gull
ļ ļ j	Pled-billed Grebe	Marah Hawk	Great Black-backed Gull
Γ	Double-created Cormorant in fugit	Oaprey	Herring Gull
			Ring-billed Gull
1 1 1	HERONS	Duch Hawk /Everine	Franklin's Gull
+ +	Great Blue Heron	Pireon Hawk	Bonaparte's Gull
∤ ↓	American Egret Convintor	Sparrow Hawk Hertret	• Forster's Tern
† · · · · · · · · · · · · · · · · · · ·	Snowy EgretLittle Blue Heron	GALLINACEOUS BIRDS	Common Tern
1 1	Green Heron Jun Sicken William	1 1 1	Caspian Tern
17: !	Black-crowned Night Heron	Ruffed Grouse Hungarian Partridge	Black Tern
1 7 7		Bob-white	DOVES AND PIGEONS
11 1 1	American Bittern .Least Bittern	Ring-necked Pheasant	Rock Dove
1	Terre Bittern	<u> </u>	Mourning Dove
. sw	ANS, GEESE, DUCKS	MARSH BIRDS	
	Whistling Swan	King Rail	CUCKOOS
	Canada Goose	Virginia Rail	Yellow-billed Cuckoo
1 1 1	Snow Goose	Sora Provide Callinule Common hurthen	Black-billed Cuckoo
$\Gamma = 1$	Blue Goose	Coot	OWLS
	Mallard		Barn Owl
1 1 1	Black Duck	SHOREBIRDS	. Screech Owl
	Gadwall	Pining Plover	Great Horned Owl
1 1 1	European Widgeon	Semipalmated Plover	Snowy Owl
! ; ;	Baidpate	Killdeer	Barred Owl
1 + 1	Pintail	Golden Player	Long-eared Owl
1 1 1	Green-winged Teal	Black-bellied Plover	Short-eared Owl
1	Blue-winged Teal Shoveller	Ruddy Turnstone	, i. i gavener out
1 1 1		Woodcock	GOATSUCKERS, ETC.
1 [Wilson's Snipe	Whip-poor-will
1 - 1 - 1	Redhead Born analysis Durch	Hudsonian Curlew	
+ 1 1	Ring-necked Duck Canvas-back	Upland Plover	Chimney Swift
! ! !	Greater Scaup Duck	Spotted Sandpiper	
1! [Lesser Scaup Duck	Willet	Ruby-throated Hummingbird
1. 1	American Golden-eye	Greater Yellow-legs	Belted Kingfisher
1 1	Buffle-head	Lesser Yellow-lere	
1 4 4	Old-squaw	Knot	WOODPECKERS
1	White-winged Scoter	Pectoral Sandpiper	. Flicker
	Ruddy Duck	White-rumped Sandpiper	Red-bellied Woodpecker
1 1 1	Honded Merganser	Baird's Sandpiper Least Sandpiper	Red-hended Woodpecker Yellow-beilied Sansucker
'		. T. L L Lengt Sandbiner	
	American Merganser Red-breasted Merganser	Red-backed Sandpiner	Hairy Woodpacker Downy Woodpacker

FLYCATCHERS	GNATCATCHERS, ETC.	WEAVER BIRDS
Eastern Kingbird	Blue-gray Gnatcatcher	English Sparrow
Crested Flycatcher	Golden-crowned Kinklet	
Phoebe	Ruby-crowned Kinglet	BLACKBIRDS AND ORIOLES
Yellow-beilied Flycatcher	American Pipit	Bobolink
Acadian Flycatcher		• Meadowlark
Alder Flycatcher Walter		. Western Meadowlark
Leant Flycatcher	Northern Shrike	Red-wing Blackbird
Wood Pewre	Migrant Shrike	Orchard Origle
Olive-sided Flycatcher Empidonax		B.iltimore Oriole
- Impidonax	1 1 Starling	Rusty Blackbird
LARKS	VIREOS	Breweris Blackbird Commin
Horned Lark	1	Bronzed Grackle
	White-eyed Vireo	Cowbird
SWALLOWS	Yellow-throated Vireo	TANAGERS
Tree Swallow	Blue headed Vireo School by Red-eyed Vireo	1 I
Bank Swallow	Philadelphia Virgo	Scarlet Tanager
Rough-winged Swallow		
Barn Swallow	T 1 Warbling Viteo	FINCHES, SPARROWS, etc.
Cliff Swallow	WOOD WARBLERS	• [] Cardinal
Purple Martin	1 1	Rose-breasted Grosbeak
	Black and White Warbler Prothonotary Warbler	Indigo Bunting
CROWS AND JAYS	Golden-winged Warbler	Dickcissel
Blue Jay	Rive-winged Warbler	Evening Grosbeak
Crow	Tennessee Wartier	Purple Finch
	Orange-crowned Warbler	Pine Grosbeak
TITMICE, NUTHATCHES, CREEPERS	Nashville Warbler	Reduall
Black-capped Chickadee	Parula Warbler	Pine Siskin
Tufted Titmouse	Yellow Warbler	Goldfinch
White-breasted Nuthatch	Maknoha Warbler	Red Crossbill
Red-breasted Nuthatch	Care May Warbler	White-winged Crossbill
Brown Creeper	Black-throated Blue Warbier	Kol-eved Towhee
	Myrthe Warbler Gulleher on nepect	Savannah Sparrow
WRENS	Black-throated Croen Warbler	Gusshopper Sparrow
House Wren	Ceratean Warbler	Henslow's Sparrow
Winter Wren	Blackburnian Warhler	Sharpstuded Sparrow
Bewick's Wren	Chestron sided Warhler	Vester Sparrow Lark Sparrow
, Carolina Wren	Bay-breasted Warbier	State-colored Juneo
Long-billed Marsh Wren	Black-pull Warbler	Tree Sparrow
Short-holled March Wren bidge	Pine Warbler	hipping Sparrow
	Prairie Warbler Pidm Warbler	Lield Starrow
MOCKINGBIRDS	Overdood	White-crowned Sparrow
• Mockingbird •	Northern Water-thrush	White-throated Sparrow
Cathird	Laurenan . Water through	Fox Sparrow
Brown Thrasher	hentucky Warbler	Lincoln's Sparrow
	Connecticut Warhier	Swamp Sparrow
THRUSHES	Mourning Warbler	Song Sparrow
• Bobin	Yellow-throat	Landand Longspur
Word Thrush	Yellow-breasted Chat	L. I Snow Buntane
Hermit Thrush	Howard Warbier	· Touse Junch
1 : (Move-broked Throch Su Bondon 4	Wilson's Warbler	
. Gray-checked Theash	Canada Warbler	
Verry	Redstart	
Bluebrd		

Total Species:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To:

Localities:

From: Total:

Distance: By Car — On Foot

Finish:

Start:

Total:

		VULTURES, HAWKS, FALCONS Turkey Vulture Sharp-shinned Hawk Cooper's Hawk	Stilt Sandmier Semjelmatel Sandmier Semjelmatel Sandmier Western Sandmier Ruff-breasted Sandmier Sanderling
	WATER BIRDS	Red-tailed Hawk Red-shouldered Hawk Broad-winged Hawk	Red Phalarone Wilson's Phalarone Northern Phalarone
	Horned Grebe	Rough-legged Hawk Bald Eagle	GUELS AND TERNS Glaucous Gull
-	Pied-billed Grebe Double-created Cormorant	Marth Hawk	Great Black-backed Gull Herring Gull
	HERONS	Oaprey Duck Hawk	Ring-billed Gull Franklin's Gull
	Great Blue Heron American Egret	Pigeon Hawk Sperrow Hawk Kishal	Bonaparte's Gult Forster's Tern
	Snowy Egret Lattia Blue Haron Cogn Heron	GALLINACEOUS BIRDS Ruffed Groune	Common Tern Caspian Tern Black Tern
-	. Black-crowned Night Heron	Hungarian Partridge Bob-white	DOVES AND PIGEONS
1 :	American Bittern Least Bittern	Ring-necked Phessant	Rock Dove Mourning Dove
SV	VANS, GEESE, DUCKS 	MARSH BIRDSVirginia Rail	CUCKOOS Yellow-billed Cuckoo
	Canada Goose Snow Goose	Sora Florida Gallinule	Black-billed Cuckoo
	Blue Goose Mallard	Coot	OWLS Barn Owl
	Hlack Duck Gadwall	SHOREBIRDS Piping Plover	Screech Owl Great Horned Owl
	European Widgeon Baldpate	Semipalmated Plover Killdear	Snowy ()wl Barred Owl Long-pared ()wl
	Pintail Green-winged Teal Blue-winged Teal	Golden Plover Black-bellied Plover Ruddy Turnstone	Short-enred Owl
	Shoveller .Wood Duck	Woodcock Wilson's Snipe	GOATSUCKERS, ETC.
	Redhead Ring-necked Duck	Hudaonian Curlew Upland Plover	Whip-poor-will Nighthawk
	Canvas-back Greater Scaup Duck	Spottad Sandpiper Solitary Sandpiper	Chimney Swift Ruby-throated Hummingbird
	Lesser Scaup Duck American Golden-sye	Willet Greater Yellow-legs	Beited Kingfisher
	Buffle-bead Old-squaw	Leaser Yellow-leas	WOODPECKERS
1.	.White-winged Scoter	Pectoral Sandpiper White-rumped Sandpiper	Flicker
	Ruddy Duck Hoorled Merganeer	Baird's Sandpiper	Red-headed Woodnecker Yellow-bellied Sansucker

FLYCATCHERS		GNATCATCHERS, ETC.		WEAVER BIRDS
Fastern Kingbird		Blue-gray Gnatcatcher	1	English Sparrow
Crested Flycatcher	• 1	Golden-crowned Kinglet		
Phoebe	•	Ruby-crowned kinglet		BLACKBIRDS AND ORIOLES
Yellow-heilied Flycatcher	+ +	American Pipit	•	Bobulink
Acadian Flycatcher	1 1	American Pipit	i	Mendowinsk
Aider Flycatcher	1 1	Cedar Waxwing	i	Western Meadowlark
Least Flycatcher	1 1	Northern Shrike	•	Red-wine Blackling
Wood Pewee	! !	Migrant Shrike	I	Orchard Oriole
Olive-sided Flycatcher	•	STATE SATIRE	I	Baltimore Origle
Empidonax	-1 1	Starling	•	Rusty Hiscobied
		LIBEOG	I	Brewer's Blackbard
LARKS	1 1	VIREOS	•	Houses trackle Lemonon
i i Horned Lark	1 1	White-eyed Vireo	اه	Lywbird
		Yellow-throated Viren		
SWALLOWS	• 1	Himshended Vireo Soulary		TANAGERS
Tree Swallow		Rid-eyed Vireo		Scarlet Tanager
Bank Swallow		Philadelphia Virgo		Scatter tanager
Rough-winged Swailow	l i	Warbling Vireo		FINCHES, SPARROWS, etc.
Barn Swallow			1	i insenta, arannywa, etc.
Cliff Swallow		WOOD WARBLERS	• [Cardinal
Purple Martin	1 1	Black and White Warbler	- 1	Rose-breasted Grosbeak
	!!!	Prothonotary Warbler	- 1	Induso Bunting
CROWS AND JAYS	1 :	Golden-winged Warbler	1	Dickeissel
Itiue Jay	1	Blue-winged Warbler	- 1	Evening Grosbeak
Crow	1 !	Lennessee Warbler	- 1	Purple Finch
· · · · · · · · · · · · · · · · · · ·	•	. Urange-crowned Warbler	ļ	Pine Grosheak
TITMICE, NUTHATCHES, CREEPERS	• 1	Nashville Warbler	1	Redonit
Black-capped Chickadee	1 1	Parula Warbler		Pine Siskin
Tofted Telmouse	1 1	Yellow Warbler	•	Goldfinch
White-breasted Nuthaich	!!!	Mognolia Warbler	- 1	Red Crossb II
Rod-breasted Nuthatch	• i	Cape May Warting	1	White-winded Crossbill
Brown Crosper		Black-throated Blue Wathler	1	Red-eved Towhee
	• [. Wertle Warbler guitte Inches	•	Savannah Sparrow
WRENS	1 !	Black-throated Green Warther	•	. Grasshot per Sparrow
1 1 :	1 1	1 Cerulean Warbler	i	Henslow's Starrow
House Wren		Blackburnian Warbler	•	Sharted and Sparrow
. Winter Wren	[]	thestnutended Wartiler	•	Visiter Scarrow
Bowick's Wren		Rev-breasted Warbler	ļ	Lark Sparrow
Cirolina Wren	•	Biack-mill Warther	•	Shitocolores Junco
Long-billed Marsh Wren		P ne Warbler	•	Liee S. acrow
. Shortabilian Museh Wren 21019c		Pairie Warbler	- ;	Chipming Scarrow
	•	Indm Wurhler	•	4 Field Starrow
MOCKINGBIRDS		Oven bird	•	White-crowned Starrow
. Mockingbird	i :	Northern Water-thrush	•	White-throwed Sparrow
· Catbird		Lagusiana Water-thrush	-	Fox Startow
Brown Thrasher		Is ntucky Warbler	•	Lancoin's Starrow
		Connecticut Warbier	•	Swamp Spatrow
THRUSHES		Mourning Warbler	•	Song Sparrow
Robin	•	Yeliow-throat		Lapland Lanyspur
\ wet 77 -+	i '	Yellow-breasted that	0	Snow Bunting
		Howled Warbler	•	House Fruch
Hive-backed Thrush		Busin's Warbler		
· A toray heeked Thrush		Canada Warbles		
Viery	•	Resistant		

Total Species:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To: From: Total: Fittle activity in jun. Easin area all show a coi Fet: dublicate of yan. 2 mertingued on the usper field on Fet. 29th. Mar. since days inon ceresia.

Distance: By Car — On Foot

Finish:

Start:

Total:

1		VULTURES, HAWKS, F.	•	Stilt Sandpiper Semipulmated Sandpiper Western Sandpiper Buff-breasted Sandpiper
		Sharp-shinned Cooper's Hawk	1 1	Sanderling
				Red Phalarone
	i .	Red-tailed Haw		Wilson's Phalarone
1 1	WATER BIRDS	Red-shouldered Broad-winged		. Northern Phalarope
	Common Loon	kough-legged I		
	Horned Grebe	Baid Eagle	1 1	GULLS AND TERNS
	Pied-billed Grebe			Glaucous Gull
		Marsh Hawk		Great Black-backed Gull Herring Gull
	Double-crested Cormorant	Osprey	1 1	Ring-billed Gull
	HERONS	Duck Hawk		Franklin's Gull
	Great Blue Heron	Pigeon Hawk	• 1	Bonaparte's Gull
	American Egret	Sperrow Hawk	uetrel	
	Snowy Egret			Forster's Tern
!!!	Little Blue Heron	GALLINACEOUS BIS	RDS	Common Tern
	Green Heron	Ruffed Grouse	1 1	Black Tern
	Black-crowned Night Heron	Hungarian Par	tridge	, DINCE LELIE
	American Bittern	Bob-white		DOVES AND PIGEONS
	Least Bittern	Ring-necked Pl	neasant •	Rock Dove
				Mourning Dove
SWA	NS, GEESE, DUCKS	MARSH BIRDS		
	.Whistling Swan	King Rail	1	CUCKOOS
	Canada Goose	Virginia Rail	i 1	Yellow-billed Cuckoo
	Snow Goose	Florida Gallinu	1 1	Black-billed Cuckoo
	Blue Goone	Coot		OWLS
1 ; ;	Mallard			Barn Owl
	Black Duck	SHOREBIRDS	i 1	Screech Owl
	Gadwall	Piping Plover		Great Horned Owl
	European Widgeon	Semipalmated I	Player	Snowy Owl
l. i i	Baldpate Comurcoan Hidyen	Killdeer	;	Barred Owl
	Pintail	Golden Plover	i l	Long-eared Owl
	. Green-winged Teal	Black-hellied P	lover •	Short-eared Owl
	Blue-winged Teal	. Ruddy Turnston	ne i	. 1 Saw-whet Owl
1 1 4	Shoveller	Woodcock		GOATSUCKERS, ETC.
	Wood Duck	Wilson's Snupe	Zemimos	Whip-poor-will
	Redhead	Hudaonian Cur		Nighthawk
	Ring-necked Duck	Upland Plover	1 1	- Ingraciawa
ie ie e	Canvas-back	Spotted Sendon	per	Chimney Swift
	Greater Scaup Duck	Solitary Sandpi	ner i	Ruby-throated Hummingbird
	Lesser Scaup Duck	Willet	_ i	
	"American Golden-eye	Greater Yellow-		
j (64 +	Buffle-head	Lesser Yellow-l	egu	WOODPECKERS
1 1	Old-equaw	Knot		1
 	White-winged Scoter	Pertoral Sando		Flicker
	Ruddy Duck	White-rumped		Red-bellied Woodpecker
	Hooded Merganser	Baird's Sandnir	T T	Yellow-bellied Saneucker
1 1 1	. American Merganser	Red-backed San	- 7 7	Hairy Woodpacker

FLYCATCHERS	GNATCATCHERS, ETC.	WEAVER BIRDS
Eastern Kingbird	Blue-gray Gnateatcher	English Sparrow
Crested Flycatcher	Golden-crowned Kinglet	
Phoebe	Ruby-crowned Kinglet	BLACKBIRDS AND ORIOLES
Yellow-beilied Flycatcher		Bobolink
Acadian Flycatcher	American Pijut	Mendowlark
Alder Flycatcher	Cedar Waxwing	
Least Flyratcher		Western Meadowiark Red-work Blackbook
Wand Pewee	Northern Shrike	
Ohve-sided Flycatcher	Migrant Shrike	Orchard Oriole
Empidonax	Starling	Buttmore throte Runty Blackbard
		Brewer w Blackbord
. , LARKS	VIREOS	Bennzed Granule Schulette
· Horned Lark	White-eyed Vireo	
	Yellow-throated Vireo -	
SWALLOWS	Rius-headed Vireo	TANAGERS
Tree Swallow	Rod-eyed Vireo	Scariet Tanager
- Bank Swallow	Philadelphia V.reo	1 1 Correct Lanager
Rough-winged Swallow	Warbling Vireo	FINCHES, SPARROWS, etc.
Barn Swallow -		1 1
Cliff Swallow	WOOD WARBLERS	Cardinal
Purple Martin	Black and White Warbler	Rose-breasted Grosboak
	Prothonotary W: rbler	Indigo Bunting
CROWS AND JAYS	Golden-winged Warbler	Daknissei
Blue Jay	Hige-winged Warbler	Evening Graebeak
Crow	Lennessee Warbler	Purple Finch
	Orange-crownest Wartsler	Pine Grisbean
TITMICE, NUTHATCHES, CREEPERS	Nashville Warbier	Restruit
Black-capped Chickadee	Parota Warbler	Pine Sissi n
Fafted Titmouse		Losidfineh
White-breasted Nothatch	Yellow Warhler	Red Crossbill
	, Mognolia Warbier	White-winder Cheston
Red-breasted Nuthatch	Care May Warbler	Red-eyed Tawhee
i Brown Cropper	Black-throated Blue Withhier	Swannin Searrow
MIRON.	Myrtle Warbler	Istasshopper Sparrow
WRENS	Biack-throated Green Wirther	Honston - Starron
House Wren	+ Cerulean Warbler	Sharpstoned Starrow
Winter Wren	Blackburman Washler	
, Rewick's Wree	4 Considerable Worlder	Luck Soarms
Lucolina Weet	1 Bay-breested Warbler	Extendines Japan
Lang-billed Marsh Wren	10 sekspoll Warfage	1 line St rrow
short-billed Marsh Wren	Pine Wilbler	Committee Street
	. Prairie Warhier	Led Starrow
MOCKINGBIRDS	Pom Worster	White country Secretar
	, , Over bod	
. Morkingbird	. , Sombleen Wider thrush	White-throated Sources
• Cathird	Load and Water-throsh	1 13 31 377 14
Brown Thrasher	kontacky Warbler	Librain's Science
	Connectical Warbler	1 1 2 Walter Station
THRI SHES	Mourning Warbier	t the Scarrow
i li den	. Yellow-throat	Localization former of
Wessi Thrush	Yellow breasted - hat	1 Stow Borns
. Hermit Ti -n	Harred Warbier	Minge of nest
(Open-bottomed Ermanh	Wilson - Warbler	• • • • • • • • • • • • • • • • • • • •
Secretaries Inches	stada Warbier	
Verty	Restart	
Hillebrd		

Total Species: Individuals:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To:

From: Total: Localities:

Distance: By Car — On Foot

Finish:

Start:

Total:

WATER BIRDS	VULTURES. HAWKS, FALCONS Turkey Vulture Sharpshinned Hawa Geoper's Hawk Red-tailed Hawk Red-shouldered Hawk Brod-winged Hawk	Stift Sandjoper Semipalmatest Sandjoper Western Sandjoper Buff-breasted Sandjoper Sanderling Red Phatarone Wilson's Phalarone Northern Phalarone
	Rough-legged Hawk Bald Eagle Marah Hawk Osprey Duck Hawk Piteon Hawk Susprey Hawk Acatual	GULLS AND TING Glaucous Gull Great Black-backed Gull Herring Gull Ring-billed Gull Frankin's Gull Bonaparte's Gull Forster's Tern Common Tern
Little Blue Heron Green Heron Black-crowned Night Heron American Bittern Lenat Bittern SWANS, GEESE, DUCKS Whistling Swan	GALLINACEOUS BIRDS Ruffed Grouse Hungarian Partridge Bob-white Ring-necked Phenaant MARSH BIRDS King Rail Virginia Rail	Caspian Tern Black Tern DOVES AND PIGEONS Rock Dove Mourning Dove CUCKOOS Yellow-billed Cuckoo
Canada Goose Snow Goose Blue Goose Blue Goose Mallard Black Duck Gadwail European Widson Baldeste January Pintail Grean-winged Teal Blue-winged Teal	Sora Florida Gallinule Coor SHOREBIRDS Pitung Plover Seminalmated Plover Kildeer Golden Plover Black-belied Plover Ruddy Turnatune	Black-billed Curkoo OWLS Barn Owl Screech Owl Great Horned Owl Showy Owl Barred Owl Long-eared Owl Short-eared Owl Show-whet (twi
Shoveller Wood Duck Radhead Ring-necked Duck Canvas-back Greater Scaup Duck Lesser Scaup Duck American Golden-eve	Woodcock Withouts Snape 24211714212 Hudaonan Curiew Upland Plover Spotted Sandpiper Solitary Sandpiper Willet Greater Yellow-leas	GOATSUCKERS, ETC. Whip-poor-will Nighthawk Chimney Swift Ruby-throated Hummingbird Beltad Kingflaher
Buffle-head Old-squaw White-winged Scoter Ruddy Duck Hooded Merganser American Merganser Red-breasted Merganser	Lenser Yeilow-lenn Knot Pertoral Sandniver White-rumied Sandniver Baird's Sandniver Lenst Sandniver Lenst Sandniver Red-backed Sandriver Dowlitcher	WOODPECKERS Flicker Rad-belled Woodrecker Rad-beelded Woodrecker Yellow-bellied Sansucker Hairy Woodrecker Downy Woodpecker

1 1	FLYCATCHERS	GNATCATCHERS, ETC.	WEAVER BIRDS	
	Eastern Kingbird	Blue-gray Gnatcatcher	harlish Sparrow	
	Crested Flycatcher	fielden-crowned Kinklet		
1 1	Phoebe	Ruby-crowned Kinglet	BLACKBIRDS AND ORIOLES	
1 1	Yellow-hellied Flycatcher		1 1 1	
1 1	Acadian Flycatcher	American Pipit "the	Bohounk	
1 1	Alder Flycatcher w. turum	Cedar Waywing	Meanowisck	
1 1	Least Flycatcher		Western Mendowiark	
1 1	Wood Pewee	Northern Shrike	Red-work Bluckbort	
1 1	Olive-sided Flycatcher	Migrant Shrike	Orchard Orsole	
[]	Empidonax	Starling	Butimore Oriole	
			Rusty Blackford	
	LARKS	VIREOS	Brewer's Blackbard	
! 1	Horned Lark	White-eyed Viren	Bennent trackle de motor	1
	+		• L i townerd	
	SWALLOWS	Yellow-throated Vireo	TANAGERS	
1 '	Tree Swallow	illue-headed Virco	1 ASAGERS	
	Bank Swallow	Redeved Virea	Scariet Tanager	
	Rough-winged Swallow	Padadelphia Vireo		
	Barn Swallow	1 . Warbling Vireo	FINCHES, SPARROWS, etc.	
! !	Cliff Swallow	WOOD WARBLERS	• 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
1 1	Purple Martin	1 ! "OOD WARDLERS	Cardinal	
	rurne martin	Black and White Warbler	Rose-breasted Grosbeak	
	ROWS AND JAYS	i Prothonotary Warbler	Irdigo Bunting	
, ,		(Golden-winged Warbler	Dicknisel	
	Blue Jay	Blue-winged Warbler	Evening Growbenk	
	(, Low.	lennewee Wartder	Purole Forch	
	[Orange-crowned Warbler	Pine Grosheak	
TITMICE.	NUTHATCHES, CREEPERS	Nashville Warher	Redroll	
,	Black-cauted Chickadee	Paru a Warbler	Pine Siskin	
. 1	Fufted Tetmouse	Yellow Warbier	· loddfineh	
		1	Red Crossfull	
	White-breasted Nathatch	Macholia Warbler	White-winged Consolid:	
! !	Red-breasted Nuthateh	Cape May Warbler	Red-eved Towhee	
	.rown Criegar	Black-throated Blue Warbler	Savann in Sparrow	
		Murete Wirther Lara - humfald	Leastooper Sparrow	
	WRENS	Black throated Green Warbles	Historia - Storma	
	House Wren	Cerulean Warbler	Share et of oil Sparrow	
1	Winter Wren	Blackburrean Warbier	Nester States	
	Bewick s Ween	Chestnot soled Warbler	Louis Statone	
	Carolina Wren	Bay-breasted Warbler	_ 1 1 1	
•	Long-billed Marsh Wren	, Black-boll Wartier	histocopores Junco	
	short-billed Marsh Wren	i Pine Wichler		
	. marconner marsh with	, Prore Wortner	Parante Sparrow	
	MOCKINGBIRDS	Parm Warbler	e I Starrow	
	TO KINGBIRDS	, Overstand	Whitesenamed Scarrow	
	Markingbord	Northern Water-thrush	Abdestrooted Sparrow	
	Cithed	Leonisiana Water-throsh	1 1 A Statema	
	Brown Ihrasher	hentuces Wurbber	Lationti's Sparrow	
		onnectical Warbar	Aomo Starrow	
	THRUSHES	Mourn by Warber	* ONE STATEON	
	listan •	Yellow throat	La rata Language	
1	Wind The seh		the second of th	
		Yellow breasted Char	· course innch	
	Hermit Thrush	, Howten Warbier	, , ,	
	incombilities the see seell not he	Waste & Wathler		
4	or as otherwest. I to see	Canada Warlder		
		Resistant		

Total Species:

July Muy 1988

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To:

Localities:

From: Total:

Distance: By Car — On Foot Finish:

Start:

Total:

,					• 1		Stilt Sandpiper
	1		VULT	URES, HAWKS, I	FALCONS	1 1	Seminalmated Sandjuper
i	1	1	1	Turkey Vultu	· · · · · · · · · · · · · · · · · · ·	1 1	Western Sandpiper
1	ı		1	i Turkey Volto	•	I = I	Buff-breasted Sandpiper
i		- 1	1	, Sharte-Minned		•	Sanderling
i .		-4	1	Coopers Haw	k	1 1	Red Phalarope
i		• 1	1	. Red-tailed Ha	w k	1 1	Wilson's Phalarone
!	I	I	I	. Red-shouldered		1	Northern Phalarote
!	WATER BIRDS		1	Broad-winged	Hawk		
	Common Loon	ļ		Rough-legged	Hawk	G	ULLS AND TERNS
i	Horned Grebe	1	al.	. Bald Eagle	1	1 1	Glaucous Gull
	Pied-billed Grebe	• i		Marsh Hawk			Great Black-backed Gull
 	5.11	•	İ				Herring Gull
1	Double-crested Cormorant is flugal		+	Oaprey	•	1 i	Ring-billed Gull
	HERONS	ı	Ţ	. Duck Hawk		1 !	Franklin's Gull
1 ' '	Great Blue Heron		1	. Pigeon Hawk	• }	ii	Bonaparte's Gult
1	American Egret	• į	J	Sparrow Ham	* Kintiele		
1	Snowy Egret					1 !	Forster's Tern
• • •	Little Blue Heron			ALLINACEOUS BI	IRDS	+ +	Common Tern Caspian Tern
	Green Heron was Juichtel Warn		1	Ruffed Grouse	▼ 1	1 •	Caspian Tern Black Tern
	Black-crowned Night Heron	•	•	Hungarian Pa			Black lern
			1	Bob-white			VES AND PIGEONS
1	American Bittern	i	1	Ring-necked I	Pheasant 6	1	Rock Dove
	Least Bittern				• i	1 !	Mourning Dove
sw	ANS, GEESE, DUCKS			MARSH BIRDS	, <u></u>	<u> </u>	
1 1 1	Whistling Swan	, ,	1	King Rail	4	1 1	CUCKOOS
:				Virginia Raif	1	1 1	Yellow-billed Cuckoo
1	. Canada Goose			,Sora	imnon marken		Black-billed Cuckon
1	Snow Goose	• ;	•	,	wie men marken		
1	Blue Goose		•	Coot	1	1 1	OWLS
:	Mallard				 ,	1	Barn Owl
1	Black Duck		,	SHOREBIRDS	1	+ +	Screech Owl
1	Gadwall	•	1	Piping Plover		- !	Great Horned Owl
1	European Widgeon	• :	i	Semipalmated	Plover		Snowy Owl
	Baldpate	• ;	ì	Killdeer	•	1 1	Barred_Owl Long-eared_Owl
	Pintail	- :	ĺ	Golden Plover	l l		Short-eared Owl
1	Green-winged Test	• :	i	Black-bellied 1		1 1	Saw-whet Owl
· · ·	Blue-winged Test	•	ţ	. Ruddy Turnet	υn e .	· ·	
	Shoveller	,	i .	Woodcock		G	DATSUCKERS, ETC.
	Wood Duck		ĺ	Wilson's Snup		1 1	Whip-poor-will
	Redhead	•	1	Hudsonian Cu	rlew	1 i.	Nighthawk
	Ring-necked Duck	,	1	Upland Plover		1 1	
	Canvas-back	• ;	1	Spotted Sandr	uper	+ +	Chimney Swift
	Greater Scaup Duck		1	Solitary Sandi	puper	1	Ruby-throated Hummingbird
4 · · · •	Lesser Scaup Duck	• 1	ł	Willet	• 1		Balted Kingdishaa
	American Golden-eye	• !	1	Greater Yellos			Belted Kingfisher
$\mathbf{r} = (\mathbf{r}_{i}, \dots, \mathbf{r}_{i})$	Buffle-head	•	i	Lesser Yellow	-legs		WOODPECKERS
	Old-squaw	- 1	+	Knot	▲ 1	1 1	
	.White-winged Scoter	• }	ł	Pectoral Sand		- J.	Flicker
1	Ruddy Duck	2-t	+	White-rumped		- 	Red-bellied Woodpecker
		2.	ŧ	Baird's Sandri	·	. ∤ ∤-	Red-headed Woodpecker
1	Hooded Merganser	•	ł	Least Sandnin		1 1	Yellow-heilled Sapsucker
1	American Merganser	1	1	. Red-backed Sa	ndinier	. 1	Hairy Woodpecker
, ,	Red-broasted Merganeer	A 1		Dowitcher	_ [1 1	Downy Woodpacker

FLYCATCHERS	GNATCATCHERS, ETC.	WEAVER BIRDS
Eastern Kingbird	Blue-gray Cinateatcher	English Sparrow
Crested Flycatcher Phoebe	Golden-crowned Kinglet Ruby-crowned Kinglet	BLACKBIRDS AND ORIOLES
Yellow-bellied Flycatcher		- Bobolink
Acadian Flycatcher	American Pipit	Meadowlark
Adder Flycatcher Walk	Cedar Waxwing	. Western Meadowlark
Least Flycatcher	Northern Shrike	Red-wing Blackbord
Word Pewee Olive-saled Flycatcher	Migrant Shrike	Orchard Oriole
Empulonax	Starling	- Baltimore Oriole
· · · · · · · · · · · · · · · · · · ·	7 1 Starring	Rusty Blackbird
LARKS	VIREOS	Brunned Grackle is norman
Horned Lark	White-eyed Vireo	Cowbied
	Yellow-throated Vireo	- Combita
SWALLOWS	Blumbraded Vireo solutary	TANAGERS
Tree Swallow	Red-eyed Vireo	Scarlet Tanager
Bank Swallow	Philadelphia Vireo	T T TANAGE TANAGE
Rough-winged Swallow	Warbling Vireo	FINCHES, SPARROWS, etc.
Barn Swallow	WAYN BARREDS	- 1 1 1
Cliff Swallow Purple Martin	WOOD WARBLERS	Cardinal Rose-breasted Grosbeak
i. i turpie marcin	Black and White Warbler	Indigo Bunting
CROWS AND JAYS	Prothonotary Warbler	Dickerssel
Blue Jay	i Golden-winged Worbler	Evening Gronbeak
Crow	Blue-winged Warbler	Purple Finch
Crow	Lennessee Wartiler	Pine Grosbeak
TITMICE, NUTHATCHES, CREEPERS	Orango-crowned Warbler	I Reduall
I 1 1	Nashville Warbler	Pine Siskin
Black-capped Chickadee Tufted Tatmouse	Parote Werbler Yellow Warbler	Goldfinch
White-breasted Nuthatch	Magnilia Warbler	Red Crossfull
Red-brewsted Nuthatch	Case May Wartiler	White-winged Crossfull
Brown Coeper	Black-throated Blue Warbler	Red-eyed Towhee
	Myrtle Warbler	Savannah Sparrow
WRENS	Black-throated Green Warbler	Grasshopper Sparrow
House Wren	Cerulean Warbler	Henslow's Sparrow
Winter Wron	Blackburnian Warbler	Sharp-tuled Sparrow
Bewick's Wren	Chestnat-sided Wacher	Vesper Sparrow Lark Sparrow
Carolina Wren	Bay-breasted Warhler	Share-colored Juneo
Long-billed Marsh Wren	Black-roll Warble	Tree Sparrow
Short-billed Marsh Wren	I . Pine Wirhler	Chipping Sparrow
	Patrie Warhler	Field Sparrow
MOCKINGBIRDS	1 Palm Warbler	White-crowned Sparrow
, Mockingbird	Overshird Northern Water thrush	White-throated Sparrow
Catherd	Louisiana Water-thrush	fox Sparrow
Brown Thrasher	hontucky Warbler	Lancoln's Sparrow
	Connecticut Warbon	Swamp Sparrow
THRUSHES	Mourning Warbler	Song Sparrow
Robin	Yellow-throat	Labland Lonespur
Wood Thrush	Yellow-broasted Chat	Inow Bonting
. Hermit Theish	Howted Warbler	Hospit Justi
. Olive-backed Incom	Wilson v Warbler	
Grav-cheeked Thrush	Canada Warbler	
. Verry	Resstart	
: Bitebood		

Total Species:

FIELD TRIP RECORD

Weather:

Meteorological Report

Observers: William A. Klamm Nancy R. Klamm

Field Time:

To: From:

Lince there was applet I of rain at the end of Aug. there were carried took I water, therefore kneddle lucke same tack. Since in 6th of Sight, there have been no ducker.

Total:

Distance: By Car — On Foot

Finish:

Start:

Total:

		VUL.	TURES, HAWKS, FALCONS Turkey Vulture Sharto-Mined Hawk Cooler's Hawk	-	Stift Sandjuper Semipalmated Sandjuper Western Sandjuper Buff-breasted Sandjuper Sanderling
	WATER BIRDS		Red-tailed Hawk Red-shouldered Hawk Broad-winged Hawk		Red Phaiarone Wilson's Phaiarone Northern Phaiarone
+ • •	Common Loon	· · · · · · ·	Rough-legged Hawk		GULLS AND TERNS
	Horned Grebe	_ † †	Bald Eagle	_	Giaucous Gull
- -	Pied-billed Grebe	• !	Marsh Hawk	1	- Great Black-backed Gull
	Double-crested Cormorant in the	1 1	Osprey	- •	Herring Gull
		• • •	·	_ •	Ring-billed Gull
	HERONS	- 4	Duck Hawk	- i !	Franklin's Gull
•	. Great Blue Heron	- · +	ر بر Pigeon Hawk	-	Bonsparte s Gull
	American Egret	• 1 1	Sparrow Howk Yestra	ĺĺ	Forster's Tern
1	Snowy Egret			- •	Common Tern
.	Little Blue Heron		GALLINACEOUS BIRDS	• j	Caspian Tern
• i	Green Heron wieen Jacked meton		Ruffed Grouse	•	Black Tern
	. Black-crowned Night Heron		Hungarian Partridge		
	American Bittern		Bob-white		DOVES AND PIGEONS
'	Least Bittern	. 1	Ring-nerked Pheasant	•	Rock Dove
<u> </u>	. Deat Into in			- •	Mourning Dove
51	VANS, GEESE, DUCKS	1 1	MARSH BIRDS		
1 1	Whistling Swan	1 1	King Rail	1 1	CUCKOOS
			. Virginia Rail	↓ ↓	Yellow-billed Cuckno
' 1 '	.Canada Goose	•	Sora	1 1	Black-billed Cuckon
1.	Snow Goose	1 4	Florids Gallinule		
- 1	,Blue Goose		. Coot	1 1	OWLS
	, Mallard			- 1	Barn Owl
• , ,	. Black Duck	1 1	SHOREBIRDS	+ (Screech Owl
	, Gadwall		Piping Plover		Great Horned Owl
1 .	European Widgeon	•!	Semipalmated Plover		Snowy (hul
• • •	Baldpate 2 merca Wigion	•	.Killdeer		Barred Owi
4 4	Pintail	• 1	Golden Plover	1 1	Long-eared Owl
	. Green-winged Teal	• :	Black-bellied Plover	• •	Short-eared Owl
' !	, .Blue-winged Teal	.	Ruddy Turnstone		. 35W-WIRE (/W/
1 1	, Shoveller		Woodroek		GOATSUCKERS, ETC.
	, .Wood Duck		Wilson's Snipe	1 1	Whip-poor-will
	. Redhead	. !	Hudaonian Curlew	! !	Nighthawk
	Ring-necked Duck	: 1	Upland Plover	_ ! !	Nighthawa
I :	. Canvas-back	1 1	Spotted Sandpiper	•	Chimney Swift
	Greater Scaup Duck	: 1	Solitary Sandpiper	1	Ruby-throated Hummingbird
: '	Lesser Scaup Duck	: :	Willet	_ : !	i
	. American Golden-eve	•	Greater Yellow-legs	-	Beltad Kingfisher
	. Buffle-head	•]	Lesser Yellow-less		
	, Old-equaw	I 1	Knot	, ,	WOODPECKERS
1 .	. White-winged Scoter	•	Pectoral Sandpiper	•	Flicker
		. 1	White-rumped Sandjujer	1 1.	Red-bellied Woodnecker
1 .	Ruddy Duck	I I	Baird's Sandniper	•	Red-headed Woodpecker
	Hooded Merganser	1 1	Least Sandpiper	•	Yellow-beilled Sansucker
1 :	American Merganser	1 1	Red-backed Sandpiper	1.1	Hairy Woodnecker
1 :	. Red-breasted Merganser	T I	Dowitcher	•	Downy Woodpacker

FLYCATCHERS		GNATCATCHERS, ETC.		WEAVER BIRDS
Eastern Kingbird	1 1	Blue-gray Gnatcatcher	1 1	English Sparrow
Crested Flycatcher	l I	Golden-crowned Kinglet		
Phoebe	1 1	Ruby-crowned Kinglet	BLA	CKBIRDS AND ORIOLES
Yellow-bellied Flycatcher			•	Bobolink
Acadian Flycatcher	1 1	American Pipit	1 1	Meadowlark
. Alder Flycatcher	1 1	Cedar Waxwing	1 1	Western Meadowlark
Least Flycatcher		Northern Shrike	• []	Red-wing Blackbird
Wood Pewee	1 1	Migrant Shrike	1 [Orenard Oriole
Olive-sided Flycatcher	_	Migrant Shrike	I	Baitimore Oriole
. Empidonax		Starling	I 1	Rusty Blackbird
			I 1	Brewer's Blackbird
LARKS	1 i	VIREOS	1 1	Bronzed Grackle
Horned Lark	1 1	White-eyed Vireo	1 1	Cowbird
 -	1 4	Yellow-throated Vireo		
SWALLOWS	1 1	Illue-headed Vireo		TANAGERS
Tree Swallow	1 1	Red-eyed Vireo	1 1	Scarlet Tanager
Bank Swallow	1 1	Philadelphia Vireo		- Carret Tanakei
Rough-winged Swallow	1 . 1	Warbling Vireo	FI	NCHES, SPARROWS, etc.
Barn Swallow			1 1	1
Cliff Swallow		WOOD WARBLERS	1 1	Cardinal
J U Purple Martin	•	Hlack and White Warbier	1 1	Rose-breasted Grosbeak
	1 1	Prothonotary Warbler	1	Indigo Bunting
CROWS AND JAYS	1 1	Golden-winged Warbler		Dickerssel
Blue Jay	1 :	Rlue-winyed Warbler	1 1	Evening Grosbeak
Crow	1	Tennessee Warbler	1 1	Purple Finch
	• ' '	Orange-crowned Warbier	1 1	Pine Grosbenk
TITMICE, NUTHATCHES, CREEPERS		. Nashville Warbler	1 1	Redpoil
Black-capped Chickadee		Parula Warbler		Pine Siskin
Tufted Titmouse	•	Yellow Warbler	•	Goldfinch
White-breasted Nuthatch		Magnolia Warbler	1 1	Red Crossbill
Red-breasted Nuthatch	• 1	Cape May Warbier	1 1	White-winged Crossbill
Brown Croeper		Black-throated Blue Warbler	1 1	Red-eyed Towher
1 1 Brown Creebet	• 1	Mustle Withiar Willow - numped		Savannah Sparrow
WRENS	- t t	Black-throates Green Warhler	1 1	Grasshopper Sparrow
WRENS	1 !	Cerulean Warbler	1 1	Henslow's Sparrow
House Wren	1 1	Riackharman Warbler	1 1	Sharp-tailed Sparrow
Winter Wren		Chestnut-sided Warbler	1 1	Vesner Sparrow
, Bewick's Wren		Ray-breasted Warbler	1 1	Lark Sparrow
, Carolina Wren		Riack-poll Warbler		State-colored Juneo
Long-billed Marsh Wren	1	Pine Warbler		Tree Sparrow
Short-billed Marsh Wren		Prairie Warbler Prairie Warbler	1 1	Chipping Sparrow
	• :	Palm Warbler	- (i	Field Sparrow
MOCKINGBIRDS	7	Over bird	•	White-crowned Sparrow
Mockingbird	,	Northern Water-thrush	•	White-throated Spacrow
Cathird) 1	Laursiana Water-thrush	1 1	Fox Sparrow
Brown Thrasher	'	1 Kentucky Warbler	• [Lincoln's Spairow
Diown Chianner	1	Connecticut Warbier	1 1	Swamp Sparrow
THRUSHES		Mourning Warbler	•	Song Sparrow
	• '		1 1	Lapland Longsour
Robin	- ! .	Yellow-throat	1 (Snow Bunting
, Wood Thrush	,	Yellow-breasted Chat	•	Trouse Finer
Hermit Thrush	• 1	Howled Warbier		a week a which
	- 1	Wilson's Warbler		
Gray-cheesed Thrush		Canada Warbler Redstart		

Total Species:

APPENDIX E
SAGINAW, MI, CDF BOTULISM CONTROL MANAGEMENT PLAN
(Includes an excerpt from the 1982 Saginaw CDF Operations Manual
referring to botulism control.)

CONFINED DISPOSAL FACILITY BOTULISM CONTROL MANAGEMENT PLAN SAGINAW, MICHIGAN JANUARY, 1982

I. DATA GATHERING PHASE

Saginaw Bay CDF Monitoring Plan

- 1. Site visits: Once per 2 weeks starting when temperatures reach the mid-60's (around 15 April). Once per week starting mid-June.
- 2. Monitoring team will consist of at least one person from the Corps and one person from the Michigan Department of Natural Resources (MDNR).
 - 3. Corps will provide boat.
 - 4. Corps will provide instruments to measure temperature and dissolved oxygen (DO).
 - 5. Personnel will walk the perimeter of at least the north dike.
 - 6. Measurements of temperature and DO will be made of any accessible ponded water.
 - 7. Inspectors should indicate on map of CDF (using a new map every week):
 - a) Locations of birds:
 - 1. Numbers & types (species) estimated.
 - 2. Conditions of birds.
 - b) Note on map: mud areas, ponded water, mud crack areas, dry-firm areas.
 - c) Note on map: areas with vegetation.
 - d) Other general comments should be written at bottom of map or attached, including climate conditions.
 - 8. Inspectors will take 12 photos each trip showing general condition of the facility.

II. REACTION PHASE

Saginaw Bay CDF Immediate Response Plan

- 1. If the monitoring team reports sick or dead birds or other individuals report sick or dead birds, the Corps and MDNR will react immediately.
- 2. Initial contacts are Stanley R. Jacek, Corps of Engineers (313-226-6796) and Daniel Morgan, MDNR 8-253-3930 (517-373-3930).
- 3a. Sick and dead birds collected will be provided to the MDNR field representative, and MDNR laboratories will make the determination of whether or not botulism is present in the affected birds.
- 3b. Response will include an increase in field visits to two or more times per week to remove dead birds.

- 4. If botulism is found by the MDNR to be the problem, exploders will be put into operation up to nine on the north cell dike. (If more exploders are needed, borrow from FWS, and purchase more).
- 5. Experiments with placement of imitation snow owls on rafts will be accomplished. Owls to be provided by the MDNR Roscommon Office.
- 6. Additionally, a determination would be made as to whether or not operational changes should be made as a response. These changes could include:
 - a. Stopping dredging.
 - b. Pumping more fresh water after each dredge load discharge.

III. LONG-RANGE OPERATIONAL PHASE

Saginaw Bay CDF Operational Plan

This plan is predicated on the knowledge that water management practices within the disposal site are the key to the successful control of the toxin-producing bacteria.

This plan includes the following:

- 1. Date of Material Placement
 - a. Place material into the CDF as late in the year as practicable. Cold weather (less than 68° F) inhibits production of the toxin. Not discharging into the CDF will keep sediments dry, thus inhibiting bacterial growth.
 - b. Fall material placement has an added advantage of holding back the protein substitute (organics in the dredge material which the bacteria need) until after it is too late in the year for the bacteria to grow.
- 2. Planned Distribution of Dredged Material Within the Dikes
 - a. Place material directly into the low areas (presently on the east side) during dredging operations. This would allow the mud flats to dry out, and keep a water layer over the most recently placed material.
 - b. Movement of material after initial dredge placement by use of small hydraulic dredge placed within CDF.
- 3. Drying of Sediments Within the CDF
 - a. Evaporative drying will remove water from the upper few inches of dredged material by capillary resupply of the soil, resulting in crust formation. This aids precipitation runoff via desiccation cracks.
 - b. Good surface drainage, rapidly removing precipitation and preventing ponding of surface water, accelerates evaporative drying. The most efficient method of promoting good surface drainage is by constructing drainage trenches in the disposal area.*

^{*} EM 1110-2-5007 18 Dec 1978.

- c. A dragline could be used to form a perimeter trench, 12 to 15 ft inside the dike, 6 to 8 ft wide, and 12 to 24 in. deep. Operations would normally begin at the weir, digging a sump, extending into the disposal area using maximum boom and bucket reach. Because the material is already piled to the top of the weir, at Saginaw, it would probably be best to allow it to drain to the east side into the existing pool, and pump that pool down to lake level if necessary. The excavated material would be cast on the interior slope of the perimeter dike.
- d. Interior drainage via drainage trenches should be initiated when perimeter trenching decreases fluid consistency of dredged material below the thin drying skin to allow trench construction to a significant depth, and support capacity of the soil allows conventional low ground pressure construction equipment to enter the disposal area to construct the trenches.
- e. After the above trenching has dried the top dike crust out sufficiently, a conventional dragline may be placed in the CDF on mats and trenching may take place at 4-month intervals.
- f. Once a crust of 25 in. is achieved a small dragline may be able to operate with mats.
- 4. Surface trenching and drying not only decrease the chance for botulism, but help prevent mosquito problems, and firm up the soil for future use of the facility. Drying the sediments also increases CDF capacity. On a large-scale basis, costs of creating disposal volume by progressive surface trenching range from \$0.10/yd³ to \$0.30/yd³ (1977 dollars).*

IV. STUDY PHASE

- 1. Use of consultants to provide recommendations on dike management to minimize botulism outbreaks.
 - a. WES Presently we have contacted the US Army Engineer Waterways Experiment Station (WES) at Vicksburg, MS. A representative from WES is scheduled to make a site visit to Saginaw in April. This site visit will provide the basis for immediate advice and a longer range study of disposal area management to minimize outbreaks of botulism.

^{*} Technical Report EL-81-11, Dec 1981, pg 137.

EXCERPT FROM: OPERATION AND MAINTENANCE MANUAL SAGINAW RIVER CONFINED DISPOSAL FACILITY LAKE HURON, MICHIGAN 1982

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3. 4.	Facility Description	1
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14.	Disposal of Private Dredgings	7
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24.	Mooring Facility and Dredge Pipeline	13
	OPERATION	
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26.	Operation in Non-Dredging Periods	16*
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В	Exhibits	
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E	Essential Corps of Engineers Personnel	
F	Assurances	
G	Use of Confined Disposal Areas by Permittees	

^{*} This portion of the original text has been reproduced here as pp E8-E9.

27. BOTULISM CONTROL

a. General - Botulism poisoning occurs as a result of ingestion of toxin produced by the bacterium *Clostridium botulinum*. The conditions for growth are simply: warm temperature, animal protein food supply, and high moisture content or water.

There are now six known types of botulism, each type designated by a letter (A-F) but all are strains of the same bacterium. Type C is responsible for most waterfowl mortalities. Types A, B, E, and F affect humans while D affects cattle. Type E, in addition to causing human disease, also causes losses of some water-associated birds in the Great Lakes area.*

Perched ponds and mud flats with warm stagnant water and dead fish or invertebrates brought up with dredged material facilitate botulism and should be avoided. The most effective method of preventing botulism is to manage the CDF with the objective of drying the dredged sediments, and to maintain close surveillance of the CDF during periods of high potential for botulism.

- b. Botulism Surveillance Period If mud flats are present, botulism can occur when temperatures reach the mid 60s. Therefore, inspections of the CDF should be made periodically between 15 June and 31 October. Between 15 June and 1 August inspections should be made at least once every 2 weeks. During the most critical botulism season, 1 August thru 31 October, inspections should be made at least once per week. Botulism sickness in waterfowl can be identified by the following symptoms which are a result of the extent to which the central nervous system is paralyzed:
 - (1) The bird is unable to fly but may still be able to swim or walk.
 - (2) The bird can only sit, or flop on the ground, often not even being able to raise its head. In this case the bird will die from lack of food and water but could survive if given fresh water and protected from direct sunlight and predators.

If dead or sick ducks are found in the facility, the following actions should be taken immediately:

- (1) Contact Mr. Don Bilmaier, Chief, Operations and Maintenance Branch, 313-226-6796, who will contact the MDNR field representative.
- (2) Bury all carcasses immediately, or place carcasses in plactic bags and remove from the site. (A single decomposing carcass (animal, fish, or bird) can produce enough botulism-infected maggots to kill many waterfowl.)
- (3) Sick birds collected shall be given water and provided to the MDNR field representative for determination of whether or not botulism is present in the affected birds.

^{*} Resources Agency of California. 1971. "Waterfowl Botulism Management," Wildlife Management Leaflet No. 14, Sacramento, CA.

