

BLACKWATER NATIONAL WILDLIFE REFUGE^{WO}
Cambridge, Maryland

Martin NWR
Susquehanna NWR

ANNUAL NARRATIVE REPORT

Calendar Year 1991

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

BLACK WATER



NATIONAL WILDLIFE REFUGE

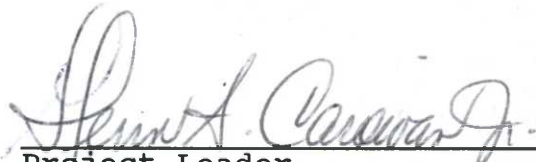
REVIEW AND APPROVALS

BLACKWATER NATIONAL WILDLIFE REFUGE COMPLEX

Blackwater National Wildlife Refuge
Susquehanna National Wildlife Refuge
Martin National Wildlife Refuge


ANNUAL NARRATIVE REPORT

Calendar Year 1991



Project Leader

3-6-92
Date



Associate Manager
Division of Refuges-South

4-7-92
Date



Regional Office Approval

4-10-92
Date

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Cambridge, Maryland

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INTRODUCTION

On December 31, 1931, the Migratory Bird Conservation Commission authorized the Secretary of Agriculture to purchase 10,000 acres from the Delmarvia Fur Farms, Inc. of Philadelphia, Pennsylvania (note spelling of "Delmarva") for the establishment of the "Blackwater River Migratory-Bird Refuge" at the recommended price of \$14.00 per acre. On December 9, 1931, the Secretary entered into an agreement with Delmarvia Fur Farms, Inc., effective January 1, 1932, to lease 8,167.99 acres for the refuge. The Secretary subsequently determined that it was in the best interest of the Government to acquire 8,240.99 acres for the refuge from the Delmarvia Fur Farm and two other properties by condemnation. A notice of condemnation was filed August 26, 1932, and these tracts were conveyed to the Government in January 1933.

Blackwater NWR was therefore officially established under the authority of the Migratory Bird Conservation Act (MBCA) on January 23, 1933, for the purpose of providing habitat for migrating and wintering birds. Since that time, additional lands have been added to the refuge under the authorities of the Endangered Species Act (ESA) and the Refuge Recreation Act (RRA) for the purposes of providing additional habitat for migratory birds and for the Southern bald eagle, the Delmarva fox squirrel, and other endangered species.

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**U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM**

INTRODUCTION

Blackwater National Wildlife Refuge Complex is composed of three nationally significant wildlife areas historically noted for providing important habitats for large concentrations of wintering waterfowl, several endangered species, and a wide variety of migratory birds.

The first and largest of these areas to be established as a National Wildlife Refuge (NWR) was Blackwater NWR. Originally authorized for establishment by the Migratory Bird Conservation Commission on December 3, 1931, and named "Blackwater Migratory Bird Refuge," the refuge's current 17,684 acres are a showplace for the U.S. Fish and Wildlife Service's Refuge System. The refuge's expansive marshes, dominated by three-square bulrush, its moist-soil impoundments, and its variety of croplands form the favorable trichotomy of habitats which are most essential to thousands of migrating and wintering waterfowl. In addition to being an outstanding waterfowl area, the refuge has one of the only full scale refuge visitor centers in Region 5, and offers comprehensive and structured wildlife interpretive and public education/awareness programs to thousands of visitors annually. Due to the diversity of wildlife populations, including the endangered Delmarva fox squirrel and the Southern bald eagle, the quality of refuge programs and facilities, and its proximity to Washington, D.C., the refuge is regularly used to demonstrate many of the Service's activities to Department of Interior representatives and foreign dignitaries.

Susquehanna NWR, the second area in the complex to be established as a refuge, was authorized by a series of Presidential Proclamations and Executive Orders dating back to August 25, 1939. These actions originally closed 13,363 acres of water in the upper part of the Chesapeake Bay, at the mouth of the Susquehanna River and on the famous Susquehanna Flats, to the hunting of migratory waterfowl. They also granted the Department fee title to the four-acre Battery Island. In 1978, the Presidential Proclamations were withdrawn, and the currently remaining Battery Island (now reduced in size to one acre by erosion) is of little use as part of the Service's Refuge System. The newly formed Battery Island Preservation Society is currently trying to have the island leased or transferred to them so that it can be properly maintained as a historic site.

The last of the complex's refuges is Martin NWR, a 4,423-acre refuge acquired largely through donations by Glenn L. Martin in 1954. Located on Smith Island, in the historic waterfowling area of Tangier Sound, the refuge lies in the heart of one of the largest waterfowl feeding grounds on the Chesapeake Bay. The surrounding marshes and waters are of major importance in meeting the feeding and resting requirements of a large segment

of the diving duck population which migrates across the country from the Central and Mississippi Flyways through the Great Lakes region to winter in the Chesapeake Bay area. The refuge is also used intensively by black ducks, pintails, mallards, and Canada geese, and is an important breeding area for osprey, peregrine falcons, and several species of waterbirds.

Two additional refuges, Eastern Neck NWR and Mason Neck NWR, were historically administered as part of the complex, but became independently operated in 1966 and 1973, respectively.

The three refuges of the Blackwater National Wildlife Refuge complex are all in the State of Maryland, and are widely distributed within the Chesapeake Bay from Havre de Grace in the north to Crisfield in the south. (Figure 1)

Blackwater NWR, the administrative center, is located in Dorchester County about 12 miles south of Cambridge.

(Figure 2) Susquehanna NWR, the northernmost refuge, is located on Edmondson's Island (Battery Island), at the mouth of the Susquehanna River, in Harford County, and at the upper reaches of the Chesapeake Bay. (Figure 3) Martin NWR, the southernmost refuge, is located in Somerset County on Smith Island, approximately 15 miles offshore from Crisfield. (Figure 4)

A. HIGHLIGHTS

- Blackwater NWR added over 1,000 acres to the refuge in 1991. (C.1)
- Salinity readings at the head of the Blackwater River in November were higher (13 ppt) than any previously recorded, and immediate actions were undertaken to control the source of salinity intrusion. (D.5.F)
- Project Leader Carowan was recognized for his minority recruitment efforts in January. (E.1)
- Tractor Operator John Paul retired from duty in November, subsequent to a decision by DOI's chief physician that Mr. Paul could not safely perform his duties. (E.1)
- Several employees were recognized with awards for their performance. (E.1)
- Station employees received approximately 131 staff days of training ($\frac{1}{2}$ staff year). (E.1)
- Volunteer numbers doubled in 1991. (E.4)
- Maryland's Canada Goose Management Plan was completed in April, 1991. (E.7a)
- Blackwater NWR took the lead in developing a comprehensive fire management plan for the Shore's lower six counties. (E.7.d)
- Assistant Secretary Hayden visited the refuge on August 16. (E.8.c)
- Chairman of the Congressional Sportsman Caucus visited Blackwater on September 18. (E.8.c)
- Aerial ignition was utilized for the second consecutive year, with outstanding results. (F.9)
- Blackwater Refuge successfully fledged 13 bald eagles from 6 nests in 1991, a record number. (G.2.a)
- Waterfowl's response to management changes was excellent. (G.3)
- Friends of Blackwater sales topped \$26,000 in 1991, four times greater than before ORP Briggs took over the program. (H.18)

- Even with an increase of more than 1,500 passes issued, entrance fee collections reached almost \$36,000 (H.20)
- A new John Deere 4055 tractor was purchased. (I.4)

B. CLIMATIC CONDITIONS

1991 TEMPERATURES/PRECIPITATION RECORD Dorchester County, Maryland			
Month	Temperatures F.		Precipitation (inches)
	Low	High	
January	14	58	7.05
February	18	70	1.29
March	26	79	6.35
April	30	86	4.12
May	44	96	2.95
June	46	96	3.72
July	60	101	7.73
August	60	94	5.22
September	40	94	2.85
October	*	*	*
November	*	*	*
December	*	*	*
			Total 41.28

* No data available. State budget cutbacks closed Church Creek fire tower so we were no longer able to obtain data from their weather records.

Notable climatic occurrences included extremely high tides during the period 11/2-3 and 11/10-11. The first freeze of the fall was on 11/4.

C. LAND ACQUISITION

1. Fee Title

The Conservation Fund closed on the 475-acre lower Sherman Tract from Bob Pascal on January 14, 1991. Approval to post these new lands was received on February 22.

On October 21, Regional Office realtors Axel Larson and Katharine Bentley closed on the Gregg Tract (562.7 acres). The new tract was posted by month's end.

Barren Island, 200+ acres of island wetland habitat, was purchased by the Conservation Fund for transfer to the Service. Although we have the property, title was not received by year's end. The island is located in the Chesapeake Bay, west of Hooper's Island, Dorchester County, and approximately 10 miles from the Blackwater NWR office.



Pines dominate the south end of the Barren Island, where an eagle nest is located, as well as a heron rookery.

GCH 10/91



Interior habitat of Barren Island. GCH 10/91



The island is dwindling, as evidenced by the remains of this early 1900's hunting lodge at the north end that is being swallowed by the Bay. GCH 10/91

3. Other

During May, the LARC committee approved the inclusion of the J.D. Williams property (800 acres) within the refuge acquisition area. Remaining funds from the Pascal Tract purchase will be allocated for procuring Barren Island.

On May 9, Project Leader Carowan, Refuge Operations Specialists Heet and Barker, and Biological Technician Giese met with Roby Hurley of Chesapeake Corporation to discuss management and a potential cooperative agreement of two 1000-acre tracts on Buttons Neck. During an on-site visit, it was noted that this tract of land would be good for studying forest practices and their effects on Delmarva fox squirrels.

On May 29, Dave Sutherland of the Conservation Fund came to the refuge and met with Project Leader Carowan and Refuge Operations Specialist Heet regarding potential acquisitions. The following properties in the vicinity of the refuge were discussed and/or visited: Valliant, Linthicum (Buttons Neck), Insley, Horseman, Fair Meadows, Marsh Market, and Bishops Head.

In June, Project Leader Carowan continued to work closely with the Conservation Fund and The Nature Conservancy on acquisition of the Gregg Tract, Bishop's Head, and Barren Island. In addition, Carowan met with representatives from Chesapeake Timber Company to discuss the disposition of the Linthicum Tract (1200+ acres) on Button's Neck and the potential sale of additional lands in southern Dorchester County adjacent to the refuge (Valliant Tract, Spicer Tract, and the Adams Tract). Carowan also met with Mr. J.D. Williams on June 5 to update Mr. Williams on Realty's progress.

RO Ascertainment Biologist Carl Melburg was at Blackwater in September to look at the above properties and prepare a funding request for the Washington office.

On July 2, Project Leader Carowan met with Dorchester County Commissioners and received the Commission's approval to pursue a challenge grant for a handicapped-accessible fishing facility on Key Wallace Drive.

On July 11, Carowan met with State Senator Fred Malkus and resolved his questions and concerns about future land acquisition at Blackwater. The Senator had submitted a Freedom of Information Request to the 2003 team.

On July 12, Project Leader Carowan met with Mr. Bob Miller, Chief of Realty, and representatives from The Nature

Conservancy, Maryland Historical Land Trust, and Department of Natural Resources for a tour of the lower Nanticoke River and discussions regarding Service involvement in future land acquisition.

On 7/24-25, Axel Larson and Katharine Bentley, Regional Office Realty, came to Blackwater to examine the Gregg Tract and review the boundary dispute problem on the Handley Tract.

Carowan met with Mr. Ace Parker on July 29 to review a proposal to purchase the 1500-acre Ewing Tract on the upper Blackwater.

Also during July, the annual acquisition briefing package was completed for the Director.

On October 17, Carowan met with Wayne Klockner of The Nature Conservancy and Ralph Bitely of Ducks Unlimited, regarding acquisition and management of lands in the northern end of the Big Blackwater River watershed.

In November, Supervisory Refuge Operations Specialist Heet submitted formal proposals to the LARC committee to acquire the Linthicum, Vallient, Ewing, and Burton tracts.

D. PLANNING

2. Management Plans

The Station Management Plan, finalized and approved, was received on 2/25. Copies were sent to Congressman Gilchrest and U.S. Senators Sarbanes and Mikulski.

The Public Use Plan was submitted for review on 5/31. By year's end, there had been no action taken by the RO.

The Fire Management Plan was amended 6/19.

The Wildlife Inventory Plan was sent to the Field Biologist-South for comments on 8/28.

The Annual Water Management Plan was revised and completed in September, and submitted to Field Biologist-South Laskowski on the 18th. Major changes in the plan included a shift in reporting period from a calendar year to an April-through-March period, a change in format style, and the re-setting of several critical water gages inside and outside the impoundments.

4. Compliance with Environmental and Cultural Resource Mandates

a. Impoundment Restoration Project

The refuge impoundment restoration project, made possible by challenge grant funds from Ducks Unlimited, received its share of setbacks this past year but now seems to be on track again. An archaeological survey of the affected sites was completed in February by John Wilson. His approval was given after he found there to be no significant archaeological sites involved. Shortly thereafter, on February 25, a draft EA was prepared on the impoundment restoration project. The next day, news releases were issued and, on March 1, the draft EA was distributed for the 30-day public review.

In March, the refuge staff met with Soil Conservation Service representatives in Cambridge for their recommendations and approval on the impoundment restoration project. The project was then turned over to Ecological Services staff, who subsequently prepared our project application for Corps of Engineers' approval. The Corps' effort to protect non-tidal wetlands was still very much an issue all summer; our permit was finally approved on November 26. In the interim, during August, we learned that recent legislation required the Corps to return to the use of their 1987 Manual instead of the currently accepted 1989 manual. Obviously, the November permit approval was too late for construction during the summer of 1991, so the work was rescheduled for the summer drawdown of refuge impoundments during 1992.

b. Shoreline Protection Permit

Rip-rap work on 200 feet of the Little Blackwater River adjacent to Quarter 1 was completed in 1991, in accordance with a 1990 permit approval. Another 200 feet along the Wildlife Drive remain to be done under the same permit. (See section I.2. of this report.)

5. Research and Investigation

a. "Evaluation of Cropland and Impoundment Use by Wintering Waterfowl at Blackwater NWR" (51530-89-01)

Objectives of this study are to:

- 1) Determine relative use-rates of specific habitats and crops at Blackwater.
- 2) Determine relative use of specific fields within

- the station's cropland management program.
- 3) Determine "chronology of use" within fields and different crops by wintering waterfowl.

A progress report was prepared for this in-house refuge study after a year's initial data collection in 1988-89, which evaluated the last year of cooperative farming in the summer of 1988. 1989-90 data, representing the first year of refuge force account farming, was collected and is pending analysis. Data from the second year of force account farming data, 1990-91, was collected through March of 1991.

As expected, results of the initial study year's report and subsequent years' observations identified specific fields that feeding Canada geese either preferred, avoided, or used in proportion to availability. The same type of information and results were also achieved for various crop types within each field. By applying this information, it is anticipated that waterfowl use of avoided fields may be increased through the use of preferred crops in a particular field. Tentative results of the study also showed the importance of annual ryegrass within harvested soybean fields as a green browse for geese. Canada goose use of unharvested soybean fields overseeded with ryegrass was also significantly greater than soybean fields which were not overseeded. Perennial Ladino clover was also shown to receive extensive use by geese for browsing, with goose use-days in this crop even exceeding unharvested corn fields. Combined information gathered from this study so far has been used to improve the cost effectiveness of the station's force account farming program. Field Biologist South Laskowski has recommended that the three years of study data be evaluated in one final report sometime in the future. He has also requested that he be involved in the analysis and final report since he completed the first year's progress report and has been the principal investigator since the study's inception.

b. "An Assessment of the Nutria Population on Blackwater NWR" (51530-90-01)

Objectives of this study are to:

- 1) Field test techniques to estimate nutria population levels and densities within Blackwater National Wildlife Refuge.
- 2) Determine the nutria's current range and distribution throughout the refuge.

- 3) Correlate, through repeated annual studies, changes in population levels and occupied range on the refuge.

Collection of trappers' data by the refuge staff for the 1991 nutria mark-recapture distribution study was completed March 15, the end of trapping season. All 12 of the refuge's trappers participated in the study, which rebated them \$1.50 per nutria collected. The Denver Finance Center held the bid collections in a suspense account, and issued reimbursement checks up to the limit of each participating trapper's bid. Of the \$2943.47 in bids collected for refuge trapping rights, \$2215.50 was refunded by the Service. Trappers checked in a total of 2,282 nutria trapped or hunted on refuge marshes. The number of recaptures was sufficient to generate reliable data for the refuge's nutria mark-recapture study: 34 eartags were recovered from the 81 nutria banded pre-season. The total number of nutria taken on the study area (trapping unit G, 530 acres) was, oddly enough, 530 nutria. The total population estimate for the study unit, determined by utilizing the Lincoln index, was 1,263 nutria or 2.4 per acre with 95% confidence limits of 1,054 to 1,472. Nutria densities on the remaining refuge marsh acreage will average about the same, possibly more. Currently there is essentially no market value for the nutria pelt; therefore no incentive exists to trap for that purpose.

By the end of 1991, 102 new nutria had been eartagged and released in the study area for recapture in 1992.

c. "Methane Fluxes in a Submerging Wetland Ecosystem in the Chesapeake Bay." (51530-91-01)

This study is being conducted by Dr. Court Stevenson, Ms. April Smith, and Mr. Jeff Cornwell from the University of Maryland's Horn Point Environmental Laboratories in Cambridge. The purpose of the research is to quantify and compare the maximum flux of CH_4 from both subsiding and stabilized marshes within the Blackwater marsh ecosystem. It is hypothesized that the degradation process of submerged organic matter in refuge marshes may play an intrinsic role in the loss of such marshes. The results of this study may be utilized to support management schemes to mitigate the effects of refuge marsh inundation. Study data collected on the refuge in August 1991 may be biased in that the samples were taken in previously burned areas of the marsh. New samples may therefore be required during the summer of 1992.

d. Delmarva Peninsula Fox Squirrel Study (51530-70-01)

The original study began on the refuge during the winter of 1970-71 as a population estimate using the Lincoln index mark-recapture technique. Plans were to repeat the study every five years. With some minor adjustments in the methods of capture, recapture, and marking techniques, the study was repeated in 1976, 1980, 1983, and 1991.

On March 3, refuge staff Bill Giese, Richard Webster, and Jason Barker and volunteer Julie Barker conducted a night-long check of squirrel boxes and eartagged 15 Delmarva fox squirrels. On March 28 the recapture phase began in the same 52-acre woodland block, using wire live traps baited with corn. During this recapture, 13 new fox squirrels were captured and eartagged and 10 recaptures were caught. From this data, a population of 44 fox squirrels is estimated to be utilizing the study area, with 95% confidence limits of 33 to 55 fox squirrels. As part of the Delmarva Fox Squirrel Recovery Team efforts, this site has been designated as one of several benchmark population monitoring sites, representing an example of a mature mixed hardwood/pine habitat. In February, 58 fox squirrel boxes were placed in pure pine habitat on the Jarrett Tract as another benchmark site representing pine habitat type; mark-recapture will begin there in early 1992.

e. "Genetic Variation Within and Among Populations of Delmarva Fox Squirrels" (50181-0-0811)
Final Report, December 1991.

The first report on the original 1989 study proposal was conducted by Nancy Moncrief of Virginia Museum of Natural History and Raymond Dueser of Utah State University, Department of Wildlife and Fisheries. Blackwater staff collected and froze 70+ Delmarva fox squirrel carcass specimens from road kills from 1989-91 as representatives of the squirrel population in this area for the study. The carcasses were turned over to the researchers and, during the summer of 1991, field sample tissues were taken at the refuge for lab workup. The abstract from the final report follows:

"ABSTRACT

We compared genetic variation within and among a total of 19 populations of fox squirrels (*Sciurus niger*) using data from horizontal starch-gel electrophoresis. The primary focus of this study was populations of Delmarva fox squirrels (*S. n. cinereus*) from the Eastern Shore of Maryland and Virginia (Blackwater and Chincoteague National Wildlife Refuges) as well as other populations of eastern fox squirrels from Maryland, Virginia, and Georgia. Overall variation in Delmarva fox squirrel populations from Blackwater and Chincoteague National Wildlife Refuges is comparable to that found in populations of other eastern fox squirrels and that reported by Moncrief (1987) for western populations. Additionally, these two *S. n. cinereus* populations possess an electrophoretically detectable genetic attribute not present in any other population of *S. niger* examined to date. This information on genetic variation should be incorporated into management plans and strategies for continued reintroduction of *S. n. cinereus* throughout the Delmarva Peninsula. Although our findings are encouraging, in that there is genetic variation in *S. n. cinereus*, the long-term security and sustainability of Delmarva fox squirrel populations remains uncertain."



Dr. Nancy Moncrief, center, and assistants necropsy Delmarva fox squirrels at the refuge for their genetic variation study. LPH 3/91

f. Blackwater NWR Marsh Loss Scoping Workshop

Prompted by recent discoveries resulting from new and rejuvenated management activities and direction, participants met at Blackwater National Wildlife Refuge on December 10 to review past, current, and future actions regarding the continuing problems of loss and degradation of refuge marshes.

Project Leader Carowan provided an overview of the history of Blackwater Refuge, its enabling legislation, its purposes, its major management programs, and future management direction. Refuge Biologist Larry Hartis then identified the meeting's objectives as follows:

- (1) To establish and maintain communications between a broad range of individuals and agencies involved in marsh loss and island erosion, sea level rise, and similar issues;
- (2) To encourage a sharing of past, current, and future information and research findings on those issues;
- (3) To demonstrate recently identified ecological problems and trends at Blackwater NWR via the new Geographical Information System (GIS); and
- (4) To engage in open discussions regarding reasonable solutions or options to marsh loss problems, if they exist at this time, specifically at Blackwater, and generally to our coastal systems as a whole.

The Blackwater Refuge area and vicinity contain some of the most extensive wetland habitats in the Chesapeake Bay. Unfortunately, the area also contains some of the most dramatic examples of accelerated loss of marsh vegetation. Refuge marshes are dominated essentially by one plant species, Scirpus olneyi. Aerial photo comparisons of the refuge for a 40-year period, beginning with those taken in 1938, documented that half of the refuge Scirpus marsh, approximately 5,700 acres, has been lost by conversion to shallow-open water. This loss represents a rapid, catastrophic elimination of extremely important habitats on which a wide variety of endangered and migratory bird species are dependent, and significantly affects the ability of the refuge to meet its wildlife purposes and objectives.

Several factors were identified in the early 1980's by researchers such as Stevenson, Kearney, Pendleton, and Leatherman as being possible contributors to marsh loss on the refuge. These factors included sea level rise, subsidence, sediment starvation, salinity increase, over population of grazers (muskrat, nutria, and geese), annual prescribed burning, and erosion (caused by wind and open water.) These factors were subsequently revisited by several of these researchers as follows:

- **Mr. Edward Pendleton** reviewed findings from his research investigations conducted at Blackwater Refuge from 1979 through 1981, and concentrated on identifying conditions as they existed at that time. In his study, he determined that the plants at Blackwater were not doing more poorly than elsewhere, and that above ground production was high as compared to the seven areas he had identified for comparison. There was little evidence of overgrazing by nutria and muskrats, but he did note that the study immediately followed two of the most severe winters experienced in recent Chesapeake Bay history. These severe winters had a devastating effect on the nutria populations when coupled with excellent trapping pressure that was prompted by very high fur prices. He also noted that the annual burning of the three-square marsh vegetation was not a problem; that burning did not affect the peat since it removed only the above-ground dead vegetation down to within 4 to 6 inches of the marsh; and that burning provided nutrients and removed the dead thatch letting in greater amounts of light which subsequently prompted the fire-dependent three-square marsh vegetation to flourish with increased steam densities. Salinity conditions were examined, and general conditions throughout the refuge were less than 5 ppt, with Shorters Wharf reaching a high of only 8 ppt. (Salinities above 5 ppt suppress Scirpus seed production, and salinities above 10 ppt will kill rhizomes.) Salinities at that time and at the levels indicated were, therefore, discounted as a major problem. Chemical analyses, including those for agricultural pesticides and herbicides, were also conducted, and there were no detectable amounts which were identified as adversely affecting vegetation production, specifically including atrazine. The damming effect of Shorters Wharf road was investigated, and the road was definitely affecting flow, but water levels were found to be higher on the east side of the road, discounting the theory that the road was damming downstream flow and drowning the upstream Blackwater marshes. Sea level rise, however, was greatly affecting the marshes, 4mm per year in fact, and when coupled with sediment starvation, these two factors were suspected of being the major contributing causes of marsh loss in the Blackwater Refuge.
- **Dr. Mike Kearney** confirmed from his investigations that sediment loss from the system was much greater than the sediment input, and that the marshes were not building rapidly enough to keep pace with sea level rise. He pointed out that marshes are formed essentially by one of two mechanisms, accretion of suspended sedimentary materials or slow formation of peat/biomass from plant materials. In addition, the marshes were being ripped

apart internally by the formation of ponds which enlarged at extremely rapid rates due to wind-driven erosion as waves pounded the fragile peat layers. Large mats of vegetation and peat would break off and float away constantly, adding to the size of the ponds which later would merge to form open lakes of water that continued to erode with every storm. It was during this period that Kearney noted "unprecedented high rates of marsh loss" and, because the now sediment starved marshes could no longer build themselves at the same rate as the sea level rise, marsh loss accelerated to degrees much higher at Blackwater than at other areas in the region and world. He stated that his studies revealed that if one were to reverse the marsh loss process (under the same environmental conditions that existed in the early 1980's), sediments would have to be added to support accretion, and the ponding process would have to be slowed.

- **Dr. Court Stevenson** presented evidence that Blackwater was, in fact, atypical and that in the mid 1980's Blackwater's sediment rates were below par. (This, of course, is not surprising since the system had already begun to break up, winds were driving accelerated erosion and ponding, and the now existent larger ponds were constantly being churned so that sediments were always in suspension. Consequently, with the increased velocity of discharge created by the raising of Shorters Wharf road and its damming effect, these suspended bottom and peat layer sediments were sucked from the system and discharged. The needed new mineral sediments that were being imported from the Blackwater and Little Blackwater Rivers were likewise being washed downstream without any benefit of establishing new marshes or replenishing the existing marshes.) Blackwater was experiencing a major negative sedimentation rate, and when accompanied with a subsidence rate of about three times higher than the national rate, the marshes were undergoing major, major problems. Dr. Stevenson compared these problems with those in Louisiana where similar problems are occurring: reduced sediment input, low tidal energy, deteriorating backmarsh which becomes waterlogged, burning for muskrats, and slowly increasing salinities.

Dr. Kitchens presented the recent work that the Florida Cooperative Research Unit completed at Savannah National Wildlife Refuge. Savannah Refuge was experiencing major problems with the conversion of marsh vegetation as a result of the Corps of Engineers' tide gate on Back River that was installed in 1977. This gate similarly affected the tidal and hydrologic regimes of the Savannah River, much as Shorters Wharf's damming and the rising sea levels were affecting Blackwater. Saltwater intrusion to the historically fresh-

water marshes that were characterized by peat soils caused the vegetative community to undergo a conversion to more salt-tolerant species and caused the degradation of the peat soils on which the fresh water species were dependent. Presence of peat depends on the absence of sulphate, and with saltwater comes the sulphate. Dr. Kitchens' work at Savannah added yet another negative dimension to the earlier works of Pendleton, Stevenson, and Kearney, for the research at Savannah demonstrated conclusively that salinities above 0.5 ppt could adversely affect these types of fragile, peat-dominated freshwater communities.

Dr. Kitchens demonstrated the applicability and utility of a GIS in dealing with the varied facets of their research at Savannah, showing in particular the effects of the tide gate in operation vs. the tide gate out of operation, and the resultant immediate response of these marshes in reverting to fresh water ecosystems upon removal of the saltwater. Dr. Kitchens also emphasized the utility of applying GIS data to models which could very accurately (80%) predict what would happen when water regimes were restored and the salinity was reduced.

Recent investigations and findings at Blackwater were presented by Project Leader Carowan. Noteworthy were the greatly increased effects of the marsh grazers, most importantly the nutria, and the dramatic increases in salinities. These two contributing marsh loss factors have been monitored by the refuge since the previously discussed studies were conducted, and there have definitely been major changes in both.

On one 400-acre trapping unit, over 1,500 nutria have been harvested in the past two years; yet there continues to be an abundance of nutria in these marshes. Such numbers are causing great damage to the marshes, since nutria not only graze above-ground vegetation, but also grub out the rhizomes of the three-square vegetation creating depressions for saltwater accumulation, which in turn attacks the peat. Snow goose use is also rising with an annual population increase of approximately 500 to 1000, and an increased number of greater snow geese which also excavate the rhizomes.

But it was the salinity information that was most shocking, and actions to solve these problems will obviously require the immediate attention of a great number of agencies to correct. Sampling in November 1991 revealed salinity readings on the Little Blackwater River as high as 14 ppt, on the Blackwater River at Highway 335 bridge as high as 8 ppt, and - even more disturbing - at the upper historical limits of the freshwater Blackwater River near James Island, an unprecedented 13 ppt. The confirmation that marsh loss in the upper Blackwater River

has created a direct channel connecting the "Ditch" to the Little Choptank River and the Chesapeake Bay was characterized as the most catastrophic environmental event that could possibly affect the fragile Blackwater River ecosystem. It is this connection which is pumping significant amounts of saltwater into the historically freshwater marshes of the Blackwater Refuge. As Dr. Kitchens' research confirmed, the future presence of the peat-dependent ecosystems at Blackwater and Fishing Bay depends on the total absence of saltwater and accompanying sulphate.

Having addressed the most significant past and present environmental threats affecting the future of the Blackwater Refuge marshes (and potentially the future of Blackwater Refuge itself as we know it today), the participants agreed that the following plan of action would receive immediate attention:

1. Implement a more formal, scientifically valid salinity sampling program with a better defined set of objectives focused at answering the questions of how serious the breach in the marshes in the upper Blackwater is, and what the immediate and long-term threats are for saltwater intrusion from the Little Choptank.
2. Convene a scoping meeting with all involved regulatory agencies to develop strategies to eliminate saltwater intrusion on the upper end of the Blackwater River.
3. Complete the habitat mapping portion of the refuge's Geographical Information System. Ground truth the satellite imagery for application supporting these problems, and procure the necessary computer equipment to allow the refuge to manage this information.
4. Reconvene the participants of the subject workshop within four months to update and review progress, and to determine future courses of action particularly in respect to public involvement. (Note: The participants agreed that credible information needed to be obtained and summarized, and that the various agencies needed to be apprised of this information before the seriousness of these new findings was released to the public.)

Once the immediate threats associated with saltwater intrusion on the upper Blackwater River are resolved, the participants agreed that continued monitoring of salinity intrusion from the lower end of the system would be required; and that strategies to deal with sea level rise, salinity problems, and sediment loss would be reviewed and addressed in an action plan.

The problems that have been identified in the Blackwater Refuge area are very serious and have long-term implications to the future management of the refuge if not addressed in a timely and effective manner. Many of the problems that are affecting Blackwater Refuge and its marshes are also affecting other areas of the Chesapeake Bay and the nation. We have a unique opportunity to work together to resolve these environmental threats and conflicts.

g. Effects of Annual Versus Biannual Burning Cycles on Blackwater NWR Marshes

Natural wildfires and local trappers have historically burned the marsh system in Dorchester County, including the refuge marshes, for hundreds of years. This process has helped maintain the marsh ecosystem at the Scirpus olneyi level of plant succession, has opened the marsh temporarily, and has promoted regrowth that is denser than that in unburned marsh areas. However, this annual burning regime may be removing above-ground biomass that would otherwise be accreted upon the marsh surface, thus possibly contributing to marsh loss. This refuge in-house study will be an attempt to monitor long-term differences that may be seen when comparing annual versus biannual burning cycles on controlled areas of refuge marsh. A study proposal for the project will be written in 1992; priority demanded that half of the study areas be sampled during late summer of 1991 for correct sample size before the January 1992 prescribed burning season.

h. Geographical Information System (GIS) for Blackwater NWR

A GIS is on the verge of becoming a reality for Blackwater NWR. Through contacts with Fish and Wildlife Service Coop. Unit Leader Dr. Wiley Kitchens in Gainesville, Florida, the refuge was able to acquire some of the basic components of a GIS by December 1991. Gainesville Coop. Unit personnel obtained satellite imagery of the refuge and digitized a computer image for us. All of the imagery and initial classification of the data are preliminary at this point, and will need ground truthing and referencing before subsequent data can be overlaid.

E. ADMINISTRATION

1. Personnel

Project Leader Glenn Carowan received an EEO Achievement Award for his affirmative action outreaches during 1990 recruitment.

John Coleman, a minority veteran, filled an appointment as temporary RecAide (GS-189-04) January through May. His assistance allowed the visitor center to stay open during ORP Briggs' days off.

On 1/3, a Worker's Compensation case was filed for a work injury involving Tractor Operator John Paul. (Section E-6.)

On June 19, Tractor Operator John Paul was suspended for three days without pay for insubordination, following an incident when he refused to relinquish a tape recorder he had on his person during an interview with his supervisors.

Willie Booker, EEO Counselor, was at Blackwater on July 15 to gather facts concerning a grievance filed by Tractor Operator John Paul. A considerable amount of staff time was devoted to discussions with Mr. Booker on this matter. Mr. Booker reported that he did not find any violation of EEO regulations concerning John Paul. Mr. Paul's EEO claim against the refuge was still pending at year's end.

November 1 was Tractor Operator John Paul's last day of work at Blackwater. After a lengthy process involving both refuge and regional office staff, Mr. Paul received a disability retirement because of a work-related injury, incurred 6/12/90, that resulted in his inability to perform required duties.

Tractor Operator (Firefighter) Mike Truitt's intermittent appointment was re-activated on 7/29 to provide much-needed assistance with duties that Tractor Operator John Paul was unable to perform.

Applicants for the temporary Engineering Equipment Operator position were interviewed in July. Mr. Richard Thurman was selected, and EOD'd August 11. His skills and work attitude were a great asset to the station, and helped achieve the completion of several impoundment restoration projects.

Temporary Recreation Aide Ann McCreedy reported for duty November 4. Ann has a B.S. degree in Forestry and Wildlife and some experience in recreation. She was a much-needed assistant for the Public Use program.

Personnel Specialist Mike Meagher met with Project Leader Carowan, Biologist Hartis, and BioTech Giese as part of the process of upgrading the Biological Technician position at Blackwater from a GS-7 to a GS-8. BioTech Giese received the upgrade in December (five months from the date the SF-52 was submitted).

Three times during the year, vacancy announcements were distributed and calls were placed to 300 minority job listings to recruit for the refuge's GS-0322-03 part-time clerk position. No qualified minorities applied, so the position remained vacant at year's end.

Recruitment for the GS-4 Clerk (Office Automation) position vacated by Cheryl Truitt in May did not elicit applications from minorities either. To keep office productivity high during the recruitment period, the position was temporarily filled by Julie Barker for two 30-day emergency appointments. No minorities applied to the re-advertisement of the position in the late fall. After interviews with candidates on an OPM referral list which included Julie Barker, a decision was made to hire Mrs. Barker for the job.

BLACKWATER NWR - ONBOARD STRENGTH FY88 - FY92				
	FTE	PERMANENT		TEMPORARY
		Full-time	Part-time	
FY 1992	11.3	9	2	5
FY 1991	10.75	9	2	4
FY 1990	10.3	9	2	2
FY 1989	11.0	9	2	2
FY 1988	11.0	9	1	2



Left to right: Refuge Operations Specialist Jason Barker, Supervisory Refuge Operations Specialist Gary Heet, and Project Leader Glenn Carowan. ROW 12/91



Outdoor Recreation Planner Maggie Briggs. AM 1/92



Biological Technician Bill Giese (left) and Biologist
Larry Hartis (right). GCH 1/92



Richard Webster, Maintenance Mechanic
GCH 1/92



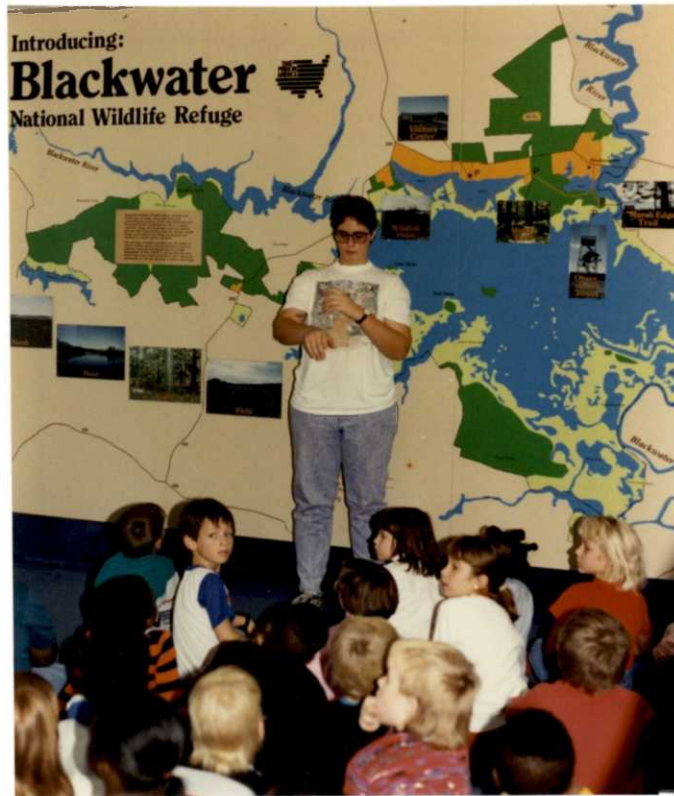
S/N RW4055P0103.... Office Assistant/Property Custodial Officer Meg Walkup checks out the new John Deere. This \$58,000 end-of-year gift from the RO brought Blackwater's personal property inventory to over \$800,000 acquisition value. JLB 1/92



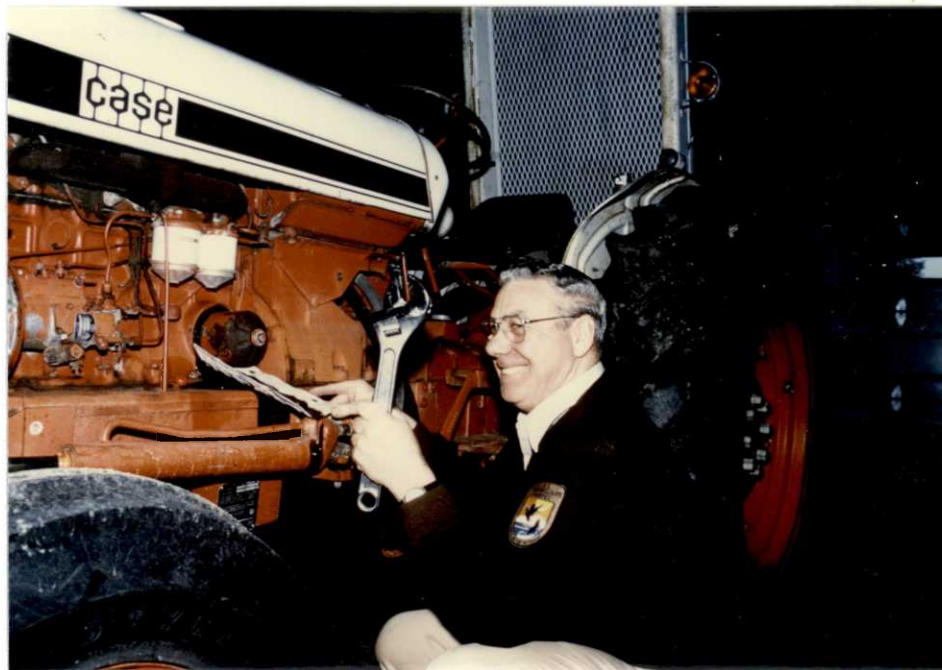
Julie Barker, who entered on duty as Clerk (Office Automation) on 12/30, was a welcome addition to the administrative support team. MW 1/92



John Coleman served as temporary Recreation Aide
January through May. MMB 1/91



Temporary RecAide Ann McCready helped at the
visitor center during the busy winter months.
MMB 11/91



Automotive Mechanic Frank Hughes. GAC 1/90



Tractor Operator John Paul sustained a debilitating injury in June, 1990 that subsequently led to his disability retirement on November 1, 1991.



Intermittent firefighters Mike Truitt (left)
and Keith Morris (right). WMG 11/90

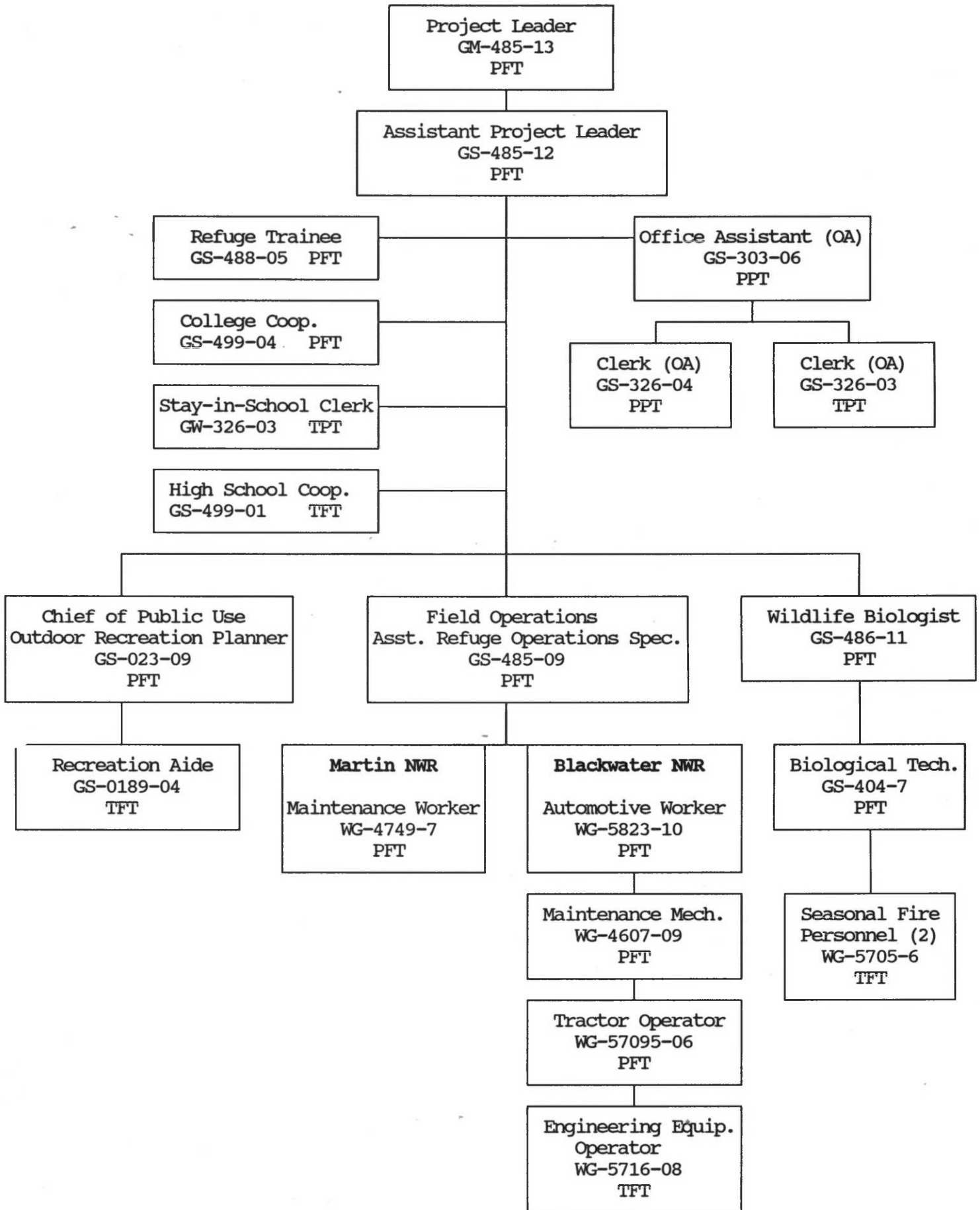


Temporary Heavy Equipment Operator Richard Thurman
takes a welcomed lunch break after finishing the
removal of stumps in Pool 5. GCH 9/91

BLACKWATER NWR PERSONNEL

	<u>NAME</u>	<u>TITLE</u>	<u>GRADE</u>	<u>EOD</u>	<u>STATUS</u>
1.	Glenn A. Carowan	Project Leader	GM-13	6-05-89	PFT
2.	Gary C. Heet	Supervisory Refuge Operations Specialist	GS-12	12-30-90	PFT
3.	Larry P. Hartis	Wildlife Biologist	GS-11	5-06-90	PFT
4.	Jason A. Barker	Refuge Operations Specialist	GS-09	9-09-90	PFT
5.	Maggie M. Briggs	Outdoor Recreation Planner	GS-09	8-08-90	PFT
6.	William M. Giese	Biological Technician	GS-07	8-26-71	PFT
7.	Meg Walkup	Office Assistant	GS-06	4-14-87	PPT
8.	Cheryl L. Truitt	Clerk-Typist (resignation effective 5-6-91)	GS-04	7-17-89	TPT
9.	Julie L. Barker	Clerk (Office Automation)	GS-04	12-30-91	PPT
10.	Teresa Brittingham	Clerk (Stay-in-School)	GS-03	6-03-91	TPT
11.	John Coleman	Recreation Assistant (termination effective 5-30-91)	GS-04	1-27-91	TFT
12.	Ann McCready	Recreation Assistant	GS-04	11-04-91	TFT
13.	Parrish Monk	Career Awareness Student	GS-04	6-23-91	TFT
14.	Deonte Dorsey	High School Coop. Trainee	GS-01	6-02-91	TPT
15.	Franklin A. Hughes	Automotive Mechanic	WG-10	2-22-60	PFT
16.	Richard O. Webster	Maintenance Worker	WG-07	6-13-83	PFT
17.	John W. Paul	Tractor Operator (retirement effective 11-1-91)	WG-06	6-24-82	PFT
18.	Vernon K. Morris	Seasonal Firefighter	WG-06	12-17-90	TFT
19.	Michael A. Truitt	Seasonal Firefighter	WG-06	12-17-90	TFT
20.	Richard Thurman	Eng. Equip. Operator	WG-08	8-11-91	TFT

**ORGANIZATION CHART
BLACKWATER NATIONAL WILDLIFE REFUGE COMPLEX**



The extra efforts put forth by refuge employees Jason Barker, Maggie Briggs, Bill Giese, Larry Hartis, Meg Walkup, and Richard Webster were recognized with Special Achievement Awards. Project Leader Carowan also received Special Achievement Award for his performance in 1991.



Office Assistant Meg Walkup is presented with a well-deserved Level V by Supervisory ROS Heet, for her outstanding success in handling administration. GAC 1/92



Supv. ROS Heet presents ORP Maggie Briggs with a Level IV for an exceptional job in getting the visitor center and Environmental Education Program off to a running start. GAC 1/92



Supv. ROS Heet presents Biologist Hartis with a Level IV for his untiring efforts and accomplishments in organizing and carrying out the refuge's biological program. GAC 1/92



Assistant Manager Barker receives Level IV from Project Leader Carowan for his sustained performance in supervising the refuge's maintenance program, and managing Martin Refuge. GCH 1/92



Assistant Manager Barker presents 31-year employee Frank Hughes with a Level IV for his contribution to the refuge maintenance program. GAC 1/92



ROS Barker presents Maintenance Mechanic Richard Webster with a Level IV for his continued outstanding performance in the maintenance program at Blackwater and Martin Refuges. GAC 1/92



Biologist Hartis presents 20-year Biological Technician Bill Giese with a Level IV for his persistent hard work and success in the refuge's biological program. GAC 1/92

Staff training days totaled 131.5 SD (1052 hours) in CY91, and included the following:

Administrative Training

- ▶ Office Assistant Walkup attended the Region 5 Administrative Workshop in Williamsburg, VA March 4-8.
- ▶ Project Leader Carowan and Supervisory Refuge Operations Specialist Heet attended Drug-Free Workplace training in Laurel, MD May 15.
- ▶ Refuge Operations Specialist Barker attended Introduction to Supervision classes in Baltimore, MD June 24-28.
- ▶ Project Leader Carowan and Supv. ROS Heet attended the Annual Project Leaders' Meeting in Easton, MD Sept. 9-13.

- ▶ Office Asst. Walkup completed the Thomas Hardy 16-Hour Small Purchases class in November.
- ▶ ORP Briggs, Office Asst. Walkup, and Biologist Hartis attended R:Base training provided by Field Biologist-South Laskowski at Eastern Neck NWR November 4-6.
- ▶ Outdoor Recreation Planner Briggs attended OPM training in Windows 3.0 software, December 2-3.

Safety

- ▶ Carowan, Barker, Hartis, and Giese attended a rabies seminar sponsored by the Maryland's Public Health Dept. and Department of Natural Resources, March 1.
- ▶ Maintenance Worker Harrison attended Heavy Equipment/Farm Tractor training in Cape Charles, VA May 6-7.
- ▶ Supv. ROS/Safety Officer Heet attended OSHA Collateral Duty Course for Safety Officers in Chicago, IL Aug. 5-9.
- ▶ Automotive Mechanic Hughes and Maintenance Mechanic Webster completed Commercial Drivers License training.
- ▶ Carowan, Heet, Barker, Hartis, Giese, Harrison, Briggs, Brittingham, Truitt, Thurman, McCready, and Webster attended CPR refresher training in Cambridge, MD on November 20.

Law Enforcement

- ▶ Project Leader Carowan, Supv.ROS Heet, ROS Barker, Biologist Hartis, BioTech Giese, and Maintenance Worker Harrison attended Law Enforcement Refresher in Cape Charles, VA in April
- ▶ Carowan, Heet, Barker, Giese, Hartis and Harrison attended semi-annual Firearms Requalification at Eastern Shore of Virginia NWR October 7.

Biological/Farming

- ▶ BioTech Giese, Tractor Operator Paul, and Maintenance Mechanic Webster received Pesticide Recertification in Delmar, MD January 30.
- ▶ Wildlife Biologist Hartis attended a Canada Goose Symposium in Milwaukee, WI April 22-25.

- ▶ Refuge Operations Specialist Barker attended Wetlands Identification/Delineation in Cambridge, MD May 13-16.

Public Use/Interpretation

- ▶ Outdoor Recreation Planner Briggs attended the 1991 Small Museum Association Meeting in Ocean City Feb. 24-26.
- ▶ ORP Briggs attended the National Association for Interpretation Region II Workshop in Hockessin, DE March 13-16.
- ▶ Outdoor Recreation Planner Briggs attended Interpretive Skills classes in Harpers Ferry, WV June 10-16.

Fire Management Training

- ▶ Project Leader Carowan attended Fire Management for Line Officers in Harper's Ferry, WV January 15-17.
- ▶ Wildlife Biologist Hartis attended S-260: Fire Business Management in Blacksburg, VA February 12-13.
- ▶ Refuge Operations Specialist Barker and Wildlife Biologist Hartis attended S-212: Power Saws, March 19-20.
- ▶ ROS Barker and Wildlife Biologist Hartis attended S-211: Portable Pumps and Water Use, March 21-22.
- ▶ Project Leader Carowan, ROS Barker, and BioTech Giese attended OAS Basic Helicopter & Fixed Wing Safety and Aviation Program Overview for Supervisors training in Laurel, MD May 6. Supv. ROS Heet and Biologist Hartis attended Basic Helicopter & Fixed Wing Safety training in Orangeburg, SC on June 11.
- ▶ Project Leader Carowan and ROS Barker attended I-220: Incident Command Systems at Cape Hatteras National Park Station in Buxton, NC June 13-14.
- ▶ Wildlife Biologist Hartis attended S-270: Basic Air Operations in Charlottesville, VA June 18-19.
- ▶ Project Leader Carowan and BioTech Giese attended the Mid-Atlantic Interstate Forest Fire Protection Compact in Emmitsburg, MD September 24-26.

3. Other Manpower Programs

Linda Gribko, a West Virginia University graduate student and Coop. student with the U.S. Forest Service, arrived at the refuge on 1/23 for a two-week stint. Linda assisted with crop utilization research, wood duck box maintenance, and other duties until 1/31.

On June 28, Project Leader Carowan met with Quonda Jackson regarding recruitment for the Student Cooperative Program.

Parrish Monk, a Career Awareness Institute student from Tennessee, began a six-week appointment at the refuge in June. Much time was spent by Biologist Hartis in providing orientation, supervision, and assistance to Mr. Monk, an effort rewarded by Parrish's enthusiasm and hard work. Parrish's exposure to refuge activities ranged from monitoring water level management, to sitting in on a refuge court case, and conducting annual wood duck nestbox production checks.



Career Awareness student Parrish Monk (right) assists Biologist Hartis with goose relocation. * GAC 7/91

Blackwater was granted a Stay-in-School Program position in April. Recruitment efforts garnered only three applicants: one college student and two high-school students (one of whom later withdrew). The appointment was finalized in May, and Teresa Brittingham began work as a GS-3 Office Automation Clerk on June 3. The SIS Program's financial assistance enabled Ms. Brittingham to continue her college education beyond the junior college level: After working full-time at the refuge during the summer, Teresa enrolled at Salisbury State University, with a major in Elementary Education. Teresa's assistance at both the visitor center and the refuge office was especially valuable during staff shortages.



Stay-in-School Clerk Teresa Brittingham has an important role as a member of Blackwater's administrative support team. MW 1/92

Deonte Dorsey entered on duty as a high school cooperative student June 6, and worked 16 weeks to receive training in the Outdoor Recreation Planner field. In the fall, Deonte returned to his senior year at South Dorchester Cambridge High School but continued to work on weekends in the refuge visitor center assisting with the Public Use Program.



Deonte Dorsey, High School Cooperative program trainee, provided able assistance at the VC. MMB 7/91

College Coop. Student Robin Blair did not return for her second summer in the program. Over a six-month period, a number of futile attempts were made to contact Ms. Blair concerning her intentions of staying in the program. Finally, Ms. Blair was terminated in November after she failed to answer our requests.

Ruth Kondylas, a student at Chesapeake Community College, applied for a position under the Student Cooperative Program. Mrs. Kondylas provided volunteer assistance with the refuge waterfowl time-activity studies on week-ends during the fall and early winter. Pending RO approval, Ruth may start the Coop. program in June 1992.

4. Volunteer Programs

The Blackwater Volunteer Program not only continued to support the refuge in 1991, but almost doubled in size. In response to numerous news articles advertising the need for volunteers, off-site promotion at various exhibits, and encouragement by the volunteers themselves, 47 new people enlisted as volunteers. Ten volunteers were lost due to death, illness, illness in the family, other commitments, or loss of interest, resulting in an end-of-the-year total of 96 volunteers. In spite of all the new volunteers, the visitor center had to be closed one full day and 3 half-days in October. The hiring of temporary Recreation Assistant in November prevented such occurrences the rest of the year.

The majority of the volunteers assisted in staffing the visitor center. They also helped with the Blackwater mobile exhibit at various off-site exhibitions, led bird walks, and guided bus tours. About eight of the volunteers performed other work in the refuge biological or maintenance programs.

The volunteers donated 3,076 hours as follows:

Volunteer Hours 1991

Month	V.Ctr. Staffing	Other PU	Biolog. Asst.	FOB	Vol. Coord.	Maint.	TOTAL
Jan.	212		6	21	4		243
Feb.	247		3	6	4		260
Mar.	232		9	6	12		259
Apr.	288	12	6	6			318
May	212	8	18	9	6		247
June	78		26	7		24	135
July	8		9	14			31
Aug.		12	9	6		17	44
Sept.	300	16	19	8	8	11	362
Oct.	308	35	22	10	8	8	391
Nov.	336	15	31	15	10		407
Dec.	<u>362</u>		<u>13</u>	<u>4</u>			<u>379</u>
Total	2583	98	171	112	52	60	3076

One of our most dedicated and enthusiastic volunteers, Tom Applegarth, died of a heart attack on June 10, 1991. His smiling face has been missed at the visitor center.

Volunteer Marie Perry and her husband spent two mornings in October painting the wall white near the eagle nest exhibit in the visitor center.

In addition to our regular volunteers, several others did special projects throughout the year:

- Fran Butterworth and Ruth Ann Kondylas did volunteer work for credit in the honors program at Chesapeake College: Fran did crop utilization surveys on weekends, while Ruth Ann acted as an observer in Jay Hestbeck's Migrant/ Resident Canada Goose Study.
- Two enthusiastic young men volunteered some work in June. Doug Dorsch, from the local area, helped with maintenance projects. Andy Fanter, a previous volunteer, worked for one week, and then left to accept a paying job in Kansas, his home state; Andy may return again next year.
- Mr. Greg Torchio, an architectural engineer from Centreville, Maryland, volunteered his professional services to design a concept plan for the combined Visitor Center/Office.

Three volunteer workshops were held this year. A workshop held January 12 provided instruction in operating the new cash register purchased by the Friends of Blackwater. A Fall Update Workshop/Social was held in the visitor center September 13 to update the returning and new volunteers for the fall season. A day-long workshop was held October 19: a morning session oriented volunteers to the procedures for operating the visitor center, and an afternoon session provided training for guiding Wildlife Drive bus tours and Marsh Edge Trail walking tours.

On May 31, a Volunteer Awards dinner was held at the visitor center. Staff members and volunteers socialized and enjoyed a delicious potluck dinner. Awards were presented to the volunteers by Supv. Refuge Operations Specialist Gary Heet. Many of the volunteers had given 100 and 200 hours of their time, 5 volunteers had contributed more than 300 hours, and 3 volunteers had contributed over 400 hours. There were also 9 volunteers who have volunteered at Blackwater visitor center for 5 years, 6 who volunteered for more than 6 years, and 1, Ruth Bien, who has volunteered for 7 years. Special awards were presented to Zeeger de Wilde, Maurice Rimp, Helen Combes, Caroline Garner, and Bob Evans for having volunteered more than 150 hours since the last awards dinner in August, 1989. Mr. Evans contributed 311 hours in that time. Although he was not present at the banquet, college student Andy Fanter topped Bob's hours by volunteering 463 hours in 1990-1991. Andy's awards were mailed to him at his new job.



Husband-wife volunteer teams are reliable sources of visitor center staffing. MMB 7/91

5. Funding

The following is a breakdown of Blackwater's funds for the past five fiscal years:

<u>ACTIVITY</u>	<u>Fiscal Year (\$1,000's)</u>				
	<u>FY91</u>	<u>FY90</u>	<u>FY89</u>	<u>FY88</u>	<u>FY87</u>
Endangered Species	3.0	3.0	3.0	3.0	3.0
Expenditures for Sale	7.0	7.0	7.0	7.0	7.0
Quarters Maintenance	1.5	9.1	2.9	4.2	5.4
Fire	50.5	117.5	-	-	-
1261	384.3	302.3	237.1	257.9	245.8
<u>1262</u>	<u>171.0</u>	<u>175.0</u>	<u>170.5</u>	<u>145.4</u>	<u>276.5</u>
TOTAL	617.3	613.9	420.5	417.5	537.5

6. Safety

During January, the step test was given to employees who had marginally passed it earlier, before their assignments to prescribed burning.

Load binders were immediately replaced following an accident involving Tractor Operator John Paul. John received a nose fracture and severe cut when, while he was unloosening the binders, one of them sprang up and cracked him on the face. This accident resulted in a Worker's Comp. claim, lost time, and surgery; and culminated with the RO's issuing a directive to eliminate the use of spring-loaded binders on all Region 5 refuges.

New high-tensile chains were obtained for assorted hauling, towing, and winching projects. This purchase will enable us to save our good chains for binding down equipment during transportation.

Rabies boosters for two staff members were administered at the local health department on 1/29. Although no incidences of rabies have been recorded in Dorchester County to date, increased concern over the spread of the disease to nearby counties has resulted in a decreased supply of the vaccine.

On May 6, Carowan, Barker, and Giese attended an eight-hour, OAS-sponsored aircraft safety meeting at Patuxent National Wildlife Research Center.

An emergency purchase of a LORAN radio was made for Martin Refuge's Maintenance Worker Harrison on 5/10 following his previous day's experience of being stranded in the Bay with no local radio contact. With the VHF radio, Mike can reach fellow Smith Islanders on land or sea for immediate assistance.

In July, the need to install "headache" guards on pickup trucks was emphasized following an accident involving our canoe and the rear window in the S-10 pickup. While Career Awareness Student Monk was checking wood duck boxes, he attempted to turn his truck around on a narrow woods road. The stern of the canoe, which was sticking out the back of the truck, hit a tree, pushing the bow through the back glass.

In September, Temporary Engineering Operator Richard Thurman was given audiometric testing, per OSHA requirements. On November 21, Carowan, Heet, Hartis, Giese, Webster, Truitt, and Harrison received annual audiometric testing in Cambridge.

On November 20, Carowan, Heet, Barker, Hartis, Giese, Harrison, Briggs, Brittingham, Truitt, Thurman, and McCready attended CPR refresher training at Dorchester General Hospital.

Quarterly safety meetings were held during the year; topics included hypothermia and shore survival, Lyme's disease, "Protecting Wildlife when Using Granular Insecticides at Planting," and fire safety.

7. Technical Assistance

a. Canada Goose Advisory Committee

Maryland's Canada Goose Advisory Committee was appointed by the Secretary of Maryland's Department of Natural Resources in January 1990 to advise and assist the Department in the development of a management plan for Canada geese. Committee members included Project Leader Carowan; the Honorable Fred Malkus, Jr., Cambridge; the Honorable Michael J. Sprague, Bryans Road; the late Mr. Charles "Chic" Allen, Baltimore; Mr. Ray Marshall, Newcomb; Mr. Gerald O'Mara, Oxford; Mr. George Bragaw, Burtonville; Mr. Richard Dolesh, Upper Marlboro; Mr. Dan Finney, Baltimore; Mr. Ladd Johnson, Cambridge; Mr. Arthur Harris, III, Chestertown; Mr. Jack Miller (committee chairman) Randallstown; Dr. Frank Rohwer, Frostburg; and Mr. Robert Fuller, Easton.

Towards this end, the tasks of this committee for the next 16 months consisted of the following: 1) Development of a wintering Canada goose population objective; 2) Development of a Canada goose management plan; 3) Advising the Department and the Wildlife Advisory Commission on potential harvest strategies/regimes under different population scenarios; 4) Development of objectives for resident Canada goose populations; and 5) Identification of habitat enhancement objectives.

The committee completed the final draft of "The Management Plan for Canada Geese in Maryland" in April. The overall purpose of the plan is to provide a framework for establishing and maintaining a wintering goose population compatible with available winter habitat and capable of sustaining long-term recreational use.

Before developing the plan, the committee conducted a careful and thorough review of the history of the Canada goose in Maryland and its importance to the State, including population trends, current status, and past management practices. Against that background, the committee developed the guiding rationale for managing Canada geese, defined specific goals, and recommended strategies for achieving those goals.

The rise and decline of Maryland's wintering Canada goose population are documented in the management plan. Estimated numbers of Canada geese wintering in the State, based on

standardized midwinter inventories, increased steadily from 42,100 birds in 1948 to 607,000 in 1981. Since 1981, the number of birds in the wintering population has declined by nearly 50%. All other long-term measures of Maryland's wintering goose population show similar trends. The January 1991 estimate placed the wintering population at 332,000 geese.

The plan identifies factors involved in the decline of the wintering goose population. The primary contributors to the past decline were the large number of geese harvested by hunters and, occurring concurrently, several extended years in which the reproductive success of the goose population was below normal. Also identified as contributing factors in the goose decline are loss of winter habitat and a reduction in the amount of available winter food.

The primary management goals cited in the plan are:

(1) To restore and maintain the wintering goose population to a level of at least 400,000 birds, and (2) To provide a reasonable opportunity for sustained recreational harvest. In the absence of further declines in the population, the plan recommends initially structuring goose hunting seasons and bag limits to achieve a harvest rate of 20%. With normal reproductive success, the size of the wintering goose population should increase as long as the harvest rate does not exceed 20%. The plan also addresses the possibility of allowing increased harvest rate when a 3-year average in the midwinter estimates of 400,000 birds is achieved.

Additional management strategies recommended in the plan are:

- continue the midwinter and mid-November waterfowl inventories;
- utilize neckbanding and other monitoring practices to develop data on goose survival and movements;
- cooperate with FWS and the Atlantic Waterfowl Council in efforts to assess Canada goose nesting and reproductive success;
- require waterfowl-picking houses to submit records on the number of waterfowl processed each season;
- support efforts to improve estimates of goose harvests from Federal harvest surveys;
- develop a State waterfowl harvest survey to achieve reliable estimates of harvest and publicize the importance of the survey data;
- continue to conduct a State hunter questionnaire survey;
- where feasible, utilize public lands to provide additional sanctuary areas for geese;
- continue to encourage, through education and information efforts and incentive programs, farming and land management practices which will benefit Canada geese.

The plan also considers the growing problem of resident Canada geese. Management strategies recommended include: (1) Continuing the waterfowl breeding survey to obtain estimates of the number of breeding pairs of Canada geese in the State; (2) Discouraging increases in the resident goose population; and (3) Supporting research to determine the dynamics of resident goose populations and their relationship to migrant goose populations.

In order to achieve broad public support for management efforts and an appreciation of the Canada goose resource, the plan recommends developing a relevant information program targeted to public and private landowners, and youths.

The Advisory Committee recommends a review and reevaluation of the plan five years following initiation, or upon attainment of the 3-year midwinter average of 400,000 geese.

b. Assistance in Implementation of Canada Goose Management Plan Strategies

Biological Technician Giese assisted State biologists in completing the mid-November and mid-winter State-wide surveys, flying transects on both the Western and Eastern Shores. BioTech Giese and Biologist Hartis also conducted aerial surveys of the refuge and the immediately surrounding area periodically throughout the year and during these specified survey periods.

The refuge neck-banded both resident and migrant Canada geese (see Section G. 16.).

c. Sika Deer Studies

Refuge staff assisted Maryland Department of Natural Resources personnel for the second consecutive year in capturing and eartagging sika deer on the refuge as part of the State's population study. In February and March, during seven attempts, refuge and State personnel live-trapped and marked (eartagged) 49 sika deer at two locations on the refuge (see Section G. 16.). The largest number captured on one occasion using the drop-net method was 13 (at the refuge site on Route 335). The total number trapped and tagged by the State at all locations in Dorchester County during 1991 was 70, thereby making the refuge's contribution quite significant.

In addition, staff also assisted the State in providing sika deer specimen collections to Dr. George Feldhamer and graduate assistants from Southern Illinois University. Dr. Feldhamer's and the State's interest is to determine the percentage of fawns in the fall harvest that are reproductively active. It has been thought that sika deer breed as fawns and, as a

result, can sustain a high hunting harvest even though only one fawn is normally produced per doe. However, it appears from Dr. Feldhamer's preliminary findings that this is not true and that sika deer may have to be two years old before they breed. If this information is correct, overharvest may be occurring.

d. Fire Management, Maryland Resource Conservation Service

On June 25, 1991, Blackwater Refuge, in cooperation with the Maryland Resource Conservation Service, Forestry Division, hosted a "Comprehensive Fire Planning" workshop to solicit input from the public, local and State representatives, the Service, the Forestry Division, Maryland's Park Service, Chesapeake Forest Products Company, and Glatfelter Timber Company in developing a comprehensive fire management plan for the six-county area around Blackwater Refuge. The common goal was "to provide the best resource management and protection possible in the Eastern Region of Maryland at the least cost to government agencies, industry, and private citizens."

The workshop was organized to accomplish the following objectives:

- (1) To enhance relations between cooperating agencies and participating companies;
- (2) To determine "Where we are" and "Where we want to go" in terms of fire management programs and activities, preparedness to deal with prescribed burning and wildfires, equipment availability and compatibility, unit strength, specialized equipment, etc.; and
- (3) To develop a comprehensive fire management plan that will answer "How we can cooperatively reach our goal."

Over fifty people from the various organizations, the public, and elected officials attended the meeting. Mr. John Riley, Acting Director, Maryland Resource Conservation Service, Forestry Division began the agency/industry reports after an introduction and welcome by Mr. Carowan and Mr. Adkins, Forestry Division. Of particular interest was the information Mr. Riley provided on the activities of the State's Policy and Direction Team. The Team, after visiting 10 states, identified 18 action items to improve fire management programs in Maryland including but not limited to: Designation of fire specialists in each project area; establishment of wildfire management zones with caches and various levels of fire preparedness; establishment of maximum response times; designation of target personnel; appointment of a training team and preparation of a training plan; continuation of support with Maryland Fire Service; promotion and utilization of excess property programs; implementation of meetings and improvement of contacts with

fire companies; improvements in safety; institution of policy for billing for suppression costs; establishment of minimum standards for fire tool caches; establishment of policy for visiting fire departments; establishment of one fire investigator/LE officer per region; improvements in communications; and formation of ICS (incident command system) and overhead teams.

Following Mr. Riley, Mr. Doug Wigfield, Division of Wildlife, discussed Wildlife's role in prescribed fire and wildfire preparedness. Mr. Wigfield concentrated primarily on reviewing the use of fire on Fishing Bay Wildlife Management Area for both habitat management and wildfire presuppression. Mr. Wigfield particularly stressed the importance of continuing the use of aerial ignition as a presuppression tool, for which he thanked the refuge for implementing and bringing to the State's use in the 1989/90 fire season. Mr. Wigfield said that Fishing Bay was one of the few wildlife management areas in the State that utilized prescribed fire, and bemoaned the serious fuel loads that had accumulated on other State areas. Surprisingly, Maryland is not a very progressive state in terms of utilizing prescribed fires for presuppression or for habitat management with the exception of the use of fire on a couple of demonstration sites. Many of the State forests have extremely high fuel loads and fire risks are severe.

Mr. Daryl DeCesare, Division of Parks, spoke next about the State's park system and their use and non-use of fire, their preparedness for wildfire suppression, and the problems of balancing the needs of the park visitor with the needs of utilizing fire on park lands. Much like the Division of Wildlife lands, the parks also have not employed prescribed fire management and have extremely high fuel loads. Pocomoke State Forest represents one of the worst examples of mismanagement regarding the overabundance of volatile fuels.

Mr. Carowan discussed in detail the refuge's fire management program, history, and benefits to wildfire suppression and habitat. He also discussed the refuge's renewed cooperative working relationship with the Forest Division and others involved in fire management, reviewed the existing cooperative agreement with the State, discussed unit strength, summarized the safety and cost benefits of aerial ignition, reviewed recent training accomplishments and future needs, and described the types of available equipment and the intended and preplanned acquisition of equipment that would ensure compatibility with the Forest Division's equipment.

Mr. Allen Carter, RFMC, reviewed the Department's and the Service's policies on wildfire suppression and the criteria for developing fire management plans. He discussed the types of fire management activities the Service is involved in nationally and regionally, and discussed briefly the new

cooperative agreement with Virginia. In addition, Mr. Carter reviewed the Regional Preparedness Plan and the levels which will specify specific activities at the Regional level as national wildland fire activities intensify.

Mr. Larry Walton spoke representing Chesapeake Forest Products Company, and reiterated the support the Chesapeake has historically provided to wildfire suppression. Mr. Cal Lubben, also from Chesapeake, gave a brief overview of the company's prescribed burning efforts (a very modest 300 acres a year), and discussed their company's unit strength, training, and equipment availability.

Mr. Jack King, Vice President for Chesapeake, also made a brief presentation about the company's pleasure in being asked to participate in this meeting, and congratulated the Forestry Division and the Refuge for reaching out to develop partnerships with industry. Mr. King continued by dedicating the company's future involvement and commitment to developing a comprehensive fire management plan.

Mr. Tommy Tyler, President of the Maryland Forest Association and Regional Forest Board, addressed the group on the ability of the Association to lobby the legislature and the Board's ability to provide funding for fire management projects or equipment.

Mr. Gary Hartley, Assateague Island National Seashore, concluded the morning session by discussing the fire management plans for Assateague, and the park's proposed implementation of prescribed burning next year after several studies have been completed.

Following a superb lunch that was provided by Chesapeake Forest Products Company, Mr. Heet moderated the afternoon session to identify and discuss various problems, the need for developing a "red flag," planning tactics, agreements, liability, overhead teams, dispatch plans, etc. Several generic names were also proposed for the "fire compact" including the "Maryland Fire Management Group." An outline for the development of the fire management plan was formulated, and topics/problems were assigned accordingly.

From Blackwater, Mr. Heet was assigned to the team that would develop the section on "Objectives and Current Status", Mr. Giese was assigned to the team completing the "Presuppression" section, Mr. Hartis was assigned to the "Suppression" section, and Mr. Barker was assigned to the "Evaluation" section. It was agreed that these sections would be completed by the various teams and submitted to a "Task Completion Team" by January 1, 1992. Mr. Carowan will work with other division heads in compiling the individual sections into a workable plan that has been proposed to be completed by June 1992. Following

completion of the plan, a practical exercise will be conducted at one of the Eastern Region's State Forests to determine how well the various teams "planned."

Overall, the meeting was extremely progressive and worthwhile, and was very well received by those attending, as well as those who, because of meetings in Washington and Annapolis, could not attend. Among those who had other commitments but subsequently expressed their pleasure in witnessing the development of such cooperation were Congressman Gilchrest, State Senators Malkus and Riley, and several local delegates. Having just witnessed an extremely bad fire season, we too will be very glad one day that we have a "compact" that is prepared to handle a wildfire situation. Certainly, it was very pleasing to note in Mr. Adkin's closing comments that, "Undoubtedly the utilization of aerial ignition in 1990 and 1991 by Blackwater Refuge and Fishing Bay Wildlife Management Area was one of the greatest contributions to wildfire suppression in lower Dorchester County. With extremely hazardous fire conditions in 1991 equal to those experienced in 1981, the respective acres of wildfire were reduced to 3,000 acres of marsh and 500 acres of woodlands in 1991 from 25,000 acres of marsh and 2,500 acres of woodlands in 1981."



An Interagency Fire Management Workshop was held at Blackwater NWR on June 25. The objective of the workshop was to prepare a comprehensive fire management plan for the lower six counties of Maryland. GCH 6/91

e. Mid-Atlantic Forest Fire Protection Compact

Project Leader Carowan and Bio. Tech. Giese participated in the Mid-Atlantic Forest Fire Protection Compact meeting at the National Fire Academy in Emmitsburg, MD on September 24-26. The six states in the compact - Maryland, Virginia, Pennsylvania, New Jersey, West Virginia, and Ohio - were represented. Fire preparedness, presuppression, and suppression were the main issues discussed. Project Leader Carowan spoke to the group about the Fish & Wildlife Service's fire management programs and capabilities in Region 5.

f. Endangered Species, Choptank Electric Membership Corp.

On December 8, in response to a request from Choptank Electric Membership Corporation (EMC), the refuge provided assistance in determining the impacts of the company's proposed sub-station on Bayly Road, Cambridge, Maryland on the Delmarva fox squirrel. The Service's Fish and Wildlife Enhancement Annapolis Field Office had indicated in previous correspondence that "the project may have an effect on the endangered squirrel." This determination was forwarded to REA (Rural Electric Administration) in Washington, and the new administrator immediately stopped the project based on Enhancement's letter until a conclusive finding was made. Since the Annapolis Enhancement Field Office had not physically examined the one-acre site prior to issuing their conclusion and had relied on confirmation from the State of Maryland which was nonresponsive to Choptank EMC's requests for assistance, the refuge staff confirmed for all concerned that the site would have "no effect" on the Delmarva fox squirrel. John Wolflin, Supervisor, Annapolis Field Office, concurred with the refuge's findings in his letter of December 13, 1991. The expedient action by the refuge made it possible for Choptank EMC to salvage their project and ensure its continuing bureaucratic race for funding in REA.

g. U.S. Navy, Bloodsworth Island

Assistant Project Leader Heet and staff from the Annapolis FWE Field Office met periodically throughout the year with representatives from the U.S. Navy regarding the management of Bloodsworth Island. The island has a long history of use as a bombing range, and the bomb craters and ponds support a large number of waterfowl. Under the Cooperative Agreement that was signed last year to assist the Navy in management of its property, the refuge agreed to complete waterfowl inventories of the island in conjunction with our regularly scheduled aerial surveys. These surveys were completed as scheduled.

h. Waterfowl Disease Workshop

Refuge staff assisted the Grand National Waterfowl Hunt Club in planning a waterfowl disease seminar on February 21. Dr. Milt Friend and Dr. Kathy Converse from the Service's Wildlife Disease Lab in Madison, Wisconsin had met earlier with refuge staff and Grand National members in November, 1990, to initiate plans for the workshop and to tour some of the Regulated Shooting Areas in Dorchester County where large numbers of pen-reared, free-flying mallards were being released. The refuge had been working with the GNWHC, the Directorate, staff from Patuxent, and the Disease Lab to improve the emphasis being placed on detecting/preventing disease in the pen-reared, free-flying mallard populations in Dorchester County. Over 100 people from the private sector, FWS, and Maryland DNR were in attendance.

i. National Wildlife Refuge Administration Act of 1991

On November 25, Project Leaders Carowan and Schroer (Chincoteague NWR) attended the first of a series of meetings at The Wilderness Society in Washington, D.C. to discuss House and Senate legislation about the NWRS, including S. 1862 and H.R. 2881, Senator Graham's Bill and Representative Studds' Bill, respectively. In attendance were Jim Dougherty, Kathy Tollerton, and Robert Dewey from the Defenders of Wildlife, Jim Waltman from Audubon, Ginger Merchant from the National Wildlife Refuge Association, Bill Reffalt and Pam Eaton from the Wilderness Society, Don Barry and Paul DeLong from the World Wildlife Fund, Rollin Sparrowe from the Wildlife Management Institute, and Rob Shallenberger, Tom Fullrath, and Don Voros from FWS Refuge Division. Carowan was asked to provide a "manager's perspective" of the proposed legislation and the way management of refuges would be affected.

j. International Assistance

THE RUSSIANS ARE COMING! THE CHINESE ARE COMING! And they came, on September 10 and November 18, respectively. The refuge, in cooperation with the Office of International Affairs, conducted tours of the refuge for Russian and Chinese wildlife managers interested in the refuge's farming and moist soil management programs. Biologist Hartis conducted the tour for Russian managers Dmitri Banine, Bladimir Azurow, and Alexandr Kotchergin. Project Leader Carowan toured the refuge with the Chinese managers.



Project Leader Carowan discusses moist soil management in Pool 1 with wildlife managers from China. Blackwater NWR is frequently used to demonstrate management programs to foreign visitors. GCH 11/91

8. Other

a. North American Waterfowl Management Plan

The North American Waterfowl Management Plan, an international agreement signed between the U.S. and Canada in 1986 to protect, enhance, and restore wetland habitats across the continent, presents a number of new opportunities and challenges for NWRs. The Plan establishes conservation goals for wetland habitats in specific regions of the continent; sets objectives for restoring waterfowl populations; and provides a framework for accomplishing local, regional, and international goals.

In the United States, six key waterfowl breeding, migration, and wintering habitat regions, called Joint Ventures (JVs), have been established to implement the Plan. In Region 5, the Lower Great Lakes/St. Lawrence Basin and the Atlantic Coast JVs have coalitions of Federal, state, and private partners working together to restore waterfowl populations.

Blackwater NWR lies within the Blackwater/Nanticoke Focus Area of the Atlantic Coast JV, and is playing an active role in achieving the objectives of the JV and NAWMP. Vast expanses of fresh and brackish estuarine marshes are the outstanding feature of this area. Four major types of waterfowl habitat are well represented: fresh estuarine bay marsh, brackish estuarine bay marsh, brackish estuarine river marsh, and brackish estuarine bay. Many of these marshes are adjoined by large tracts of sawtimber used by nesting bald eagles and good-sized agricultural fields.

The Blackwater/Nanticoke section is a significant waterfowl area. Canada geese, mallards, black ducks, and canvasbacks are most important. Large numbers of blue-winged teal use this area during their fall and spring migration. Approximately 8,000 canvasbacks roost on Fishing Bay and the Nanticoke River along the eastern shore of Elliotts Island. Black ducks are well distributed over all three types of estuarine marsh, although most occur in the brackish bay marsh. A fairly large number of black ducks breed in the brackish estuarine bay marshes. Additional breeding waterfowl include mallards, blue-winged teal, gadwall, and wood ducks. During their fall migration, large numbers of wood ducks concentrate at the head of the Blackwater, Little Blackwater, and Transquaking Rivers.

Some impoundments on Blackwater NWR require adequate water supply to achieve full management potential for producing moist soil foods. Several open marsh water management projects have been completed in this area. The long-term effects of this management upon waterfowl and wetland communities need to be evaluated. Protection of these habitats should be accomplished through acquisition or long-term leases. The waterfowl carrying-capacity of this area can be enhanced through open water marsh management, reduction of insecticide use, improved management of existing State and Federal impoundments, and better management of adjacent agricultural uplands in this area. Protection of private wetlands and adjoining buffers is best accomplished by either conservation easements, tax incentive programs, or acquisition. Due to the importance of this area for a wide variety of wildlife, 53,500 acres have been identified for protection and 5,000 for enhancement.

Blackwater's 1991 activities to meet North American Waterfowl Management Plan and Joint Venture objectives included the following:

- On January 9 and April 10, representatives from the MD Department of Natural Resources, Delaware Department of Natural Resources and Environmental Control, The Nature Conservancy, The Conservation Fund, and the Service met at Blackwater to discuss future acquisition efforts on the Eastern Shore in reference to accomplishing the objectives of the North American Waterfowl Management Plan (NAWMP). Of primary concern for the refuge were efforts to purchase important waterfowl habitats in southern Dorchester County and along the Nanticoke River.

- On February 15, Assistant Project Leader Heet attended a wetland restoration meeting at Maryland DNR's conference center on Wye Island. Present at the meeting were Maryland DNR personnel, Department of Navy biologists, FWE Field Supervisor Wolflin, Field Biologist Laskowski, several members of the Chesapeake Bay Program, and a biologist from Patuxent. A draft cooperative agreement between the Navy, FWS, and MD DNR was presented and discussed on the management of Bloodsworth Island in relation to supporting the objectives of the NAWMP.

- On July 12, Project Leader Carowan and Realty's Bob Miller met with representatives from The Nature Conservancy for a float trip of the Nanticoke River. The trip originated in Seaford, Delaware, and ended at Vienna, Maryland. Acquisition priorities were discussed.

b. Private Wetlands Restoration Initiative

The outstanding initiative that began the private wetlands restoration program in 1990 in the Delmarva area was dampened by the FY 91 Regional directive to "only accomplish restoration on projects that had been approved in FY 90." It was clear that, in Maryland, no new projects were to be identified, no new landowners were to be contacted, and no new cooperative agreements were to be developed in 1991.

The Annapolis FWE Field Office had been responsible for securing permits for 18 of the 20 approved projects but, as 1991 began, continuing confusion about the wetlands delineation manual and wetlands identification criteria, coupled with an equally frustrated Corps, immediately eliminated all but the 2 projects that did not require permits. Since permits were not forthcoming, the very patient and previously supportive 18 private landowners were subsequently notified that, without the necessary permits, their projects were cancelled until further notice.

On January 9, the 1991 Private Wetlands Initiative budget for Maryland was received. On January 25, Project Leader Carowan met with Eastern Neck NWR Assistant Manager Lamoy to reinstate efforts to ensure project completion on the Bankhead and Copeland properties in Kent County, Maryland. Neither of these two projects required permits, both properties were identified for the CRP (Conservation Reserve Program), and both qualified for 50% cost sharing with ASCS (Agricultural Stabilization and Conservation Service). SCS (Soil Conservation Service) engineers estimated the cost of these at \$10,000 each, exactly the amount of money that was received in the 1991 Private Wetlands Initiative budget for Maryland. However, after much discussion with the Regional Private Lands Coordinator, it was agreed that the cost/benefit ratio of these two projects was not good, and that since Pennsylvania needed additional funds to support projects with much greater benefit and cost per acre ratios, funds should be transferred accordingly.

With the elimination of all the hard worked for projects in Maryland, the refuge staff shouldered its continuing commitment to the private wetlands initiative and marched off to support efforts in other states. BioTech Giese and Project Leader Carowan both completed wetlands identification assignments in New York during the weeks of April 1-7 and April 7-14, respectively, with a follow-up synopsis of constructive management recommendations and suggestions for the New York folks to consider.

In July, we received official notification from ARD FWE Pisapia that Maryland's \$20,000 for 1991 restoration had been eliminated, and that a new cooperative agreement with Maryland DNR had been authorized for \$150,000 a year.

With the dawn of a new fiscal year, FWE Field Supervisor Wolflin sponsored a 1992 private wetlands initiative meeting at the refuge on October 31. This meeting was primarily directed towards fostering the cooperative agreements with Virginia, Delaware, and Maryland, and for setting the stage for completing projects in 1992. The refuge strongly recommended to FWE that the Service owed "rights of first opportunity" in 1992 to the original 18 landowners in Maryland who had been promised projects in 1990 and who had not been fairly treated in the permit application process. Time will tell if these recommendations are followed.

c. Other Items

Project Leader Carowan provided extensive support to the development of the 1991 Refuge Officer In-Service Training at the Eastern Shore of Virginia NWR.

On February 12, Project Leader Carowan met with Mr. Carl Herbert, Director of the Maryland Department of Education, to discuss the Junior Fellowship Program and Career Awareness Institute. Mr. Herbert supervises several of the State's gifted student programs, and it was intended that these programs might afford the Service with opportunities to hire some extremely qualified minorities. However, much to our surprise, Mr. Herbert was not as interested as we, and the opportunity was lost.

On July 11, Project Leader Carowan met with Senator Malkus to discuss the refuge's future acquisition program, and to alleviate fears that the refuge was considering condemnation of the Senator's lands adjoining the refuge.

On July 24, the refuge hosted an Area Aircraft Services Evaluation. DRD Kaufman, Mr. Gene Steffen from the Washington Office, Office of Aircraft Services staff, and representatives from Bombay Hook, Prime Hook, and Cambridge LE were present. One item clearly identified was the common need among refuges and LE for more aircraft time, and more carded pilots in the Blackwater Refuge area.

On August 16, Assistant Secretary Hayden visited the refuge to review management activities. Governor Hayden was favorably impressed with the diversity of management programs and the abilities of the staff to improve public relations in Dorchester County.

On September 18, Project Leader Carowan met with Representative Richard Schulze, (R-PA) Chairman of the Congressional Sportsman's Caucus, to introduce the Congressman to management actions on Blackwater Refuge.

On October 16, Project Leader Carowan spoke to 40 members of the Tidewater Farm Club, updating them on the refuge's newest management programs and activities.

On October 18, Project Leader Carowan spoke to 120 members at the Fall Forestry Board's Educational Meeting, with particular emphasis being placed on the refuge's timber management plans and the effects on Delmarva fox squirrels. Carowan reemphasized the need for completion of the Delmarva fox squirrel recovery plan, and the need to involve industry in implementing recovery actions.

On November 5, Carowan met with State Senator Winegrad to discuss the refuge's use of agricultural chemicals and its soil management practices.

F. HABITAT MANAGEMENT

1. General

Blackwater NWR's major habitat types and acreage are as follows:

Estuarine Deep Water	4,064 acres
Estuarine Emergent Wetlands	8,621
Estuarine Forested Wetlands	39
Palustrine Forested Wetlands	3,845
Palustrine Scrub Forest	51
Open Fresh Water	7
Cropland	426
Uplands	541
<u>Administrative Lands</u>	<u>90</u>
Total	17,684

One of the most serious habitat problems that continues to threaten the future of Blackwater National Wildlife Refuge is the significant annual loss of marsh habitat. From 1938 to 1970, over 5,000 acres of Scirpus olneyi marsh have been replaced by open water. The cause(s) of such devastating loss has not been definitely identified but possibilities may include sediment starvation, sulfate production, rising sea levels, increasing salinity, overgrazing by nutria and waterfowl, and wind/water erosion. Obviously some of the problems are, for all practical purposes, beyond present management capabilities. Recent studies did suggest several management actions which, if implemented and monitored, could result in slowing or reversing these losses. These recommendations included using alternative prescribed burning cycles in the marsh, and continuing control of high nutria and muskrat populations, as both of these grazers were considered to adversely affect the structure of the marsh.

The Station Management Plan recognized the severity of the marsh loss problem by recommending as a high priority objective "the need to monitor/evaluate/attempt to control marsh loss." To accomplish this objective, the plan identified the following specific management strategies:

- 1) Development of a procedure to accurately monitor annual fluctuations in nutria populations. (See Section D.5.B)
- 2) Removal of excess nutria and muskrat in accordance with the refuge's trapping plan. (D.5.B, H.10)
- 3) Development of alternative prescribed burning program on one- to two-year rotations. (D.5.G)
- 4) Development and implementation of a project to conduct management actions and evaluate their effectiveness toward reversing wetland loss and restoring lost wetland vegetation. (Section D.5.F)

Salinity intrusion to the upper reaches of the historically fresh Blackwater River further compounded the problems of marsh loss and ecosystem changes. (See Section D.5.f)

2. Wetlands

a. Marsh

Aside from the management of refuge impoundments, current refuge wetland habitat management occurs on approximately 12,000 acres of brackish marsh. The primary thrust is the annual prescribed burning of 3,000⁺ acres of predominately Olney three-square marsh. The exclusion of fire to a section of marsh south of Pools 3 and 4 is equally important. Burning in that area is postponed until late winter in an effort to discourage potentially extensive and destructive snow goose feeding which historically has accelerated marsh loss in that area. Indirect marsh management on the refuge also occurs in monitoring snow goose populations and allowing a maximum of 5,000 to overwinter on the refuge because of their destructive marsh feeding habits. Nutria and muskrat population monitoring and trapping are management tools that also attempt to reduce potentially destructive marsh grazers.

b. Impoundments

Waterfowl habitat at the refuge is a trichotomy composed of the impoundment system, the natural brackish marsh, and the force account croplands. The primary objective of this trichotomy is to provide and make available a diversity of food crops for maintaining a healthy population of migrating and wintering waterfowl.

Five rainwater-dependent pools comprise the refuge impoundment system. These impoundments (Pools 1-5) contain approximately 243 acres at full pond levels (not including flooded timber in Pools 1, 2, and 4 and emergent marsh in Pool 4). In 1991, all refuge impoundments were eventually drawn down or pumped dry during the summer months to encourage emergent natural moist soil vegetation or to plant refuge agriculture crops on higher elevations.

Unusually dry weather conditions with very little rainfall and unseasonably warm weather persisted throughout the fall and early winter of 1990. Light rainfalls in December had done little but moisten the lowest of elevations in all refuge impoundments; 1991 arrived dry. During a three-day period (January 6-8), the essentially dry refuge impoundments received the first significant amounts of water in the form of snow, sleet, and rain. By the end of January, two more rains had brought Pool 4 to full pond level and Pools 1, 2, 3, and 5 to levels near full. Waterfowl use in impoundments increased dramatically following each rain and subsequent rise in pool water levels as more moist soil plants and croplands planted in grain were made available by the water level rise.

The vast majority of the spring migration of waterfowl occurred early, around the full moon on February 28 and the first week in March. Refuge pools were partially drawn down in mid-March to increase waterfowl use by the remaining birds on residual moist soil plant foods and invertebrates. Further drawdowns in Pools 3 and 5 were done in mid-April to prepare for planting croplands adjacent to those impoundments and for anticipated construction of sub-dikes in Pool 3. Pools 1 and 4 were drawn down approximately one month earlier than previous years. This earlier drawdown favored a greater volume and diversity of moist soil plant food production, which received extensive waterfowl use upon reflooding during the fall. Water level gages were defective on the interior of Pools 1, 2, and 3 and were relocated and set in concrete. Exterior gages for marsh water level readings were also installed exterior to Pools 1, 3, and 4.



New water level gages in impoundments were installed this summer at locations designed to prevent winter ice damage. This one inside Pool 1 is mounted to piling that supports a 6" Gator electric pump. LPH 9/91



All old water level gages were defective in elevation by varying degrees, making guess work out of water regimes. This one at Pool 1 was lag-bolted to the concrete wall on the outfall end of the water control structure. All gages were reset with 0.0 at sea level. LPH 9/91

Rainfall for gradual reflooding of impoundments was somewhat limited during the fall months. At least this year we did receive beneficial rains in late September, early December, and again in late December to make moist soil plant foods available to waterfowl. Programs specific to individual impoundments for 1991 are as follows:

Pool 1

Pool 1 is a 30-acre impoundment at full-pool composed of organic soil in the center portion, tending toward more mineral/sandy soils in the shallow edges. Salinities for the year ranged from 0.0 ppt at full pond levels to 2.0 ppt at drawdown. Waterfowl feeding activity was good during January and February as a result of much needed rainfall the first week of January 1991, which shallow-flooded the previous year's crop of redroot flatsedge and panicum. Waterfowl use peaked during this period at 2600 Canada geese, 750 mallards, 120 black ducks, 550 pintails, and 250 green-winged teal. Rapid partial drawdown by gravity flow was done on March 20 to expose and make available any residual plant foods or invertebrates for waterfowl. Final drawdown utilizing the 6" electric pump was started on May 21, with complete drawdown achieved by June 5. By design this was approximately one month earlier than the previous year's drawdown date in order to facilitate more complete drainage, resulting in more extensive vegetation coverage.



Wading bird use in Pool 1 during drawdown in May.
LPH 5/91



Maintenance pumping in Pool 1 to remove excess
water in early June. LPH 6/91



Complete drawdown of Pool 1 on June 5 still left some residual water pooled in center. Moist soil plants had not sprouted by this date. LPH 6/91



Another June 5 photo of Pool 1 showing the extent of pooled water remaining that would not drain because of the silted condition of the existing old ditch (right). LPH 6/91



TESTING! TESTING! An attempt to open old drainage ditch in Pool 1 was made in July, using the Bombardier and backhoe attachment; result was helpful but conditions toward the center of the pool were too wet and unstable. LPH 7/91



Pool 1 moist soil plant response by August 1. Shallow water remaining in center retarded sprouting response. LPH 8/91

Maintenance pumping to remove summer rainfall and sub-surface ground water that collected at lower elevations was required all summer. The vegetative response was excellent and diverse: approximately 60% redroot flatsedge (lower and wetter elevations), 25% Walteri millet (scattered and mid-elevations), and 15% panicum (higher perimeter elevations).



PHOTO 1 OF 3: Pool 1 moist soil plant response by the first week in September. Diversity and density were excellent, with 60% redroot flatsedge, 25% Walteri millet, and 15% panic grass as shown by this series of three photos at different locations in Pool 1. LPH 9/91



PHOTO 2 OF 3.



PHOTO 3 OF 3.



Not only was Pool 1 diverse and dense - it was "rank," as referenced by these water gage faces. LPH 9/91



Pool 1: Walteri millet in foreground and redroot flatsedge in background during first week of September. LPH 9/91



Another attempt to open the drainage ditch in Pool 1 was made during mid-September, using Region 5's high floatation Gemco ditcher under more stable conditions. This effort would have worked but, to our surprise, the ditcher was received with major hydraulic and mechanical problems that prevented its use this year. GAC 9/91

Waterfowl utilization in Pool 1 was excellent, especially following each rain and water level rise. The first rainfall of the season for reflooding occurred the last week in September. October's waterfowl use subsequently peaked at 2000 Canada geese, 800 green-winged teal, 250 pintails, and 400 mallards. Two more rainfalls occurred in December, and foraging waterfowl use peaked for the fall season in Pool 1 at 2500 Canada geese, 900 mallards, 1100 green-winged teal, 600 pintails, and 25 black ducks.



Waterfowl response to moist soil plants in Pool 1 was excellent. Geese in this December 4 photo seemed to prefer the larger seed heads of Walteri millet. LPH 12/91



Following each rainfall and water level rise, waterfowl use of Pool 1 intensified. LPH 12/91



During mid-December, pintails and green-winged teal seemed to prefer to feed the upper shallow edges of Pool 1 in search of the smaller seed heads of redroot flatsedge and panic grass. LPH 12/91

Pool 2

Pool 2 is a six-acre impoundment with organic soils. Until 1990, Pool 2 was a permanent water impoundment maintained for waterfowl brood habitat and as a potential water source, when full, for shallow flooding of Pool 1 when needed. Salinities here were 0.0 ppt all year. Lotus has choked the impoundment for years. Willow and sweetgum dominated the edges until the summers of 1990 and 1991, when approximately 80% of the brush and woody growth around the perimeter was removed, opening a corridor between Pools 1 and 2 and the adjacent agriculture cropland to facilitate waterfowl access and use in both pools and fields.



Pool 2, in early August, was choked with lotus. More brush and woody growth were removed this summer from the pool edges (right and center background of photo) to promote waterfowl access and use. LPH 8/91

In January and February, waterfowl use of Pool 2 - primarily as a loafing/resting site - was intermittent, with peaks of only 900 Canada geese, 100 mallards, and a few green-winged teal and pintail, since the lotus had no food value for waterfowl. Rapid drawdown started March 20 and was completed the last week in June. Vegetative response was the same as in previous years: almost 100% coverage by lotus, with small interspersed areas of water starwort and primrose. In mid-summer, the refuge "boneyard" was relocated from the Pool 2 site, and additional brush/trees were also removed. Pool 2 did not accumulate any rainwater until early December. Waterfowl use for a loafing/resting site peaked the remainder of that month at 500 Canada geese, 300 mallards, and 25 green-winged teal.



The old refuge storage area/"boneyard" was removed (left background), as were additional trees/brush from the Pool 2 dike road (left foreground). LPH

Pool 3

Pool 3 contains approximately 117 acres at full pool and is primarily mineral in soil composition. Salinities for the year ranged from a low of 0.0 ppt at full pool to a high of 2.0 at drawdown. Good waterfowl foraging use occurred in the impoundment during in early 1991, when reflooding of 1990 plant growth was finally realized. A moist soil area of approximately 68 acres, which provided an almost solid stand of Bidens, peaked in waterfowl use at 2500 Canada geese, 5900 mallards, 425 black ducks, 600 pintails, 175 green-winged teal, and 400 swans. A 21-acre planting and flooding of sorghum adjacent to the moist soil area boosted peak use to 3700 Canada geese, 6200 mallards, 475 black ducks, 120 green-winged teal, and 80 pintails. Another planting of 6 acres of German millet attracted peaks of 1500 Canada geese, 1050 mallards, and 45 black ducks. Pool 3 received a rapid partial drawdown on March 7 to increase availability of remaining moist soil plants and invertebrates to waterfowl that had not yet migrated out of the refuge. Increased duck use resulted (mainly mallards, black ducks, and pintails). Approximately 450 swan also found the moist soil area very attractive during this period.



The 22-acre willow/brushy area in the south end of Pool 3 gets consistent and heavy use by all species of waterfowl during windy, cold, stressful weather, in their attempt to thermoregulate. LPH 12/91

Pool 4

Pool 4 is a 69-acre impoundment at full pool containing approximately 17 acres of open water, 9 acres of flooded, emergent marsh, and 43 acres of marginally flooded timber land. Soils are typically organic in a shallow surface layer underlaid by a hard clay. The organic layer tends to remain somewhat saline, ranging this year from a low of 0.0 ppt to a high of 5.0 ppt. 1990's moist soil plant production was attained on approximately 7 acres of the open water area and contained redroot flatsedge, Walteri millet, and panic grass. Waterfowl foraging use on that area in January and February 1991 peaked at 1850 Canada geese, 1075 mallards, 130 black ducks, 80 green-winged teal, and 30 pintail. Drawdown was started by gravity flow on March 11; pumping began the last week in May and was completed by the first week in June.

Final drawdown was started on April 16 (after a 1.5 inch rain) to allow preparation for planting in adjacent cropland fields and the higher edges of the impoundment. Drawdown was also intended to prepare the site for possible construction of interior dikes to subdivide the pool; however, this project never materialized in 1991 because of Corps of Engineers permit complications. Drawdown was completed by late May.



Drawdown of Pool 3 completed by late May. This photo shows some sprouting vegetation by June 13.
LPH 6/91

Because of the planned construction in Pool 3, the impoundment had to be drawn down too rapidly and remained too dry for most of the summer. Regardless, a beneficial diversity of plants developed including bidens, foxtail millet, panic grass, flatsedge, and smartweed. Undesirables also appeared in the form of cocklebur and willow sprouts. During extremely cold weather, the 22 acres of well-established willow in the deep south end of the pool continued to be utilized extensively by both ducks and geese in an attempt to thermoregulate. Rainfall for flooding did not occur until the first week in December. Peak usage by foraging waterfowl did not occur until the last week of that month, with 2600 Canada geese, 2400 mallards, 150 black ducks, 200 green-winged teal, and 550 pintails.



Pool 3 on September 3, moist soil plant response could have been better with more moisture in the regime. Note encroachment of cocklebur and salt-marsh fleabane. LPH 9/91



Water level in Pool 3 on September 3 where it remained essentially all summer - too dry. LPH 7/91



Photo taken of the middle portion of Pool 3 on September 20 shows difference in plant response caused by soil disturbance. On left, old levee plow dike was flattened with the dozer, producing more panic grass and smartweed. On right, the undisturbed area remained bidens and flatsedge. LPH 9/91



Rainfall sufficient to flood any of the moist soil plants in Pool 3 did not come until the first week in December. Afterwards, waterfowl use by Canada geese, mallards, pintail, green-winged teal, and black ducks (as shown in photo) continued on a regular basis until year's end. LPH 12/91



Pool 4 on June 13 just after complete drawdown. Notice water lily in center background is still green. LPH 6/91



Pool 4 on August 1 (2 months later). Organic soils high in salinity for a fresh water impoundment caused moist soil plants (as seen in photo) to be dwarfed in stature, but this was the best response ever in the pool. Note success of our objective of stressing water lily in center background. LPH 8/91

Pool 4 required maintenance pumping with the 16 inch Crisafulli pump all summer to remove excess rainwater and subsurface ground water that collected at lower elevations. Moist soil plant response was good because of a drawdown date one month earlier than last year's. Maintenance pumping also allowed additional stress to be applied to the growth of water lily. Moist soil plant composition was similar to Pool 1 on approximately 15 acres of the open water area producing redroot flatsedge, Walteri millet, and panic grass; composition percentages were approximately the same as Pool 1's. Although not nearly as lush and dense as Pool 1, this was the best response yet for Pool 4 since summer drawdown regimes were implemented in 1989. Waterfowl foraging peaked in December at 600 mallards, 450 green-winged teal, 200 pintails, and 75 black ducks.



Summer-long maintenance pumping, using the Crisafulli pump in Pool 4 borrow pit was required to lower saturated soil water levels for moist soil plant production. LPH 6/91



Pool 4 response by Walteri millet by mid-September.
LPH 9/91



Pool 4 response by redroot flatsedge and dwarfed Walteri
millet by mid-September. LPH 9/91

Pool 5

Pool 5 is approximately 60 acres in size and contains primarily mineral soils. Salinities ranged from 0.0 ppt at full pool, to 1.0 ppt at drawdown in the borrow pit in July. Last year's (1990) moist soil and cropland plant production available for early 1991 waterfowl use included 23 acres of Japanese millet, and 25 acres of corn/annual ryegrass; the remaining 12 acres was in a diversity of moist soil plants (Panicum, Cyperus, Bidens, Pluchea, Ammannia, and Phragmites). The Japanese millet was mostly consumed in late 1990 and the 25 acres of corn was consumed in January and February, associated with use of adjacent cropland fields also in corn. Use of moist soil plant production in January and February peaked at 650 Canada geese, 1850 mallards, 260 black ducks, 80 pintails, and 35 wigeon. Drawdown started on March 11 to increase production of moist soil plants and availability of invertebrates for the remaining waterfowl. Duck use increased until the last few migrants departed. During mid-April, some of the stop logs were pulled to implement a more rapid drawdown in preparation for planting of croplands in the adjacent Key Wallace Drive fields.



Pool 5 on June 13, two months after drawdown in mid-April to allow planting of croplands on adjacent Key Wallace fields. Limited moist soil plants responded. LPH 6/91

Most of the summer, conditions were drier in Pool 5 than planned for optimum moist soil plant production. This condition was partially due to excess rain water that had to be removed by pumping in early August to prevent flooding of newly sprouting Japanese millet. Saltmarsh fleabane, toothcup, and some panic grass were essentially the only moist soil plants produced, and these were in limited amounts and only on the lowest of elevations.



Pool 5 on September 9: Moist soil plant response was better but not great. Anticipating construction in the pool, water levels were kept too low and soil salinity in combination with mineral soils discouraged good moist soil plant production. Dozer in center background was used in September to remove stump piles, taking advantage of dry conditions. LPH 9/91

Except in the borrow pit, the impoundment remained dry until the first significant rainfall in early December. Following the rain, use on the planted Japanese millet by waterfowl peaked in late December at 1400 Canada geese, 900 mallards, 125 pintails, and 30 black ducks. No significant use of the limited moist soil plant area was observed by year's end.



Pool 5: Canada goose use (December 4) in Japanese millet after recent rain. The Japanese millet was planted in the higher elevations of the pool. LPH 12/91



Pool 5: Canada goose and mallard use (also during the first week of December) following rainfall, in limited amounts of moist soil plants available. LPH 12/91

c. Miscellaneous Wetland Meetings

On 3/18, Dr. Leigh Fredrickson and a cadre of his graduate students visited Blackwater. Discussion and field observations were centered around our water management program.

On 3/19, Project Leader Carowan and Refuge Operations Specialist Heet met with Soil Conservation Service representatives in Cambridge regarding the refuge's subimpoundment project.

On 3/22, Carowan and Heet met with Bob Zepp, Annapolis ES, regarding the subimpoundment project.

On 3/28 and 29, Richard Yee, RO Engineering, visited Blackwater to discuss the subimpoundment work proposed for Pools 3 and 5. Also discussed were future projects in Pools 1 and 4, and the removal of Quarters 1.

On 4/9, Refuge Operations Specialist Heet met with Soil Conservation Service staff to finalize and obtain approval for our Pool 3 subimpoundment project. The matter was handed over to Ecological Services, who then wrote up our project application for Corps of Engineers approval.

May 13-16, ROS Barker attended a wetland delineation workshop in Cambridge, MD. The course was conducted by the joint efforts of FWS, COE, SCS, and EPA. Topics covered were pertinent and information gained will be useful to refuge operations.

On November 19, Murray Laubhan toured the refuge impoundment system with Biologist Hartis and Zone Biologist Laskowski. Murray is gathering information for his work with the Moist Soil Advisor System.

3. **Forests**

The need for general habitat cover typing and, more specifically, a forest type inventory is becoming more obvious each year within many of the management programs at Blackwater. Requests for funding for such projects have not been fruitful. Regardless, the refuge is indirectly making some progress toward that end. A refuge Geographical Information System is well underway, and completion of ground truthing of the computer image should give us at least a general idea of the major components of our habitat types according to canopy cover. Identification of understory components will be more labor intensive.

In November, refuge staff met with Ace Parker, a private consultant forester, to discuss the potential for his company's conducting a cover type inventory of the refuge. Our available funding was not in line with his price quotes of \$7-8 per acre on a 1% cruise (1 plot per 10 acres) and \$12-13 per acre on 2% cruise (1 plot per 5 acres). We opted to wait and see how much of this data we could get from our GIS.

In July, final touches were added to the refuge's two deer exclosures that were erected by Biologist Hartis according to Field Biologist Laskowski's "Region 5 Deer Exclosure Guidelines." One of the exclosures is located on the Woods Trail on the Wildlife Drive in mature, mixed hardwood/pine habitat. The other is in similar habitat on the 50-acre tract of woods, approximately 200 yards northwest of the YACC building. No initial data have been sampled to date. Construction of the exclosures will probably require more time and money than the guidelines predict. Project Leader Carowan prepared a memorandum to Associate Manager McAndrews noting these discrepancies, and questioned the need to spend scarce dollars on such research when other biological monitoring programs - like Delmarva Fox Squirrel population and habitat studies - remain unfunded.



Deer exclosure erected on the Woods Trail off the Wildlife Drive. Another is located 200 yards northwest of the YACC building in the 50-acre tract there. GAC 7/91

4. Croplands

As the 1990 refuge agricultural crops were somewhat unavailable to waterfowl while still standing, portions of the corn, sorghum, and soybeans were mechanically knocked down immediately after the waterfowl hunting season ended in mid-January. Low wet areas of agricultural fields next to the impoundments, edges, and flooded crops were utilized prior to the end of the hunting season. Our goal is to make food available to the waterfowl on a staggered basis, either naturally or mechanically, during their entire stay at the refuge. Legal ramifications prevent mechanical manipulation during the hunting season.

All refuge crops received heavy utilization during the fall, winter, and early spring. Virtually all crops, with the exception of some small acreages of soybeans, were utilized by waterfowl, other migrating birds, deer, and Delmarva fox squirrels, despite a very mild winter.

The 1991 agricultural program began in February with the collection of soil samples to minimize the use of artificial fertilizers. These samples were analyzed by the University of Maryland and fertilization recommendations given. Liming of agricultural fields was conducted as ground conditions permitted, in order to maintain pH levels within plant-growing range.



Ladino clover fields were used extensively by both Canada and snow geese. LPH 10/91



The center of most refuge fields received heavy utilization from Canada and snow geese, resulting in some eatouts of clover and wheat stands. LPH 9/91

By March, touch-up reseeding of clover fields was initiated where heavy feeding by geese had thinned stands.

In early April, approximately 40 acres of fields were disked and/or chisel plowed in preparation for planting new ladino clover fields.

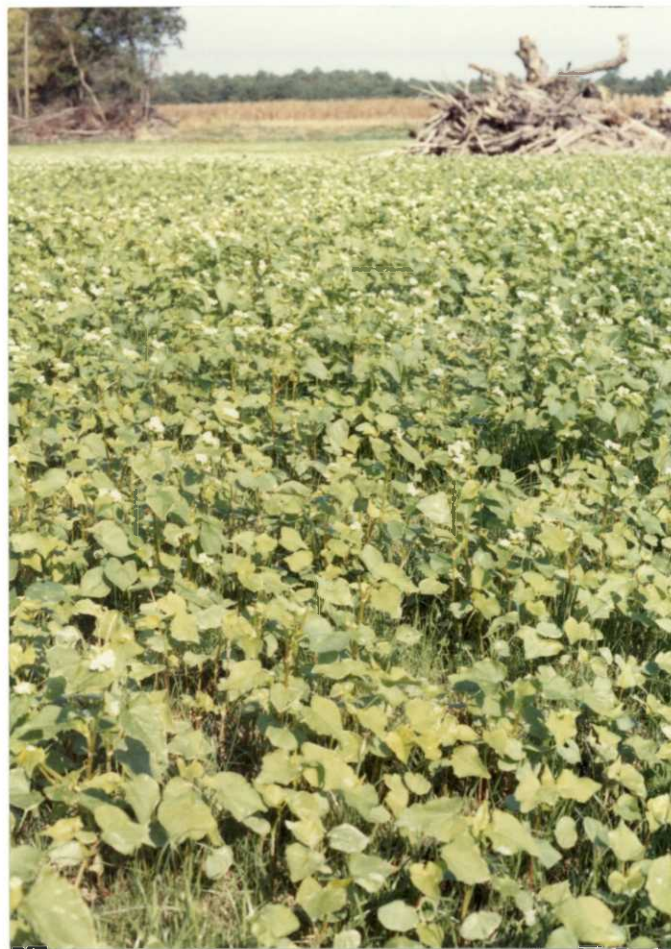
In early May, rotated clover fields, heavy growth ryegrass, corn fields, and sorghum fields were moldboard plowed.

Tillage and ground preparation for corn planting began in early May, with 64 acres planted in corn. In late May and early June, 49 acres of sorghum were planted. Some problems with germination on 40 acres of sorghum necessitated re-planting. The culprit turned out to be seed maggots, which eat off seed sprouts during both pre- and post-emergence of the plant. The recommended remedy was treatment of the seed prior to planting with a seed inoculate.

A 4240 John Deere tractor was borrowed from Back Bay National Wildlife Refuge for utilization during planting.

The months of June and July found the refuge staff busy

mowing clover to reduce weed competition, cultivating and side-dressing corn with nitrogen, and planting the remainder of the sorghum and 20 acres of soybeans. Spot treatment of weeds in soybean fields with a post-emergent herbicide (Blazer®) was necessary on seven acres. Japanese millet planting began in mid-July into mid-August. Several refuge fields were burned prior to cultivation to eliminate dead grasses before mid-August buckwheat planting. Late August and early September, the staff was busy with clover mowing; buckwheat planting; overseeding buckwheat with wheat, ryegrass or crimson clover; and top-dressing buckwheat and millet fields. In mid-September, 124 acres of corn, sorghum, and soybean fields were aerially overseeded with annual ryegrass to provide green browse for waterfowl and prevent soil erosion.



Buckwheat fields were seeded with wheat, crimson clover, and annual ryegrass to produce a browse as well as a hot food.

All refuge crops are now planted for account, a project required considerable effort by the staff both in performing the work and maintaining the equipment. The result: A crop put into the ground in a timely manner, utilizing the best farming and soil conservation practices, with minimal chemical use, and a very respectable yield available for wildlife use. The refuge's farming program has received praise from local residents, farmers, visitors, and government officials.

Future refuge farming goals are to experiment with further reduction of chemicals and fertilizers (perhaps using chicken manure as a substitute), conducting more timely testing for nitrogen needs, and utilizing more no-till or minimum tillage procedures.

CROPS PLANTED FOR WILDLIFE Blackwater NWR - 1991			
<u>Crop</u>	<u>Acreage Herbicide-Treated</u>	<u>Acreage Untreated</u>	<u>Total Acreage</u>
Clover (ladino)	-	111	111
Corn	56	8	64
Sorghum	20	29	49
Soybeans	7	13	20
Millet	-	65	65
Buckwheat	-	76	76
Sunflowers	-	2	2
Soybean/food plot/ German millet	-	3	3
TOTALS	83	307	390

Some refuge crop programs are geared toward producing combination crops consisting of a mixture of planted and natural foods. One prime example is the planting of sorghum in refuge pool bottoms. Depending on the timing of the soil disturbance and moisture conditions, different natural food responses were achieved, as illustrated in the following two photographs.



May-planted sorghum in portions of Pool 3 produced lush stands of panicum when chemicals were eliminated. LPH 9/91



June-planted sorghum in Pool 3 produced lush stands of redroot cyperus when chemicals were eliminated. These types of manipulation guarantee a crop of desirable waterfowl foods when disking and disturbance are necessary. LPH 9/91



Pool elevation also determines the response of natural vegetation. The sorghum on the left was heavily mixed with redroot cyperus, while the lower soils in the shallow ditch in the center of the photo produced lush stands of panicum with some wild millets. LPH 8/91

9. Fire Management

The prescribed burning program was submitted and approved in the fall of 1990. This year's program addressed the justification for burning the 5,370 acres of refuge marshes and 38 acres of refuge woodland to reduce fuel hazard and wildfire dangers, to encourage Olney three-square growth, to assist in control of muskrat and nutria populations, and to reduce understory growth.

For the second consecutive year, the main thrust of the burning program was aerial marsh ignition using an OAS helicopter and Mark III Premo ping pong delivery. This method allowed refuge staff to very effectively and safely burn large acreages of marsh in a very short period of time: 2,130 acres of marsh was burned during 5.9 hours of actual flying time. This year's aerial ignition program was conducted by the refuge staff, with BioTech Giese serving

as burn boss and Biologist Hartis and Refuge Operations Specialist Barker as the Premo Mark III operators. Using a rented OAS-carded helicopter and operator worked very well, and this year's aerial program was conducted under much better burning conditions than last year's, with greatly improved results. Aerial ignition will continue to be utilized in the future as a very effective method of marsh burning and presuppression.



Aerial photo showing results of helicopter burning operations. GAC 1/91

Four members of the Blackwater staff were trained and certified as Premo Mark III operators during the OAS training session at Blackwater, December 10-14, 1990, in preparation for the 1990-91 burning season. This training and experience taught staff members to operate the machines and to perform maintenance on the Premo Mark II machine, and resulted in the staff's being able to more effectively conduct ignition procedures and to carry out emergency procedures during a machine malfunction.

Aerial ignition requires an intensive preburn preparation to ensure that the burning is conducted in a safe manner. Eagle nests, private property, refuge woodland, trappers, and public highways must be protected from fire and smoke resulting from refuge burning operations. This requires ground preburning in some instances; plowing and/or maintaining lines; and informing private landowners, public agencies, and refuge trappers of the aerial burning operations. These procedures were conducted without problems prior to this year's aerial burning. These procedures do, however, take time, and wildfires resulted during the preparation period. Most wildfires were presumed to have resulted either from impatient trappers unable to wait for marshes to be burned, or trespass fires originating from private lands.

Ground ignition was used to burn a total of 1,240 acres. This method is still required in some planned refuge marsh burn areas that cannot be burned aerially due to prescription requirements, smoke management, public safety near roads and private residences, and wildlife management objectives. Also, several marsh units were burned after March 1 to prevent snow goose depredation.

As required, all fires which occurred on the refuge outside the planned prescription requirements and not set by refuge staff were documented as wildfires. All wildfires were investigated and in some cases control actions initiated. Most of these fires required only observation and evaluation. In those cases requiring control action, contact with additional staff members was made according to the fire response plan. In two instances, contact was made with BioTech Giese by local fire authorities regarding a fire on the refuge. Response by BioTech Giese was then made and, since an evaluation was made of the fires' status, fire response procedures were carried out. Lack of adequate communication between the refuge and local fire agencies became apparent during these wildfire situations, and slowed refuge response to fire situations. Response time to wildfires could also be shortened significantly by having refuge vehicles available at appropriate staff members' residences during periods of high fire danger. Quick reaction time with the proper equipment will be greatly enhanced by this option.

Fires during the evening of January 29 involving 926 acres in the area, and again on the morning of January 31 involving 25 acres, indicated that an arsonist was at work on the refuge and the surrounding vicinity. As burning conditions were excellent on the evening of January 31, a coordinated effort

with the MD Forest Service fire wardens was initiated to carry out a surveillance of refuge and private lands in an attempt to apprehend this firebug. This surveillance was successful and an apprehension was made. The case is still pending the State court system. Again, a radio communication deficiency was very apparent during this cooperative effort.

Additional fire funding for two seasonal firefighters-tractor operators was a major improvement for the fire program in FY91 and FY92. These two positions were filled with very competent, experienced individuals who were capable of carrying out fire related tasks and burning operations with minimal supervision after a training period. These two personnel will be retained for future seasonal employment. They not only supplied competent assistance in fire related activities, but also provided much-needed manpower to complete other projects.

The refuge's fire equipment and supplies were upgraded during the year to allow staff participation in the interagency fire program and provide equipment for more safely controlling refuge fire activities. \$2,428 were spent on NUS supplies. A major firefighting equipment upgrade was made with the delivery of the tracked Bombardier in February. This acquisition, which includes a 200-gallon pumper unit, will play an important role in controlling wildfires and enhancing prescribed burn operations.

Marsh biannual and annual evaluation plots were burned in appropriate rotations again this year without incident. These areas will be evaluated in future years to determine the difference between annual and biannual burning rotation on marsh vegetation regeneration. This is a significant question relating to marsh loss, and the answer will provide an important management direction for remaining marshes at Blackwater.

Blackwater has made great strides in developing and enhancing a more successful fire program. With the increased emphasis on safety, utilizing aerial ignition and having adequate equipment to control prescribed burns and to respond to wildfires become increasingly important.

While the majority of the refuge burning program consists of marsh burning in January-March, several agricultural fields were burned in July to remove dead vegetation prior to mechanical cultivation for buckwheat planting.



Grass fields were strip burned to remove winter ryegrass residues prior to planting buckwheat. GAC 8/91

Staff time expended on prescribed burn and fire management activities (excluding training and program/report preparation) during the 1990-91 season totaled 55 staff days:

Prescribed burning, aerial	11.3 staff days
Prescribed burning, post-aerial	22.4 staff days
Wildlife pre-suppression	18.5 staff days
Wildfire suppression	2.8 staff days

Salary cost for these staff hours was \$5493. Seasonal firefighter salaries totaled \$12,770. Cost of helicopter aerial ignition totaled \$5,432 (\$4,282 for OAS flight time and \$1,150 for incendiary ping-pong balls). Final cost of the refuge program (excluding training, fire supplies and equipment) for the 1990-91 burning season was \$23,695.

FY91 BURNING ACTIVITIES - BLACKWATER NWR							
UNIT	MARSH ACREAGE	ACRES MARSH BURNED	ACRES WOODS BURNED	NUMBER WILD- FIRES	WILDFIRE ACREAGE BURNED	GROUND IGNITION ACRES	AERIAL IGNITION ACRES
A	480	400	-	2	55	-	345
B	190	170	-	1	30	125	15
C	175	120	-	-	-	120	-
D	60	50	3	1	8	45	-
E	200	160	-	-	-	50	110
F-I	235	194	-	1	49	115	30
G	530	450	-	-	-	50	400
H	500	450	-	-	-	-	450
J	475	176	-	2	6	150	20
K	380	300	-	1	15	255	30
L	760	380	-	-	-	200	180
M	200	175	10	1	15	110	60
N	607	381.2	-	6	191.2	20	170
P	378	300	-	2	90	-	210
Q	200	180	-	3	70	-	110
TOTALS	5370	3886.2	13	20	529.2	1240	2130

10. Pest Control

Following aerial waterfowl surveys in April and May, several overpasses of the refuge were made to check for pine bark beetle infestations. Two possible sites were observed: one turned out to be a lightning strike area and the second could not be located from the ground. Continued aerial monitoring will be conducted as bark beetle infestations are heavy in some areas south of the refuge.

Gypsy moth traps were placed in ten locations scattered across the refuge as they have been in the past 10⁺ years. Results are summarized in the following charts.

1991 will probably be the last year of moth trapping, as egg masses are now being found on the refuge. Once this occurs, infestation of this pest has begun and the traps no longer provide an accurate index to the pest population size. The next procedure is to survey egg masses in marked plots to determine intensity of the infestation.

Some moderate defoliation was observed in several areas of the refuge. The most heavily defoliated forest was on the Luthy Tract and the newly purchased Pascal Tract; both areas are prime Delmarva fox squirrel habitat.

GYPSY MOTH TRAPPING RESULTS	
1987-1991	
YEAR	# MOTHS CAUGHT
1987	722
1988	2186
1989	2170
1990	3435
1991	3428

GYPSY MOTH EGG MASS SURVEY RESULTS		
1990-1991		
Plot Number	# Egg Masses/Acre	
	1990	1991
1	40	80
2	0	480
3	0	2240
4	40	1600
5	0	0
6	0	0
7	0	960
8	0	40
9	0	0
10	0	0
11	0	0
12	0	0
1990 Range = 0-40 egg masses/acre		
Average = 7 egg masses/acre		
1991 Range = 0-2240 egg masses/acre		
Average = 338 egg masses/acre		

Forty acres of phragmites were aerially sprayed with Rodeo®, using a contracted helicopter. Twenty acres were spot-sprayed in Pools, 1, 4, and 5. An additional 20 acres of phragmites-infested tidal areas adjacent to refuge pools were also sprayed.

Small areas of Johnsongrass and Canadian thistle were hand spot-sprayed with Roundup® herbicide. These small infestations occurred in refuge fields and along dike shoulders. Control of these noxious weeds is required by Maryland law.

Herbicides used during force account farming operations are charted below:

1991 HERBICIDE USE DURING FORCE ACCOUNT FARMING OPERATIONS.		
<u>Chemical</u>	<u>Acreage Treated</u>	<u>Target Species</u>
Roundup®	spot spraying	Johnsongrass, Canadian thistle
Dual®	135 acres	Annual grasses and weeds
Blazer®	7 acres	Annual weeds

Regional restrictions on the use of the herbicide atrazine or any blends containing atrazine seriously restricted refuge options. The refuge utilized the herbicide Dual®, which is primarily a grass control, and planned cultivation or post-emergent spraying if weed escape became too great. No post-emergent spraying was conducted, but wet weather prevented cultivation in some areas. Weed competition was heavy in some areas, but it was felt that it could be tolerated in order to minimize herbicide use. The primary problem weed was morning glory. While mechanical weed control was successful this year, long-term weed problems may result despite crop rotations, rotary hoeing, and cultivation. The timing of mechanical control is so weather-dependent that other actions (post-emergent spraying) must be available if needed. While the refuge recognizes the importance of reducing chemical use, it is nevertheless frustrating to watch your investment and work to produce a crop get hampered by weeds and insects. We are growing these crops for wild-life, not for profit; however, the average farmer sees money draining from his bank account and gets out the sprayer and some potent chemicals to take care of his problem. We sympathize to a degree.

All herbicide treatments on the refuge were conducted under the direction of BioTech Giese, a certified pesticide applicator. Maintenance Mechanic Webster was also certified as a private pesticide applicator in order to become familiar with agricultural chemicals, their uses and application.

G. WILDLIFE

2. Endangered and/or Threatened Species

Blackwater habitat is host to three endangered species. The bald eagle and the Delmarva fox squirrel are year-round residents and the peregrine falcon is occasionally observed migrating through the area.

a. Bald Eagles

Bald eagles utilize the refuge expanses of marshes, open water, and upland areas to feed throughout the year. Migrating eagles from both the north and south utilize the Chesapeake Bay region as a wintering area. Resident eagles nest along wooded edges of refuge and throughout the County.

The National Wildlife Federation's Mid-Winter Bald Eagle Survey was conducted at Blackwater on January 14 from 10:00-10:30 a.m. Eleven refuge and Maryland Department of Natural Resources personnel participated in the survey and observed a total of 50 bald eagles: 17 adults, 18 immatures, and 15 unknown. One adult golden eagle was also sighted.

Also on 1/14, an evening survey was conducted of the Smith tract eagle roost, and 41 eagles (including 5 adults) were observed entering the primary roost site. Another 9 eagles (including 3 adults) were observed entering a secondary roost site adjacent to Pool 4.

Periodic checks were made of these two eagle roosts during late winter and spring. Roost use was estimated to be between 30-70 eagles until late April, when use began to decline to 5-10 birds.

During aerial waterfowl surveys in January and February, refuge staff checked refuge eagle nests to determine activity and production. The Maryland Department of Natural Resources conducts aerial surveys in the region to determine nest use and success, but these surveys normally do not begin until mid-February. The refuge surveys provided a more accurate and timely status of nest use, for application in determining management activities such as trapping in closed areas around nests.

The refuge and Maryland DNR aerial surveys found a total of six eagle nests on the refuge. The refuge nests successfully fledged 13 young; an additional 10 nests adjacent to the refuge (2 miles) produced 17 young; and 11 nests scattered throughout the remainder of the County raised

21 young. This total of 51 young fledged from 26 productive nests (or 1.96 young per nest) is a record number for both the County and the refuge.

Negotiations were finally completed with one of the adjacent landowners for acquisition of a tract next to the eagle roost. The Conservation Fund purchased the 475-acre tract and the Fish and Wildlife Service took title on April 1, but not before some extensive timbering occurred adjacent to the roost. Despite assurances from the landowner that a buffer would be left around the boundary adjacent to the roost, virtually every tree was removed. However, eagle utilization of the roost does not appear to have been affected.

Contrary to the problems of past years, Dorchester County eagles did not experience any fatalities or injuries in 1991, at least that we can document. Hopefully this positive trend will continue.

b. Delmarva Fox Squirrels

Blackwater continues to support one of the largest remaining populations of Delmarva fox squirrels, which formerly ranged from southeastern Pennsylvania through the Delmarva Peninsula to Northampton County, VA. To date, this species is found naturally in six counties on Maryland's Eastern Shore and two locations in eastern Virginia, and has been reintroduced in two locations in Delaware and other areas of Maryland.

The Delmarva Fox Squirrel Recovery Team held one meeting during the year and, as part of updating the recovery plan, identified two areas on Blackwater as benchmark population sites. These benchmark locations, one in predominately pine forest and one in old-growth mixed pine/hardwood forest, will be surveyed once every two years (one site per year) to monitor the population status of the squirrel on Blackwater by determining a population estimate through a mark-recapture study. BioTech Giese serves as a member of the Delmarva Fox Squirrel Recovery Team.

The first population monitoring survey in the hardwood/pine area was initiated during March. (See Section D.5.). An estimated 44 Delmarva fox squirrels live in the 52-acre block of woodland.

The refuge staff marked survey lines/points and installed nest boxes in the pine benchmark study area for future censusing. In order to duplicate the same procedures in the hardwood/pine area that were established several years ago, 29 trapping points and 58 nest boxes were placed in this area.

The Blackwater staff built the needed 58 squirrel boxes for the pine site, as well as an additional 50 nest boxes for Eastern Neck National Wildlife Refuge and 50 for the Maryland Department of Natural Resources for their benchmark population monitoring sites.

On March 19, Dr. Nancy Moncrief of the Virginia Natural History Museum and Dr. Cindy Driscoll of the Patuxent Wildlife Research Center necropsied 41 Delmarva fox squirrels at the refuge. (See Section D.5.e.) Most of these squirrels were roadkills found along Key Wallace Drive and other roads in the county. Late 1990 and 1991 were bad years for Delmarva fox squirrels in terms of encounters with automobiles, with an abnormally high number of squirrels collected from County roads.

Delmarva fox squirrel surveys were conducted the last two weeks of October and early November. These surveys are fixed-point timed surveys in which the observer goes to a marked location and observes for 30 minutes. The first 10 minutes are not surveyed to minimize the disturbance factor of entering the area. The observer then records the number of Delmarva fox squirrels and gray squirrels, and notes the mass crop status. This year's survey suggested that both Delmarva fox squirrel and gray squirrel populations may be somewhat depressed from 1990 levels.

Due to observations of spot outbreaks of southern pine bark beetle and with the movement of gypsy moth into the area, BioTech Giese requested U.S. Forest Service assistance in monitoring and evaluating forest pest problems and their effects on Delmarva fox squirrel habitat. Refuge monitoring of gypsy moth populations through scent traps and egg mass checks has been conducted for a number of years by the Forest Service with refuge staff assistance. A meeting was held on October 30 to train refuge staff to identify the levels of pest populations where control is recommended and can occur in a timely manner if approved. In addition, on-site training from Forest Service personnel will be scheduled for 1992 to assist refuge staff in identifying and counting gypsy moth egg masses. Regional forester Allen Carter attended this meeting, and will be developing a regional policy for spraying/threshold levels as well as preparing the required EIS and Section 7 approvals. The ongoing GIS habitat mapping now being developed will be of great assistance in determining habitat types susceptible to gypsy moth attack.

c. Peregrine falcons

One sighting was made, during the fall of 1991, of a peregrine falcon. This adult male was believed to be passing through the area.

3. Waterfowl

The predominant management focus at Blackwater NWR continues to be on waterfowl. Innovative and more intensive management practices are being incorporated into the refuge's waterfowl program in the face of declining continental, flyway, State, and refuge waterfowl populations. For a third consecutive year, cooperative farming has been replaced by force account farming, with refuge staff and equipment conducting all aspects of cropland production. This ensures that all of the resulting crops are left for waterfowl, primarily geese. (See Section F.4.). Another new direction for the refuge is moist soil management, which is converting an increasing number of acres of refuge impoundments from croplands to natural foods for waterfowl (primarily ducks). Finally, a most recent focus is phasing the refuge croplands into sustainable agriculture, emphasizing reduced pesticide use and increased use of no-till and organic fertilizers.

In November 1990, Blackwater NWR drafted and set new five-year waterfowl objectives for the winter seasons 1990-91 through 1994-95. The scope of the new objectives was broadened to reflect and address the primary purpose for which the refuge was established: to provide habitat for migrating and wintering birds. Historically, peak populations of waterfowl occur on the refuge during the fall migration period from mid-November to mid-December. Some of these peak population birds migrate, leaving a relatively stable wintering population. Therefore, Blackwater NWR waterfowl objective numbers are two-phased: mid-winter and peak.

Mid-winter refuge objective numbers are based on a percentage of the most current Maryland DNR objective numbers, for the following reasons: 1) the refuge habitat and management practices are similar to the State's; 2) the refuge mid-winter population is an integral part of a relatively stable, State-wide mid-winter population; and 3) the State conducts comprehensive surveys only during the mid-winter period. Peak objectives are based on the refuge's average peak for the last ten years.

The most current Station Management Plan for Blackwater NWR therefore reflects the following new objectives:

Canada Goose Objective: High Priority

- Provide sufficient habitat to maintain migrating and wintering Canada geese in good health:
 - 1) a mid-winter (January count) population of 20,000; and
 - 2) an annual peak population of 50,000.

Dabbling Duck Objective: High Priority

- Provide sufficient habitat to maintain migrating and wintering dabbling ducks in good health:

- 1) a mid-winter (January count) population of 10,000;
- 2) an annual peak population of 20,000.

The following two tables represent the years and number of waterfowl utilized in setting the objectives. The ten-year peaks and mid-winter tables (1980-89 and 1981-90, respectively) correspond to the same ten-year waterfowl over-wintering period, i.e., winter seasons 1980-81 through 1989-90.

MID-WINTER WATERFOWL COUNTS (1981-1990) USED FOR SETTING 1991-1994 OBJECTIVES				
	---Canada Geese---		--Dabbling Ducks--	
	<u>BLK NWR</u>	<u>STATE</u>	<u>BLK NWR</u>	<u>STATE</u>
1981	20,000	607,700	12,575	75,300
1982	20,000	432,200	5,325	44,500
1983	25,000	567,200	6,900	41,600
1984	23,000	457,200	5,250	43,100
1985	20,000	486,000	10,335	38,000
1986	15,000	544,600	6,125	50,600
1987	15,000	377,900	14,675	65,000
1988	15,000	312,000	7,050	49,900
1989	20,000	263,400	5,575	59,200
1990	18,000	250,900	6,675	57,900

BLACKWATER NWR WATERFOWL PEAKS 1980-1989 USED IN SETTING 1991-1995 OBJECTIVES		
	<u>TOTAL DUCKS</u>	<u>CANADA GEESE</u>
1980	35,375	60,000
1981	16,050	55,000
1982	24,400	65,000
1983	21,000	60,000
1984	14,500	55,000
1985	14,775	45,000
1986	17,125	40,000
1987	17,040	30,000
1988	9,035	35,000
1989	12,600	25,000

1991 waterfowl survey methods were implemented according to the Wildlife Inventory Plan revised in 1990. Aerial surveys were scheduled for every other week during the winter, with regular ground/water surveys alternating every other week between the aerials. The new waterfowl inventory procedure also included fixed-point ground surveys. The fixed-point surveys were conducted the morning preceding each aerial survey if geese were detected flying out of the refuge, and continued on the ground while the aerial surveys were in progress if geese were observed flying into areas that had already been covered by air.

Comparisons of Maryland DNR and Blackwater NWR mid-winter (January) waterfowl counts for the last five years and for 1991 are shown in the first table below. Peak waterfowl counts (usually November-December) are similarly charted in the second table.

WATERFOWL MIDWINTER COUNT COMPARISONS							1986-1991	
-----Maryland Mid-Winter-----								
	1986	1987	1988	1989	1990	5-yr. Mean	1991	
Canada geese	544,600	377,900	312,000	263,400	250,900	349,760	331,900	
Snow geese	53,000	50,300	61,400	105,000	11,200	56,180	78,300	
Dabblers	50,600	65,000	49,900	59,200	57,900	56,520	78,000	
Tundra swan	30,200	25,700	22,100	28,500	20,600	25,420	23,100	
-----Blackwater NWR, January (first week)-----								
	1986	1987	1988	1989	1990	5-yr. Mean	1991	
Canada geese	15,000	15,000	15,000	20,000	18,000	16,600	20,000	
Snow geese	3,000	2,600	3,500	2,500	2,000	2,720	3,500	
Dabblers	6,150	14,700	7,050	5,600	6,700	8,040	13,600	
Tundra swan	900	1,000	100	50	100	430	200	

BLACKWATER NWR WATERFOWL PEAK COUNTS		1986-1991					
	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>Mean</u>	<u>1991</u>
Canada geese	40,000	30,000	35,000	25,000	28,000	31,600	30,000
Snow geese	3,000	3,500	4,000	3,600	3,550	3,530	6,000
Dabblers	17,125	17,040	9,035	12,600	20,839	15,328	21,350
Tundra swan	1,200	1,000	500	450	350	700	1,200

We met our refuge waterfowl objective numbers in three of the four categories in 1991. Canada geese peaked in November 1991 at 30,000, somewhat short of the objective of 50,000. The mid-winter Canada goose count of January 1991 at 20,000 met the goal of 20,000. Dabbling ducks peaked in December 1991 at 21,350, slightly above the mark at the 20,000 objective level. Lastly, the mid-winter dabbling duck count in January 1991 also exceeded the goal at 13,600, with the objective 10,000.

Overall waterfowl use at Blackwater NWR for 1991 was above average when comparing use-days from the table above. The total use-days for 1991 of 6,354,928 was considerably above the 1986-90 five-year mean of 5,647,657 and above last year's total of 5,665,825. **Obviously, our new management programs are working to benefit waterfowl!**

WATERFOWL TOTAL USE-DAYS	
1986 - 1991	
1986	6,570,666
1987	5,548,874
1988	4,900,838
1989	5,552,084
1990	5,665,825
5-yr. mean	5,647,657
1991	6,354,928

Canada goose use-days for the year were down: 2,828,225 in 1991, compared to 1990's 3,029,107. Most of the Canada geese left the refuge the first week of March; the first fall arrivals appeared in early October. Canada geese peaked the first week in November at 30,000.

Snow goose use-days for the year were 544,040 compared to last year's 350,213. All snow geese had left the refuge by mid-March and the first group of fall arrivals of 50 appeared the first week of October. Snow geese peaked the first week in December 1991 at 6,000. Total Canada and snow goose use-days this year were 3,372,265 (last year's total was 3,379,320).

Tundra swan use-days for 1991 were 39,420, compared to 38,035 for 1990. Swan numbers dwindled all spring until the last 25 migrants left the third week of March. The fall swan population began on the refuge the last week of October and peaked at 1,200 the last week of December 1991.

Duck use-days for the year totaled 2,943,243; last year's total was 2,248,470. Spring duck migration from the refuge occurred generally the first two weeks in March and fall arrivals began appearing in mid-September. The peak duck population occurred the last week in December with 21,395 birds. Mallards peaked at 10,000, black ducks at 2,000, pintails at 1,500, and green-winged teal at 2,800. Coot populations were nonexistent, with no more than 25 seen the entire year.

WATERFOWL PEAKS/USE-DAYS		
BLACKWATER NWR		
1991		
SPECIES	1991 PEAK	USE-DAYS
Canada geese	30,000	2,828,225
Snow geese	6,000	544,040
Tundra swan	1,200	39,420
Mallards	10,000	2,626,785
Black ducks	2,000	
Pintail	1,500	
Green-winged teal	2,800	

Wood duck use on the refuge peaked in mid-October: 2,000 were counted during a fall roost inventory by BioTech Giese. Wood duck production, which was determined from a complete check in July-August, totaled 482 wood ducks to flight. Another 150 wood ducks were estimated to have been produced from natural cavities.

ANNUAL REPORT FORM WOOD DUCK BOX PROGRAM INFORMATION-1991	
Total boxes up:	<u>197</u>
Total usable boxes:	<u>197</u>
Use by wood ducks of usable boxes:	<u>177</u>
Number successful boxes used by wood ducks:	<u>85</u>
Use by other ducks:	<u>0</u>
Period/# boxes checked:	
May-June	<u>0</u>
July-Aug.	<u>197</u>
Use by other wildlife:	
Starling use was extensive: 109 boxes out of 197.	
Great crested flycatcher use was detected in 4 boxes, and flicker use in 1 box.	
Total wood ducks hatched: *	<u>963</u>
Wood duck broods produced:	<u>85</u>
# surviving to flight stage:	<u>482</u>
Plans for next year:	
<input type="checkbox"/> More boxes	
<input type="checkbox"/> Fewer boxes	
<input type="checkbox"/> Entrance holes created in trees	
<input type="checkbox"/> No change	
<input checked="" type="checkbox"/> Other:	Relocate selected boxes or groups of boxes from marsh or otherwise open habitat where starling interference tends to prevail, to the edge of forested habitat where it seems to be discouraged.
* Not including dead wood duck young found in box.	

Other refuge waterfowl production estimates in 1991 were as follows:

Canada geese	125
Mallard	225
Black duck	130
Gadwall	15
Blue-winged teal	20

By late June, 13 molting adult resident Canada geese had produced approximately 125 young, mainly around and within refuge impoundments. About 60 of the adults were breeders and about 65 were non-breeders. Off-refuge resident geese in July and August that had finished molting moved to the refuge, adding another 125 birds and bringing our total to 380. To prevent repetition of refuge crop depredation problems experienced in previous years, some of the geese were captured and relocated by Maryland Dept. of Natural Resources and refuge personnel.

Also in cooperation with Maryland Department of Natural Resources, the refuge participated in the 1991 Migrant-Resident Canada Goose Study, by banding and neck-collaring resident and wintering geese. See section G.16.

4. Marsh and Water Birds

Great blue herons, the primary species in this category, utilized the refuge year-round. Green-backed herons, little blue herons, American egrets, snowy egrets, cattle egrets, and glossy ibis returned to refuge marshes in mid-March. Refuge impoundments are heavily utilized during drawn-down periods. Most colonial birds leave the area in October/November, depending on weather conditions.

Double-crested cormorant numbers have risen significantly over the past several years, perhaps due to increased salinities of refuge waters, with a peak of 150 observed scattered through-out the refuge.

5. Shorebirds, Gulls, Terns, and Allied Species

Large flocks of herring and ring-billed gulls were observed in refuge fields following March rains. Large, mixed flocks of laughing and herring gulls utilized refuge fields during farming operations in April, May, and June.

Shorebird utilization of mudflats in drawn-down pools was again noted during September following some light flooding from rainfall, and dowitchers and dunlins were frequently

observed in Pool 1. Many shorebirds were also found on tidal mudflats throughout the marsh areas. Jack snipe and killdeer were frequent users of these areas.

6. Raptors

Bald eagles are the most prominent raptor found on the refuge, and are the major focus from the general public and refuge activities. In 1991, there were 6 active nests on the refuge and 9 immediately adjacent to the boundary. Dorchester County supported a total of 26 nests, which produced 51 young. The refuge's peak eagle use occurs during late winter and early spring, primarily at several roost sites that supported 75+ eagles at their peak. These roosts, located on the east side of the refuge, consist of a primary roost and a secondary roost approximately one-half mile from the primary roost. Another roost is located on the west side of the refuge and has been found to support 3 to 10 eagles. Blackwater is now supporting record numbers of eagles throughout the year. Most of these are bald eagles, but golden eagles also use the refuge. Golden eagle use was estimated at three to four birds during the winter months.

Red-tailed hawks, American Kestrels, and Northern harriers are the most common hawk species, with red-shouldered and sharp-shinned hawks seen occasionally. Red-tailed hawks nest in several locations on the refuge. Large migrations of kestrels pass through the refuge every fall.

On 11/19, an immature red-tailed hawk with an injured talon was captured by refuge staff and transported to a local rehabilitator. The bird was dehydrated and starving, and soon died.

Barn, barred, screech, great horned, and short-eared owls are all found on the refuge. All species except short-eared owls, which winter on refuge marshes, nest on the refuge. Barn owls nest in nest boxes, duck blinds, and the peregrine tower. All eight barn owl nesting structures were utilized, with a first nesting beginning in March and a second nesting in September or October. In 1991, 75 barn owls hatched, and 74 fledged; if these, 38 were leg-banded by refuge staff in cooperation with the Maryland Department of Natural Resources' ongoing study.

Another raptor species of prominence that nests on the refuge is the osprey. Osprey arrived back on the refuge in early March, and began nesting activities shortly thereafter. Of the 30 nesting platforms available, 17 were used. A total of 39 young fledged from refuge nests, and an additional 8 fledged from 5 nest sites adjacent to the refuge. Osprey

normally leave the area by mid-September, but this year several were observed on the refuge as late as the beginning of November.

7. Other Migratory Birds

The refuge hosts small populations of migratory game birds such as mourning doves, American woodcock, and crows. Mourning doves are heavily hunted in the area, with hunters relying primarily on sunflower food patches as their lure. Mourning doves peaked in the fall at 200-300, and small populations nested on the refuge during the summer. American crows now nest more frequently on the refuge; major flights are observed primarily in the fall and early winter. These migrations are also mixed with fish crows, which utilize the western portion of the refuge closer to the Bay. Crows continue to be a primary waterfowl nest predator on the refuge. The local pen-reared mallards which are scattered throughout the area are particularly hard hit due to their vulnerable nesting habits.

American woodcock are year-round residents with nesting occurring. Significant numbers of woodcock were observed during February and March. On October 23, Woodcock Biologist Greg Sepik toured several areas of the refuge with Wildlife Biologist Hartis and BioTech Giese. Areas with existing habitat potential were visited and management techniques discussed. Future management for woodcock is planned in some woodland areas.

Songbirds migrate through the area: myrtle warblers, pine warblers, white-throated sparrows, and red-winged blackbirds are some of the major species. Several food plots were planted by the refuge staff to provide food for songbirds and to enhance viewing opportunities for visitors.

Refuge staff have been active in providing artificial houses for various songbird species to increase nesting sites and to enhance interpretive efforts. Six purple martin houses are located around the residences, office, and visitor center, and all were used. Prothonotary warbler boxes were placed in several refuge impoundments.

1991 was the seventh year of the bluebird nest box program at Blackwater. Of the 39 available at locations throughout the refuge, 23 boxes were used and 69 bluebirds were fledged. Bluebird boxes were also utilized by Carolina wrens and chickadees. English sparrows were removed when possible to reduce competition.

BLUEBIRD NEST BOX PRODUCTION, 1987 - 1991					
	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
Bluebirds fledged	147	124	145	120	69
Other Species	42	11	30	14	37

8. Game Mammals

Muskrat and nutria surveys were conducted in November and December. Muskrat numbers remained at a low level in refuge marshes despite good weather and water conditions during the spring and summer. Despite low fur prices (70¢ on average) and low trapper interest, 3,614 muskrats were taken from refuge marshes.

Major vegetation damage is being observed throughout the refuge. This damage combined with rising sea and salinity levels are reverting many areas of vegetation to open waters and mudflats at an alarming rate. The Nutria Distribution Study, initiated in 1989 by the Maryland Department of Natural Resources and the refuge to determine nutria population status in the County, was discontinued in 1990 because of lack of funds. The refuge, however, continued its rebate program in order to encourage take of nutria as well as assist in determining population status. The rebate program offered refuge trappers \$1.50 per nutria tail, up to the amount of their bid. In order to assure that rebate nutria were taken on the refuge, trappers were required to call prior to the hunt and to bring nutria tails (evidence of kill) into the office the same day. At the close of the 1990-91 trapping season, \$2,215.50 was rebated to trappers from \$2,943.47 available from bid collections. All 12 refuge trappers participated, taking a total of 1,477 nutria. The refuge staff also removed nutria when possible during burning operations.

Nutria populations were estimated, utilizing inventory procedures, at 7,750, up from 5,700 in 1990. A mark-recapture study was initiated on Unit G in the interior of the refuge: 81a nutria were tagged on the unit prior to the trapping season, and 560 nutria were taken on this area, including 34 tagged animals. Utilizing the Lincoln index mark-recapture procedure (see below) an estimated 2.4 nutria per acre can be found on this unit of marsh.

LINCOLN INDEX MARK-RECAPTURE PROCEDURE TO
ESTIMATE NUTRIA POPULATIONS: $N = Tn/t$

T = number marked in the pre-census period
t = number of marked animals trapped in the
census period

n = total animals trapped in the census period
N = population estimate

$N = \frac{81 \times 530}{34} = 1263$ on 530 acres = 2.4 nutria/A.

Trapping of muskrat, nutria, fox, raccoon, skunk, and opossum is a traditional use of Dorchester County marshes. These activities have continued on the refuge to prevent over-population and disease, and to protect marshes, dikes, roads, and nesting waterfowl.

Red and gray fox are present on the refuge, with red fox the dominant species. Raccoons were extremely abundant on the refuge, but only 31 were taken by refuge trappers due to low fur prices.

River otter are present on the refuge; although they can legally be taken in the State, they are protected here. Approximately 30 otter frequent refuge marshes and are seen periodically by staff and visitors.

The eastern gray squirrel and the endangered Delmarva fox squirrel populations were estimated to have decreased during 1990. This estimate was based on the annual trend survey using a time count at 60 locations in refuge woodlands.

The refuge woodlands support two species of deer: the whitetail deer primarily use upland fields and forests, and the exotic sika deer prefer wetland woods and marshes. Trend data from monthly spotlight surveys, conducted October through March, suggest that the whitetail herd may have increased slightly while the sika population in certain areas of the refuge may have declined. A two-day deer hunt was held on December 3 and 5. (See Section H.6.)

10. Other Resident Wildlife

The bobwhite quail population appears to be stable on the refuge, with a number of coveys observed throughout the refuge. Agricultural field filter strips seeded in Serica and Korean lespedeza were maintained for cover and food. Small food plots were also planted for small birds and mammals.

The wild turkeys transplanted by the Maryland Forest, Park and Wildlife Service on an area north of the refuge are well established, and were observed periodically on the refuge. The hunting pressure from a spring gobbler season should have distributed the young birds throughout more of the area.

On 4/2, a turkey management seminar was held at Blackwater. Conducted by Maryland Department of Natural Resources, the meeting focused on the biology of Eastern Shore wild turkey, relocation efforts, and hunting safety and etiquette. Approximately 20 local residents attended the seminar.

15. Animal Control

Nutria and their over-population remain the largest concern of the refuge staff. Major marsh vegetation loss is occurring throughout the refuge. This nutria damage to vegetation combined with the rising sea levels and increased salinity are changing refuge marshes into ponds and mudflats. This year's mark-recapture nutria study estimated a population of 2.4 nutria per acre (after 1,000 nutria were taken from the study unit the previous year). Another mark-recapture study is planned for this unit in 1992 to monitor nutria populations. Refuge trappers are taking increasing numbers of nutria despite the fact that no fur market is available. (See Section H.10)

Two local turtle trappers were issued Special Use Permits to take snapping turtles from the refuge's impoundments and open water areas in order to reduce predation on waterfowl. These trappers removed 39 turtles, weighing a total of 387 pounds.

The refuge continues to receive deer crop depredation complaints from adjacent landowners in the Kentuck Swamp area north of the refuge. Despite the refuge deer hunting that occurred in this area, the take of whitetails was very limited: only 7 whitetails were taken during 2 days of hunting by 39 hunters. The 1992 deer hunt will attempt to rectify this problem by opening the forested area around the Wildlife Drive to 15 hunters. It is believed that this area has been utilized by the deer herd as a sanctuary in past years.

16. Marking and Banding

In cooperation with Maryland Department of Natural Resources, the refuge began leg banding and neck collaring in 1991 as participants in the Migrant-Resident Canada Goose Study. A quota of 200 Canada geese was assigned to the refuge as a post hunting season goal for winter migrants. Two rocket net shots on 2/7 and 2/15 resulted in the capture and marking of 208 geese utilizing 178 of the new type of flexible collars and 30 of the older hard plastic collars.



The refuge banded 208 post season winter migrant Canada geese; 178 were fitted with the new flexible white collar as shown and 30 were marked with the old hard plastic yellow collar. GCH 2/91

As part of the comprehensive Migrant-Resident Canada Goose Study, refuge staff neck-collared 59 adult resident Canada geese on the refuge from June 28 through July 8. In addition, 89 flightless young were captured and relocated without collaring. All flightless young and molting adults were captured by driving the birds by land into wire holding pens fitted with funnel-shaped wings.

The refuge goose quota for summer resident neck-collaring was 50 birds. By design, the study required that all resident geese fitted with white flexible collars would be released on the site where captured and that no young-of-the-year would be marked. As a spin-off study, the refuge was allowed to utilize yellow flexible collars on adult resident geese that were captured on the refuge and relocated to Martin NWR. The relocation of these adults and some of the young not only benefitted the refuge in curtailing crop damage, but also provided a test of our theory that many relocated birds eventually return to the refuge. By year's end, 9 of the 17 yellow-collared adults taken to Martin NWR had returned to Blackwater, accompanied by numerous uncollared young-of-the-year birds that were then at flight stage.

BLACKWATER NATIONAL WILDLIFE REFUGE RESIDENT CANADA GOOSE BANDING SUMMARY - 1991						
Date Captured	Number Captured	---Flexible Collars---			Release Site	
		White	Yellow	None		
6/28/91	63	8 adults	17 adults	38 young	BLK NWR	6/28
					GLM NWR	6/28
					GLM NWR	6/28
7/03/91	36	1 adult		35 young	BLK NWR	7/03
					Deal WMA	7/05
7/05/91	11	3 adults		8 young	BLK NWR	7/05
					Deal WMA	7/05
7/08/91	38	30 adults		8 young	BLK NWR	7/08
					GLM NWR	7/08
TOTAL	148	42	17	89		
Summary: 59 - adults captured 89 - young captured 42 - adults white collared, released on Blackwater 17 - adults yellow collared, released on Martin NWR 46 - young not collared, released on Martin NWR 43 - young not collared, released on Deal Island Wildlife Management Area by Maryland Dept. of Natural Resources						



Project Leader Carowan has a firm grasp on the problem of refuge resident Canada geese. Yellow flexible collars were fitted to some adult summer resident birds as a refuge spin-off study under the Maryland's new Migrant-Resident Canada Goose Study. LPH 7/91

Eartagging of the endangered Delmarva Peninsula fox squirrel for a mark-recapture population study was repeated in 1991. See Section 5.D.

Population estimates and densities for nutria were also obtained by mark-recapture. See Section 5.B.

Refuge staff banded 38 barn owls young from nest boxes located throughout the refuge marsh. This banding was in cooperation with an on-going study by Maryland Department of Natural Resources. See Section G.6.

Blackwater NWR staff assisted Maryland DNR personnel in live-trapping and marking (eartagging) 49 sika deer on the refuge in February and March (see table). None with eartags was taken in the refuge fall harvest.

The refuge also cooperated with the State in providing sika deer specimen collections (reproductive tracts, etc.) to George Feldhamer and a graduate assistant from Southern Illinois University, at the refuge check station. Their interest is to determine the percentage of fawns that are reproductively active at the time of the fall harvest.

SUMMARY OF SIKA DEER TAGGED
1991

Date	Location	Juvenile ♂	Adult ♂	Juvenile ♀	Adult ♀	Recap- tures	TOTAL
2/23	BNWR (RT335)	2	1	1	2	-	6
2/26	BNWR (RT335)	2	0	3	8	-	13
2/27	Gootee (RT336)	-	-	-	-	-	0
3/1	BNWR (RT335)	1	-	3	2	-	6
3/5	Gootee (RT336)	-	-	1	3	-	4
3/5	BNWR (RT335)	2	1	3	2	-	8
3/8	BNWR (Robbins)	2	3	1	3	1	10
3/12	BNWR (Robbins)	1	1	1	1	-	4
3/15	Montchester	4	1	4	-	-	9
3/17	BNWR (Robbins)	1	1	-	-	-	2
3/25	Spicer (Keane)	1	2	1	-	-	4
3/30	Spicer (Keane)	<u>3</u>	<u>-</u>	<u>1</u>	<u>-</u>	<u>-</u>	<u>4</u>
TOTALS		19	10	19	21	1	70

Blackwater: 49 of the 70

17. Disease Prevention and Control

On March 1, Carowan, Barker, Hartis, and Giese attended a seminar on rabies conducted by the Maryland Public Health Department and Department of Natural Resources anticipating spread of the disease to our area.

A DVE outbreak was documented near the refuge in Dorchester County in April, and responded to by staff from the Madison lab as follows:

"TELEPHONE MESSAGE

To: Kathy Converse
From: George Haas
Date: May 7, 1991
Subject: Duck Plague in Maryland

Phil Jackson, Jr. Farm, Cambridge, MD
(RT 16, 3 miles South of Cambridge--3 miles from Blackwater NWR)

Converse and Charlotte Quist went to Cambridge, Maryland to investigate the confirmed Duck Viral Enteritis (DVE) outbreak at Phil Jackson's farm. They worked at the Jackson Farm with Larry Hindman and 3 Maryland technicians. This farm was very clean and well-cared for. It is not near the water and Jackson had clean pens with a good watering and food system. Converse doubted that wild birds came in contact with the penned birds (though there were some free-flying-captive-reared mallards associated with the pens. In addition to Muscovy ducks and mallards, Jackson had one Canada goose, one pintail and one wood duck. One hundred and twenty ducks were destroyed at this farm. They cleaned and disinfected the grounds and left a pile of nest boxes and straw for Jackson to burn. Jackson will not be allowed to have birds at the farm for one year and then he will have to place sentinel birds on the facility to determine whether plague is still present.

Jackson is developing a aviculture operation on his father's farm. Last year, he raised and sold 1,100 mallards to Regulated Shooting Areas in the area. Converse will recommend that Jackson give the Service a list of the people that he sold these birds to.

Ladd Johnson sent out a press release to all Grand National Hunt members alerting them to the DVE outbreak at the Jackson farm and asking them to report any sick or dead birds. Hindman reports that he has had excellent cooperation from Johnson and the Grand National Hunt.

Haddoway Residence, Stevensville, MD (near Centreville)
(off RT 8 in Stevensville)

While in Cambridge, Converse became aware of another suspected DVE outbreak at the Haddoway residence in Stevensville, Maryland. This is a private residence with pens and a pond on the bay. It is 50 yards from the water. The pond is spring-fed. This residence is being run as a rehabilitation center (it may not be licensed). Converse and Quist went to this residence on Friday. The Haddoway's have lost 30 Muscovy ducks—6 were left and 2 of these looked sick. These birds were examined by the Maryland Department of Agriculture, Centreville, and show classic plague lesion—material was sent to Madison last Thursday. The state has placed a quarantine on this property.

This is a very sloppy facility, and hundreds of free-flying mallards use the pond. An elderly couple run this facility as a humane shelter. They possessed one Canada goose that could not fly. Converse is very concerned about this facility, because the Maryland agencies are reluctant to deal with this facility. There are a lot of ducks at risk as a result of poor management. Converse will send Hindman and Haddoway a list of recommendations (copy to me). The Maryland agencies are reluctant to require this couple to depopulate and disinfect; yet they did require a professional facility, that did not impact wild birds, to depopulate and disinfect (essentially this facility will be closed for at least 1 year). The Service has no direct authority to address this problem (exception may be if these wild birds are being held without a permit).

I contacted our Permits Office to determine whether the Haddoway residence is a licensed rehabilitation facility (it is not; however it may be a subpermittee of a licensed facility, and our Permits Office cannot determine this) and whether the Canada goose is legally held (this also cannot be determined). I called Don Patterson (Richmond LE) to request his assistance with these requests.

General

Converse will send me a brief statement about the DVE outbreaks in the Delmarva area, so that the Region can do a press release. We had 3 other die-offs in this area where DVE was suspected but not confirmed earlier this year.

END OF TELEPHONE MESSAGE"

Refuge staff continued to cooperate with the Madison Lab to monitor DVE outbreaks on the Shore. Refuge also assisted Department of Natural Resources by providing 100 bushels of shelled corn for drugging affected birds.

to the public every scheduled day except one full day and three half-days in October, between the effective dates of these temporary workers' appointments. Nevertheless, a full-time assistant ORP is needed to provide educational and wildlife-oriented programs for the schools and public.



High School Cooperative student Dorsey and two volunteers show films, run the bookstore, and answer visitors' questions at the refuge visitor center, freeing ORP Briggs for administrative duties.
MMB 7/91

2. Outdoor Classroom - Students

Dorchester County schools frequently visited the refuge, as second-graders continued their study of the Canada goose. There were 23 county school groups of 685 students that toured the Wildlife Drive, viewed a film or slides, and received an orientation to the Refuge from ORP Maggie Briggs or RecAide Ann McCready. In addition, 35 groups of 1195 students from out of the County also toured the refuge and visitor center. Of these, 28 requested orientation talks and a slide program or film before touring the Wildlife Drive. Approximately 2,060 students visited Blackwater NWR this year and received some type of orientation to the Refuge.



Even mosquitos and deerflies cannot deter the enthusiasm of these youngsters from Talbot County. MMB 7/91

In July, ORP Briggs was able to assist three groups in a closer look at a brackish-water marsh. Both the Talbot County Summer Camp of 50 students and the Maryland 4-H Summer Camp of 50 students experienced first-hand (with lens, enamel pans, and nets) the marsh, open water, and woods near the Marsh Edge Trail. The Talbot County group studied the ecology of a marsh, did marsh transects, and completed a cemetery study program. They then compared their findings with their previous investigations at Horn Point. With Leader Ken Couture, the 4-H group studied marsh ecology and food chains, and also did a marsh transect. Both groups found some relief from the summer sun and insects with an orientation and Blackwater slide program in the visitor center, followed by a tour of the Wildlife Drive. A group of 60 Dorchester County YMCA daycampers also explored the Marsh Edge Trail and Wildlife Drive.

On July 22, 24 gifted and talented high school students in the "Living with the Land, A Conservation Experience" program at Hashawha Environmental Appreciation Center went on a tour of the Wildlife Drive. This group of students also watched a film on National Wildlife Refuges and the Blackwater slide program. Maggie spoke to them on the role of the National Wildlife Refuge system, Blackwater NWR, educational training programs, and work experiences, and answered their many questions on Blackwater NWR.



Maryland 4-H summer camp students suffered the heat to learn about the marsh ecosystem at Blackwater. MMB 7/91

ORP Maggie Briggs worked with SCS District Manager Cyndi Slacum, Maryland DNR Project Forester Scott Daniels, Maryland DNR Chesapeake Bay Critical Area Watershed Forester John Bidwell, University of Maryland Horn Point Environmental and Outdoor Education Specialist Kathy Baptist, USDA SCS Soil Scientist James Brewer, and Infinity Recycling Incorporated founder Ford Schumann to hold the first annual Dorchester County Envirothon at Horn Point on April 30. Teams from North Dorchester High School and Cambridge South Dorchester High School competed in five natural resource areas: wildlife, forestry, aquatics, soils, and environmental issues (this year's topic was waste management). In addition to preparing the wildlife resource material, ORP Briggs helped prepare the students by presenting a slide program on wildlife to the teams at the two schools on April 10, 11, 17, and 18. The winning team, "Students Specializing in Saving the Environment," from Cambridge-South Dorchester High School also took top honors in the State-wide competition held in May at the Garrett County 4-H Camp near Grantsville, MD. They then competed in the National Envirothon held in Presque Isle, Maine in August. Although the Cambridge team did not win the National competition, they placed 4th and had the best score in the wildlife category. The team members were Lazzlo Ambrus, Robbie Allen, Chris Willey, Mark Asplen, and Michael Giese (the son of Biological Technician Bill Giese and a volunteer at Blackwater NWR).



Participants in the first Dorchester County Envirothon.
MMB 4/91



This Dorchester County Envirothon Team went on to win
the State competition and placed fourth in national.
MMB 4/91

3. Outdoor Classrooms - Teachers

On July 3, the University of Maryland Center for Environmental and Estuarine Studies at Horn Point held a teacher workshop at Blackwater to compare the refuge wetlands with Horn Point's.

4. Interpretive Foot Trails

Visitors continued to enjoy the year-round access to the Marsh Edge Trail as well as the Woods Trail. Many of the school groups also took advantage of the trails when time allowed. However, due to shortage of interpretive staff at Blackwater NWR, these groups were on their own in interpreting the trails. To help offset the shortage of interpretive services at the refuge, Dorchester County Soil Conservation Service and Maryland Forest, Parks and Wildlife Service provided the Dorchester County schools a guide service for the Marsh Edge Trail when their classes visited Blackwater. Tom Brannock, from SCS and also a volunteer at Blackwater, led 8 groups of 300 students from 5 Dorchester County schools on a tour of the Wildlife Drive this year. George Benjamin, a forester from Maryland Forest, Parks and Wildlife Service, led 4 groups of 100 students from 3 Dorchester County schools.

On April 2, work began on the Marsh Edge Trail wheelchair access project. (See Section I.1)

5. Interpretive Tour Routes

Except for 5 tour buses that were guided by volunteers and various groups led by Refuge staff, the 105,805 people who toured the Wildlife Drive were self-guided. Approximately 45 commercial bus tours introduced 2,136 people, mostly senior citizens, to Blackwater NWR by stopping at the visitor center (sometimes viewing the Blackwater slide program) and touring the Wildlife Drive. Some of these groups included: Sears Roebuck, Inc. Retirees; Channel Marker, Inc.; Audubon Society of New Jersey; William Hill Manor; National Zoo; SAM Seniors; Telephone Pioneers; Southern Eastern Shore Travel Council; Heron Point Retirement Community; Epsilon Kappa; Grandwood 55+ Club; St. Joseph Catholic Sodality; Strausburg Senior Citizens; Wesleyan Circle; Grace United Methodist Church group; Colgate Golden Age Club; and Ginger Cove Retirement Home.

Blackwater NWR was listed in Maryland's Travel and Outdoor Guide under the Hiking and Cycling section, in the Maryland Bicycle Touring Map published and distributed by the

Maryland Office of Tourism Development, and in the Bicycling in Dorchester County leaflet published and distributed by the Dorchester Chamber of Commerce and Maryland Department of Tourism. The distribution of these publications helped bring approximately 1630 bikers to Blackwater NWR to tour the Wildlife Drive while cycling.

The First Annual Cycle Tour for Cystic Fibrosis was held on October 12, bringing over 60 cyclists to lunch at the visitor center and then ride around the Wildlife Drive as part of their route.

On October 19, Carroll Handley was issued a special use permit to operate a mule-drawn wagon tour of the Wildlife Drive each weekend. The wagon tours were advertised to start at the visitor center at 10 a.m. on Saturdays and Sundays and run at two-hour intervals ending with a 4:00 p.m. tour. By the end of the year, Mr. Handley had given 26 tours for 183 people. In December, Mr. Handley became somewhat discouraged with the small attendance, and decided to run the wagon only when someone called and requested the tour. Maybe Mr. Handley will become more optimistic with the spring weather in 1992.



The slow-paced wagon tour is a wonderful way to enjoy the Wildlife Drive. MMB 10/91

6. Interpretive Exhibits/Demonstrations

Blackwater NWR was invited to enter their mobile exhibit at numerous shows and exhibits. The exhibit, manned by ORP Maggie Briggs and/or volunteers, introduced the refuge to a great number of people unaware of its existence, and to improve the public's understanding of refuge activities and policies. Entering the exhibit also enhanced a spirit of cooperation with other local organizations. The mobile exhibit was set up at the 46th National Outdoor Show, held February 22 and 23. This annual show drew approximately 3,000 people to view the National Muskrat Skinning Contest, Miss Outdoors pageant, and numerous displays dedicated to the trappers, watermen, sportsmen, and wildlife. The refuge mobile display was also taken to the 24th Annual Ward Art Exhibition & Sale in Salisbury Civic Center in October. Attended by approximately 7500 people, the Ward show features a wide assortment of waterfowl art, decoys and merchandise.

The refuge's participation in two other local activities - Earth Day Celebration in April involving 700 people, and Dorchester County Outdoor Showcase in September attended by 6,000 people - also recruited new volunteers.



Blackwater's mobile display suffered wind damage at the Maple Dam Elementary School Fair. MMB 9/91

On August 14 and 15, Blackwater NWR was able to get a lot of exposure to out-of-town and out-of-state people at the Northeast Agricultural and Environmental Expo held at the Salisbury Civic Center. The Expo was sponsored by the National, Delaware, and Maryland Associations of Conservation Districts and held in conjunction with the 31rst Annual NACD NE Regional meeting. Because the Expo was held on a weekday, only 800 people (mostly meeting attenders) viewed the exhibits.

Cambridge Scientific Industries paid for the refuge's exhibit space at the Dorchester Chamber of Commerce 12th Annual Seafood Feast-i-val held at Horn Point in August. ROS Jason Barker and wife Julie staffed the exhibit, and enjoyed the all-you-can-eat Maryland seafood along with approximately 1,350 other people.

The annual Maryland Forest Association Fall Forest Festival was held at the Tuckahoe Steam Engine Park near Easton on October 12. Attendance was down from last year to approximately 950 people.

The refuge exhibit was also set up at Maple Dam Elementary School Fair in Cambridge, where information was distributed to a younger audience. Approximately 800 people attended the school fair on September 29.

ORP Briggs was a judge for the South Dorchester School K-8 Science Fair on April 10 and the Dorchester County Science Fair on April 25. The top project for Dorchester County was a recycling project by sixth grader Crystal Shockley from South Dorchester School K-8.

The North American Waterfowl exhibit was displayed in the visitor center throughout the year.

Activities were organized for what may become an annual event at Blackwater NWR: National Hunting & Fishing Day. Maggie single-handedly coordinated a program of activities for September 28, including fishing, archery and blackpowder demonstrations, and hunter safety and taxidermy displays. Competing with a number of already established National Hunting and Fishing Day events, County festivals, and the first day of archery season for deer, the program was not as well attended as hoped, but was a good start for future outdoor activities and special events at the Refuge to interpret these recreational uses. The Maryland Department of Natural Resources and local sporting promoters not only enthusiastically lent their support and assistance, but encouraged the Refuge to hold the event next year.



Maryland DNR police loaned their hunter safety equipment to provide visitors with some .22 target practice at the refuge's National Hunting & Fishing Day program. MMB 9/91

7. Other Interpretive Programs

Six bird walks were held at the refuge in March, April and May, and seven more in September, October and November.

The walks were led by experienced birders Harry Armistead, Terry Allen, and Dick Kleen. Harry started the National Hunting and Fishing Day activities with the first fall bird walk, while Terry led the last one with a group of birders from the Cypress Swamp Bird Group from Prince Frederick, Maryland.

On February 9, John Bull, author of the Audubon bird guide, led a tour of 27 people around the Wildlife Drive and, in the visitor center, presented a talk entitled "Winter Birds of the Eastern Shore." Mr. Bull used bird skins to demonstrate how to identify many of the species found at Blackwater NWR. The program, sponsored by Environmental Concern of St. Michaels, MD, was available to the refuge visitors.

Off-site slide programs on Blackwater NWR were presented to the Monday Blues Homemakers meeting on October 3, and to the Daughters of the American Revolution meeting on October 9. Both presentations were well received. It is amazing that people who have lived near Blackwater all their lives have never visited the refuge.

A talk on "How Public Use and Interpretation is Used in the Management of Blackwater NWR" was given to approximately 12 participants in the Wetland Link International Group of Managers. The visiting members hold positions similar to an Outdoor Recreation Planner, in various other countries. After a discussion on Blackwater, the members picnicked and then toured the Wildlife Drive as the sun set on the refuge.

Through contacts with Nell Baldacchino, Public Use Specialist at the Patuxent Wildlife Research Center, Blackwater's Biologist Larry Hartis conducted a tour of management practices at the Refuge for three soviet guests: Dmitri Banine, Bladimir Azurow, and Alexandr Kotchergin. Managers of large land areas in Russia and western Siberia, these Soviets were interested in the management practices employed at Blackwater.

In October, Project Leader Glenn Carowan, ROS Jason Barker, and Biological Technician Bill Giese gave a tour of Blackwater to 145 members of the Maryland Forestry Advisory Board.

Several groups held meetings in the visitor center auditorium, focusing on such diverse topics such as waterfowl banding, turkey management, fire management, OAS contracting, gypsy moth control, scoping, and trapping.

8. Hunting

The refuge held a two-day, either sex, quota gun hunt for white-tailed and sika deer on December 3 and 5. Following a news release announcing the hunt, 470 applications and \$2,330.00 were received by the September 30 deadline. Hunters were allowed to apply and hunt in a group of up to three. A public drawing was held October 10 to select a quota of 290 hunters to hunt approximately 4,175 acres. Of these, 235 participated in the two-day hunt; no stand-by permits were issued. Check-in was required of all hunters in addition to mandatory checking of deer at the refuge check station. Refuge staff ran the check station, collected biological data, and functioned as a designated check station for the State.

**HUNTER DISTRIBUTION AND NUMBER OF DEER HARVESTED BY AREA
BLACKWATER NWR 1991**

HUNT AREA	HUNTERS SELECTED (2 DAYS)	HUNTERS HUNTED (2 DAYS)	WHITE-TAIL HARVESTED	SIKA HARVESTED	TOTAL	% TOTAL
A	72	54	2	4	6	9.7
B	50	39	7	1	8	12.9
C	32	25	0	5	5	8.1
D	52	44	0	14	14	22.6
E	54	47	0	27	27	43.5
F	30	26	0	2	2	3.2
H *	<u>(0)</u>	<u>(0)</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0.0</u>
TOTAL	290	235	9	53	62	100.0

* No handicapped hunter applied for handicapped only" hunt area H.



Patuxent pilot recycled damaged airplane nosecone into hunting safety. Somehow he managed to get his two deer. GCH 12/91

The table below is a summary of refuge deer harvests since 1985. It indicates a slight drop in the white-tailed harvest from a previous six-year mean of 15 to the 1991 two-day (December 3 and 5) harvest total of 9. Sikas, on the other hand, had a six-year harvest mean of 33 and in 1991 the harvest was 53. It appears that the current rate of harvest for both species must be, at the minimum, sufficient when considered with all other population factors and evidenced by the stability of the spotlight counts. Annual harvest rates and hunter success are as much a function of weather conditions during the hunt itself as any other factor. Extremes in temperature and moisture, in combination with weather patterns, may bring harvest rates up or down each year, but harvest rates average out over several years.

DEER HARVEST SUMMARY									
BLACKWATER NWR - 1991									
YEAR	WHITE-TAILED			----SIKA----			TOTAL DEER	TOTAL HUNTERS	TOTAL DAYS
	♂	♀	TOTAL	♂	♀	TOTAL			
85	5	15	20	2	0	2	22	76	2
86	14	7	21	10	10	20	41	118	2
87	5	10	15	12	37	49	64	160	2
88 ¹	9	6	15	14	19	33	48	154	2
89	13	4	17	16	46	62	79	98	2
90	4	0	4	9	25	34	38	142	2
91 ²	5	4	9	23	30	53	62	235	2

¹ First year for Jarrett Tract deer harvest.
² First year for Pascal and Slacum Tract deer harvest.

9. Fishing

Although the Refuge is closed to fishing from October 1 to April 1, the spring white perch run attracted large numbers of fishermen to Key Wallace Drive near the bridge that crosses the Little Blackwater River. A hazardous traffic problem and increased litter resulted. Project Leader Carowan has been working with Dorchester County to promote a challenge grant to provide a public parking area, fishing dock, and boat ramp. It will also be necessary to amend Title 50, CFR Regulations to allow year-round fishing and crabbing from Key Wallace Drive, but continue to prohibit it in other areas of the Refuge October 1 - April 1.

10. Trapping

Fifteen trapping units were available for public bids in the 1991 trapping season. A total of \$2,943.47 was received for trapping rights. This was significantly lower than the \$5,290.61 received in 1990. This decrease was due primarily to the low fur price forecast. (Muskrat carcasses continued to bring more money, \$2.00-\$2.50, than the fur, 75¢.) The refuge and Maryland trapping season began on January 1 and ended on March 15.

The refuge again offered a \$1.50 rebate for each nutria taken from the refuge trapping units. All twelve trappers participated in this program, removing 1,477 nutria for a \$2,215.50 rebate from the bid funds. Due to State budget cuts, the nutria rebate program was conducted this year without the assistance of the Maryland Department of Natural Resources.

During the 1991 season, 3614 muskrats, 2282 nutria, 178 raccoons, 62 opossums, 24 skunks, and 3 foxes were taken by refuge trappers.

Furbearer Harvest - Blackwater NWR			
	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>
Muskrat	3926	3849	3614
Nutria	2002	3400	2282
Raccoon	42	11	178
Opossum	26	16	62
Skunk	0	0	24
Fox	5	2	3

11. Wildlife Observation

Visitors reported their "rare, endangered, and unusual" sightings in the visitor center register throughout the year. There were 214 mature and 46 immature bald eagles recorded, with as many as 23 eagles seen in one trip around the Wildlife Drive, compared to 202 mature and 69 immature sightings last year. There were 21 mature and 13 immature golden eagles (a total of 34), compared to 14 mature and 8 immature (a total of 22) golden eagles sighted in 1990. This number is quite an increase over the 3 or 4 seen in previous years. Visitors also reported sighting 11 peregrine falcons and 20 Delmarva fox squirrels.

A Ross's goose was sighted four times, a white-fronted goose twice, and a Hutchins goose once. Other rare birds recorded included the northern goshawk, yellow-headed blackbird, Brewers blackbird, lesser black-backed gull, royal terns, Wilson's plover, lesser golden-plover, black-necked stilt, longbilled dowitcher, Wilson's phalarope, and red crossbill.

Other uncommon or rare birds included: red-shouldered hawk, Cooper's hawk, sharp-shinned hawk, merlin, barn owl, wild turkey, pileated woodpecker, red-headed woodpecker, brown-headed nuthatch, rusty blackbird, brown creeper, winter wren, prothonotary warbler, yellow-throated warbler, prairie warbler, palm warbler, cliff swallow, sora rail, coot, ring-necked duck, ruddy duck, common merganser, little blue heron, Caspian tern, spotted sandpiper, western sandpiper, pectoral sandpiper, black-bellied plover, short-billed dowitcher, belted kingfisher, northern oriole, summer tanager, cedar waxwing, and snow bunting. The eastern bluebird has become fairly abundant in the fields along Key Wallace Drive.

Although not on the refuge, a sandhill crane was reportedly seen in Cambridge (near the Route 50 bridge) by the Audubon Wildlife Society on March 3.

17. Law Enforcement

On the evening of 1/28, a number of wildfires were set on the refuge and throughout the lower County, endangering several residences and burning down a hunting lodge. By noon of 1/30, four more fires had been set on the refuge. A stakeout was planned for a site along a refuge road that transects the marsh, and involved Refuge Officers Giese and Hartis and two Maryland Forest Service officers. Within 30 minutes of their arrival on the stakeout site, the team apprehended an individual setting fires along the road.

This individual was charged in State court with malicious setting of fires on lands of another. By year's end, Officers Giese and Hartis had been to court four times. On the fourth trip to the courthouse, the case was finally called - the defendant failed to appear. Local authorities are now looking for this individual with a bench warrant.

Refuge Officers Giese and Barker recovered several stolen refuge and County road signs. The signs were reported by an area resident who found them in a wooded area.

All refuge officers attended one week of law enforcement refresher training at Eastern Shore of Virginia NWR.

Refuge officers attended semi-annual Firearms Requalification training at Eastern Shore of Virginia NWR October 7. This refresher was combined with a training operation with Special Agents working the rail season. Officers Giese and Barker stayed an extra day to assist with this operation.

Refuge Officers Barker and Giese conducted a routine patrol through the adjacent Fishing Bay Wildlife Management Area on October 18, opening day of Maryland duck season. An NOV was issued to one hunter who had an improperly plugged gun.

Hartis, Barker, and Giese assisted Special Agents in Delaware November 3-5, the opening of that state's waterfowl season.

Carowan, Heet, Barker, Hartis, Giese, and Harrison (A.K.A. The Blackwater LE Team) assisted Mason Neck National Wildlife Refuge during their opening days of shotgun deer hunting on November 17-18.

On November 25-29, Giese and Barker assisted Special Agents and Maryland Department of Natural Resources police in working MBTA during the middle split of Maryland waterfowl season. Several significant violations were cited. It became apparent that baiting is still a major problem in Dorchester County, as 17 documented baited areas were found by State and Federal officers.

On the night of November 29, Giese and Barker worked on a spotlighting stakeout. Notices of violation were issued to two people for spotlighting on a National Wildlife Refuge and after-hours trespass on a National Wildlife Refuge.

18. Cooperating Associations

The Friends of Blackwater (FOB) proposed a challenge grant of \$1,250 to the Fish and Wildlife Foundation to donate matching funds for a new 10' by 4' sandblasted entrance sign to be placed at the entrance to the visitor center. The cooperating association also agreed to increase the original \$500 amount set aside for printing the Marsh Edge Trail Guide leaflet to \$3,000, since the cost of printing has increased.

FOB continued to support Blackwater National Wildlife Refuge by publishing a newsletter that reported news of the Refuge and its policies to members as well as to prominent local community and State officials, leaders and organizations. They promoted Blackwater at the Earth Day Celebration and Dorchester County Showcase in Cambridge by staffing the Blackwater mobile exhibit and distributing information to the public.

The most impressive contribution was the FOB book sales. The sales total for 1991 was \$26,472.24, one-and-one-half times 1990's sales total of \$10,432.00.

FOB Sales Totals By Year (1987-1991)								
	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>			
January	\$	632.33	\$	452.41	\$	651.21	\$	828.17
February		474.82		248.51		836.65		2,221.63
March		422.17		383.49		381.66		1,539.11
April		634.37		783.02		470.72		1,584.04
May		512.90		492.88		616.97		1,067.63
June		\\\\\\\\\\		101.71		\\\\\\\\\\		509.11
July		404.54		404.72		\\\\\\\\\\		580.28
August		\\\\\\\\\\		\\\\\\\\\\		106.22		1,173.49
September		351.99		402.39		776.69		2,323.13
October	\$	408.99	1,170.92	754.40	1,924.91			4,567.68
November	1,332.04	1,332.04	1,339.07	1,447.30				6,509.95
December	<u>831.67</u>	<u>478.48</u>	<u>531.64</u>	<u>1,322.04</u>	<u>3,568.02</u>			
Totals	\$2,572.70	\$6,441.59	\$6,000.47	\$10,431.00	\$26,472.24			
	///	Money added in next month's total						
	\\\\	Money added in previous month's total						

One of the reasons for the increase in sales is the addition of a Blackwater T-shirt with a goose design and a Blackwater sweatshirt with an eagle design. However, the main reason probably stemmed from the fact that the visitor center was open to the public every day except holidays, and weekends in the summer months. This in turn was due to the hiring of temporary recreation assistants to help in the spring, fall, and winter months, and a cooperative student to assist during the summer months. The increase from 50 to 88 volunteers to help staff the visitor center was also a contributing factor to keeping the center open for visitation and sales.

In addition to the sweatshirts and T-shirts, other new items in inventory included: Eagles of North America; The Bluebird Book, Birds & Marshes of the Chesapeake Country; Protecting Endangered Species; NWR Color Book; The Canada Goose; Photographing Waterfowl; Waterfowl by Mackenzie; monarch butterfly notepaper; John Taylor's wood duck, bluebird and peregrine falcon postcards matted for framing; peregrine falcon and whitetail deer fawn posters; and duck stamp magnets.

In January, The Friends of Blackwater purchased a new Sharp cash register that greatly improved the ease of operation, money-handling, and recordkeeping by volunteers and staff.



Friends of Blackwater 1991-92 officers (front row, L-R): Maurice Rimpo, Vice-President; Helen Combes, President; Eileen Sistik, Secretary; Jamie Roeder, Treasurer. FOB Board members (back row, L-R): Madeline Parks, Lois Albert, Zeeger deWilde; Advisor, Maggie Briggs.

20. Entrance Fees

The following is the breakdown of passes issued during 1991:

<u>Pass</u>	<u>Number</u>	<u>Fee Collected</u>
Daily Passes		\$29,439.42
Duck Stamps	275	3,937.50
Golden Eagle Passport	103	2,575.00
Golden Age Passport	667	FREE
Golden Access Passport	25	FREE
		<u>\$35,951.92</u>

Entrance Fees Collected 1988 to 1991

	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
January		\$1,510.97	\$2,192.59	\$2,020.52
February		2,551.42	2,515.72	2,196.30
March		396.71	1,228.44	2,810.04
April		471.00	3,848.05	1,625.47
May		670.96		968.65
June		1,079.04	683.72	1,693.88
July		1,828.15	1,452.86	1,646.95
August	\$ 744.95	721.16	1,573.79	1,474.95
September	1,507.50	768.29	1,651.67	2,302.50
October	5,213.00	3,149.21	4,201.18	4,665.45
November	4,637.00	7,291.86	6,242.04	5,784.71
December	<u>918.91</u>	<u>1,411.01</u>	<u>2,657.18</u>	<u>2,250.00</u>
Total	\$13,021.36	\$21,849.78	\$28,247.24	\$29,439.42

Total Fees Collected 1988-1991

	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
Entrance Fees	\$13,021.36*	\$21,849.78	\$28,247.24	\$29,439.42
Duck Stamps	3,150.00	2,262.50	3,187.50	3,937.50
Golden Eagle	<u>125.00</u>	<u>1,725.50</u>	<u>1,700.00</u>	<u>2,575.00</u>
Total Fees	\$16,296.36	\$25,837.78	\$33,134.74	\$35,951.92

*Aug. - Dec. only

Number of Passes Issued 1988-1991

	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>
Entrance Fees	4,654*	6,990	8,878	10,424
Duck Stamps	315	181	255	275
Golden Eagle	5	69	68	103
Golden Age	947	795	676	667
Golden Access	<u>24</u>	<u>25</u>	<u>25</u>	<u>25</u>
Total	5,945	8,060	9,902	11,494

*Aug. - Dec. only

I. EQUIPMENT AND FACILITIES

1. New Construction

On 4/2, work began on the new handicapped-accessible Marsh Edge Trail, funded through a challenge grant and private donations. Work progressed in "spurts" through the summer and into fall. At year's end all clearing, sideboard installation, and site preparation had been completed. Some of the gravel base material was installed via a "Bobcat loader" donated to the refuge for a week by a local businessman.

2. Rehabilitation

This year the footwork was laid to address the long-standing need for major rehabilitation and upgrading of the visitor center. Project Leader Carowan and Refuge Operations Specialist Heet met with two Chesapeake College students (2/5) and Dr. Ron Spencer, University of Maryland - Eastern Shore (2/22) to solicit architectural input needed to initiate planning and design for renovation of the visitor center.

On 7/22, Mr. Greg Torchio (architect and Chesapeake College instructor) agreed to work with the design project. We provided \$4000.00 for materials and his staff's time. He volunteered his own time. A draft program "needs document" was developed at the refuge level. After a meeting with Mr. Torchio and Associate Manager McAndrews et al, a final draft of the program was provided to Mr. Torchio for reference in his planning and design work. A set of draft blueprints was completed in December. Refuge Operations Specialist Heet "fine tuned" them to meet specific needs with respect to office detail and juxtaposition. A final drawing, forthcoming in 1992, will provide electrical, mechanical, and structural details as well as cost estimates for each.

On 10/17, Project Leader Carowan and ROS Barker met with Saulnier and Raphael, RO Engineering, to discuss potential layout for visitor center entrance road and relocation plans for maintenance area to the YACC area (site plan, building location, size requirement, etc.).

Maintenance Worker Webster worked 4/8-9 rehabilitating the station's chisel plow. New springs and tines were installed and adjusted. The three point hitch was modified to fit our quick coupler attachment. On 4/12 Webster fabricated wing extensions for our PTO field ditcher. This enables a more gradual (easier to drive equipment across) ditch in our agricultural fields.

On 7/11, Contractor Mike Trice began rehabilitation of the Quarters 2 front porch. A new floor was laid and the posts and screening were replaced along with the front door. Now residents can enjoy fresh air without the biting insects.

This summer, the aluminum pipe gate at the entrance to McGraw's Island was bent by an automobile pushing up against it. Approximately a week later, another auto had succeeded in breaking the gate in two. At this time, a replacement gate (approximately six feet wider) was installed. This new gate will facilitate access to and from the island with wide farm implements.

Willow trees were removed from a significant portion of the Pool 2 boundary. The trees were bulldozed into piles and burned as they dried out. On 7/19, a pulp loader/operator was contracted from Spicer Lumber to remove the remnant piles.



Rented pulp-loader removed piles of debris from clearing willow from Pool 1 margins. JB 7/91

On 9/30, contractor Norris Taylor dismantled and removed the observation tower, as it was no longer safe.

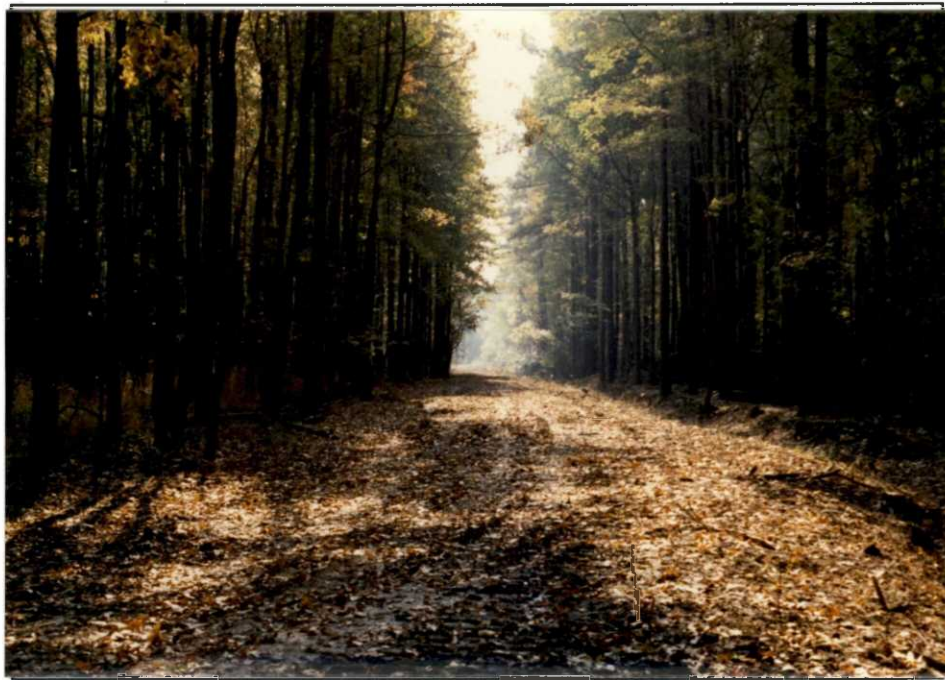


Blackwater's unsafe observation tower was removed.
GCH 9/91

In mid-October, work was initiated to clear the overgrown dike running on a north/south line between the Wildlife Drive and the back corner of Field 7. All trees were cut/bulldozed and hauled out. The ditch on the west side of the dike and south side of Field 7 was cleaned out utilizing a rented Cat 215 excavator. Two 24" corrugated metal pipe stop-log structures were installed to divert water coming from Key Wallace/Green Briar Swamp over to Pool 2, instead of allowing it to go unused out to the marsh (under the wildlife drive). As we are dependent on rainwater to fill our impoundments (Pools 1 and 2), this ability to better utilize available runoff is a great asset. Late November and early December rains came, and the structures worked perfectly, providing the impoundments with much-needed water.



Dike west of Pools 1 and 2 prior to initiating work.
GCH 6/91



Same dike after clearing and reshaping. GCH 10/91



Two water control structures were installed to divert runoff water to Pool 2. GCH 10/91

In December, rip-rap was placed along the Quarters 1 lawn area from the outlet of the Pool 1 water control structure to the boat ramp bulkhead. This much-needed project is both functional for erosion control and aesthetically pleasing.



Rip-rap was placed along the Little Blackwater River, south of Quarters 1. GCH 12/91

In December, trees lining the southwest interior side of the Pool 3 dike were cut down and towed away, to maintain the integrity of this irreplaceable dike.

3. Major Maintenance

In February, a new fee collection box, fabricated from an old postal drop box, was installed at the Wildlife Drive entrance. The old box was inadequate in size and design. Now we can get through a busy day without fee envelopes over-filling the old canister and falling on the ground.



"The good, the bad, and the ugly" in process of installing improved entrance fee deposit box.
GCH 6/91

Also in February, our small Bombi tracked vehicle sustained major drive train problems while being utilized in prescribed burn activities. Front axle breakage and subsequent bearing failure required maintenance work for the remainder of February and half of March. A major front axle component was unavailable (non-production) for this 1979 machine. As a result, the part had to be fabricated by a machinist shop. This increased down time and cost for this project.

In April, both rear shocks and tires were replaced on the station's Caravelle sedan.

After being returned from use at another station, our John Deere 550 dozer had some serious mechanical problems. In June it had to be sent to Powlen Equipment for repair of the center blade pin/bushing assembly (\$1,636). During some tree removal work in July, the track chain assembly went from bad (marginally operable) to worse (unable to use), when one of the chain links broke.

Clark Equipment got the repair bid and performed the following work to restore the dozer to operating condition: 1) replaced both tack chains, 2) replaced sprockets, 3) replaced idlers and brackets, 4) replaced rollers, 5) repaired track adjusters, and 6) removed six inches of pad width from each track (\$7,063.92).



Bent wing blades, pushed in grill...broken track chains and worn pin bushings (in photo) were part of the damage to the JD 550 dozer. GCH 6/91

On 7/25, Blackwater's 4X4 Dodge was scheduled to be taken to Canada by Patuxent for waterfowl banding crew use. The day before the truck's scheduled departure, the clutch went out and an emergency repair was done. Clutch, pressure plate, throw out bearings were all replaced, and a broken linkage rod (cause of failure) was welded.

In the fall, as cooler weather approached, the long-term "trickle" leak of water from beneath the visitor center became much more than a trickle! A leaking hotwater heat pipe under the foundation created a warm water pond on the southeast corner of the building. Service personnel from Dorchester Service Associates were able to shut that pipe off and re-route the hot water flow.

The new Bombardier was earmarked for fire suppression work. During October and November the maintenance and fire crew worked feverishly to modify and prepare the machine for the upcoming season. Following is a lengthy account of all work done, with the end product a true fire-fighting machine that we are all proud of:

- Fabricated and installed radiator guard, roll cage and stump guard,
- Installed brackets to hold fire axe, flappers, torches, etc.,
- Installed 8 foot tool box,
- Installed mobile radio and holder for two portables,
- Wired spot light connectors (two in front, one in back),
- Wired and installed spot lights on front, flood lights on back,
- Fabricated and installed "tie-down" plates on front of machine,
- Added foam proportioner and control panel,
- Installed slip in fire pump with extended draft hose and 50 feet of 1 1/2 inch hose,
- Painted tailgate with abrasive paint to avoid slippage when wet.

The new Bombardier tracked vehicle developed a chronic overheating problem in its hydraulic system. The problem became so severe after just a short period of use that the machine could not be used. After much prodding on our part, the local dealer (Linthicum Heights, MD) sent two mechanics to diagnose the problem. Adjusting a hydraulic flow valve (to reduce restriction), reversing the fan direction, and screening the radiator alleviated the problem.

December, 1991 saw the maintenance staff again cleaning and preparing equipment for winter storage and next spring's use. Both bush hog mowers (10' and 13') were cleaned, serviced, and painted. The planter was thoroughly washed out and cleaned, as was the spray rig. Both Crisafulli pumps and the powerhead were cleaned, serviced, and stored for winter. This activity now will save our staff many headaches in the spring.



Refurbished bushhog is almost as good as new. GCH 12/91

4. Equipment Utilization and Replacement

On 2/4, we received our new Bombardier "muskeg" model tracked vehicle. Several "glitches" in early operation were experienced but resolved (see Section I.3).

On 3/9, a representative from Spectra Physics came to the refuge, at our request, to demonstrate a laser plane transit. The capabilities of this equipment and the potential for its use in many of our refuge projects was obvious. We purchased one and have used it on several projects. The accuracy, ease of operation, and speed with which the unit can be used justified the price.

On 6/13, we picked up a flatbed trailer from Supawna Meadows National Wildlife Refuge. This excessed trailer will be an asset to us in transporting a variety of materials including Bombardier tracked vehicles and other fire equipment.

In July, the refuge continued to beg and borrow (but not steal) tractors to conduct our farming program. This year and last year, Back Bay National Wildlife Refuge loaned us the use of their 4240 John Deere during the ground working and planting seasons. However, this year the loan was cut short, as Back Bay needed it to run some Crisafulli pumps. Fortunately, when Back Bay staff came to retrieve their

tractor on 8/7, they were able to stop at Chincoteague National Wildlife Refuge and bring their new 2953 John Deere for us to use.

On 8/8, we purchased a John Deere moldboard plow from Jones Equipment in Cambridge, to replace our old plow which was worn to the extent that it would not do its job effectively. Also, the old plow was of an age that no parts were available for repairs.

On 8/8, the rear window of the S-10 pickup was replaced after an unsecured canoe broke the left side of the window.

Twice in the month of August we borrowed Eastern Neck's stake body dump truck for use in projects like boneyard cleanup and stump pile removal. The truck provided invaluable additional "hauling capabilities" for us on these projects.

In September, a new 1991 Dodge Ram half-ton replacement pickup was received.

In September, we learned that year-end money would be made available to replace the refuge's 450 Farmall tractor with a John Deere 4055 four-wheel drive tractor. We received this \$58,000.00 present on 11/1. The entire staff was excited about this much needed addition to our farming program.



It was a happy day at Blackwater when our new 4055 "green machine" arrived! JB 11/91

5. Communications Systems

In January, a telephone was installed in Refuge Operations Specialist Barker's new "kitchen" office. Also at this time, speed-dialing was added to all lines for frequently dialed numbers.

Five portable multi-channel radios were purchased from Midland. We requested crystals for refuge, County sheriff, and Department of Natural Resource police frequencies, which were provided. All the radios had to be sent back as they would not function properly. In addition, the crystals they sold us would not work in the radios they sold us. The five radios were replaced by five new ones from the Midland factory.

One additional Motorola MT 1000 (refuge frequency only) was ordered in September. Also in September, we ordered seven Bendix/King programmable hi-band, hand held radios with 9120 fire funds. This radio will enable us to communicate with State fire personnel during cooperative fire fighting incidents.

6. Computer Systems

Two computer workstations were received and assembled in April. The mobile furniture has made the computers more accessible to all staff and aided us in making more efficient use of our cramped office space.

Wiley Kitchens, Coop. Unit leader at the University of Florida (Gainesville), came to the refuge on May 7 to lend his valuable expertise to getting the GIS up and running on our 386 computer. Dr. Kitchens returned in December to demonstrate the GIS to a group of State and refuge biologists (see Section D).

End-of-fiscal-year funds provided a second laserjet printer, which was installed at the visitor center. The center's old NEC impact printer was excessed. A handheld scanner was also obtained with end-of-year funds.

Refuge profile data for the first RMIS module was compiled and submitted to RO. Also, a test of the RMIS Public Use Module was completed, with disks and feedback sent to George Geis.

Blackwater's IPWs were entered on the Region's new RPPS database. But the RPPS program seemed to be plagued with a bug that kept replicating the files until our 386's hard drive was full, whereupon all data would be lost. After over a week of repeated attempts to get this program to work, a disk with a partial listing of IPWs and hard copies of the remainder were sent to Refuges.

8. Other

On 3/13 our John Deere 550 dozer was loaned to Eastern Shore of Virginia National Wildlife Refuge to assist in building demolition and removal.

Last year it was decided that Quarters 1 was essentially a non-useful maintenance problem and should be removed. Questions as to the house's inclusion in the National Register were allayed by Jo Ellen Freeze, Maryland Historical Trust, due to the various renovations and changes made to the original house over the years. The only remaining stumbling block in the way of removing the house was asbestos problems, including roof shingles and lining of pipes in the crawlspace under the house.

In April contract bid packages were sent out for the asbestos removal portion of the project. Tomorrow's Environmental Concerns from New Jersey was awarded the contract and began work in late October. By November's end, all removal work was completed. The work order was later amended to have the contractor remove asbestos siding from the boathouse, too.



After removal of asbestos siding and pipe insulation, Quarters 1 was ready for demolition. JB 12/91



Asbestos shingles were removed from the boathouse,
also. GCH 12/91

At year's end, we were working with a local fire department to set a date to burn down the house as a training exercise.

On 6/12, a contractor re-painted the lines in the parking area at the visitor center.

On 7/24, Blackwater's dump truck was loaned to Eastern Shore of Virginia National Wildlife Refuge for use on their visitor center project.

Blackwater's Honda ATV and its seeder attachment were loaned to Prime Hook, Bombay Hook, and Supawna Meadows National Wildlife Refuges for clover seeding.

On 8/8, major cleanup activities began in the refuge boneyard behind the maintenance area, between Pools 1 and 2. Materials were transported to a new location in a field on the Luthy Tract. The County brought in their excavator and dump trucks, crushing and hauling away old concrete pieces. This material was used by them as rip-rap along the south shore of Key Wallace Drive where it passes through the refuge. Old wood/scrap and tree piles were burned and/or removed. The result was a clean, flat field between two impoundments. At this point, the ground was worked up and buckwheat and annual rye grass were planted. The completion of this project was outstanding from public use (more aesthetic), wildlife use, and logistical standpoints.



Westward view of boneyard prior to rehab efforts.
JB 6/91



Eastward view of boneyard after project completion.
Photo was taken from approximate location of bus in
previous photo. GCH 9/91

While the County had their excavator on the refuge in August, they offered it and an operator to assist in removing willow trees from the Pool 2 dike. After this was completed, we reshaped and built up the dike to its historic height.

J. OTHER ITEMS

1. Cooperative Programs

The refuge is cooperating with Dr. Frank Rohwer of the Louisiana State University Cooperative Wildlife Unit, Maryland Department of Natural Resources, and the Grand National Waterfowl Hunt Club in a \$160,000 three-year study to determine why State-released mallards do so poorly in the wild and how they interact with the wild population. The Grand National Waterfowl Hunt Club donated a mobile home that was set up on the refuge to house researchers, as well as other refuge volunteers.

3. Items of Interest

Ducks Unlimited officials were given a tour of the refuge by Project Leader Carowan on Sunday, January 13.

Refuge Operations Specialist Barker and Maintenance Worker Harrison participated in the annual Atlantic Flyway Wingbee held at Patuxent Research Center's Bird Banding Lab January 28-31.

During February, Maintenance Worker Harrison appeared on "Maryland Outdoors" documentary about Smith Island. The public television series also discussed Blackwater's burning program and nutria problems during other programs.

On 3/6, Project Leader Carowan met with John Schroer, Project Leader, Chincoteague NWR, to discuss plans for the 1991 Project Leaders' meeting.

On 4/8, a Channel 50 (Washington, DC) crew came to film some wetlands and wildlife shots for an upcoming TV special on wetlands.

During May, a consultant from the Canaan Valley Association visited to discuss Blackwater's working relationship with local municipalities. Commissioners from Tucker County, WV followed in a fall visit to Dorchester County Commissioners, to learn how the refuge is perceived and its economic impact in this area.

On June 5 and 6, two Maryland state archaeologists visited Martin NWR. As part of a fact-finding study for the State's inclusion in their Smith Island interpretive center. A written report of their findings has been requested by the refuge.

On June 7, Rear Admiral Bowman, USCG, visited Susquehanna NWR with Chuck Maslin, President of the Battery Island Preservation Society.

On June 21, Carowan and Heet visited Susquehanna NWR, took pictures of the historic lighthouse keeper's quarters, and tried to site these facilities on the Coast Guard's 45' x 45' parcel. The lighthouse keeper's quarters measured approximately 16' x 32' and the fenced-in lighthouse approximately 14' x 14'. Both structures could easily be contained in the 45' x 45' area retained by the Coast Guard. The Society is contacting the Coast Guard after receiving a copy of the Solicitor's recent opinion.

Biologist Hartis and Refuge Operations Specialist Barker responded to a US Forest Service study questionnaire regarding the use of respiratory devices on both prescribed and wildfires.

On September 9-13, Project Leader Carowan and Supv. Refuge Operations Specialist Heet attended the annual Project Leaders' Meeting in Easton, MD. Carowan had co-hosted the meeting with Project Leader John Schroer, Chincoteague NWR.

On 9/18, Congressman Richard Schulze (R-PA) stopped by the refuge for an impromptu tour conducted by Project Leader Carowan.

On 9/30, Project Leader Carowan met again with Maryland's Secretary of State concerning the role of Martin NWR in the continuing focus on developing Smith Island's tourism potential.

Project Leader Carowan attended a meeting at Senator Mikulski's office on October 16. Representatives from the Battery Island Preservation Society and U.S. Coast Guard met to further discuss the Battery Island Station. Lt. Flynn, U.S. Coast Guard, contests the solicitors opinion that they own the 45'x 45' parcel in question. After much discussion Lt. Flynn and other participants agreed that the most prudent action for the Coast Guard would be to claim ownership and transfer to the preservation society. Action item agreed on: that Lt. Flynn would seek confirmation of ownership and investigate requirements for excessing property.

4. Credits

This year's narrative involved most of the refuge staff.

<u>Section</u>	<u>Person Responsible</u>
Intro.	Project Leader Carowan
A	Project Leader Carowan Refuge Operations Specialist Heet Refuge Operations Specialist Barker
B	Refuge Operations Specialist Barker
C	Refuge Operations Specialist Heet
D	Refuge Operations Specialist Heet Biologist Hartis
E	Project Leader Carowan Refuge Operations Specialist Heet Outdoor Recreation Planner Briggs Biologist Hartis Office Assistant Walkup Clerk Barker
F	Biologist Hartis Biological Technician Giese
G	Biologist Hartis Biological Technician Giese
H	Outdoor Recreation Planner Briggs Biologist Hartis Biological Technician Giese
I	Refuge Operations Specialist Barker Office Assistant Walkup
J	Refuge Operations Specialist Heet
K	Project Leader Carowan

Photo credits are indicated by initials after each caption: JB, Jason Barker; JLB, Julie Barker; MMB, Maggie Briggs; GAC, Glenn A. Carowan; WMG, Bill Giese; LPH, Larry Hartis; GCH, Gary Heet; AM, Ann McCready; MW, Meg Walkup; ROW, Richard Webster.

Clerk Barker, Office Assistant Walkup, and Clerk Brittingham were responsible for typing, editing, and assembling the 1991 Narrative.

SUSQUEHANNA

SUSQUEHANNA NATIONAL WILDLIFE REFUGE

Havre de Grace, Maryland

ANNUAL NARRATIVE REPORT

Calendar Year 1991

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

INTRODUCTION

Long renowned for its outstanding habitat which concentrated large numbers of diving ducks, primarily canvasback ducks, portions of the Susquehanna Flats were closed to the "taking" of waterfowl by Presidential Order 2347 on August 24, 1939. President Franklin D. Roosevelt, by virtue of the authority vested by the Migratory Bird Treaty Act of July 3, 1918, thereby designated a certain part of the Chesapeake Bay as the "Susquehanna Migratory Waterfowl Closed Area." The area was increased in size, and subsequently amended by President Roosevelt on January 24, 1940 and December 6, 1941 (Presidential Orders 2383 and 2529, respectively [See Appendix I]) to further protect waterfowl and other migratory birds. On June 23, 1942, President Roosevelt issued Executive Order 9185 which declared that all waters and lands previously protected as part of the Susquehanna Migratory Waterfowl Closed Area would be reserved for use by the Department of the Interior as a "refuge and breeding ground for migratory birds and other wildlife." On June 9, 1978, the Service published changes in the Federal Register and in Title 50, Code of Federal Regulations, Part 32 which opened the Susquehanna Migratory Waterfowl Closed Area to the hunting of migratory waterfowl in accordance with annual hunting regulations. The Director had determined that the waterfowl food source had severely deteriorated, and that the attendant waterfowl use had declined to the extent that a closure was no longer necessary. This rulemaking, therefore, rescinded Presidential Orders No. 2383 and 2529, leaving only four acres of "Shad Battery" (Battery Island) as the refuge. The U.S. Coast Guard has maintained a lighthouse on Battery Island since the 1920's. This 45' X 45' reservation is detailed in Executive Order 9185.



About 1½ acres of island is all that remains of Susquehanna refuge.



Battery Island and deteriorated lighthouse.

Today, Susquehanna Refuge has been reduced by erosion to a mere 1.5 acres, and possesses little or no value to wildlife. The lighthouse, on the Coast Guard property, stands in a state of disrepair, is badly deteriorated, and has been vandalized.

The Battery Island Preservation Society seeks responsibility for the administration and management of the Island and the lighthouse keeper's quarters. At the direction of the Regional Office, this subject was the topic of much discussion during the Complex's Station Management Planning meeting in 1989, and it was mutually agreed that a cooperative agreement was the most appropriate mechanism to authorize the Society to rehabilitate and subsequently administer the structures. A final draft of the Cooperative Agreement was completed on March 21, 1990.

For the next ten months, the cooperative agreement kicked around the Regional and Washington offices with lots of discussion and input from a number of folks at all levels. Finally, Regional Solicitor Tony Conte advised that a cooperative agreement was undoubtedly the worst case scenario for dealing with the requests of the Battery Island Preservation Society since such an agreement would indicate that the Fish and Wildlife Service owned the 45' X 45' area that has been determined to be owned by the U.S. Coast Guard. Obviously, the Service did not want to imply that it owned the lighthouse

and lighthouse keeper's quarters when it didn't, and therefore the cooperative agreement was eliminated.

On October 16, Project Leader Carowan met with Ms. Susan Smith, Projects Director for Senator Mikulski, Lt. Tom Flynn from the 5th Coast Guard District, and representatives from the Battery Island Preservation Society to discuss the continuing problem of ownership of the lighthouse on Battery Island, Susquehanna National Wildlife Refuge, and the Preservation Society's desire to assume management of the historic lighthouse keeper's quarters.

Lt. Flynn contested Solicitor Conte's opinion that the U.S. Coast Guard owned the 45' x 45' parcel in question, stating that all of this parcel but the current 15' X 15' reservation for the light tower was turned over to the Service after Executive Order 9185 was signed. However, the only proof of this statement was the civil engineering design that was attached to the volume of literature that Lt. Flynn provided.

More interesting for us, and certainly more supportive of the contrary, was a letter, dated October 24, 1966, from Captain Fisher to then Governor Joseph D. Tydings, which stated that the 45' x 45' parcel was under the control of the U.S. Coast Guard. A copy of this letter is contained in the station's files.

When this was brought to Lt. Flynn's attention, he agreed that he would have to take up the issue of ownership with his superiors once again. But after considerable discussion, Lt. Flynn and the other participants agreed that the most prudent and expedient way to handle the two issues was for the Coast Guard to claim ownership and then excess the property directly to the Preservation Society. Of course, Lt. Flynn recommended that an alternate solution was for the Service to claim ownership and to subsequently culminate a cooperative agreement with the Preservation Society.

With the mutual understanding that it would be in the best interest of all concerned if the Coast Guard would claim ownership, the meeting was ended in agreement on the following action items:

1. Lt. Flynn would seek confirmation of ownership by the Commander of the Coast Guard.
2. Lt. Flynn would investigate the requirements for excessing the property administratively rather than legislatively.

3. The Service would investigate the requirements for excessing the property through GSA and report same to Ms. Smith.
4. Meet again once a decision has been made by the Coast Guard.

On October 29, Senator Mikulski wrote a letter to Admiral J.W. Kime, Commandant, USCG, asking that the Coast Guard or DOI accept jurisdiction so that this property can be excessed and properly maintained. Senator Mikulski reiterated the difficulty she has in explaining to constituents that no agency claims jurisdiction over the property, and asks for support from the Coast Guard.

At year's end, the issue is still pending!

MARTIN NATIONAL WILDLIFE REFUGE

Smith Island, Maryland

ANNUAL NARRATIVE REPORT

Calendar Year 1991

U.S. Department of the Interior
Fish and Wildlife Service
NATIONAL WILDLIFE REFUGE SYSTEM

INTRODUCTION

Martin NWR was established by the late Glenn L. Martin's gift to the United States of 2,482 acres (some later documents say 2,569.86 acres) of land in two deeds dated December 20, 1954 and January 11, 1955. This represented what was at the time Mr. Martin's private hunting preserve, and was donated to the Government because of his interest in wildlife conservation. At the time, he also undertook to acquire certain remaining ownerships on the island lying north of Smiths Thorofare. He died, however, prior to completion of this program, but successfully negotiated for another 1,377 acres which his estate offered to the Government in May 1957 at the price of \$27.06 per acre. The Migratory Bird Conservation Commission, under the authority of the Migratory Bird Treaty Act, subsequently approved the acquisition of these and other lands, including the .65 acre Norman Tyler Tract (the Tyler House property) in Ewell in 1964. This brought the refuge's total acreage to 4,423 through 1965.

A 1960 Secretarial Closing Order provided the refuge with a 300-yard wide proclamation boundary inside which waterfowl hunting was prohibited. On March 7, 1975, the Land Acquisition Advisory Committee met to consider Regional Director Griffith's recommendation to acquire an additional 3,000 acres. The proposed addition, known as South Marsh Islands, was to be acquired by The Nature Conservancy. However, after debating the issue, the Committee recommended that Service acquisition be deferred, and suggested that the Regional Director notify The Nature Conservancy that the Service preferred Maryland Department of Natural Resources acquire and manage this property.

Smith Island is named after Captain John Smith, who explored and charted this and nearby islands in 1608. The acres of marsh grasses attracted settlers who raised cattle on the island. Two early settlers were John Evans and John Tyler. Evans and Tyler are still among the most common surnames of Smith Island residents. For more than 300 years, Smith Island watermen have been making a living from the sea. They began dredging oysters with skipjacks about 1850. At one time some 50 skipjacks were based on the Island. Residents first harvested the well-known blue crab by sail, and later by power boats. Crab potting started about 1947. Today, the residents of the three villages on Smith Island - Ewell, Tylerton, and Rhodes Point - continue the Island tradition of harvesting oysters in the winter and crabs in the summer from the waters surrounding Martin Refuge.

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A. HIGHLIGHTS

On August 7 Project Leader Carowan and Refuge Operations Specialist Barker took Senator Sarbanes' Aide, Lee Whaley, to visit Smith Island and Martin National Wildlife Refuge. (See Section H.1.).

On September 30 Project Leader Carowan met with Maryland's Secretary of State regarding the Service's public education role at Smith Island. (See Section H.1.).

A new 24' X 24' workshop was constructed by refuge staff. (See Section I.1.).

B. CLIMATIC CONDITIONS

Martin NWR is located on Smith Island in the lower Chesapeake Bay immediately adjacent to the Maryland-Virginia line and about 80 miles south of Blackwater NWR. Climatic conditions were similar to those at Blackwater (Section B of Blackwater Annual Narrative Report).

D. PLANNING

2. Management Plans

Blackwater NWR Complex's Station Management Plan (includes Martin NWR Management Plan) was approved on February 25. Copies were sent to Congressman Gilchrest and Senators Sarbanes and Mikulski.

E. ADMINISTRATION

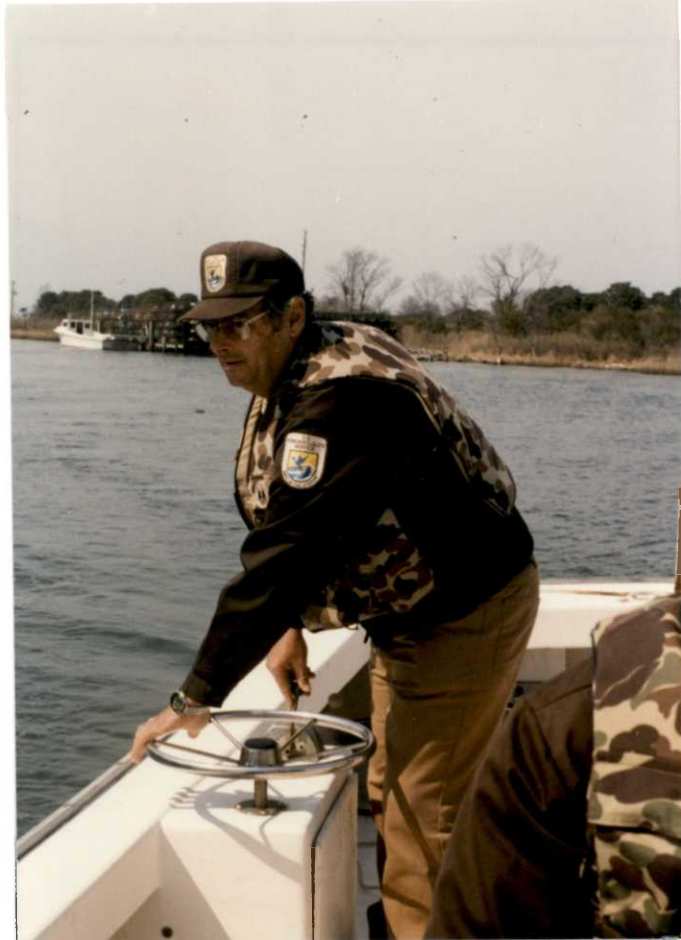
1. Personnel

Maintenance Worker Michael Harrison, a native Smith Islander and former waterman, is the only full-time employee assigned to the refuge. Administrative support and supervision are provided by personnel stationed at Blackwater NWR.

PERSONNEL

<u>NAME</u>	<u>TITLE</u>	<u>GRADE</u>	<u>EOD</u>	<u>STATUS</u>
Glenn A. Carowan	Project Leader	GM-13	6-05-89	PFT
Jason A. Barker	Refuge Operations Spec.	GS-09	9-09-90	PFT
Michael K. Harrison	Maintenance Worker	WG-07	1-28-79	PFT

MARTIN NWR ONBOARD STRENGTH FY87-FY91				
	<u>PFT</u>	<u>PPT</u>	<u>Temp.</u>	<u>FTE</u>
FY91	1	0	0	1
FY90	1	0	0	1
FY89	1	0	0	1
FY88	1	0	0	1
FY87	1	0	0	1



Mike Harrison, Maintenance Worker and boat captain. MMB 2/91



Jason Barker, Refuge Operations Specialist (left),
Glenn Carowan, Project Leader (right) MMB 2/91

On May 6-9 Maintenance Worker Harrison attended heavy equipment training at Eastern Shore of Virginia National Wildlife Refuge.

Volunteer efforts were contributed by Jason's wife, Julie Barker, totaling over 70 hours. Construction, yard maintenance and cleaning were performed.



Volunteer Barker and Refuge Operations Specialist Barker working on Martin workshop (photo taken just after air-nailer broke).
ROW 3/91

5. Funding

The following is a breakdown of the funding for Martin NWR for the last five years:

<u>Activity</u>	<u>FY91</u>	<u>FY90</u>	<u>FY89</u>	<u>FY88</u>	<u>FY87</u>
1261/1262	46,361	44,813	38,077	41,145	37,982

6. Safety

On February 21 Maintenance Worker Harrison broke his toe while unloading some roofing trusses off a barge onto a dock. He was wearing steel-toed safety shoes at the time of the accident.

On November 20 Maintenance Worker Harrison attended CPR Refresher Training with the Blackwater staff at Dorchester General Hospital.

On November 21 Maintenance Worker Harrison received audiometric testing with the Blackwater staff at Dr. Effron's office in Cambridge.

G. WILDLIFE

2. Endangered and/or Threatened Species

On March 26 there were four peregrine falcon eggs in a nest in the old falcon tower. A Maryland Department of Natural Resources biologist climbed the tower on May 20 and banded three young.

A pair of falcons used the new falcon tower from late May through September. The pair was very defensive of the tower and used it repeatedly for roosting (evidenced by large number of dead birds in box on top). We hope this pair will return and nest next year.

3. Waterfowl

An aerial waterfowl brood survey was flown on June 11 by BioTech Giese and Refuge Operations Specialist Barker. Results tallied six black duck broods with a total of 23 young (avg. = 3.8 young/brood) and 1 mallard brood with eight young.

Approximately 50 resident geese captured at Blackwater National Wildlife Refuge were taken to Martin NWR for release. On June 28, 17 adults with yellow neck collars and 33 young, without neck collars were released on the north end of the island along the Back Cove area. Several of the yellow-collared geese were seen on the refuge for the remainder of the year.

A cooperative agreement between the U.S. Fish & Wildlife Service, U.S. Navy, and Maryland Department of Natural Resources was established to manage Bloodsworth Island in accordance with the North American Waterfowl Management Plan. As a result of this agreement, money was made available through the Navy to conduct aerial surveys of Bloodsworth, South Marsh, and Smith Islands. This provided us with much greater ability to estimate waterfowl numbers than our current boat survey technique.

4. Marsh and Water Birds

On March 25, Dr. Roland Limpert, with the assistance of Maintenance Worker Harrison, surveyed great blue heron rookeries on the refuge. The objective was to locate banded

(color-coded leg bands) birds of known age, previously captured on the refuge. No color banded birds were located. Heron nesting was underway at the time of the observations.

On May 24 Refuge Operations Specialist Barker and Maintenance Worker Harrison assisted Dr. Sladen, Dr. Limpert, and Mr. Primrose with banding young great blue herons. Twenty-five young were banded with Service leg bands and color marked bands. All banding was done on the Captain Dan's/Cherry Island rookery.

5. Shorebirds, Gulls, Terns, and Allied Species

On May 24, a gull survey was conducted by Refuge Operations Specialist Barker and Maintenance Worker Harrison on the Long Acre portion of Martin National Wildlife Refuge. A total of 217 nests were found; down from 313 last year. However, general observations indicated as much or more gull use around the island this year.

6. Raptors

On April 17 Maintenance Worker Harrison checked 30 osprey nesting structures. Twenty-one had eggs and adults present; thirteen of these were incubating.

On July 3 Barker, Harrison, and Researcher Gorsuch banded osprey young. Twenty-five young were banded out of 56 active nests this year. Osprey young ranged in size from newly-hatched to birds already capable of flight. Staff were accompanied by a film crew doing a science learning film for the Prince George's county, MD cable school television network. The film crew was able to stay overnight on the refuge and got what they felt was excellent footage for their film. The film was shown to all science teachers in Prince George's County and an excerpt was aired on the weekend Washington D.C. news.

16. Marking and Banding

In August pre-season banding was initiated. A slow start was made with only 30 birds banded by month's end. An adjacent state wildlife management area (Deals Island) started baiting prior to our efforts at Martin. It appeared that the majority of our birds were "sucked in" by the state area. By mid-September a total of 88 black ducks and 7 mallards were banded, falling short of our quota of 100 black ducks. This dearth of black ducks to band concerns us as last year 340 black ducks (396 total ducks) were banded.

H. PUBLIC USE

1. General

On August 7 Project Leader Carowan and Refuge Operations Specialist Barker took Senator Sarbanes' aide, Lee Whaley to Smith Island. They toured the town of Ewell, the Refuge's Middleton House and took a boat tour of the Refuge itself. Discussions centered around our rehabilitation of the Middleton House, our concept design plan for displays, public use, and funding potentials other than line item budget funds.

On September 30, Project Leader Carowan met again with Maryland's Secretary of State concerning the role of Martin National Wildlife Refuge in the continuing focus on developing Smith Island's tourism potential. The need for potential State input for funding Refuge exhibits was discussed, but the outlook was not good. Somerset County officials were contacted by both Project Leader Carowan and Refuge Operations Specialist Barker regarding funding and the potential for challenge grants. No favorable response was received due to severe budget shortfalls in that county.

6. Interpretive Exhibits/Demonstrations

On March 27 Marvin Cook visited Martin NWR with Project Leader Carowan, Refuge Operations Specialists Heet and Barker, Outdoor Recreation Planner Briggs, and Maintenance Worker Harrison. The interpretive needs of the Service at Smith Island were discussed in regard to where we were and where we wanted to be. Marvin took the information that was provided, along with interior room measurements of the Middleton House, back to Florida and produced a top notch interpretive exhibit concept design. This plan divided the house into three rooms containing the following displays:

- Room I: Entrance/Orientation
 Nesting Habitat Specimen Case
 Waterfowl Habitat Diorama
 Habitat Diversity Quiz Unit

- Room II: Seasonal Fish & Wildlife Specimen Case
 Featured Species Display Case
 Morphology Quiz Unit

- Room III: Fishing Tools/Methods Artifact Display Case
 Resource Exploitation Artifact Display Case
 Chesapeake Bay Wall Display Panel



Marvin Cook, President of Wilderness Graphics visited Martin NWR to develop an interpretive display package. MMB 3/91

Other structural changes suggested were: 1) placement of white picket fence along the roadway, 2) installation of an informational kiosk on the front lawn, 3) addition of a handicap access ramp, 4) provide enclosed porch giving access to two exhibit rooms allowing for circular traffic flow, and 5) assorted interior improvements.

By year-end a new Martin National Wildlife Refuge sign was purchased to replace the old erroneous Glenn L. Martin sign in front of the Middleton House. Also received was a picket fence and gate for the front of the house. A kiosk and entrance/orientation exhibit were ordered from Wilderness Graphics.

The Refuge house was sold to the USFWS by the Tyler family and had been dubbed the "Tyler House." When designing the welcome, kiosk and informational signs we took advantage of

an opportunity to change the name to Middleton house, named after the family who built (1900) and originally occupied the house.

17. Law Enforcement

On June 10, information from Somerset County Sheriffs' Department led Refuge Officers Barker and Harrison and two County Deputies to Signer's Island (Martin NWR) in search of marijuana. Two plants and a total of four growing areas were identified. Captain Dan's/Cherry Island was also reported to have plants; but a search revealed no plants or any sign of human activity. The plants were confiscated and turned over to the County for disposal. Further investigations are ongoing. A drug incident report was filed with Special Agent Spoon.

On April 1-5 Maintenance Worker Harrison attended Region 5 Law Enforcement Refresher training at Eastern Shore of Virginia National Wildlife Refuge.

On October 7 Maintenance Worker Harrison attended semi-annual Firearms Re-qualification at Eastern Shore of Virginia National Wildlife Refuge.

Officer Harrison assisted Patuxent National Research Center personnel with law enforcement activities during their deer hunt on November 15-16.

Maintenance Worker Harrison traveled to Mason Neck National Wildlife Refuge with the rest of the "Blackwater Law Enforcement Team" to assist with that Refuge's shotgun deer hunt.

Maintenance Worker Harrison took Special Agent Ricker and two Maryland Department of Natural Resources police around Smith Island and the refuge to better familiarize them with local waterways, creeks, hiding spots, etc.

I. EQUIPMENT AND FACILITIES

1. New Construction

On February 5 we finally received our Corps of Engineers permit (after a seven month wait!) to begin construction of a 24' X 24' garage/workshop behind the Middleton House. Trips were made to the island in early February to layout, dig holes, set pilings and pour concrete. On 2/21 we rented a 66 foot scow from a local waterman; all building materials for the workshop were transported in this way. Actual construction began on 2/26. Several day trips and overnight

trips had the roof finished, doors and windows hung, siding and electric installed by the end of May. Insulation, inside trim work and shelf/storage space work was done for the remainder of the year as work schedules allowed.



Well braced flooring and construction on stilts was employed to accommodate heavy loads and high tides.

ROW 2/91

2. Rehabilitation

On June 11-12 Contractor Robert Dust was hired to hang Sheetrock in the two unfinished rooms upstairs in the Middleton House. These rooms will provide additional crews quarters.

In September Maintenance Worker Harrison and Refuge Operations Specialist Barker replaced and increased the width of the refuge boat dock. A pile driver (33 foot pontoon type) was rented from Dolby Marine Inc. in Whitehaven, MD. The pile driver was towed to and from the refuge work site by the refuge boat, Osprey, to reduce rental costs. Pulling the old piling was an exercise in frustration and torture with a little futility thrown in. It took a whole day to pull the first piling; the other nine pilings took the remainder of three more days. Driving the new piling was considerably easier. The entire project required 25 staff days.

In early September the Osprey was hauled out and dry-docked. The hull was scraped, painted and the rudder shoe was replaced. The bronze prop had 1/4" holes in it; a result of electrolysis induced corrosion. A new Nybrail prop (non-corrosive alloy) was ordered for a replacement.

4. Equipment Utilization and Replacement

During the week of May 13, the 50 hp outboard experienced major mechanical problems. The service shop said cavitation had introduced air into the cooling system causing the top cylinder to overheat and partially disintegrate. A new motor costs less than repairs on this one; so one was ordered. While the boat was out of the water, to install the new motor, the bottom was scraped, resin coated, and copper painted.

On October 17 Blackwater's 1981 Ford pickup was barged out to Smith Island to replace Maintenance Worker Harrison's old Dodge. The Dodge, suffering from salt water exposure, age, and use, was taken back to Blackwater where it was excessed.

5. Communications Systems

In April, a new VHF radio was purchased for Martin's small outboard after Maintenance Worker Harrison was stranded in refuge marshes by outboard failure. His refuge portamobile could not transmit well enough for his calls for assistance to be heard. Now he will be able to maintain contact with the Coast Guard and all Bay watermen in the area of the refuge.

J. OTHER ITEMS

3. Items of Interest

Refuge Operations Specialist Barker and Maintenance Worker Harrison attended the Annual Atlantic Flyway Wingbee held at Patuxent Wildlife Research Center January 28-31.

In February, Maintenance Worker Harrison appeared on "Maryland Outdoors," a television documentary on Smith Island.

On June 5 and 6 two Maryland state archaeologists visited Martin National Wildlife Refuge as part of a fact finding study for the State's inclusion in their Smith Island interpretive center.

4. Credits

This year's Narrative was written by Supervisory Refuge Operations Specialist Jason Barker and typed by Office Automation Clerk Julie Barker.

Reptiles and Amphibians



of BLACKWATER

National Wildlife Refuge



Maryland

REPTILES include turtles, snakes, and lizards and are characterized by bodies with dry skin (not slimy), and usually with scales or scutes.

TURTLES

The vast marshes and bordering swamps which comprise Blackwater Refuge offer ideal living conditions for an array of reptiles and amphibians. Some of these creatures are often easily observed, such as a painted turtle basking on a log on a summer's day, but most are shy and elusive, well camouflaged in their environment. These cold-blooded animals become torpid or dormant and inactive with the onset of winter. But with spring's return, the refuge wetlands come alive with the sound of frogs and toads, and with the activities of turtles, snakes, and salamanders. Through the long summer nights the deep bass voice of the bullfrog resounds. By both day and night water snakes ripple the surface waters and rat snakes hunt in the woodlands; turtles appear on the roads during their wanderings; toads are conspicuous throughout the drier areas. All of these animals, from the smallest salamander to the largest snapping turtle, are important to the ecosystem of Blackwater. Many reptiles and amphibians feed on insects, others on rodents, and most, in turn, are fed upon by raccoons, egrets, or a host of other animals. But whether hunters or hunted, they all contribute to the rich assortment of wildlife which makes Blackwater so unique.

Snapping Turtle (*Chelydra serpentina*). A large, common turtle in freshwater ponds and marsh; also inhabits brackish marsh. Aggressive on land, seldom so in water. Lays eggs in upland areas in late spring. Omnivorous - feeds on vegetation as well as small animals and carrion.

Stinkpot (*Sternotherus odoratus*). Aquatic, bottom-loving species found in freshwater areas. Avoids brackish waters. Named for a musky secretion exuded when handled.

Eastern Mud Turtle (*Kinosternon s. subrubrum*). A good swimmer. Another bottom-loving turtle, though likes land. Found in brackish marsh as well as freshwater. More common than stinkpot which it resembles.

Spotted Turtle (*Clemmys guttata*). Inhabits shallow freshwater areas. Common; most frequently observed in spring, when it is often seen on roads. Likes to bask. Not aggressive.

Eastern Box Turtle (*Terrapene c. carolina*). A common dry-land turtle most frequently seen in the woodlands. A slow and deliberate mover. Omnivorous - feeds on fruits and other plant material as well as small animals. Can live for 40 years or more.

Northern Diamondback Terrapin (*Maclaclemys t. terrapin*). An aquatic turtle of salt marsh and brackish water habitats. Likes to bask. Feeds on fish, crustaceans, mollusks, and insects. Lays eggs on dikes and uplands in early summer.

Red-bellied Turtle (*Chrysemys rubriventris*). Uncommon. Prefers larger bodies of freshwater. Basks like the painted turtle but is much larger. Largely vegetarian.

Eastern Painted Turtle (*Chrysemys p. picta*). The most conspicuous turtle on the refuge. Can be seen throughout the summer and into the autumn basking in the sun on logs or stumps in the freshwater pools and brackish marsh. An excellent swimmer though may wander far from water. Feeds on aquatic vegetation, insects, and other small animals.

LIZARDS and SKINKS

Northern Fence Lizard (*Sceloporus undulatus hyacinthinus*). Favorite habitats are rotting stumps and logs. Arboreal (climbs trees). Feeds on insects and other invertebrates.

Ground Skink (*Leiopisma laterale*). As name implies, this skink is terrestrial, seldom climbs. Will enter shallow water to escape. Insectivorous (feeds largely on insects).

Five-lined Skink (*Eumeces fasciatus*). Mainly terrestrial but may occasionally climb trees. Prefers cutover woodlands with many rotting stumps or logs. Habitat usually damp. Insectivorous.

Northern Copperhead (*Agkistrodon contortrix mokeson*). Uncommon. The only venomous snake on the refuge. Mice are the principal food.

AMPHIBIANS have no external scales, two pairs of limbs for walking or swimming and usually a moist skin; they include salamanders, toads, and frogs. Amphibians derive their name (amphibious double life) from their adaption to a life both in the water and on land.

SALAMANDERS

Marbled Salamander (*Ambystoma opacum*). Largely subterranean, living underground except during brief breeding season in autumn. Eats earthworms and other invertebrates.

Spotted Salamander (*Ambystoma maculatum*). Subterranean. An early spring breeder.

Eastern Tiger Salamander (*Ambystoma t. tigrinum*). Subterranean. A very early spring breeder.

Red-spotted Newt (*Notophthalmus v. viridescens*). Largely aquatic, except in land stage, the red eft form. May remain active all winter in aquatic form, even under ice.

Red-backed Salamander (*Plethodon c. cinereus*). Terrestrial. Nocturnal, hiding under all manner of objects by day. Feeds primarily on insects and spiders.

Northern Copperhead (*Agkistrodon contortrix mokeson*).

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Largely aquatic, except in land stage, the red eft form. May remain active all winter in aquatic form, even under ice.

Red-backed Salamander (*Plethodon c. cinereus*).

Terrestrial. Nocturnal, hiding under all manner of objects by day. Feeds primarily on insects and spiders.

Eastern Mud Salamander (*Pseudotriton m. montanus*).

Found in muddy places. Burrows in mud to escape.

TOADS and FROGS

Eastern Spadefoot Toad (*Scaphiopus h. holbrooki*).

Usually found in areas with sandy soil.

American Toad (*Bufo americanus*).
Uncommon.

Fowler's Toad (*Bufo woodhousei fowleri*).
Abundant throughout the refuge, in freshwater and brackish marsh areas, fields and woods. Feeds largely on insects.

Northern Cricket Frog (*Acris c. crepitans*).
A small nonclimbing frog of permanent bodies of water with emergent vegetation for cover.

Northern Spring Peeper (*Hyla c. crucifer*).
A small woodland frog. Arboreal. Prefers swamps or wet woods. Seldom noticed except in spring breeding season when their piping song is heard.

Green Treefrog (*Hyla cinerea*).
Arboreal. Throughout fresher wetlands.

Gray Treefrog (*Hyla versicolor*).
Seldom seen on the ground; usually forages in small trees and shrubs.

Chorus Frog (*Pseudacris triseriata*).
A small treefrog that climbs very little. Can be found in dry as well as freshwater habitats.

Eastern Narrow-mouthed Toad (*Gastrophryne carolinensis*).
Secretive; in damp areas. Very rare.

Bullfrog (*Rana catesbeiana*).
A large and common frog in the larger bodies of freshwater. Feeds primarily on insects, as do nearly all frogs.

Green Frog (*Rana clamitans melanota*).
May be found wherever there is shallow fresh water.

Southern Leopard Frog (*Rana utricularia*).
Common in shallow freshwater habitats. Also at edge of brackish marsh. Ventures well away from water in summer.

Pickerel Frog (*Rana palustris*).
Common in freshwater and brackish marsh. Also found in fields and wood margins.

All turtles and snakes in this list have been identified on Blackwater Refuge by refuge staff. The occurrence of some of the more rare and secretive skinks, salamanders, frogs and toads has not been fully substantiated; however, they are included here due to their expected occurrence based on range and habitat data. Common and scientific names, as well as the order in which they appear, follow Conant, A Field Guide To Reptiles and Amphibians (1975). To aid in further refinement of this list your observations and suggestions are welcomed.

For further information contact:

Refuge Manager
Blackwater National Wildlife Refuge
Route 1, Box 121
Cambridge, Maryland 21613
Telephone: (301) 228-2677

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE



As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U. S. administration.



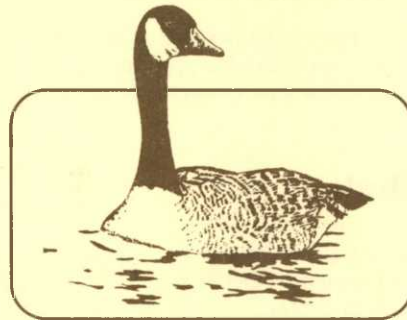
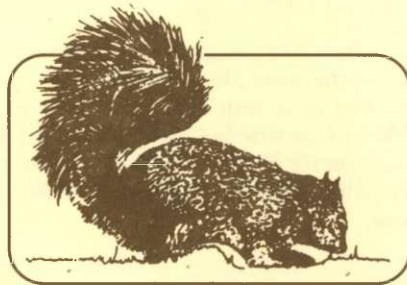
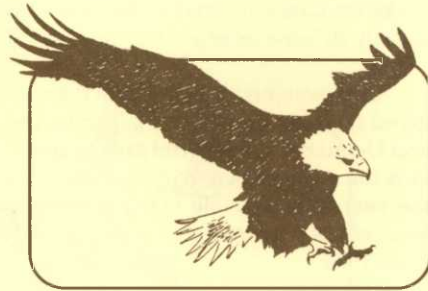
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November 1978

Blackwater

National
Wildlife
Refuge



Cambridge, Maryland

meet the nutritional needs of migrating and wintering waterfowl. Although waterfowl hunting is not permitted on the Refuge, hunting is extensive on surrounding areas. A winter trapping program, regulated by the Refuge and accomplished by trappers under special permit, provides protection for fragile marsh vegetation by lessening the impact of foraging furbearers. All management programs are carefully monitored to ensure the best interests of wildlife resources.

Endangered Species

Endangered species (now protected by the 1973 Endangered Species Act) are a special responsibility at Blackwater. One of these species is the Delmarva fox squirrel which once ranged from southeastern Pennsylvania down through the Delmarva Peninsula. This large, light-gray squirrel now exists in only four counties along Maryland's Eastern Shore and at Chincoteague National Wildlife Refuge in Virginia. The loss of suitable woodlands (due primarily to the demands of a growing society) is a major factor in its decline. Forest management programs at Blackwater aim to simulate and restore the type of habitat required by this beleaguered squirrel.

Our national symbol, the bald eagle, is another endangered species found on the Refuge. Like other birds of prey, the eagle's decline stems from causes endemic to our times - pesticides, pollution, irresponsible shooting, and human encroachment. The Refuge offers constant protection for this diminished species.

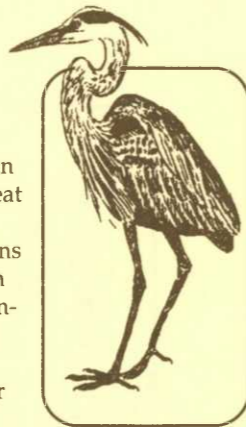
Another endangered species which utilizes the Blackwater area is the peregrine falcon, which is occasionally seen during migration.

WILDLIFE CALENDAR

Events may vary by one or two weeks depending on weather conditions.

January

Geese, swans and ducks remain in the marsh along with hawks, great blue herons, and a few species of shorebirds. Mid-winter observations are best during thaws. Eagles, both bald and golden, are sometimes conspicuous along the Wildlife Drive. Great horned owls are incubating eggs while bald eagles rebuild their nests high in loblolly pine trees.



February

First northward bound migrants appear late in February - killdeer, robins and bluebirds. Eagles laying eggs late in the month.

March

Most migratory waterfowl departing for points north. Masses of red-winged blackbirds pass through; some stay to set up territories.

April

Resident ducks and geese incubating. Majority of migrant marsh birds return by mid-April. Blue-winged and green-winged teal passing through. (Blue-winged are latest in spring and earliest in fall). Fox squirrels reproducing. Eaglets hatching.

May

Migratory songbirds peak in late April and early May with warblers being most conspicuous and abundant. White-tail fawns (usually twins) begin to appear.

June

Ospreys hatching in June. Muskrats (though seldom seen) repopulate the marsh with several litters a year. Eaglets fledge.



July

Local goslings starting to fly. Large quantities of insects being consumed by swallows, kingbirds, and flycatchers. The conspicuous marsh hibiscus (mallow) begins to bloom along marsh edges at end of month.

August

Shore and wading birds increase. Osprey young leaving the nest. Blue-winged teal from the north arrive on southward migration. Some bald eagles disperse northward after breeding season.

September

Ospreys begin leaving the marsh (headed for South and Central America). Waterfowl numbers gradually increase. Egrets and herons accumulate until cold weather pushes them south. Tickseed sunflowers blooming; cattails going to seed. Songbird migration peaks in late September and early October. Toads abundant.

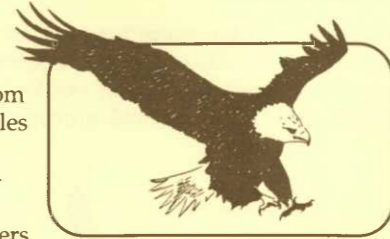
October - December

Autumn colors peak. Blackbirds are last of the songbird migrants, peaking in October and November.

Numbers of ducks and geese gradually increase, then peak in late October or November. Tundra swans from NW Canada usually arrive in early November. Several hundred remain all winter.

Breeding season of white-tails is November-February.

Bald eagle numbers increase with the arrival of migrants from the north. Golden eagles also occasionally seen during winter. Waterfowl decrease - some remain all winter, others move south or disperse throughout the Delmarva Peninsula. Burning of the marsh begins for regeneration of specific waterfowl food resources - preparation for another year.



Note: In summer, be prepared for large concentrations of flies and mosquitoes in the woods.

VISITOR ACTIVITIES

Visitor Center - Exhibits and films for daily viewing and an auditorium for special, prescheduled programs.

Wildlife Drive - Five miles of all-weather road along fresh water ponds, woods, fields, and marsh. Walking on the Wildlife Drive is permitted. For safety's sake, visitors are asked to stay within the roadway. Pets on leashes are permitted on the Wildlife Drive and established parking areas.

Observation Tower - This tower overlooks the junction of the Big and Little Blackwater Rivers and their marshlands.

Walking Trails - Interpretive trail leaflets are available at the visitor center. Visitors are reminded that pets are not permitted on the trails.

Marsh Edge Trail - Wheelchair accessible trail loops through and along the edge of the marsh for 1/3-mile. An 80-foot boardwalk extends into the marsh. Located at parking turn-off before Observation Tower.

Woods Trail - Loops through pine and mixed hardwoods for 1/2-mile. Located along Wildlife Drive.

WELCOME

Blackwater National Wildlife Refuge, located 12 miles south of Cambridge, Maryland, was established in 1933 as a refuge for migratory waterfowl. Most of its 17,121 acres is composed of rich tidal marsh characterized by fluctuating water levels and variable salinity. Other habitat types include freshwater ponds, mixed woodlands, and a small amount of cropland.

Although originally established for ducks, Blackwater has become one of the chief wintering areas for Canada geese using the Atlantic Flyway. Geese number approximately 33,000 and ducks exceed 15,000 at the peak of fall migration, usually in November.

Blackwater is also haven for three of our nation's endangered species, and possibly a fourth. The resident bald eagle and Delmarva fox squirrel are regularly seen on the Refuge as is the migrant peregrine falcon during certain periods of the year. It is possible that the red-cockaded woodpecker also occurs here though a sighting has not been confirmed since 1976.

HISTORY

Before its designation as a refuge, most of the marshland along the lower Blackwater River was managed as a fur farm. At that time, muskrats were the primary species trapped. Most of the wooded lands, including the islands, have been cut over for timber. Drainage ditches and old furrows criss-cross in some existing woods indicating past agricultural use.

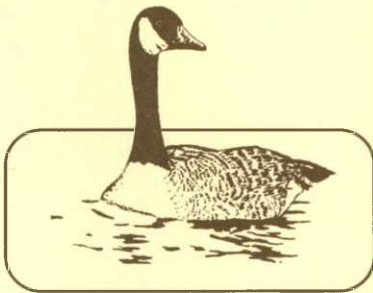
WILDLIFE

The varied habitats of Blackwater - from open water to dense woodlands - produce a diversity of wildlife in a panorama that changes by numbers and species with the seasons.

Birds

The best time for viewing waterfowl is between mid-October and mid-March. Wintering species include tundra swans, Canada and snow geese, and over 20 duck species.

The most common ducks found here are mallards, black ducks, blue-winged teal, green-winged teal, wigeon, and



pintails. Although most waterfowl migrate north in the spring, some remain through the summer, using the protected areas of the Refuge to raise their young. These nesting waterfowl include Canada geese, mallards, black ducks, wood ducks, and blue-winged teal.

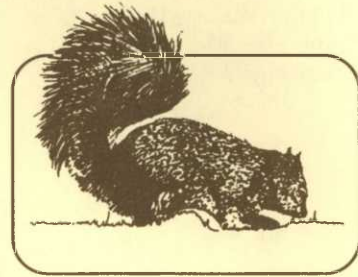
Other resident birds include the great blue heron and the bald eagle. Sightings of eagles are fairly common as Blackwater is the center of the greatest nesting density of bald eagles in the eastern United States north of Florida.

Numerous marsh and shore birds arrive in the spring, searching for food in the shallow waters. Ospreys, or "fish hawks," are common spring through fall and conspicuously use nesting platforms that have been placed throughout the marsh.

The Refuge woodlands provide year-round homes for towhees, woodpeckers, brown-headed nuthatches, bobwhite and woodcock. The warmer months invite warblers, vireos, orioles, flycatchers, and many others to this same habitat. A complete list of the birds has been published.

Mammals

In addition to its extensive list of birds, Blackwater harbors a variety of mammals, including raccoons, otters, opossums, skunks, and the elusive red fox. Muskrats are common in the marsh, as is the larger nutria, a South American rodent introduced to this country in the 1930s. The nutria population on the Refuge greatly fluctuates due to occasional severe winters. White-tailed deer can sometimes be seen in wooded areas and in fields along the forest edge. Asian sika deer, introduced to nearby James Island in 1916, prefer the wet woodlands and marsh. They are more nocturnal and, therefore, are less visible than the white-tails. Both gray squirrels and Delmarva fox squirrels inhabit the wooded areas.



MANAGEMENT

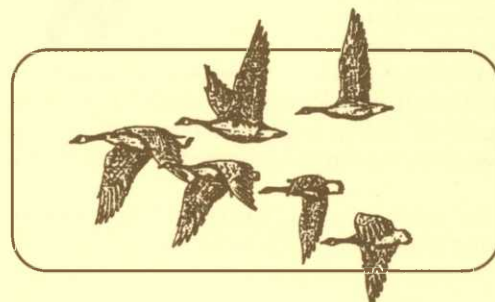
Waterfowl

Refuge programs specifically designed for waterfowl include management of the brackish marsh to produce succulent natural foods and management of impoundments to provide freshwater habitat. A variety of crops are planted and native plants encouraged, providing a variety of foods to

Bike Route - Biking is permitted along the entire length of the Wildlife Drive. Directions and regulations available at Visitor Center and Office Headquarters.

Fishing/Boating - Usually is permitted April 1 - October 1. Fishing ranges from poor to fair on the Refuge. No fishing is allowed from the shore. Boat launching is not permitted on the Refuge. For further information on fishing/boating areas and other regulations, contact the visitor center or the office headquarters.

Educational Opportunities - Organized school, civic and professional groups may reserve dates for slide talks, special movies, guided tours, and outdoor classroom activities. Write or call for additional information.



HOURS

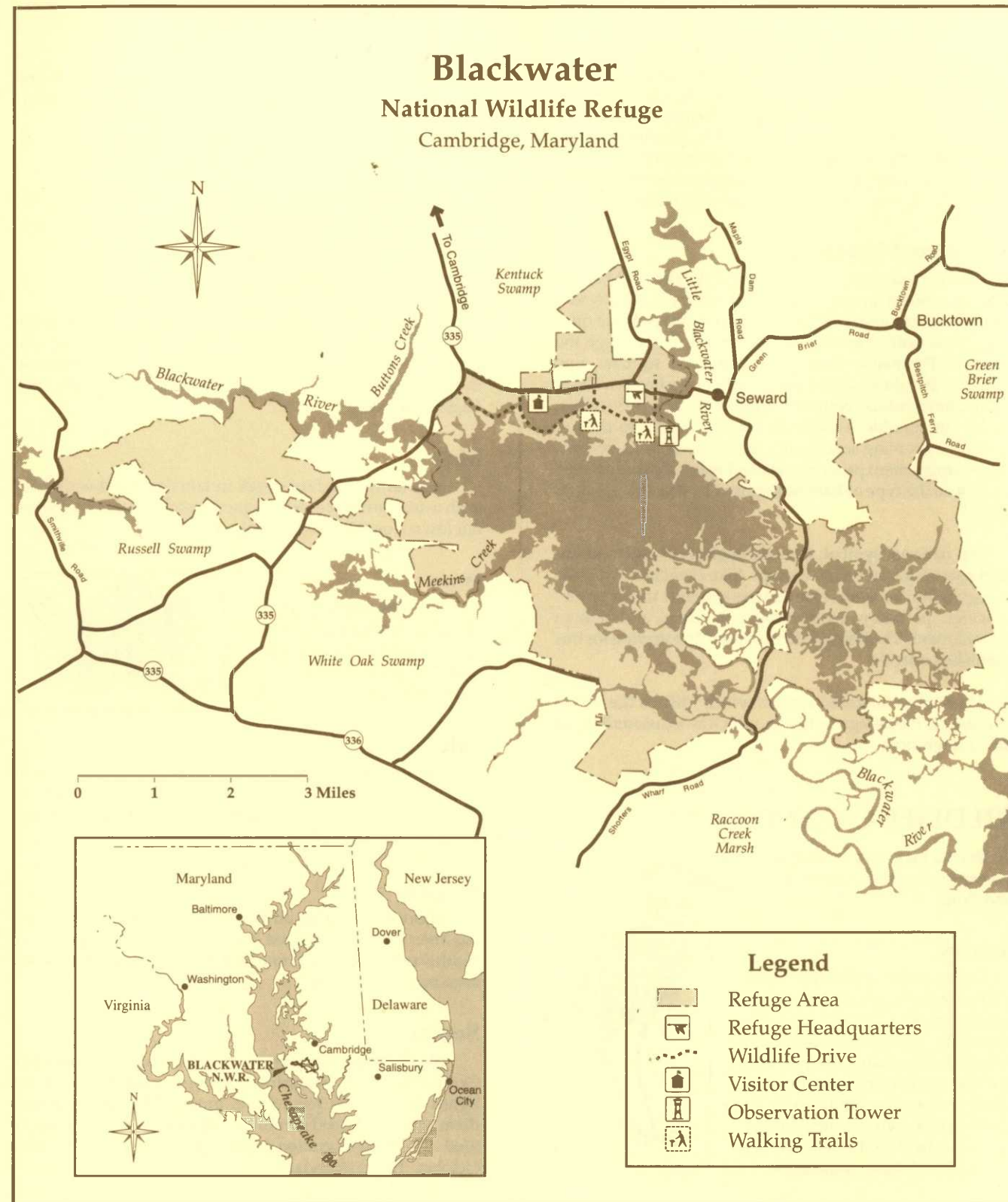
Visitor Center - Open 8:00 a.m. to 4:00 p.m., Monday-Friday; 9:00 a.m. to 5:00 p.m., Saturday-Sunday. Closed on all Federal holidays and on summer weekends (after Memorial Day through Labor Day).

Wildlife Drive and outdoor facilities - Open daily, dawn to dusk (year round). A permit is required.

Entrance Fees - A daily permit is required for all visitors to the Wildlife Drive unless they possess an annual pass or lifetime passport.

Private Vehicle	\$3.00
Pedestrian, Bicyclist	\$1.00
Commercial Van or Bus	
up to 20 passengers	\$15.00
21 or more passengers	\$25.00

Annual passes, either a Current Federal Duck Stamp valid July 1 to June 30 (\$15) or a Golden Eagle pass valid January 1 to December 31 (\$25), and free lifetime passports, either Golden Age passport for those 62 years or older or Golden Access passports for the permanently disabled, are available at the Visitor Center.



U.S. Fish and Wildlife Service

Blackwater is one of more than 470 refuges in the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service. The National Wildlife Refuge System is a network of lands and waters managed specifically for the protection of wildlife and wildlife habitat and represents the most comprehensive wildlife management program in the world. Units of the system stretch across the United States from northern Alaska to the Florida Keys and include small islands in the Caribbean and South Pacific. The character of the refuges is as diverse as the nation itself.

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For further information please contact:

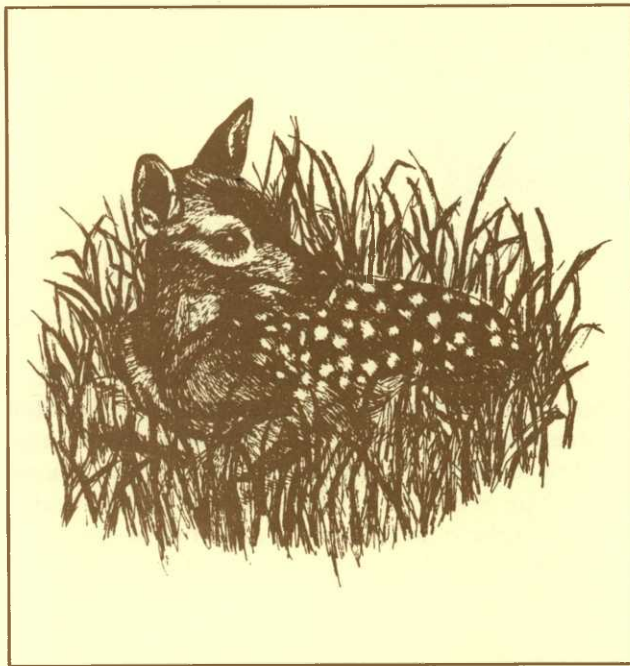
Refuge Manager
Blackwater National Wildlife Refuge
2145 Key Wallace Drive
Cambridge, Maryland 21613
Telephone (301) 228-2677



DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

Mammals

Blackwater
National
Wildlife
Refuge



Cambridge, Maryland

**Annotated List of
Mammals of the
Blackwater National Wildlife Refuge**



Opossum

(*Didelphis marupialis*).

Common in wooded areas and wood margins. Occasionally seen along roadsides at night. Omnivorous - eats both plant and animal food.

Masked Shrew

(*Sorex cinereus*)

Uncommon.

Least Shrew

(*Cryptotis parva*)

Common in the marsh.

Shorttail Shrew

(*Blarina brevicauda*)

Common in damp woodland soil habitats.

Starnose Mole

(*Condylura cristata*)

Common in damp soil.

Eastern Mole

(*Scalopus aquaticus*)

Common in cultivated fields.

Little Brown Bat

(*Myotis lucifugus*)

Common. Roosts in hollow trees.

Red Bat

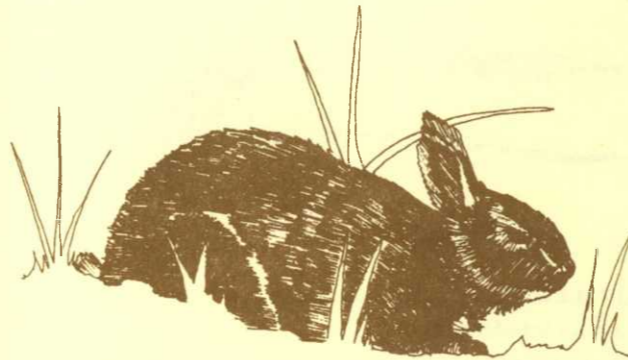
(*Lasiurus borealis*)

Common in woodlands.

Eastern Cottontail Rabbit

(*Sylvilagus floridanus*)

Very common in brushy thickets bordering roads and dikes. Frequently seen during spring and summer.



Gray Squirrel

(*Sciurus carolinensis*)

Common throughout Refuge woodlands. Prefers nut-producing hardwood trees. More arboreal than the Delmarva fox squirrel.

Delmarva Fox Squirrel

(*Sciurus niger cinereus*)

Common in wooded areas that contain little or no underbrush. Distinguished from gray squirrel by its larger size. The coloration varies but is usually light gray. This squirrel spends more time on the ground than the gray squirrel and often feeds in corn and soybean fields.

Southern Flying Squirrel

(*Glaucomys volans*)

Seldom seen because of its nocturnal habits.

Rice Rat

(*Oryzomys palustris*)

Common throughout the brackish marshes.

White-footed Mouse

(*Peromyscus leucopus*)

Abundant in wooded and brushy areas.

Meadow Vole

(*Microtus pennsylvanicus*)

Abundant in marsh where it will build its nest in muskrat houses.

Pine vole

(*Pitymys pinetorum*)

Common on all dry land habitats.

Muskrat

(*Ondatra zebethicus*)

One of the most abundant mammals at Blackwater. Their large dome-shaped houses may be seen throughout the marsh.

Nutria

(*Myocaster coypus*)

Not as abundant as the muskrat; found throughout the marsh. Larger than a muskrat, it is sometimes mistaken for a beaver.

Black Rat

(*Rattus rattus*)

Uncommon.

Norway Rat

(*Rattus norvegicus*)

Common.

House Mouse

(*Mus musculus*)

Common around Refuge buildings and in wild.

Red Fox

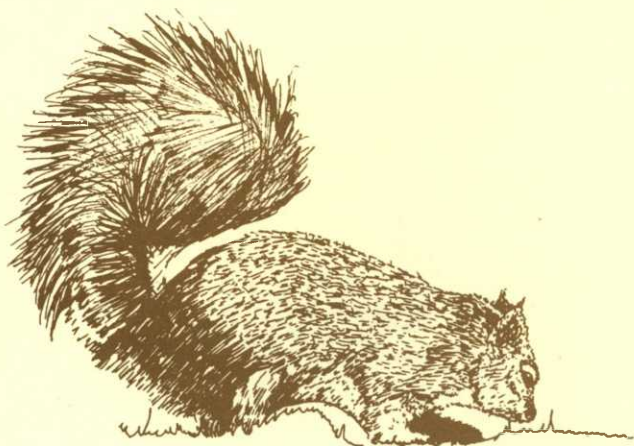
(*Vulpes fulva*)

Common, but seldom seen. Inhabits wooded and brushy areas where it feeds on rabbits, rodents and birds.

BLACKWATER NATIONAL WILDLIFE

REFUGE is located on the Eastern Shore of Chesapeake Bay in Dorchester County, Maryland, about 12 miles south of Cambridge. Established in 1933, the Refuge consists of 17,121 acres of brackish marsh, freshwater ponds, and brushy and timbered swamps. The wooded areas are predominately loblolly pine and mast producing hardwoods; three-square bulrush is the dominant vegetation in the marsh.

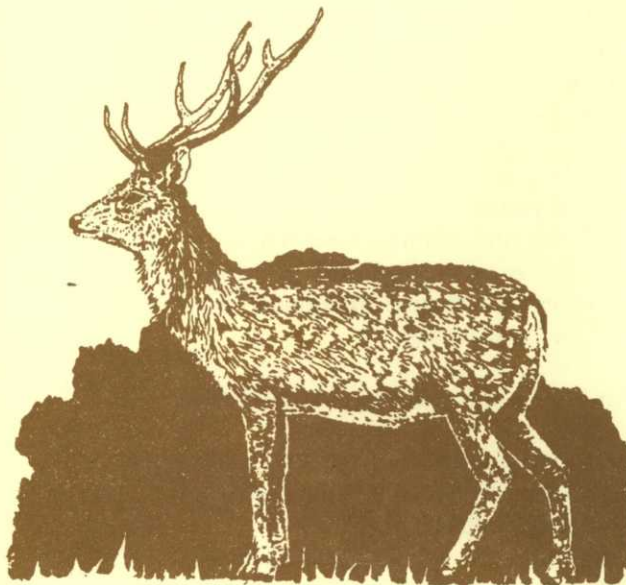
Although the mammals of Blackwater are often overlooked in favor of the more abundant and conspicuous bird life, the Refuge hosts a wide variety of mammalian forms ranging from the marsupial opossum to the hoofed white-tailed deer.



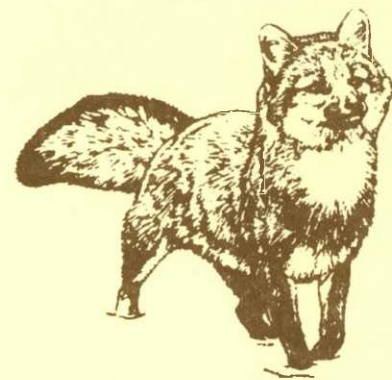
One species worthy of special note is the large, grizzled gray Delmarva fox squirrel. Currently listed as an endangered species, this squirrel is found only in a few localities on the Eastern Shore. Common on the Refuge, it is occasionally observed in the woods bordering the Wildlife Drive. Forest management programs at Blackwater are oriented toward perpetuation of this handsome squirrel.

Two other rather unusual residents are the nutria and sika deer. The nutria, a large aquatic rodent introduced from South America, is present throughout the marsh. Brought into Maryland in the 1940's for use on fur farms, the nutria eventually reached the wild where they adapted to the climate of Blackwater.

The sika deer, actually an oriental species of elk, was introduced onto James Island in Chesapeake Bay about 1916. They are now quite common in southern Dorchester County. Shorter and darker than the white-tailed deer, this animal prefers the more secluded areas of the Refuge.



The following list of 30 species is based on observations by Refuge personnel and a report prepared by John L. Paradiso of the U.S. Fish and Wildlife Service. Eight additional species are listed as hypothetically existing on the Refuge since it is within their range. Scientific names and the order in which they appear follow Miller and Kellog, *List of North American Recent Mammals* (U.S. National Museum Bulletin 205), while common names were taken from Burt and Grossenheider, *A Field Guide to the Mammals*. More detailed information on the following species may be obtained from Paradiso, *Mammals of Maryland, North American Fauna, No. 66* (U.S. Fish & Wildlife Service, April 1969).



Gray Fox
(*Urocyon cinereoargenteus*)
Uncommon. Prefers the heavily wooded areas.

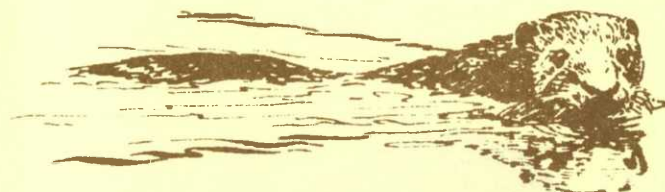
Raccoon
(*Procyon lotor*)
Very common in all wooded areas bordering water. Its varied diet includes fish, frogs, rodents, eggs, insects and plants.



Longtail Weasel
(*Mustela frenata*)
Common in brushland, fields and marsh.

Mink
(*Mustela vison*)
Uncommon. May be found in all aquatic habitats.

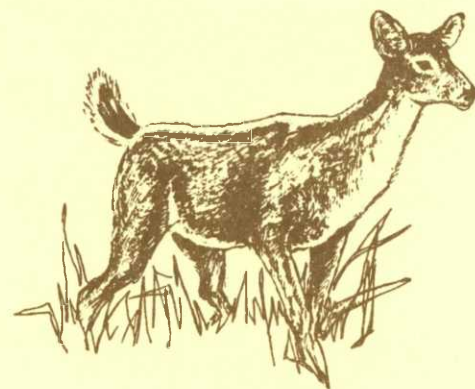
Striped Skunk
(*Mephitis mephitis*)
Common in brushy areas of Refuge.



River Otter
(*Lutra canadensis*)
Uncommon, but occasionally seen along banks of Wildlife Drive.

Sika Deer
(*Cervus nippon*)
Abundant. Found in the more secluded areas of the Refuge.

White-tailed Deer
(*Odocoileus virginianus*)
Abundant. May often be seen at dusk in tree-bordered fields.



**A Hypothetical Listing of Species
Based on Reported Range**

Keen's Bat
(*Myotis keenii*)

Silver-haired Bat
(*Lasionycteris noctivagans*)

Eastern Pipistrell
(*Pipistrellus subflavus*)

Big Brown Bat
(*Eptesicus fuscus*)

Hoary Bat
(*Lasiurus cinereus*)

Evening Bat
(*Nycticeius humeralis*)

Southern Bog Lemming
(*Synaptomys cooperi*)

Meadow Jumping Mouse
(*Zapus hudsonius*)

Notes

Date _____ Time _____

Observers _____

Weather _____

Tides _____

U.S. Fish and Wildlife Service

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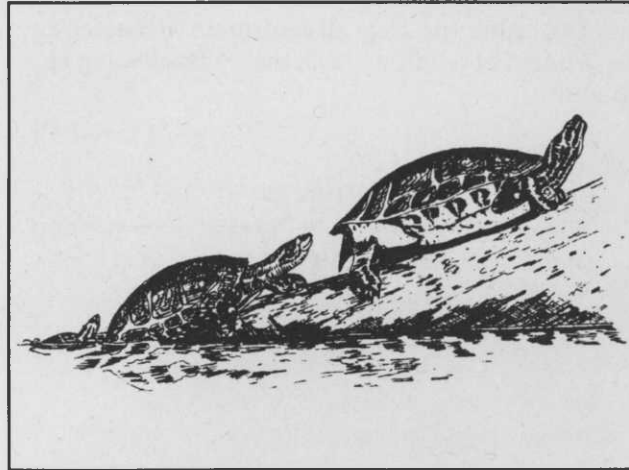
Cover illustration by Mary Friel O'Connor



**DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE**

Reptiles & Amphibians

Blackwater
National
Wildlife
Refuge



Cambridge, Maryland

Red-bellied Turtle

(*Chrysemys rubriventris*)

Uncommon. Prefers larger bodies of fresh water. Basks like the painted turtle but is much larger. Largely vegetarian.

Eastern Painted Turtle

(*Chrysemys p. picta*)

The most conspicuous turtle on the Refuge. Can be seen throughout the summer and into the autumn basking in the sun on logs or stumps in the fresh-water pools and brackish marsh. An excellent swimmer though may wander far from water. Feeds on aquatic vegetation, insects, and other small animals.

LIZARDS AND SKINKS

Northern Fence Lizard

(*Sceloporus undulatus hyacinthinus*)

Favorite habitats are rotting stumps and logs. Arboreal (climbs trees). Feeds on insects and other invertebrates.

Ground Skink

(*Leiopisma laterale*)

As name implies, this skink is terrestrial, seldom climbs. Will enter shallow water to escape. Insectivorous (feeds largely on insects).

Five-lined Skink

(*Eumeces fasciatus*)

Mainly terrestrial but may occasionally climb trees. Prefers cutover woodlands with many rotting stumps or logs. Habitat usually damp. Insectivorous.

Broad-headed Skink

(*Eumeces laticeps*)

A large woodland skink. The most arboreal of the skinks.

SNAKES

Red-bellied Water Snake

(*Natrix e. erythrogaster*)

Very common. Aquatic, though often wanders well away from water in hot, humid weather. Both water snakes like to bask on logs or brush and are adept at swimming and diving.

Northern Water Snake

(*Natrix s. sipedon*)

Common throughout the more freshwater wetlands of the Refuge. Obtains food, including frogs, salamanders, and small fish, in or near water. Both water snakes, though harmless, are sometimes mistaken for the poisonous water moccasin, which has never been recorded on the Refuge.



Eastern Garter Snake

(*Thamnophis s. sirtalis*)

Common throughout fields, woods, and marsh edge habitats. Feeds on small animals from earthworms to frogs.

Eastern Ribbon Snake

(*Thamnophis s. sauritus*)

Semi-aquatic, seldom far from marsh or pond. Prefers shallow water, swimming at the surface instead of diving as water snakes do. Eats salamanders, frogs and small fishes.

Rough Earth Snake

(*Virginia striatula*)

Uncommon. Secretive.

Eastern Hognose Snake

(*Heterodon platyrhinos*)

Prefers sandy areas. Feeds mainly on toads; also eats frogs, tadpoles and insects.

Southern Ringneck Snake

(*Diadophis p. punctatus*)

Secretive. Usually under bark, brush or other shelter near water. Small salamanders an important food.

Eastern Worm Snake

(*Carphophis a. amoenus*)

Likes moist earth. Usually found under logs, boards, or other debris.

Northern Black Racer

(*Coluber c. constrictor*)

An active snake. Feeds on rodents, small birds, other snakes, frogs and insects. Diurnal - active by day.

Rough Green Snake

(*Ophiodryas aestivus*)

Semi-aquatic and an excellent climber. Food consists of spiders, small insects and their larvae.

Corn Snake

(*Elaphe g. guttata*)

Climbs well, though mainly terrestrial, spending much time underground. Kills mice, young rats, and small birds by constriction; young corn snakes eat mostly frogs.

Black Rat Snake

(*Elaphe o. obsoleta*)

A common large snake. Usually seen on the ground though an excellent climber. Kills its prey by constriction.

Eastern Kingsnake

(*Lampropeltis g. getulus*)

Generally secretive and terrestrial though likes borders of swamps. Swims readily. Largely nocturnal in hot weather. Eats snakes, turtle eggs, rodents, and small birds.

The vast marshes and bordering swamps which comprise Blackwater National Wildlife Refuge offer ideal living conditions for an array of reptiles and amphibians. Some of these creatures are often easily observed, such as a painted turtle basking on a log on a summer's day, but most are shy and elusive, well camouflaged in their environment. These cold-blooded animals become torpid or dormant and inactive with the onset of winter. But with spring's return, the Refuge wetlands come alive with the sound of frogs and toads, and with the activities of turtles, snakes, and salamanders. Through the long summer nights the deep bass voice of the bullfrog resounds. By both day and night water snakes ripple the surface waters and rat snakes hunt in the woodlands; turtles appear on the roads during their wanderings; toads are conspicuous throughout the drier areas. All of these animals, from the smallest salamander to the largest snapping turtle, are important to the ecosystem of Blackwater. Many reptiles and amphibians feed on insects, others on rodents, and most, in turn, are fed upon by raccoons, egrets, or a host of other animals. But whether hunters or hunted, they all contribute to the rich assortment of wildlife which makes Blackwater so unique.

Reptiles include turtles, snakes, and lizards and are characterized by bodies with dry skin (not slimy), and usually with scales or scutes.



TURTLES

Snapping Turtle

(Chelydra serpentina)

A large, common turtle in freshwater ponds and marsh; also inhabits brackish marsh. Aggressive on land, seldom so in water. Lays eggs in upland areas in late spring. Omnivorous - feeds on vegetation as well as small animals and carrion.

Stinkpot

(Sternotherus odoratus)

Aquatic, bottom-loving species found in freshwater areas. Avoids brackish waters. Named for a musky secretion exuded when handled.

Eastern Mud Turtle

(Kinosternon s. subrubrum)

A good swimmer. Another bottom-loving turtle, though likes land. Found in brackish marsh as well as freshwater. More common than stinkpot which it resembles.

Spotted Turtle

(Clemmys guttata)

Inhabits shallow freshwater areas. Common; most frequently observed in spring, when it is often seen on roads. Likes to bask. Not aggressive.

Eastern Box Turtle

(Terrapene c. carolina)

A common dry-land turtle most frequently seen in the woodlands. A slow and deliberate mover. Omnivorous - feeds on fruits and other plant materials as well as small animals. Can live for 40 years or more.

Northern Diamondback Terrapin

(Maclaclemys t. terrapin)

An aquatic turtle of salt marsh and brackish water habitats. Likes to bask. Feeds on fish, crustaceans, mollusks, and insects. Lays eggs on dikes and uplands in early summer.

Eastern Milk Snake

(*Lampropeltis t. triangulum*)

Secretive. Feeds mainly on rodents and snakes.

Northern Copperhead

(*Agkistrodon contortrix mokeson*)

Uncommon. The only venomous snake on the Refuge. Mice are the principal food.

Amphibians have no external scales, two pairs of limbs for walking or swimming, and usually a moist skin; they include salamanders, toads, and frogs. Amphibians derive their name (amphibious double life) from their adaptation to a life both in the water and on land.

SALAMANDERS

Marbled Salamander

(*Ambystoma opacum*)

Largely subterranean, living underground except during brief breeding season in autumn. Eats earthworms and other invertebrates.

Spotted Salamander

(*Ambystoma t. tigrinum*)

Subterranean. A very early spring breeder.

Red-spotted Newt

(*Notophthalmus v. viridescens*)

Largely aquatic, except in land stage, the red eft form. May remain active all winter in aquatic form, even under ice.

Red-backed Salamander

(*Plethodon c. cinereus*)

Terrestrial. Nocturnal, hiding under all manner of objects by day. Feeds primarily on insects and spiders.

Eastern Mud Salamander

(*Pseudotriton m. montanus*)

Found in muddy places. Burrows in mud to escape.

TOADS AND FROGS

Eastern Spadefoot Toad

(*Scaphiopus h. holbrooki*)

Usually found in areas with sandy soil.

American Toad

(*Bufo americanus*)

Uncommon.

Fowler's Toad

(*Bufo woodhousei fowleri*)

Abundant throughout the Refuge, in freshwater and brackish marsh areas, fields and woods. Feeds largely on insects.

Northern Cricket Frog

(*Acris c. crepitans*)

A small nonclimbing frog of permanent bodies of water with emergent vegetation for cover.

Northern Spring Peeper

(*Hyla c. crucifer*)

A small woodland frog. Arboreal. Prefers swamps or wet woods. Seldom noticed except in spring breeding season when their piping song is heard.

Green Treefrog

(*Hyla cinerea*)

Arboreal. Throughout fresher wetlands.



Gray Treefrog

(*Hyla versicolor*)

Seldom seen on the ground; usually forages in small trees and shrubs.

Chorus Frog

(*Pseudacris triseriata*)

A small treefrog that climbs very little. Can be found in dry as well as freshwater habitats.

Eastern Narrow-mouthed Toad

(*Gastrophryne carolinensis*)

Secretive; in damp areas. Very rare.

Bullfrog

(*Rana catesbeiana*)

A large and common frog in the larger bodies of fresh water. Feeds primarily on insects, as do nearly all frogs.

Green Frog

(*Rana clamitans melanota*)

May be found wherever there is shallow fresh water.

Southern Leopard Frog

(*Rana utricularia*)

Common in shallow freshwater habitats. Also at edge of brackish marsh. Ventures well away from water in summer.

Pickerel Frog

(*Rana palustris*)

Common in freshwater and brackish marsh. Also found in fields and wood margins.

All turtles and snakes in this list have been identified on Blackwater Refuge by Refuge staff. The occurrence of some of the more rare and secretive skinks, salamanders, frogs, and toads has not been fully substantiated; however, they are included here due to their expected occurrence based on range and habitat data. Common and scientific names, as well as the order in which they appear, follow Conant, A Field Guide to Reptiles and Amphibians (1975). To aid in further refinement of this list your observations and suggestions are welcomed.

U.S. Fish and Wildlife Service

Blackwater is one of more than 470 refuges in the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service. The National Wildlife Refuge System is a network of lands and waters managed specifically for the protection of wildlife and wildlife habitat and represents the most comprehensive wildlife management program in the world. Units of the system stretch across the United States from northern Alaska to the Florida Keys and include small islands in the Caribbean and South Pacific. The character of the refuges is as diverse as the nation itself.

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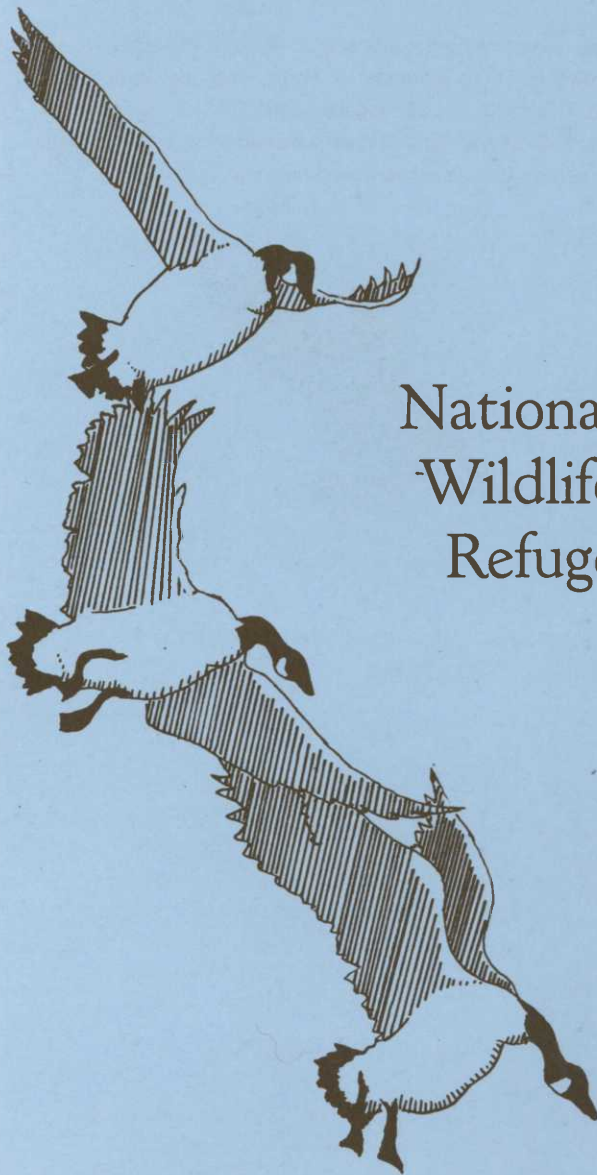
For further information please contact:

Refuge Manager
Blackwater National Wildlife Refuge
2145 Key Wallace Drive
Cambridge, MD 21613
Telephone: (301) 228-2677



DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

BIRDS of BLACK WATER



National
Wildlife
Refuge

Maryland

	s	S	F	W
___ Osprey †	c	c	c	
___ Bald Eagle †	c	c	c	c
___ Northern Harrier †	c	o	c	c
___ Sharp-shinned Hawk	u	u	u	
___ Cooper's Hawk	u	u	u	u
___ Northern Goshawk				r
___ Red-shouldered Hawk	o	o	u	
___ Broad-winged Hawk	o	o		
___ Red-tailed Hawk †	u	u	c	c
___ Rough-legged Hawk	o	u	c	
___ Golden Eagle		o	o	
___ American Kestrel	c	u	c	c
___ Merlin	o	u	r	
___ Peregrine Falcon	o	o	r	
GROUSE - QUAIL - TURKEY				
___ Wild Turkey	r	r	r	r
___ Northern Bobwhite †	c	c	c	c
RAILS - COOT				
___ Black Rail †	r	r	r	
___ Clapper Rail †	u	u	u	r
___ King Rail †	c	c	c	u
___ Virginia Rail †	c	u	c	u
___ Sora	u	u	o	
___ Common Moorhen	u	u	u	
___ American Coot	u	o	u	u
PLOVERS - SANDPIPERS				
___ Black-bellied Plover	o	o	r	
___ Lesser Golden-Plover		r		
___ Semipalmated Plover	c	u	c	
___ Killdeer †	c	c	c	u
___ Black-necked Stilt	r			
___ Greater Yellowlegs	c	c	c	o
___ Lesser Yellowlegs	c	c	c	o
___ Solitary Sandpiper	c	u	c	
___ Willet †	r	u	r	
___ Spotted Sandpiper	u	u	u	
___ Upland Sandpiper	r			
___ Whimbrel	r			
___ Hudsonian Godwit	r			
___ Ruddy Turnstone		o		
___ Sanderling	o	o	o	
___ Semipalmated Sandpiper	a	a	a	r
___ Western Sandpiper	o	o		
___ Least Sandpiper	a	a	a	r
___ White-rumped Sandpiper	u	o	u	
___ Pectoral Sandpiper	u	u	u	
___ Dunlin	c	o	c	o
___ Curlew Sandpiper	o			

	s	S	F	W
___ Stilt Sandpiper	r	o	o	
___ Short-billed Dowitcher	u	u	u	r
___ Long-billed Dowitcher	r		r	
___ Common Snipe	c	o	c	u
___ American Woodcock †	c	u	c	o
GULLS - TERNS				
___ Laughing Gull	c	c	c	
___ Bonaparte's Gull	u	u	o	
___ Ring-billed Gull	c	o	c	c
___ Herring Gull	u	u	u	c
___ Great Black-backed Gull	o	u	u	
___ Gull-billed Tern	r			
___ Caspian Tern	u	r	u	
___ Common Tern	u	o	o	
___ Forster's Tern	u	u	c	
___ Least Tern	u	u	r	
___ Black Tern	r	o	o	
DOVES - CUCKOOS - OWLS -				
SWIFTS - HUMMINGBIRDS				
___ Rock Dove †	u	u	u	u
___ Mourning Dove †	c	c	a	c
___ Black-billed Cuckoo	u	o	u	
___ Yellow-billed Cuckoo †	c	c	c	
___ Common Barn-Owl †	u	u	u	u
___ Eastern Screech-Owl †	c	c	c	c
___ Great Horned Owl †	c	c	c	c
___ Barred Owl †	u	u	u	u
___ Long-eared Owl			r	
___ Short-eared Owl	o	r	o	u
___ Northern Saw-whet Owl			r	
___ Common Nighthawk †	u	u	u	
___ Chuck-will's-widow	o	o	o	
___ Whip-poor-will	c	c	o	
___ Chimney Swift	u	u	u	
___ Ruby-throated Hummingbird †	c	c	c	
___ Belted Kingfisher †	c	o	c	u
WOODPECKERS - FLYCATCHERS				
___ Red-headed Woodpecker †	u	u	u	u
___ Red-bellied Woodpecker †	c	c	c	c
___ Yellow-bellied Sapsucker	u	u	u	
___ Downy Woodpecker †	c	c	c	c
___ Hairy Woodpecker †	u	u	u	u
___ Northern Flicker †	c	c	c	c
___ Pileated Woodpecker †	u	u	u	u
___ Eastern Wood-Pee-wee †	c	c	c	
___ Acadian Flycatcher †	u	u	u	
___ Least Flycatcher	r	r		
___ Eastern Phoebe †	c	o	c	r

	s	S	F	W
___ Great Crested Flycatcher †	c	c	c	
___ Western Kingbird		r		
___ Eastern Kingbird †	c	c	c	
LARKS - SWALLOWS - JAYS and CROWS				
___ Horned Lark †	u	o	u	o
___ Purple Martin †	c	c	u	
___ Tree Swallow †	c	c	a	o
___ Northern Rough-winged Swallow †	u	u	u	
___ Bank Swallow	u	u	r	
___ Cliff Swallow	u	o		
___ Barn Swallow †	a	a	a	
___ Blue Jay †	u	u	u	u
___ American Crow †	c	c	c	c
___ Fish Crow †	u	u	u	u
TITMICE - NUTHATCHES - WRENS				
___ Black-capped Chickadee			r	
___ Carolina Chickadee †	c	c	c	c
___ Tufted Titmouse †	c	c	c	c
___ Red-breasted Nuthatch	o	o	u	
___ White-breasted Nuthatch	r	r	u	
___ Brown-headed Nuthatch †	u	u	u	u
___ Brown Creeper	u	u	u	
___ Carolina Wren †	c	c	c	c
___ House Wren †	c	c	c	o
___ Winter Wren	u	u	u	
___ Sedge Wren	u	u	u	o
___ Marsh Wren †	a	a	a	u
KINGLETS - THRUSHES - THRASHERS				
___ Golden-crowned Kinglet	c	c	c	
___ Ruby-crowned Kinglet	c	c	u	
___ Blue-gray Gnatcatcher †	u	u	u	
___ Eastern Bluebird †	u	u	u	u
___ Veery	u	u		
___ Gray-cheeked Thrush	o	o		
___ Swainson's Thrush	u	u		
___ Hermit Thrush	u	u	u	
___ Wood Thrush †	c	c	c	
___ American Robin †	c	c	c	u
___ Gray Catbird †	c	u	c	u
___ Northern Mockingbird †	c	c	c	c
___ Brown Thrasher †	c	u	c	u
WAXWINGS - SHRIKE - STARLING				
___ Water Pipit	o	u	u	
___ Cedar Waxwing	u	o	u	u
___ Loggerhead Shrike	u	o	u	
___ European Starling †	a	a	a	a
VIREOS - WOOD WARBLERS				
___ White-eyed Vireo †	c	c	c	

The Blackwater National Wildlife Refuge, established in 1932, is located on the Eastern Shore of the Chesapeake Bay in Dorchester County, Maryland, about 10 miles south of Cambridge. It serves as an important resting and feeding area for migrating and wintering waterfowl in the chain of wildlife refuges along the Atlantic Flyway that extends from Canada to the Gulf of Mexico. The Blackwater area also has one of the largest populations of nesting bald eagles on the Atlantic Coast north of Florida.

Species names and order are in accordance with the American Ornithological Union Checklist of North American Birds, Sixth Edition. This folder lists 252 regular species of birds identified by refuge personnel and qualified visitors, plus an additional 17 species of accidentals that have been seen only one or two times.



The seasonal occurrence and relative abundance of the various species are coded as follows:

SEASON

- | | |
|-------------------|----------------------|
| s - Spring | March - May |
| S - Summer | June - August |
| F - Fall | September - November |
| W - Winter | December - February |

† - Nesting has occurred on the refuge.

RELATIVE ABUNDANCE

- | | |
|-----------------------|--|
| a - abundant | a species which is very numerous. |
| c - common | certain to be seen or heard in suitable habitat. |
| u - uncommon | present, but not certain to be seen. |
| o - occasional | seen only a few times during a season. |
| r - rare | seen at intervals of 2 to 5 years. |

s S F W

LOONS - GREBES - CORMORANT

- ___ Common Loon o o o
- ___ Pied-billed Grebe u o u u
- ___ Horned Grebe o o u
- ___ Double-crested Cormorant o r o

BITTERNS - HERONS - IBIS

- ___ American Bittern † u u u o
- ___ Least Bittern † u u u
- ___ Great Blue Heron c c c c
- ___ Great Egret u a c r
- ___ Snowy Egret c a c
- ___ Little Blue Heron u u u
- ___ Tricolored Heron u u r
- ___ Cattle Egret u u u
- ___ Green-backed Heron † c c c
- ___ Black-crowned Night-Heron † u u u u
- ___ Glossy Ibis o o o

SWANS - GEESE - DUCKS

- ___ Tundra Swan u c c
- ___ Greater White-fronted Goose r r
- ___ Snow Goose u c c
- ___ Canada Goose † a c a a
- ___ Wood Duck † u u u o
- ___ Green-winged Teal c r a u
- ___ American Black Duck † a c a a
- ___ Mallard † a c a a
- ___ Northern Pintail c r c c
- ___ Blue-winged Teal † c c c r
- ___ Northern Shoveler u r c o
- ___ Gadwall c o c u
- ___ Eurasian Wigeon r
- ___ American Wigeon c c u
- ___ Canvasback r r o
- ___ Redhead o o o
- ___ Ring-necked Duck u u o
- ___ Greater Scaup o o o
- ___ Lesser Scaup o o u
- ___ Oldsquaw o o
- ___ White-winged Scoter r
- ___ Common Goldeneye u u u
- ___ Bufflehead u u u
- ___ Hooded Merganser u r u u
- ___ Common Merganser u u u
- ___ Red-breasted Merganser o o o
- ___ Ruddy Duck u u u

VULTURES - HAWKS - FALCONS

- ___ Black Vulture o o o o
- ___ Turkey Vulture † c c c c

s S F W

- ___ Solitary Vireo r o
- ___ Yellow-throated Vireo † u r u
- ___ Red-eyed Vireo † c c c
- ___ Blue-winged Warbler u u
- ___ Golden-winged Warbler r
- ___ Tennessee Warbler r r
- ___ Orange-crowned Warbler r r
- ___ Nashville Warbler r
- ___ Northern Parula u u
- ___ Yellow Warbler † c c u
- ___ Chestnut-sided Warbler u u
- ___ Magnolia Warbler u u
- ___ Cape May Warbler o u
- ___ Black-throated Blue Warbler u u
- ___ Yellow-rumped Warbler a c c
- ___ Blackburnian Warbler o o
- ___ Yellow-throated Warbler r o
- ___ Pine Warbler † c c c u
- ___ Prairie Warbler † u u u
- ___ Palm Warbler u u o
- ___ Bay-breasted Warbler r r
- ___ Blackpoll Warbler u u
- ___ Black-and-white Warbler o c
- ___ American Redstart u c
- ___ Prothonotary Warbler † u o r
- ___ Worm-eating Warbler † u o r
- ___ Ovenbird † c u c
- ___ Northern Waterthrush r u
- ___ Louisiana Waterthrush o r o
- ___ Kentucky Warbler † u u o
- ___ Common Yellowthroat † a c a o
- ___ Hooded Warbler o o
- ___ Wilson's Warbler r
- ___ Canada Warbler o u
- ___ Yellow-breasted Chat † c c u

TANAGERS - SPARROWS

- ___ Summer Tanager † u u
- ___ Scarlet Tanager † u u u
- ___ Northern Cardinal † c c c c
- ___ Rose-breasted Grosbeak r r
- ___ Blue Grosbeak † c c u
- ___ Indigo Bunting † c c u
- ___ Rufous-sided Towhee † c c c u
- ___ American Tree Sparrow o o o
- ___ Chipping Sparrow † c c c o
- ___ Field Sparrow † u u u u
- ___ Vesper Sparrow u o r
- ___ Savannah Sparrow c c u

s S F W

- ___ Grasshopper Sparrow † u u u
- ___ Henslow's Sparrow † o r o
- ___ Sharp-tailed Sparrow † u o u r
- ___ Seaside Sparrow † o u o r
- ___ Fox Sparrow u u u
- ___ Song Sparrow † a u a a
- ___ Swamp Sparrow † c c a
- ___ White-throated Sparrow a a a
- ___ White-crowned Sparrow o o o
- ___ Dark-eyed Junco a a a
- ___ Snow Bunting o o

BLACKBIRDS - FINCHES

- ___ Bobolink u o a
- ___ Red-winged Blackbird † a a a a
- ___ Eastern Meadowlark † c c c c
- ___ Rusty Blackbird u u u
- ___ Boat-tailed Grackle o o o
- ___ Common Grackle † a a a a
- ___ Brown-headed Cowbird † c c c c
- ___ Orchard Oriole † c c o
- ___ Northern Oriole u u
- ___ Purple Finch u u o
- ___ House Finch o o
- ___ Red Crossbill r
- ___ White-winged Crossbill r
- ___ Common Redpoll r
- ___ Pine Siskin o o u
- ___ American Goldfinch † c c c c
- ___ Evening Grosbeak o o u
- ___ House Sparrow † a a a a

Please report any sightings of birds that are not in accordance with this list to:

Refuge Manager
 Blackwater National Wildlife Refuge
 Route 1, Box 121
 Cambridge, Maryland 21613
 Telephone: (301) 228-2677

ACCIDENTAL SPECIES

Accidental species that have only been seen once or twice on the refuge.

- ___ Least Grebe
- ___ Western Grebe

- ___ American White Pelican
- ___ Ross' Goose
- ___ Mute Swan
- ___ Barnacle Goose
- ___ Fulvous Whistling-Duck
- ___ American Swallow-tailed Kite
- ___ Gyrfalcon
- ___ American Avocet
- ___ Marbled Godwit
- ___ Wilson's Phalarope
- ___ Ruff
- ___ Snowy Owl
- ___ Northern Shrike
- ___ Yellow-headed Blackbird
- ___ Backman's Sparrow

NOTES

Location _____

Date _____ Total _____

Observers _____

Weather _____ Wind _____

Time _____



**UNITED STATES
 DEPARTMENT OF THE INTERIOR
 FISH AND WILDLIFE SERVICE**



U.S. FISH AND WILDLIFE SERVICE

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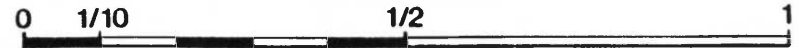
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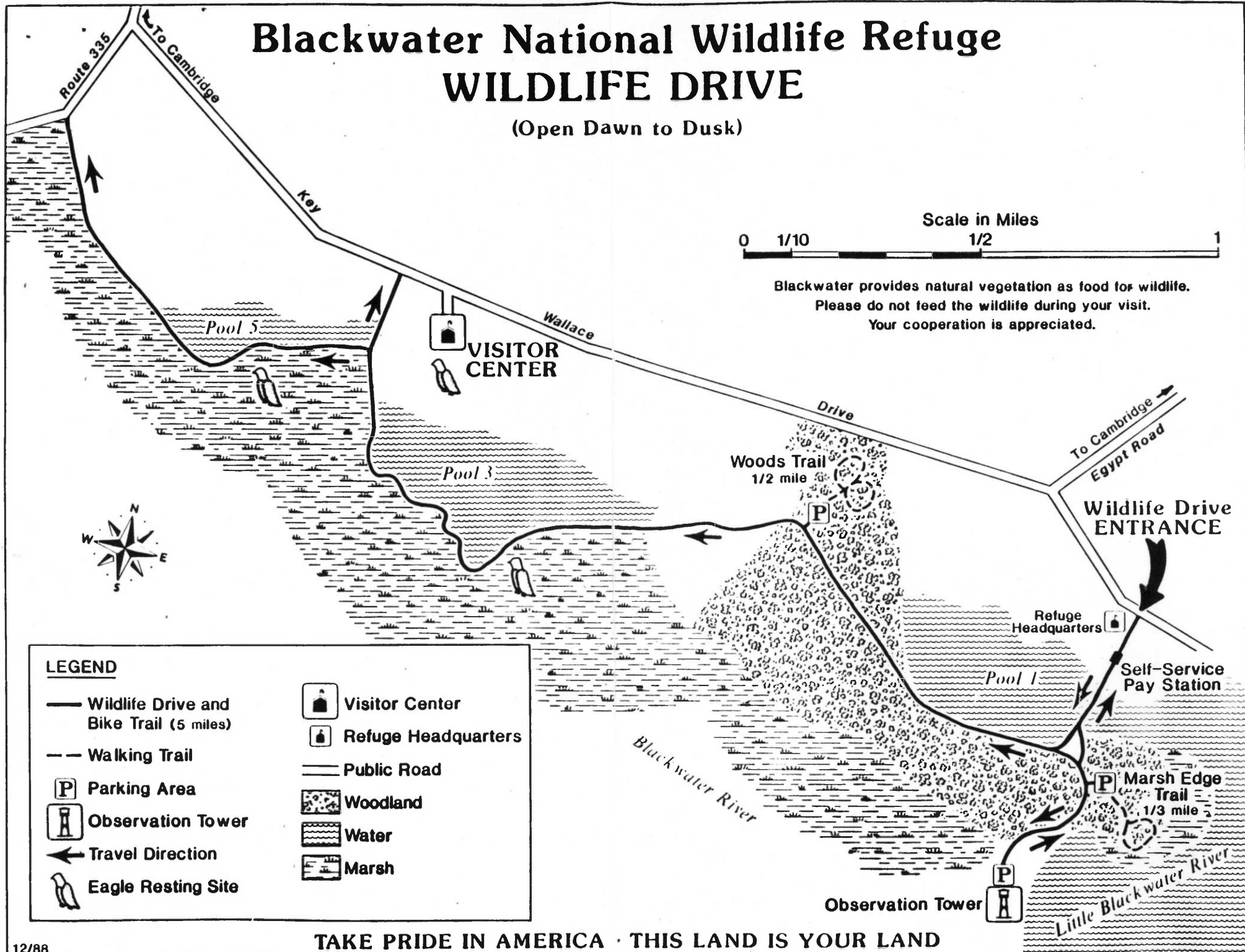
Blackwater National Wildlife Refuge WILDLIFE DRIVE

(Open Dawn to Dusk)

Scale in Miles



Blackwater provides natural vegetation as food for wildlife.
Please do not feed the wildlife during your visit.
Your cooperation is appreciated.



LEGEND

— Wildlife Drive and Bike Trail (5 miles)

- - - Walking Trail

P Parking Area

Observation Tower

Travel Direction

Eagle Resting Site

Visitor Center

Refuge Headquarters

— Public Road

Woodland

Water

Marsh

MARTIN NATIONAL WILDLIFE REFUGE

SOMERSET COUNTY, MARYLAND

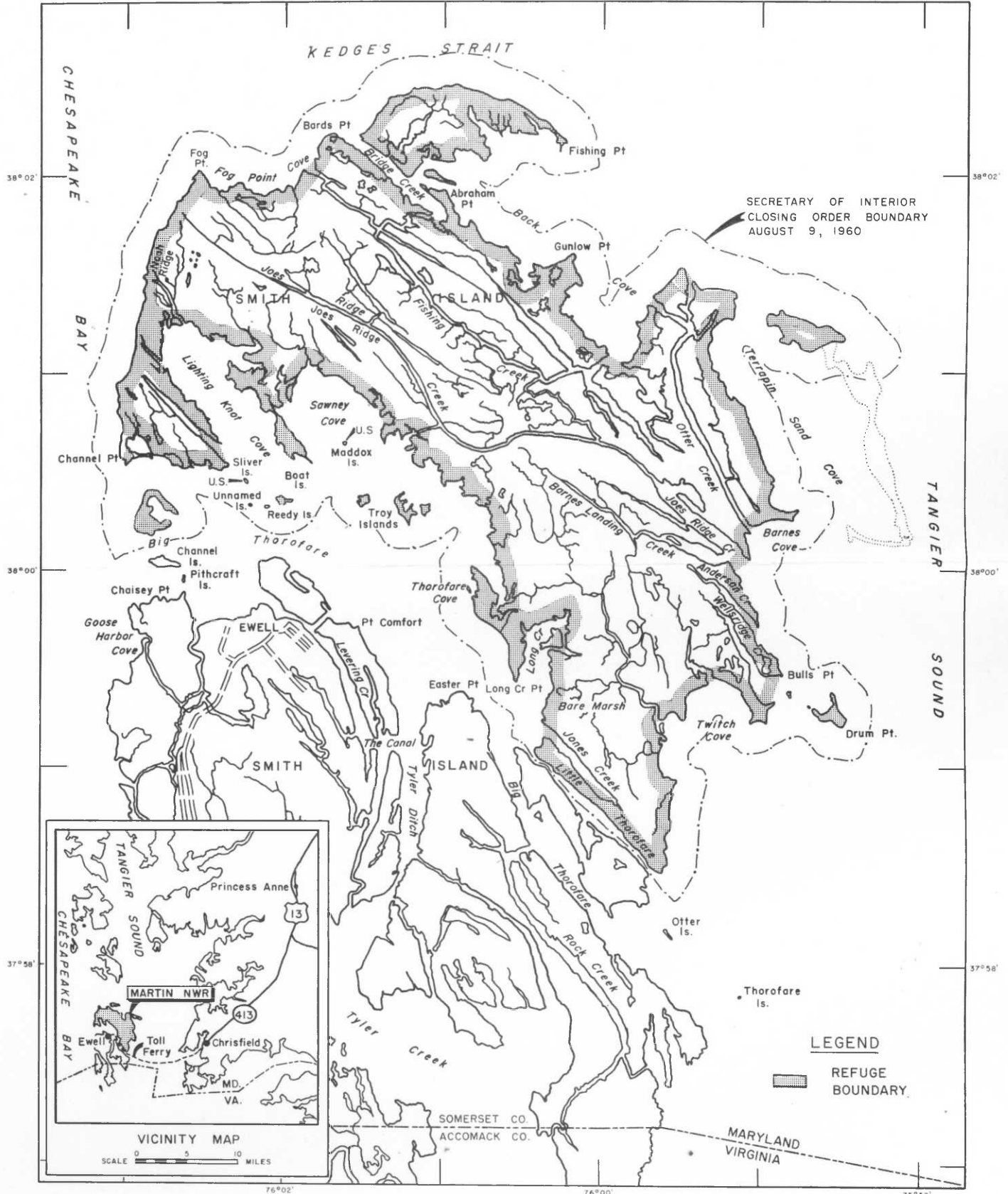
UNITED STATES
DEPARTMENT OF THE INTERIOR

FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE

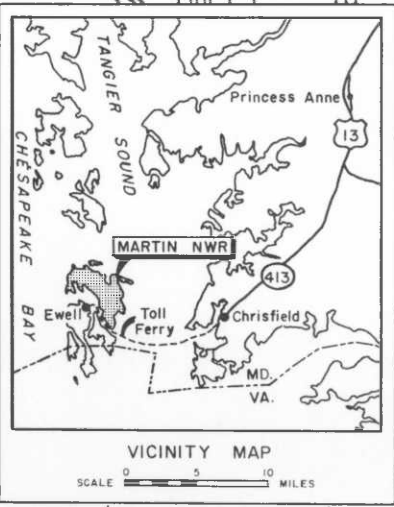
76°02'

76°00'

75°58'



SECRETARY OF INTERIOR
CLOSING ORDER BOUNDARY
AUGUST 9, 1960



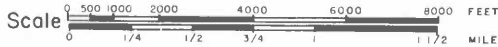
LEGEND

REFUGE BOUNDARY

COMPILED IN THE DIVISION OF REALTY
FROM SURVEYS BY U.S.G.S.

ATLANTA, GEORGIA

SEPTEMBER, 1970



MEAN DECLINATION
1970

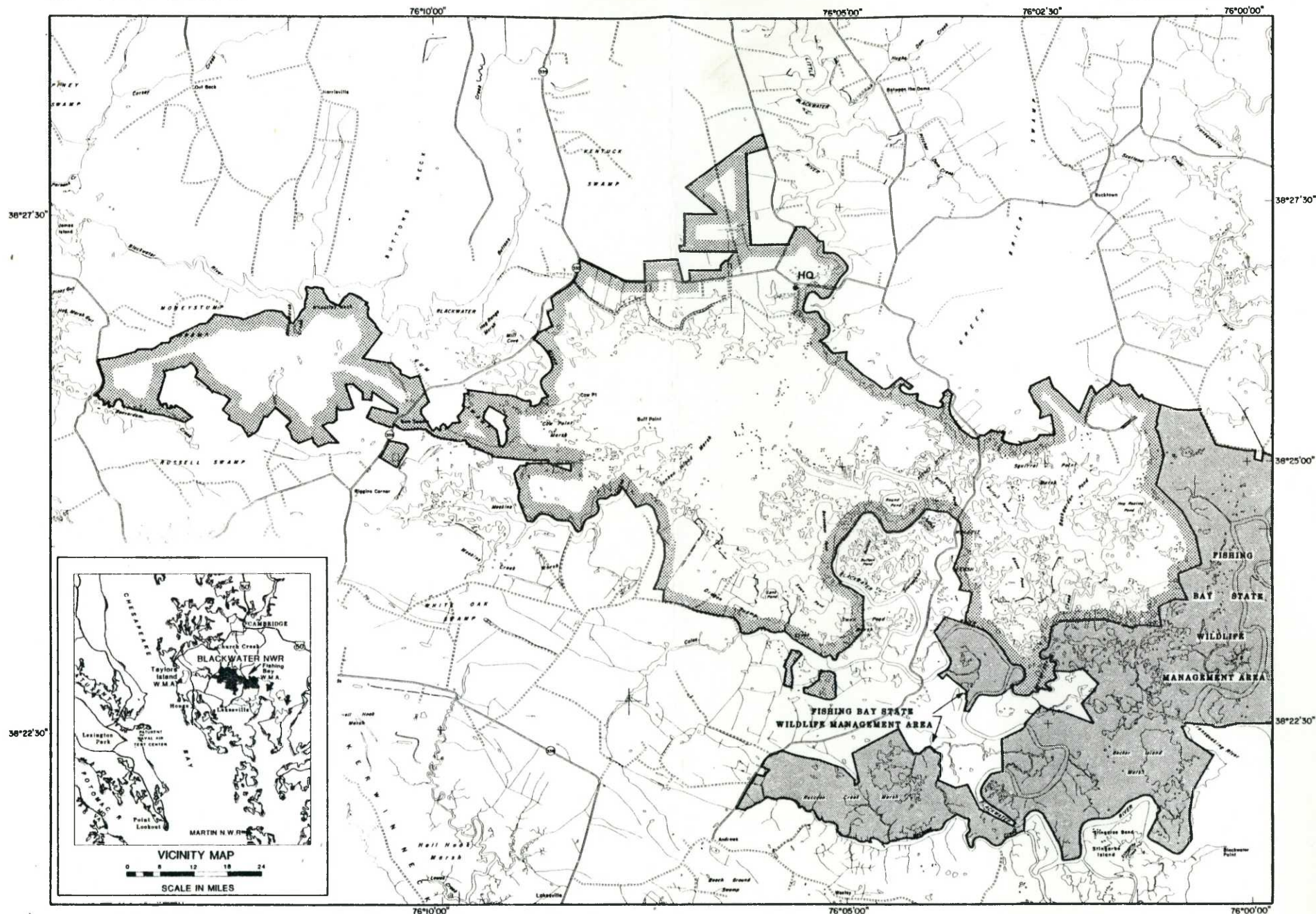
4R-MD-467-403

BLACKWATER NATIONAL WILDLIFE REFUGE

UNITED STATES
DEPARTMENT OF THE INTERIOR

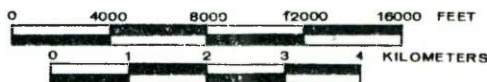
DORCHESTER COUNTY, MARYLAND

UNITED STATES
FISH AND WILDLIFE SERVICE



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NEWTON CORNER, MASSACHUSETTS MAY, 1980
REVISED: APRIL, 1985



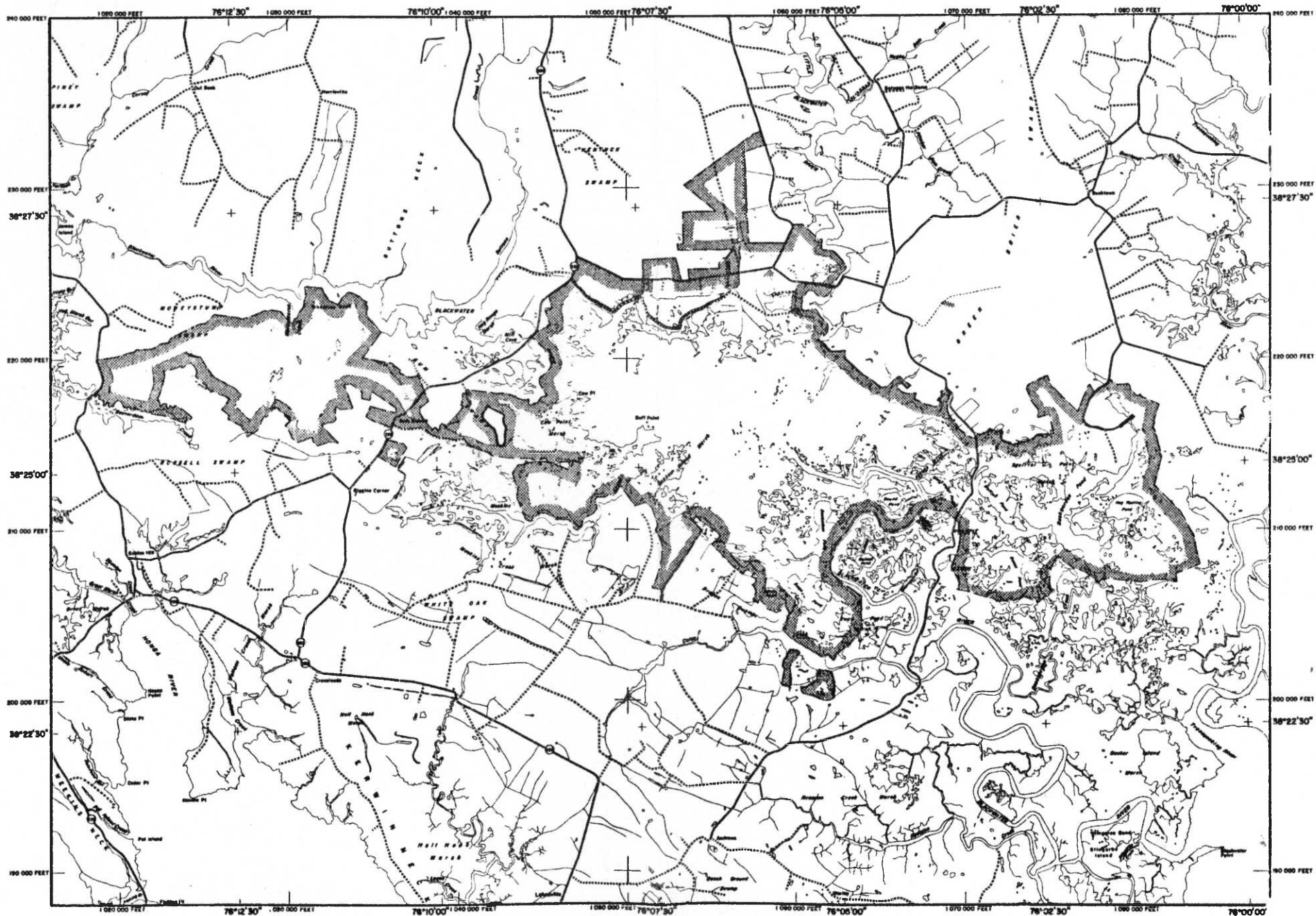
MEAN DECLINATION
1942

BLACKWATER NATIONAL WILDLIFE REFUGE

DORCHESTER COUNTY, MARYLAND

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
FISH AND WILDLIFE SERVICE



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MAY, 1980

