

SEATUCK NATIONAL WILDLIFE REFUGE

Islip, New York

ANNUAL NARRATIVE REPORT

Calendar Year - 1984

U.S. Department of the Interior

Fish and Wildlife Service

NATIONAL WILDLIFE REFUGE SYSTEM

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REVIEW AND APPROVALS

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<u>Roger A. Spaulding</u>	<u>7/17/85</u>	<u>[Signature]</u>	<u>7-23-85</u>
Refuge Manager	Date	Refuge Supervisor Review	Date
<u>Robert S. Miller</u>		<u>7/25/85</u>	
Regional Office Approval		Date	

## INTRODUCTION

Seatuck National Wildlife Refuge is located in Islip, New York, on the south shore of Long Island. The 196-acre refuge borders on Great South Bay and has salt marsh, old field, brush, and woodland habitats. Even though the refuge is surrounded by suburban development, diverse populations of wildlife are present. Nesting osprey, large numbers of deer, shorebirds, waterfowl, and songbirds occur here.

The refuge was acquired through a donation in 1968. A relative of the donor still has life estate privileges on a portion of the property and lives in a large house on the refuge.

The Seatuck Research Program, in cooperation with the U.S. Fish and Wildlife Service, is conducting an extensive research program on the refuge. The main emphasis is on managing refuges that are located in urban settings. Four biologists, associated with Cornell University, are doing the research and are stationed on the refuge. Most of the information in this report is a result of their work.



Aerial photograph of the dense development surrounding the refuge (STK-1-4, file)

INTRODUCTION

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## A. HIGHLIGHTS

BTI was used to control mosquitos on the refuge marsh. (Section F. 10).

Seatuck Reasearch Program staff continued ongoing research projects, as well as starting several new ones. (Section H.2, G.2, G.8, and G.10).

A YCC enrollee contracted Lyme disease. (Section E.6).

Several oppourtunities exist for adding new areas to the refuge. (Section C.3).

## B. CLIMATIC CONDITIONS

The weather data shown here is from Long Island McArthur Airport located about ten miles northeast of the refuge.

<u>Month</u>	<u>Average Precip.</u>	<u>1984 Precip.</u>	<u>Snow</u>	<u>Max. Temp</u>	<u>Min. Temp.</u>
Jan.	3.21	2.63	18"	50	-7
Feb.	3.13	5.55	0	57	12
March	4.22	5.53	8	50	11
April	3.75	4.81		69	30
May	3.76	9.43		74	40
June	3.23	5.14		92	46
July	3.77	8.36		88	58
August	4.03	.47		90	58
Sept.	3.66	5.06		82	45
Oct.	3.41	2.43		72	34
Nov.	4.14	1.69		68	26
Dec.	<u>3.81</u>	<u>4.3</u>	<u>19</u>	<u>65</u>	<u>22</u>
Total	44.12	55.4	45		

Most notable was the very warm fall with temperatures reaching to 65° until the end of December. Local birders feel this caused migrants to trickle through rather than move through at specific times. Duck hunters experienced a poor season, possibly because of the warm weather.

## C. LAND ACQUISITION

### 3. Other

The Town of Islip owns four islands in Great South Bay diagonally across the bay from Seatuck National Wildlife Refuge. The islands range in size from 32 to 454 acres and are vegetated for the most part by Spartina patens and to a lesser degree, by Spartina alterniflora. The largest, Captree Island, is wholly undeveloped and is disected by numerous tidal creeks, channels, and ponds. Two of the islands, Sexton and Havemeyer's have small areas of seasonal homes under permit by the town.

The Town of Islip is interested in ensuring preservation and proper management of these islands. However, they lack the facilities, expertise, or funds to do so. The town offered to deed these islands to Fire Island National Seashore, NPS, in the past, but NPS declined to accept. It is very possible that the town could be convinced to make a similar offer to the Fish and Wildlife Service. Informal contacts through Seatuck Research Program personnel indicate some interest.

If the Fish and Wildlife Service were to acquire these islands they would make an extremely valuable addition to Seatuck National Wildlife Refuge bringing the total acreage up to nearly 1000 acres. Great South Bay is an extremely important area to numerous migratory birds including black ducks, common and least terns, herons, egrets, rails and piping plover. These islands represent excellent habitat in a location where we already have a presence.

Scully Audubon Sanctuary lies adjacent to Seatuck NWR along South Bay Avenue in Islip, New York. The property is owned by the National Audubon Society which recently took full possession at the termination of the life estate of the previous owner. The property is ecologically a unit with Seatuck Refuge providing the bulk of forested habitat. Seatuck Research Program collects data on the site and considers it to be a vital portion of the habitat for the area.

It was rumored that National Audubon was considering sale of the property to development interests in order to increase their cash reserves and simplify their management. In discussions with National Audubon Society, Deputy Regional Director Ashe was assured that they had no such plans, but would contact us first if they ever did. Loss of this habitat to development would be severely damaging to the ecological integrity of Seatuck National Wildlife Refuge. The property would make a fine addition to the refuge.

#### D. PLANNING

##### 1. Master Plan

The Habitat Classification and Covertypes Mapping Report was received in August. The report was done under contract by Doug Norton of Cornell University as part of master planning. This project should be useful in formulating habitat management plans and documenting habitat changes on the refuge. The major habitats were salt marsh, forested upland, forested wetlands, and herbaceous uplands. Within these major divisions, forty-three covertypes were identified.

### 3. Public Participation

On November 19, concerned citizens, Vector Control representatives, Congressman Downey's aide and Seatuck Research Program staff met and discussed the tick and Lyme disease problem in the area. Citizens suggested fencing all refuges and parks and dipping deer in insecticides.

It was pointed out that pets and other wildlife species also harbor ticks and that a deer management plan for the refuge is being drafted.

### 4. Compliance with Environmental and Cultural Resources Mandates

A special use permit was issued to the Suffolk County Department of Public Works, Waterworks Division to deposit dredge spoil on the refuge. The spoil was placed in such a manner as to improve tern nesting habitat.

### 5. Research and Investigation

The Seatuck Research Program is a cooperative wildlife research project between the U.S. Fish and Wildlife Service and the Laboratory of Ornithology at Cornell University. The Seatuck Research Program is located on the Seatuck National Wildlife Refuge. The primary goal is to conduct studies involving suburban wildlife and to assess the importance of wildlife refuges, like the Seatuck National Wildlife Refuge, in maintaining wildlife populations in suburban areas. In addition, because of the Seatuck Research Program's location on the south shore of Long Island, the program is also involved in studies of local coastal resources.

Current research includes work with nesting and migrant bird populations on the Seatuck National Wildlife Refuge, re-establishing nesting ospreys on the western south shore of Long Island, censusing colonial waterbirds in the area of the Jones Beach barrier island, studying the relationship between suburban development and nesting bird populations, developing techniques for attracting least terns to protected nesting areas, and establishing ecologically based management practices for small, coastal salt marshes. Most of the activities outlined in this narrative were conducted by the Seatuck Research Program.

Seatuck Research Program conducted a small mammal survey using snap traps on a grid. Unfortunately, predation on captured animals was so rapid that the study was discontinued.

A nest predation study was conducted by Seatuck Research Program staff. The study was intended to determine if predation is higher in certain habitats compared to others, if time of nesting affects predation rates, what predators are

## 5. Research and Investigation continued

active and what other factors influence predation. Wicker canary nests were placed in various habitats and filled with fresh quail eggs. Preliminary results showed that raccoons were responsible for most predation, above ground nests and nests in dense cover showed less predation, and that ground nests in marsh experience the highest (70 percent) predation.

No ground nesting occurs on refuge property because of the high predator levels. This may be related to the ready proximity of alternate food sources, ie., garbage cans in the neighborhood. A more detailed study is planned in the future and will probably include raccoon reductions.



One of the nests with quail eggs used in predation study (STK-2-4, Litwin)

## 6. Other

A proposal to do a "Landscaping for Wildlife" project has been prepared. The National Wildlife Federation, Seatuck Research Program, Cornell University, and the U.S. Fish and Wildlife Service would cooperate on the project. The idea is to do a demonstration of landscaping techniques that benefit wildlife. The plan would also improve the captive waterfowl collection and pens so they could be better used for educational purposes. A film would be made that would instruct viewers on how to do a project in their own yard. All parties seem interested in moving ahead with this.

## E. ADMINISTRATION

### 1. Personnel

There is no Fish and Wildlife Service staff stationed at Seatuck National Wildlife Refuge. The Seatuck Research Program staff is located on the refuge. Tom Litwin is the director, and Dave Peterson, Rich Lent and Mary Capkanis are the biologists. This year the Seatuck Research Program also had three interns, two part-time technicians, one graduate student, and one New York State Department of Environmental Conservation intern working on projects on and off the refuge.

### 2. Youth Programs

Three YCC enrollees, Blythe Horman, Pat Albanese, and Michael Bonfis, worked at the refuge under supervision of the Seatuck Research Program staff. Administrative work was handled from the Long Island Refuge headquarters at Wertheim. The crew did a variety of maintenance tasks and assisted with wildlife studies. They did extensive work on the captive waterfowl flock including feeding, candling and culling eggs, and building pens. They recorded data on vegetation for a predator study, catbird study, and suburban bird study. They also recorded data for a deer movement study and visited the American Museum of Natural History in New York City.

### 4. Volunteer Programs

Two volunteers worked at the refuge under direction of the Seatuck Research Program staff. Karin Combs assisted in the nest predation study and Chris Hamm assisted with bird banding.

### 5. Funding

There are no separate funds for Seatuck National Wildlife Refuge. Funds to operate this station come from money allocated to Wertheim National Wildlife Refuge. The Seatuck Research Program is funded by a private trust.

### 6. Safety

After only a few days on the job YCC enrollee, Elizabeth Pless contracted Lyme disease. The disease is transmitted by ticks. The case was misdiagnosed and one week passed after onset of symptoms before it was correctly identified. It was diagnosed correctly by Dr. Ross at the New York State University at Stony Brook. Elizabeth Pless did not return to work. As a safety measure, all Seatuck Research Program staff and YCC enrollees were tested for the disease.

### 7. Technical Assistance

Manager Spaulding and Refuge Supervisor Gavutis serve on the Seatuck Research Program Advisory Board. The board meets regularly to review progress and make recommendations on work in progress and new efforts.

## F. HABITAT MANAGEMENT

### 1. General

Baseline data was collected for all habitats found on the refuge. Marsh, forest, old fields, and brush habitats were sampled for species composition and density. This information will be used to formulate a habitat management plan for the refuge and to evaluate management practices once they are in place.



Large numbers of deer are thought to be impacting refuge habitat (STK-3-4, Litwin)

### 2. Wetlands

Reductions of mosquito larvae on salt marshes have commonly been achieved by digging ditches in a grid pattern that serve to drain depressions and shallow pools on the marsh surface where mosquitos breed. However, this method of source reduction destroys the shallow pools that are an important part of the marsh ecosystem. Pools provide feeding areas for many species of wildlife and increase the diversity of insects and other invertebrates. In addition, ditching changes the water circulation on a marsh which in many instances results in vegetation changes. Due to the inefficiency of ditching in controlling mosquitos, the use of pesticides has become an established part of mosquito management. A potential alternative to these traditional methods is a technique termed open marsh water management (OMWM).

There are two primary goals of open marsh water management: reduction of mosquito numbers without damaging the natural diversity and structure of the marsh ecosystem, and reduced dependency on chemical pesticides. In OMWM the pool system on a marsh is maintained and reductions in larvae are achieved by improving the habitat of larval eating fish such as the mummichog (Fundulus heteroclitus).

On undisturbed marshes, fish are not common in the shallow surface pools and depressions where mosquitos breed because they cannot survive between spring tides. The pools dry out or become overheated during the long summer days. In OMWM, refuges for fish are created on the marsh surface by digging deep pools which, because of their depth and volume, do not dry out or overheat. Shallower connecting ditches are dug from these refuges to the mosquito breeding areas. None of the ditches, however, are connected to the tidal channels so the marsh surface is not drained. Studies in Massachusetts and the Chesapeake region have shown that such methods will reduce larval numbers on the marsh by more than 97 percent. Because conditions at Seatuck, which is on the Great South Bay, are different from those in Massachusetts or Chesapeake Bay, it was assumed that local OMWM practices would have to be modified to take those differences into account.

In June 1984, a comprehensive environmental monitoring program was begun on the salt marshes of the Seatuck National Wildlife Refuge by the Cornell Laboratory of Ornithology. Data were collected on the numbers of mosquito larvae, plant distributions and biomass, fish populations, bird-usage, insects and invertebrates, and marsh hydrology. Data were collected on eighteen study plots of one quarter hectare in size, which were distributed throughout the twenty-four hectare marsh.

The program is the first stage of a multi-year research project to evaluate the effectiveness and impacts of open marsh water management techniques on Long Island salt marshes. The study was designed to achieve four goals: 1) provide a baseline of environmental and biological data for conditions on the Seatuck marsh prior to any alterations for mosquito control, 2) provide data on which to base an OMWM plan specifically tailored to local conditions, 3) serve as a working model for the application of OMWM in the Great South Bay marsh system, and 4) serve as a preliminary step in comparing OMWM practices in Delaware, New York and Massachusetts.

#### RESULTS TO DATE:

The data collected to date indicate that the Seatuck salt marsh is, in fact, different from those found in the Chesapeake Bay Region and in Massachusetts. As a result, the methods used in these areas to achieve the goals of OMWM will need to be modified. Several observations were made that are relevant to the design of the OMWM and these are summarized on the following page:

1) A major environmental factor in the marsh is the insufficient drainage of freshwater runoff. The low salinities measured in the existing ditches (8-10%) indicate that the marsh is now acting as an impoundment for freshwater. On a properly functioning salt marsh, salinities in the tidal channels should not be much lower than in the adjacent bay. The low salinities may account for the rapid spread of Phragmites reeds into what was once a salt marsh.

2) We found a strong correlation between numbers of mosquito larvae and water levels on the marsh. At times of high water levels (due either to tides, rainfall, impeded drainage, or a combination of these) the numbers of mosquito larva increased regardless of the intense weekly spraying program.



Running transects on the salt marsh  
(STK-4-4, Litwin)

3) The Phragmites/sedge marsh along the upland boundaries of the saltmarsh is not a major mosquito breeding area. Sixty sites were sampled on 17 different days between June 12 and September 9. Of these 720 samples, only 21 had more than 1.0 larvae as an average for the three dips taken. More than three quarters of the dips had no larvae at all, and only 6 of the samples had an average count that was greater than 10.

## 5. Grasslands

A native meadow restoration project was initiated in 1983. The goal of this project was to restore a native prairie habitat and encourage nesting of grassland birds. This project has been put aside as it was found that raccoons are present in such large numbers as to prevent any successful ground nesting.

## 6. Other Habitats

Dredge spoil was added to an existing spoil site. The spoil was placed over Phragmites that separated the old spoil site from the water. This will hopefully improve the chances that least terns will use this area for nesting. Efforts to attract terns to the area are discussed in Section G. 2.

## 9. Fire Management

A cooperative agreement between the Town of Islip and the refuge was updated. As there are no refuge staff stationed here, the town fire department would lead in fire fighting efforts.

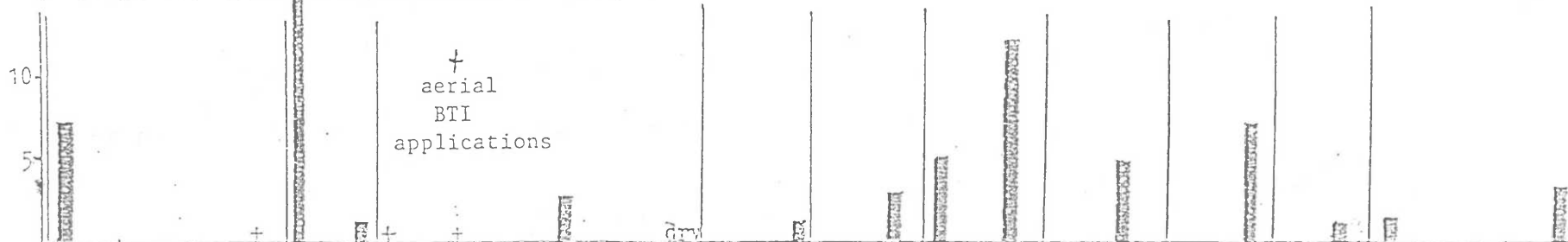
## 10. Pest Control

Seatuck is surrounded by residential areas. Mosquito control for the residential areas has been a major refuge issue. The issue has attracted media and congressional attention. The Seatuck Research Program, refuge staff, and Suffolk County Vector Control have worked together to solve the mosquito problem and at the same time protect the marshes and wildlife. In 1984, Suffolk County Vector Control applied BTI from a helicopter to the refuge and other Long Island marshes. BTI is a bacterial agent that kills larvae without the residual effects of chemical pesticides. Last year BTI was applied manually and only to refuge marshes. The expansion of its use to other marsh areas and by helicopter represents a significant step by Vector Control away from chemical control.

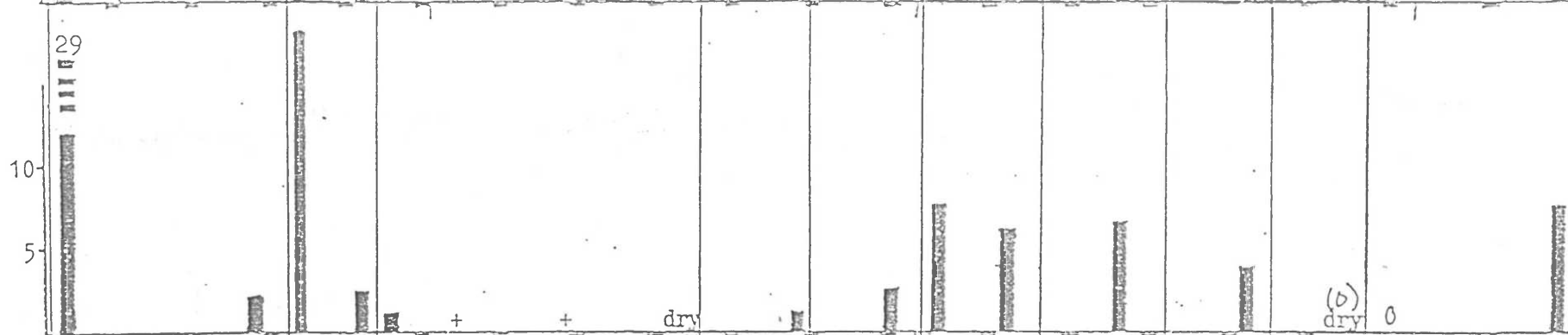
Marsh areas at Seatuck were monitored for numbers of mosquito larvae over the summer. The following chart shows the relationship of BTI spraying to larval numbers. Basically, the data shows a drop in larval numbers after spraying followed again by gradual increases.

TUCK NWR: 1984 BTI Applications and Mosquito Larval Counts

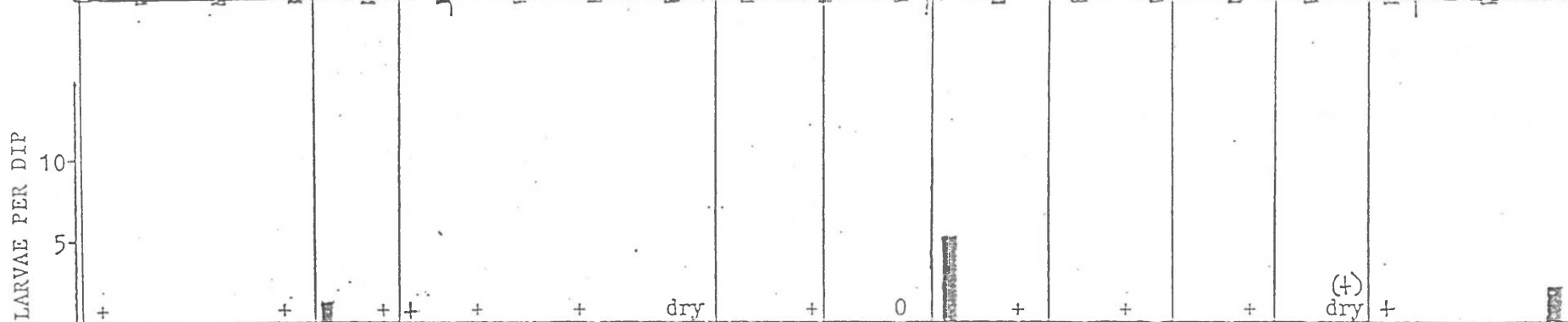
FIG 10  
A1



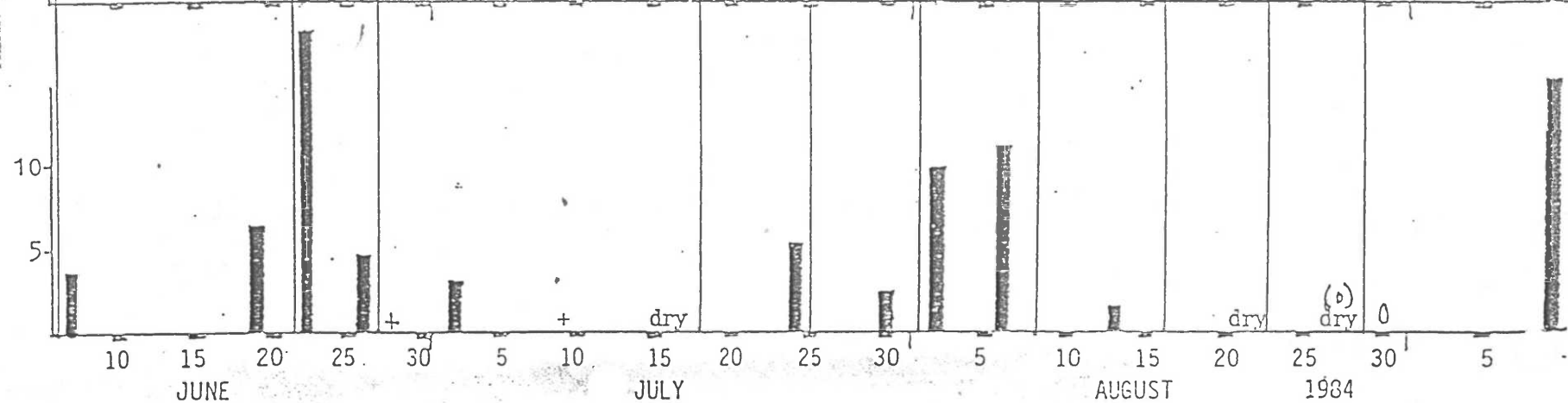
A2



A3



A4





Sampling for mosquito larvae in saltmarsh  
(STK-5-4, Litwin)

## 2. Endangered and/or Threatened Species

The osprey is listed as a threatened species by New York. During 1982, the Seatuck Research Program initiated an osprey restoration project and erected four nesting platforms. Last year, a pair of ospreys nested and produced one fledgling. A single female bird attempted to nest on another platform but was unsuccessful in finding a mate. Personnel from the research program, with the help of the Long Island Lighting Company, banded a pair of ospreys.

The least tern has been steadily declining in numbers and is now listed as endangered in New York by the New York State Department of Environmental Conservation. Several pairs of least terns nested on a golf course and a baseball field near the refuge but no birds nested on the refuge. A channel was dredged adjacent to the refuge and the spoil was placed on the refuge in an effort to create suitable nesting habitat. Six decoy least terns were placed on the spoil. Taped vocalizations of least terns nesting are played and the area is fenced against raccoons with electric wire. Four least terns were observed in the area but no birds nested.

## 3. Waterfowl

The Seatuck Research Program acquired a live duck collection from Mr. Webster, the donor of the property. Seatuck Research Program personnel have traded exotic species for waterfowl indigenous to North America and the collection will be used as an environmental education tool.



Equipment for assisting with osprey tagging was provided by Long Island Lighting Company (STK-6-4, Litwin)



Sample of decoy used to encourage least tern nesting at Seatuck NWR (STK-7-4, Litwin)

## 7. Other Migratory Birds

Research Program personnel have been involved in a migratory bird banding program. During 1983, 1,232 birds of 69 different species were banded. During 1984, 986 birds of 64 species were banded. The study will show what habitats are preferred by what species, indicating general trends in populations, and what months fall migration of these species peak. Preliminary results show that the highest peak in migration occurred in September, with a slightly smaller peak in early October. Most species were caught in shrubland as opposed to woodland habitat.

Seatuck Research Program staff assisted with the New York Breeding Bird Atlas again this year, with efforts concentrating on the eastern end of Long Island.

Study of the grey catbird, the most abundant song bird on Long Island, continued through 1984. Findings show that higher nest density was associated with lower nest success, and higher reproductive success was associated with higher nest success. It was concluded that reproductive success was a better indicator of habitat quality than density, and the best catbird habitat at Seatuck National Wildlife Refuge was shrub without overstory.

1984 was the third and final year of mapping song bird territories and populations on Seatuck National Wildlife Refuge and comparing these to other suburban areas. Results are being analyzed, but some preliminary findings include: diversity of bird species that prefer woodland (ie: black-capped chickadee, northern cardinal, tufted titmouse, northern flicker, downy woodpecker, and white-breasted nuthatch) was negatively correlated with housing density; diversity of bird species that prefer urban habitat (ie: starling, chimney swift, house sparrow and rock dove) was positively correlated with housing density. The total count of urban birds on a transect was negatively correlated with bird species diversity. Diversity in suburban breeding bird communities can be partially explained by measurable features of the suburban environment, such as tree species diversity and housing density.

## 8. Game Mammals

The Seatuck Research Program is involved in a white-tailed deer study. Fifteen of the estimated thirty-five deer on the refuge were captured and fitted with radio transmitting collars, and their movements tracked. Results showed that a pair of bucks would swim the channel to mate, does preferred the marsh areas near the bay to drop their fawns, and that the deer frequent the neighborhood gardens and shrubbery. Seatuck Research Program staff also collected blood samples and ticks from the deer to assist New York State personnel involved with a Lyme disease study.



White-tail deer fitted with radio collar  
(STK-8-4, Litwin)

#### 10. Other Resident Wildlife

During 1984, eighty box turtles were captured, marked and movements observed. This was the first phase of the study and no results are yet present.

#### 15. Animal Control

Seatuck Refuge supports approximately 35 white-tail deer. A controlled archery hunt may be needed to reduce the herd numbers in the near future. Some signs of over browsing are now evident and local residents complain of damage to ornamental shrubs. Deer involvement with the increase, locally, of Lyme disease is also of concern. The formulation of a deer management plan is scheduled for 1985.

### H. PUBLIC USE

#### 1. General

The general public is not allowed on the refuge because of the research in progress. The Seatuck Research Program does, however, have many contacts with environmental groups and gives programs to many.

This year the Great South Bay Audubon Society Library was moved into the meeting room at Seatuck. The library is quite extensive and can be used by Audubon Society members, Seatuck Research Program staff, and refuge staff. Volunteers serve as library staff.

## 2. Outdoor Classrooms - Students

Ornithology students from C.W. Post College and wildlife students from Cornell University visited the refuge. Both groups were given a refuge tour and overview of the research programs. They also had a chance to see some of the field techniques being used here.

The refuge hosted a waterfowl identification course taught by New York State Department of Environmental Conservation Biologist Steve Sanford. The students were shown films and slides and used the captive waterfowl flock to sharpen their skills. Hopefully, this program will continue and improve as the exotics are eliminated from the captive waterfowl flock. Responsibility for the flock was recently transferred to the Seatuck Research Program by Mr. Webster.



State biologist Steve Sanford teaching waterfowl identification (STK-9-4, Litwin)

Great South Bay Audubon and BOCES-SCOPE groups visited the bird banding station at the refuge. They observed birds being captured in mist nets and banded. They also learned about bird migration and the importance of refuges as stop-over points.

## 7. Other Interpretive Programs

Tom Litwin, Seatuck Research Program Director, presented slide talks to the Great South Bay Audubon Society, the Old Islip Civic Association, and the South Shore Garden Club. Dave Peterson presented a paper on Long Island colonial waterbirds at the Colonial Waterbird Conference meeting. Mary Capkanis gave a slide talk on nesting osprey to the Four Harbors Audubon Society. The Long Island Colonial Waterbird Association, and the New York State Breeding Bird Atlas Project and the Great South Bay Audubon Society all hold meetings at the refuge in the L-barn meeting room. The talks given by the Seatuck Research Program and their contact with local groups has presented the refuge in a positive light. Several positive reports on the refuge and research programs appeared in the local newspapers.

The Seatuck Research Program and the refuge were highlighted on a New York City television spot called the Big Apple Minute. The short segment featured refuge wildlife and research and was seen by millions of New Yorkers. It was aired several times on Channel 5 during the month of August.

## I. EQUIPMENT AND FACILITIES

### 2. Rehabilitation

An old residence was extensively rehabilitated during the past year for use as a new office. New siding, and a new roof were installed and the interior of the office building was completely repainted. A small apartment was also constructed in the rear of the office building.

The house was vacated after the death of Mrs. Lovering who occupied it under a life estate. During 1984, a library and meeting room were arranged in the old office building.

Repairs were made to the large duck pen in preparation for the North American waterfowl collection that Seatuck acquired from Mr. Webster. This collection will be used for environmental education and waterfowl identification.

### 6. Computer System

Seatuck Research Program received a new computer system from Cornell University. It consists of an IBM-XT with 10 megabyte hard disk and 256 kilobytes of memory, a monochrome display, a U.S. Robotics modem, and a NEC Spinwriter printer. This system is tied in with the Cornell University main frame computer through the modem/Tymnet system.

## 7. Energy Conservation

The new apartment in the office was completely insulated during 1984. The office oil burner furnace was replaced with a new higher efficiency burner.

## J. OTHER ITEMS

### 1. Cooperative Programs

The Seatuck Research Program is a cooperative program between Cornell University Laboratory of Ornithology, U.S. Fish and Wildlife Service and the Natalie Peters Webster Trust Fund. The purpose is to develop management techniques for urban insular refuges. Funds are provided by the Trust Fund, the facilities are provided by Fish and Wildlife Service and the lab provides personnel and operations.

### 3. Items of Interest

James Gillett, Chief of Refuge Management Division, Suzanne Mayer, ARD, and Robert Miller, RO Realty, visited the refuge in early October. Congressman Thomas Downey visited the refuge on June 9 and Suffolk County Legislator, Phil Nolan, visited the refuge several times throughout the year.

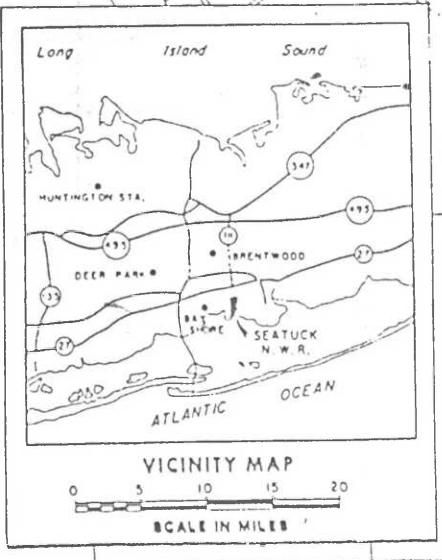
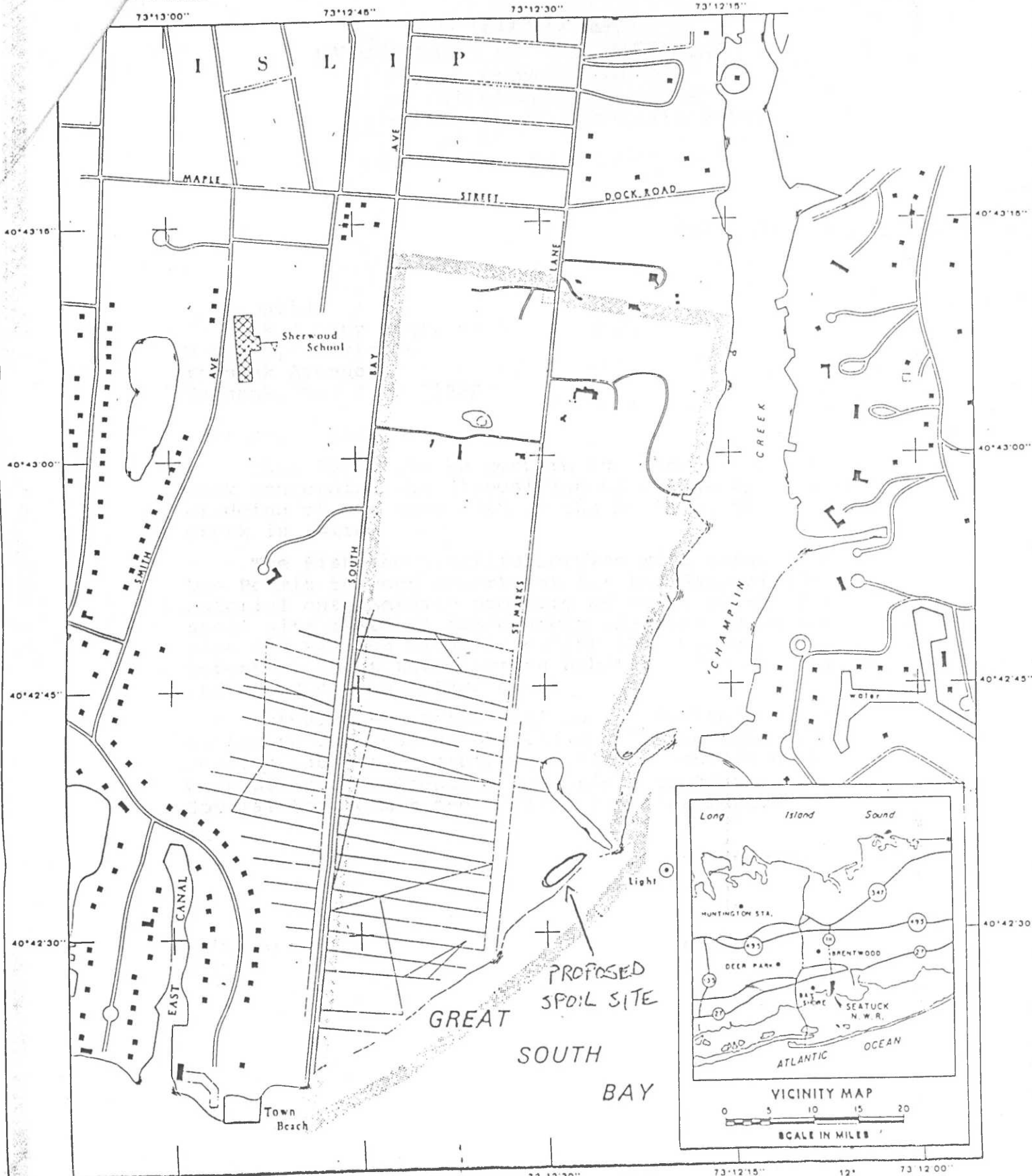
### 4. Credits

Mark Lindvall wrote sections A, B, C, D, E, F and H. John Phillips wrote sections G, I, and J. Tom Litwin wrote section F,2. Roger Spaulding edited this report and wrote section C,3. Robin Clarke typed the report. Information for this report was provided by the Seatuck Research Program staff.

# SEATUCK NATIONAL WILDLIFE REFUGE

Suffolk County, New York

STATES  
OF THE INTERIOR



73°13'00" 73°12'45" 73°12'30" 73°12'15" 73°12'00"

40°43'15" 40°43'00" 40°42'45" 40°42'30"

COMPILED IN THE DIVISION OF ENGINEERING  
FROM SURVEYS BY G. S. AND F. A. W. S.

BOSTON, MASSACHUSETTS FEBRUARY 1973



12°  
True North  
Magnetic  
MEAN  
DECLINATION  
1987